York Rapid Transit Plan

HIGHWAY 7 CORRIDOR AND VAUGHAN NORTH-SOUTH LINK PUBLIC TRANSIT IMPROVEMENTS TRANSPORTATION ASSESSMENT

FINAL REPORT

AUGUST 2005

IBI GROUP

TABLE OF CONTENTS

TABLE OF CONTENTS (CONT'D)

TABLE OF CONTENTS (CONT'D)

TABLE OF CONTENTS (CONT'D)

TABLE OF CONTENTS (CONT'D)

TABLE OF CONTENTS (CONT'D)

List of Exhibits

1. INTRODUCTION

As part of the York Rapid Transit Plan (YRTP), the Highway 7 corridor between Highway 50 and the York-Durham line has been identified as a key corridor for transit system improvements. The Highway 7 Environmental Assessment was initiated to review the feasibility of providing improved transit services on this corridor.

This report is a review of the implications of the current YRTP transit system proposal and provides input into future decisions regarding the Environmental Assessment. The EA report should be referenced for a more in depth description of the scope of the study. This report was developed through an iterative process where design options were refined based on interim transportation analysis.

1.1 Study Scope and Location

The study scope includes an evaluation of several alignment alternatives within York Region bounded by 16th Avenue to the north, Steeles Avenue in the south, Highway 50 in the west and the York/Durham Line in the east. The transportation assessment has analysed the various route alignments from west to east including the entire the Highway 7 corridor within York Region. The various routes diverting from this alignment were also analysed and include the:

- Highway 50 to Huntington Road loop;
- Vaughan north-south link via Jane Street, the Hydro corridor, Northwest Gate, Steeles Avenue and Keele Street;
- Centre Street corridor to Bathurst Street diversion;
- Woodbine Avenue to Yorktech Drive and Enterprise Drive at Warden Avenue;
- South Town Centre Boulevard to Enterprise Drive at Warden Avenue;
- Warden Avenue to Enterprise Drive;
- Enterprise Drive from Warden Avenue through the Markham Centre to Helen Avenue and Kennedy Road; and
- Bur Oak extension to/from Markham Stouffville Hospital.

To date, the process has identified a “preferred alternative” to provide a Rapid Transit System in a separate right-of-way, for the most part, in the central portion of the Highway 7 right-of-way. The preferred route is described in detail in Section 4.

1.2 Horizon Year and Analysis Periods

A 10 and 20-year horizon are being employed in the transportation forecast modelling work associated with the Environmental Assessment.

The subject section of Highway 7 serves traffic and pedestrian movements associated with neighbourhood access, retail/commercial development demands, industrial and office uses and

through commuter traffic demands. Accordingly, the critical or "worst-case" scenarios are represented by the weekday AM and PM peak hours of traffic.

1.3 Transportation Analysis Approach

1.3.1 APPROACH RATIONALE

The transportation assessment process for the Highway 7 EA was developed recognizing that:

- The Rapid Transit System will have immediate physical and operational effects on the Highway 7 corridor due to major changes in roadway cross-sections, access provisions and intersection operations; and

- The preferred alternative will need to account, as best as possible, the aggressive development aspirations throughout the study area, which will place additional demands along Highway 7 and intersecting north-south arterial road facilities.

In many instances, the immediate physical and operational effects of the Rapid Transit implementation along the Highway 7 corridor will occur regardless of the future demands. Our approach has been structured to best identify the effects of the preferred alternative on roadway and transit capacity, while recognizing the future demands associated with planned development.

The overall approach to these components is outlined in the following section.

1.3.2 GENERAL APPROACH

The impact assessment procedure used to complete the transportation assessment involves the following basic methodology:

- Assessment of the current roadway operating conditions within the study area (**Section 3**);

- Identification of current deficiencies including intersection operations, access, pedestrian operations and neighbourhood infiltration issues (**Section 3**);

- Application of the physical and operational changes to create the preferred alternative for the transit system initiative on and adjacent to the Highway 7 corridor (**Section 5**);

- Assessment of the immediate effects of the preferred alternative on the operations of the facilities (**Section 6**), including:

    - Intersection operations;

    - Pedestrian facilities;

    - Access modifications and traffic redistribution;

    - Transit facility operations including stop locations and transition areas; and

    - Traffic infiltration issues.

- Review of the effects of future development and the associated road user volumes on key constraints/intersections in the proposed road network (**Section 7**); and

- Identification of remedial measures to maintain acceptable operations of the proposed arterial road network and the study intersections in the short and long term (**Section 10**).

1.4 Highway 7 Widening Component

In addition to reviewing the implications and impacts of the current transit system proposed, this report forms the needs and justification for Highway 7 to be widened from four lanes to six lanes from Montgomery Court/Fairburn Drive easterly to Sciberras Road and assesses the resulting operating conditions of the recommended alternative and associated mitigating measures.

The Highway 7 Widening EA is being conducted in conjunction with the Highway 7 Rapid Transit EA and is discussed in Section 8.

2. DATA COLLECTION

2.1 Turning Movement Counts and Signal Timings

Existing AM and PM turning movement counts were obtained from the Region of York, Town of Richmond Hill, Town of Markham and City of Vaughan for the respective intersections under their jurisdiction. Peak hour turning movement counts were commissioned at key intersections and access locations on Highway 7 and the proposed routes at locations where data was outdated or unavailable. The intersections of interest and their type of control are summarized in **Exhibit 2-1**.

There are approximately 94 signalized and 47 unsignalized intersections along the Highway 7 corridor and other potential Rapid Transit diversion routes. All the signalized intersections are operating at a cycle length of 120 seconds with the exception of the intersections at Highway 427 S-E/W Off-Ramp, Wooten Way, Markham By-Pass and Reesor Road. The controller types are all actuated coordinated with the exception of Main Street Markham and York-Durham Line, which operate as pre-timed intersections.

Exhibit 2-1-Existing Intersections

Existing Intersections on Highway 7	Control Type
Highway 50	Signalized
Huntington Road	Unsignalized
Highway 427 W-S On-Ramp	Unsignalized
Highway 427 E-S On-Ramp	Unsignalized
Highway 427 S-E/W Off Ramp	Signalized
Vaughan Valley Boulevard / Roybridge Gate	Signalized
Highway 27	Signalized
Hy and Zel Plaza/Leisure Lane	Signalized
Martin Grove Road	Signalized
Woodstream Boulevard/Parkfield Court	Signalized

Existing Intersections on Highway 7	Control Type
Kipling Avenue	Signalized
Lansdowne Avenue/ McKenzie Street	Unsignalized
Wallace Street	Unsignalized
Islington Avenue	Signalized
Bruce Street	Signalized
Helen Street/Wigwoss Drive	Signalized
Jersey Street/Sylvan Brook	Unsignalized
Pine Valley Drive	Signalized
Marycroft Avenue/Aberdeen Avenue	Signalized
Whitmore Road/Ansley Grove Road	Signalized
Nova Star Drive	Signalized
Weston Road	Signalized
Famous Avenue	Signalized
Highway 400 W-S On-Ramp	Unsignalized
Colossus Drive/Highway 400 N-E/W Off-Ramp	Signalized
Highway 400 E-S On-Ramp	Unsignalized
Highway 400 W-N On-Ramp	Unsignalized
Highway 400 S-E/W Off-Ramp	Signalized
Highway 400 E-N On-Ramp	Unsignalized
Commerce Street	Unsignalized
Edgeley Boulevard/Interchange Way	Signalized
Millway Avenue	Signalized
Jane Street	Signalized
Maplecrete Road	Unsignalized
Creditstone Road	Signalized
Costa Road	Unsignalized
Keele Street	Signalized
Baldwin Avenue/Bowes Road	Signalized
Centre Street/North Rivermede Road	Signalized
Rivermede Road	Signalized
Bradwick Drive	Unsignalized
Langstaff Road	Signalized
Thornhill Woods Drive	Signalized
Bathurst Avenue Connection Road	Signalized
Hunter's Point Drive	Signalized
Yonge Street Connection Ramp	Signalized
Red Maple Road	Signalized
Silver Linden Drive	Signalized
Bayview Connection Ramp	Signalized
Doncrest Road (Commercial Entrance)	Unsignalized
Chalmers Road/South Park Drive	Signalized
Rockwell Road	Unsignalized

Existing Intersections on Highway 7	Control Type
Saddlecreek Drive	Signalized
Valleymede Drive/Times Avenue	Signalized
Pond Drive	Unsignalized
Commerce Valley Drive West/West Beaver Creek	Signalized
Leslie Street	Signalized
Commerce Valley Drive East/East Beaver Creek	Signalized
Highway 404 W-S On-Ramp	Unsignalized
Highway 404 N-E/W Off-Ramp	Signalized
Highway 404 E-S On-Ramp	Unsignalized
Highway 404 W-N On-Ramp	Unsignalized
Highway 404 S-E/W Off-Ramp	Signalized
Highway 404 E-N On-Ramp	Unsignalized
Allstate Parkway/East Valhalla Drive	Signalized
FrontenacDrive/Cochrane Drive	Signalized
Woodbine Avenue	Signalized
Lunar Crescent	Signalized
Fairburn Drive/Montgomery Court	Signalized
Rodick Road	Signalized
Town Centre Boulevard	Signalized
Warden Avenue	Signalized
Verclair Gate	Signalized
Village Parkway	Signalized
Sciberras Road	Unsignalized
Shoppes of Unionville Plaza	Signalized
South Drive	Unsignalized
Eureka Street	Unsignalized
Union Street	Unsignalized
Main Street Unionville	Signalized
Meadowbrook Lane	Unsignalized
Kennedy Road	Signalized
2nd Street	Unsignalized
Swansea Road	Signalized
Oakcrest Avenue	Unsignalized
Bullock Drive/Plaza	Signalized
Markville Mall Main Entrance	Signalized
McCowan Road	Signalized
Laidlaw Boulevard/Conservation Avenue	Signalized
Robinson Street/St. Patrick School Entrance/Jolyn Road	Signalized
Thatcher's Mill Way	Unsignalized
Grandview Boulevard/Galsworthy Drive	Signalized
Ovida Boulevard	Unsignalized

Existing Intersections on Highway 7	Control Type
Milne Lane	Unsignalized
Windridge Drive	Unsignalized
McPhillips Avenue	Unsignalized
Main Street Markham	Signalized
Washington Street	Unsignalized
Jerman Street	Unsignalized
Albert Street/Cosburn Road	Signalized
Savannah Crescent	Unsignalized
Wideman Street / Christman Court	Unsignalized
Wooten Way	Signalized
9th Line	Signalized
Markham By-Pass	Signalized
Reesor Road	Signalized
York Durham Line	Signalized
Intersections on Jane Street	**Control Type**
Doughton Road	Unsignalized
Interchange Way	Signalized
Highway 407 E-N/S off-ramp / N/S-W on-ramp	Signalized
Highway 407 W-N/S off-ramp	Signalized
Intersections on Steeles Avenue	**Control Type**
North West Gate	Unsignalized
Founders Road	Signalized
Intersections on Keele Street	**Control Type**
Snidercroft Road / Ron Rose Drive	Signalized
Highway 407 W-N/S off-ramp	Signalized
Highway 407 E-N/S off-ramp	Signalized
Doney Crescent / Jardin Drive	Signalized
Rockview Gardens	Unsignalized
Intersections on Centre Street	**Control Type**
Dufferin Street	Signalized
Wade Gate / Concord Road	Signalized
Carl Tennen Street / Vaughan Boulevard	Signalized
New Westminster Boulevard	Signalized
North Promenade Mall	Signalized
Bathurst Street	Signalized
Intersections on Bathurst Street	**Control Type**
Beverley Glen Boulevard	Unsignalized
Westminster Drive / Atkinson Avenue	Signalized
Westmount Boulevard	Unsignalized
Worth Boulevard / Flamingo Road	Signalized
Highway 407 W-N/W off-ramp	Signalized
Highway 407 W-N/S off-ramp	Signalized

Existing Intersections on Highway 7	Control Type
Bathurst Street Connection Road	Signalized
Intersections on Woodbine Avenue	**Control Type**
Yorktech Drive/Lanark Road	Signalized
Intersections on South Town Centre Boulevard	**Control Type**
Clegg Road	Unsignalized
Cedarland Drive	Unsignalized
IBM Driveway and Connection Ramp to Warden Avenue	Unsignalized
Intersections on Warden Avenue	**Control Type**
Cedarland Drive	Unsignalized
Enterprise Drive	Signalized
Intersections on Kennedy Road	**Control Type**
Helen Avenue / Unionville GO Station	Signalized
Unionville Gate	Signalized
Castan Avenue	Unsignalized
Avoca Road	Signalized
Eton Street	Unsignalized

2.2 Field Investigations

York Consortium transportation staff completed field investigations to:

- Confirm intersection lane configurations;
- Signal timings;
- Storage lengths;
- Access provisions; and
- Overall operation of critical intersections.

The existing lane configurations are illustrated in **Appendix A**.

Since the planned transit system right-of-way will change land access provisions on Highway 7 corridor routes, York Consortium transportation staff completed field investigations and commissioned turning movement counts at major access locations to:

- Record the level of traffic activities at major commercial and residential accesses and determine alternative routing of residents, visitors and patrons with restricted access; and
- Assess the potential for vehicles to infiltrate neighbourhoods due to restricting unsignalized and commercial accesses to right-in/right-out movements.

2.3 Background Reports

The following transportation related studies have been referenced in obtaining projected traffic volumes and development within the Highway 7 corridor.

Exhibit 2-2-Background Reports

Report	Date	Prepared by
10 Allstate Parkway Transportation Study	September 2004	IBI Group
Bayview Glen Community Transportation Study	July 2002	Marshall Macklin Monaghan
Cornell Community Transportation Study Update	October 2003	iTrans
Highway 7 / Warden Avenue Mixed-Use Development Traffic Study	May 2004	iTrans
Huntington Business park Transportation Analysis	September 2002	Dillon Consulting
Markham Centre West Master Plan Transportation Study	December 2001	iTrans
Property Protection for Steeles Rapid Transit Terminal Facilities	January 2001	Cansult Limited
Thornhill Centre Street Study	September 2004	IBI Group
Transportation Infrastructure Requirement Study East Beaver Creek Business Park, Town of Richmond Hill	May 2002	Earth Tech Canada Inc.
Vaughan Corporate Centre Transportation/Transit Planning and Functional Design Study	October 2000	Cansult Limited
York / Peel Boundary Area Transportation Study	June 2002	iTrans

3. EXISTING TRANSPORTATION OPERATIONS

3.1 Area Road Network

3.1.1 ARTERIAL AND COLLECTOR ROADWAYS

Highway 7 is an arterial roadway that travels across central Ontario connecting Ottawa in the east to London in the west. The road changes jurisdiction from a provincial highway to a regional road between the Town of Markham and the City of Brampton.

Included in **Exhibit 3-1** is a summary of the basic lane cross-sections through the study area on Highway 7 and **Exhibit 3-2** summarizes the cross-section on the other routes that the proposed Rapid Transit System will operate on.

Exhibit 3-1-Highway 7 Cross-Section

Road Section	Cross-Section
York-Peel Boundary (Highway 50) to Highway 427	Six lane
Highway 427 to Kipling Avenue	Seven lane
Kipling Avenue to Humber River	Four lanes
Humber River to Bruce Street	Four lanes
Bruce Street to Weston Road	Seven lanes
Weston Road to just east of Fairburn Drive/Montgomery Court	Six lanes
Fairburn Drive/Montgomery Court to Markham By-Pass	Five lanes
Markham By-Pass to York-Durham Line	Two lanes

Exhibit 3-2-Cross-Sections of Other Proposed Route Links

Road Section	Cross-Section
Jane Street from Highway 7 to north of Highway 407	Four lanes
Jane Street from north of Highway 407 to south of Highway 407	Six lanes
Jane Street from south of Highway 407 to Steeles Avenue	Four lanes
Steeles Avenue from North West Gate to Keele Street	Six lanes
Keele Street from Steeles Avenue to Snidercroft / Ron Rose Drive	Four lanes
Keele Street from Snidercroft / Ron Rose Drive to Jardin Drive / Doney Crescent	Six lanes
Centre Street from Highway 7 to Dufferin Street	Four lanes
Centre Street from Dufferin Street to New Westminster Gate	Five lanes
Centre Street from New Westminster Gate to Bathurst Street	Four lanes
Bathurst Street from Centre Street to Flamingo Road/Worth Boulevard	Four lanes
Bathurst Street from Flamingo Road/Worth Boulevard to Bathurst Street Connection Ramp	Six lanes
Woodbine Avenue from Highway 7 to Yorktech Drive	Six lanes
Town Centre Boulevard from Highway 7 to IBM	Four lanes
Warden Avenue from Highway 7 to Enterprise Drive	Four lanes
Kennedy Road from Helen Avenue to Highway 7	Four lanes

Arterial and major collector north-south roadways and major ramp junctions on Highway 7 and within the study area include from west to east:

- Regional Road 50;
- Highway 427 S-E/W Ramp;
- Region Road 27;
- Martin Grove Road;
- Kipling Avenue;
- Islington Avenue;
- Pine Valley Drive;
- Marycroft Avenue / Aberdeen Avenue;
- Whitmore Road / Ansley Grove Road;
- Weston Road;
- Highway 400 N-E/W Ramp;
- Highway 400 S-E/W Ramp;
- Interchange Way / Edgeley Boulevard;
- Jane Street;
- West Beaver Creek/Commerce Valley Drive West;
- Leslie Street;
- East Beaver Creek / Commerce Valley Drive East;
- Highway 404 N-E/W Ramp;
- Highway 404 S-E/W Ramp;
- Allstate Parkway / East Valhalla Drive;
- Woodbine Avenue;
- Rodick Road;
- Town Centre Boulevard;
- Warden Avenue;
- Village Parkway;
- Main Street Unionville;

- Creditstone Road;
- Keele Street;
- Centre Street / North Rivermede Road;
- Dufferin Street;
- Langstaff Road;
- Bathurst Street;
- Yonge Street;
- Red Maple Road;
- Bayview Avenue;
- Valleymede Drive / Times Avenue;
- Kennedy Road;
- Bullock Drive;
- McCowan Road;
- Main Street Markham (formerly Highway 48);
- Wooten Way;
- 9th Line;
- Markham By-Pass;
- Reesor Road; and
- York-Durham Line.

Other arterial and major collector roadways on the other proposed route links include:

- Interchange Way (Jane Street);
- Dufferin Street (Centre Street);
- New Westminster Drive (Centre Street);
- New Westminster Drive/Atkinson Avenue (Bathurst Street); and
- Flamingo Road/Worth Boulevard (Bathurst Street).

3.1.2 TRAFFIC VOLUME AND COMPOSITION

The average annual daily traffic (AADT) along Highway 7 varies from 74,450 to 8,270 vehicles. Provided in **Exhibit 3-3** below is a summary of the 2002 AADT for representative locations along the Highway 7 corridor.

Exhibit 3-3-Highway 7 Average Annual Daily Traffic Volumes

Location	2002 AADT (Vehicles Per Day)
East of Highway 50	54,930
East of Highway 427	38,690
East of Highway 27	37,970
West of Martin Grove Road	38,470
West of Kipling Avenue	42,080
West of Islington Avenue	44,060
East of Islington Avenue	38,600
West of Weston Road	52,180
West of Highway 400 West Ramp	71,480
East of Highway 400 East Ramp	74,450
East of Jane Street	52,290
East of Keele Street	44,140
East of Centre Street	30,680
West of Bathurst Street	38,480
East of Bathurst Street	43,500
East of Yonge Street	58,350
West of Leslie Street	58,420
East of Leslie Street	63,260
East of East Beaver Creek Road	61,100
East of Highway 404 East Ramp	65,380
East of Allstate Parkway	52,250
East of Woodbine Avenue	43,040
West of Warden Avenue	40,880
East of Warden Avenue	39,000
East of Kennedy Road	37,630

Location	2002 AADT (Vehicles Per Day)
East of McCowan Road	27,880
West of Highway 48	27,210
West of Ninth Line	15,950
East of Ninth Line	8,270
East of Markham By-Pass	10,390
West of York-Durham Line	15,070
Notes: Based on automatic traffic recorder (ATR) counts provided by the Region of York	

Truck movements vary considerably along Highway 7 with a higher percentage west of Highway 427 at approximately 11% of the vehicle composition during the daily traffic. West of Pine Valley Drive, the truck percentages average approximately 7% and decreases to approximately 6% east of Weston Road. In the east end of the study limits the truck percentage is approximately 4%.

The 2001 AADT volumes were summarized for the proposed route links where the transit vehicle will divert from Highway 7 and are summarized in **Exhibit 3-4.**

Exhibit 3-4-Average Annual Daily Traffic Volumes on the other Proposed RT Links

Location	2001 AADT (Vehicles Per Day)
Jane Street north of Steeles Avenue	26,920
Jane Street south of Highway 7	31,840
Steeles Avenue west of Keele Street	45,190
Keele Street south of Highway 7	30,930
Centre Street west of Dufferin Street	20,200
Centre Street east of Dufferin Street	22,230
Bathurst Street south of Highway 7	35,900
Woodbine Avenue south of Highway 7	33,170
Warden Avenue south of Highway 7	30,380
Kennedy Road north of Helen Avenue	39,000
Kennedy Road south of Highway 7	28,150

3.1.3 PEAK TRAFFIC PERIODS

The subject section of Highway 7, as well as the other proposed route links, serve traffic and pedestrian movements associated with neighbourhood access, retail/commercial development demands, and through commuter traffic demands. The peak travel demands occur during the weekday AM and PM peak hours associated with commuter/work related travel.

Generally, off-peak and weekend traffic levels are considerably less than those experienced during the weekday AM and PM peak periods. The existing AM and PM peak hour volumes are included in **Appendix B**.

3.2 Local/Regional Public Transit Network

The existing bus routes operate in mixed traffic on Highway 7 without designated transit lanes, HOV lanes, or signal priority on Highway 7. The existing routes are operated as York Region Bus Routes. There are currently no east-west Toronto Transit Commission (TTC) Routes or GO Bus

Routes that operate on Highway 7 within the limits of the Highway 7 EA. TTC and GO Transit operate a number of routes on the major north-south arterial roads intersecting Highway 7 and other routes between Highway 27 and 9th Line. These are outlined in **Section 3.2.2**

3.2.1 YORK REGION TRANSIT BUS ROUTES ON HIGHWAY 7

Several east-west York Region Transit Bus Routes operate along Highway 7 between Highway 27 and 9th Line. These routes are as follows:

- **YRT Route 1** - operates from Finch Subway Station to the Markham-Stouffville Hospital. As part of this route, the buses travel on Highway 7 from east of Yonge Street (Red Maple Road) to 9th Line (Markham-Stouffville Hospital). Limited service is available during the peak periods to Warden Avenue and the IBM bus loop via Town Centre Boulevard.

- **YRT Route 6** - operates from Weston Road and Langstaff Road to Steeles Avenue and Islington Avenue. As part of this route, the buses travel on Highway 7 from Pine Valley Drive to Ansley Grove Road.

- **YRT Route 40** - operates from Markville Mall to Rodick Road and Woodbine Avenue. As part of this route, the buses travel on Highway 7 from Scarborough Town Centre Boulevard to Warden Avenue.

- **YRT Route 77** - operates between the Bramalea City Centre and the Finch Subway Station. As part of this route, the buses travel on Highway 7 from Bramalea City Centre to west of Dufferin (North Rivermede Road).

- **YRT Route 83** - operates from Yonge and Bernard to the Promenade Mall at Bathurst and Clark Avenue. Service is occasionally extended to the Richmond Hill Secondary School and Langstaff GO Station. This route connects to GO Transit during the peak periods. As part of this route, the buses travel on Highway 7 from east of Bathurst Street to west of Yonge Street.

- **YRT Route 87** - operates from the Mosque and Teston Road intersection to the Bayview and Bantry Avenue intersection. As part of this route, the buses travel to the Rutherford GO station, travel on Highway 7 from Thornhill Woods Drive to Hunter's Point Drive, travel on Highway 7 from Garden Avenue to Red Maple Road, and travel to the Langstaff GO Station. This bus route operates during the morning rush hour (from about 6:00 a.m. to 9:00 a.m.) and the afternoon rush hour (from about 3:00 p.m. to 8:00 p.m.).

- **YRT Route 90** - operates from Bathurst Street and Shaftsbury Avenue to Leslie Street and Highway 7. Service is occasionally extended to the Seneca Campus and the Don Mills Subway during the morning and the afternoon peak periods. As part of the rush-hour route, the buses travel on Highway 7 from Leslie Street to Highway 404.

- **YRT Route 300** – the business express 300 operates from Finch Subway via Highway 407 to Commerce Valley Drive West where it travels easterly on Highway 7 to Town Centre Boulevard and then to Warden Avenue and Enterprise Drive. This express route only operates during rush hour periods.

3.2.2 EXISTING YORK REGION BUS ROUTES ON STUDY AREA ROADWAYS

Several north-south bus routes operate through the Highway 7 corridor. As the planned Rapid Transit System will not only operate along Highway 7, the existing bus routes have been examined along a number of the routes in high-density areas that the transit system may operate.

Exhibit 3-5-Existing Transit Routes

Bus Route Number	Peak Period Headways	Existing Route
TTC Route 35D	11 minutes	From Jane Street subway to Courtland Avenue.
TTC Route 20	30 minutes	New route operates from York University to the new Vaughan Mills Mall Terminal via Jane Street and Interchange Way.
TTC Route 10	45 minutes	Operates along Steeles Avenue West from York University to Weston Road where it crosses Highway 7 at Whitmore Road travelling to Islington Avenue and Langstaff Road.
YRT Route 3/3A	20 minutes	Travels between Don Mills Road/Steeles Avenue to York Universtiy.
TTC Route 107B	17 minutes	From Downsview via Jane Street to GO Rutherford Station.
TTC Route 107C	17 minutes	From Teston Road via Jane Street to north of Major Mackenzie Drive to Downsview.
YRT Route 77	15 minutes	Travels on Centre Street from Bramalea City Centre on Highway 7 to Yonge Street and ends at the GO Finch Bus Terminal.
YRT Route 88	20 minutes	Travels on Bathurst Street to/from Seneca College King Campus to Steeles Avenue where it connects to Yonge Street and terminates at the GO Finch Bus Terminal.
YRT Route 83	20 minutes	Operates on Bathurst Street to/from the Promenade Mall to Highway 7 where it terminates at Elgin Mills Road via local collector roads.
TTC Route 68B	15 minutes	Operates on Warden Avenue between the Warden subway station to 16th Avenue.
YRT Route 8	15 to 30 minutes	Travels on Kennedy Road from Steeles Avenue, connecting to Unionville GO Station and terminating at Major Mackenzie Drive.
GO Bus	N/A	GO Transit operates an express bus from York University to the Stouffville Hospital. The route runs on Kennedy Road stopping at Unionville GO station.

3.2.3 GO TRANSIT TERMINALS AND OTHER MAJOR TRANSIT TERMINALS OR CENTRES

The major transit terminals or centres where transit is prevalent are generally located at the Malls. A new terminal was opened in Nov 2004 on Jane Street south of Rutherford Road and will service the Vaughan Mills area. Additional terminals and centres are located within the Highway 7 corridor and along the proposed links include:

- Vaughan Mills Mall Terminal opening Nov 2004 on Jane Street south of Rutherford Road;
- Promenade Mall Terminal at Bathurst Street and Centre Street;
- York University Terminal at Steeles Avenue and Keele Street;
- Markville Mall at Highway 7 and McCowan Road; and
- Markham Stouffville Hospital at Ninth Line north of Highway 7.

There are four GO Transit Terminals in proximity to Highway 7 within York Region:

- **GO Langstaff Terminal** – Located on Langstaff Road south of Highways 7 and Highway 407 in Markham, on the Richmond Hill Line. GO Trains operate on 30 minute headways during the weekday AM and PM peak periods and 60 minute headways until 8:15 PM. There is no off-peak train service to this station. There is GO Bus service to the terminal throughout the day;
- **GO Unionville Terminal** – Located at Kennedy Road and Helen Avenue in Markham, on the Stouffville and Highway 407 Lines, with primary access via Kennedy Road. GO Trains operate on headways of between 30 and 70 minutes during the weekday AM and PM peak periods. Several GO busses service the terminal, on approximately 60-minute headways, throughout the day;
- **GO Centennial Terminal** – Located at the intersection of Bullock Drive and McCowan Road in Markham, on the Stouffville and Highway 407 Lines. Primary access to the terminal is via Bullock Drive. GO Trains operate on headways of between 30 and 70 minutes during the weekday AM and PM peak periods. Several GO busses service the terminal, on approximately 60-minute headways, throughout the day; and
- **GO Markham Terminal** – Located at Main Street north (Highway 48) and Station Street in Markham, on the Stouffville and Highway 407 Lines. Primary access to the terminal is via Station Street. GO Trains operate on headways of between 30 and 70 minutes during the weekday AM and PM peak periods. GO busses service the terminal throughout the day with approximately 60-minute headways.

3.2.4 PARK AND RIDE LOTS

The park and ride lots within the Highway 7 corridor are located in the east end of the study area. All of the lots offer free parking to transit patrons. The following park and ride lots and their location are summarized as follows:

- **Markham Village Community Centre** at Main Street Markham southeast of Highway 7;
- **Markville Mall** at Highway 7 and McCowan; and

- **First Markham Place** at Highway 7 and Fairburn Drive.

3.3 Land Uses and Highway 7 Access

Included in **Section 4.6** of the Environmental Study Report is a summary of the dominant land uses adjacent to Highway 7 within the study area. The land uses within the study area and their respective access provisions are reviewed as part of the impact assessment included in **Section 6.5** of this report.

3.4 Pedestrian/Cycling Demand

3.4.1 PEDESTRIAN DEMAND

The pedestrian volumes within the Highway 7 corridor vary significantly from one area to the next and are a function of adjacent land uses and transit facilities. There are pockets of developed commercial areas, industrial areas and recent and established residential areas, which generate significant pedestrian traffic.

The east and west limits of the study area are presently undeveloped with minimal commercial/industrial accesses and therefore the pedestrian/cycling demand in this area is negligible. As a result the speed limits in these areas are relatively high at 70 to 80 km/hr. The central section of Highway 7 from Centre Street to Bayview Avenue also operates at relatively high speeds due to a wide right-of-way, minimal adjacent development and low pedestrian volumes.

Included in **Exhibit 3-6** and **Exhibit 3-7** are summaries of the existing high or active pedestrian areas along Highway 7 and the proposed Rapid Transit routes. There are no off-road recreational pedestrian routes provided within the study area.

Exhibit 3-6-High Pedestrian Areas - Retail

Location	Characteristics
Highway 7/Martin Grove Road	• Woodbridge Mall
Highway 7/Lansdowne Avenue / Mackenzie Street	• Woodbridge Public Elementary School
Bruce Street	• Woodbridge High School
Islington Avenue	• Key transit transfer area • Woodbridge Pool and Memorial Arena
Marycroft Avenue / Aberdeen Avenue to Weston Road	• High-density commercial area, Colossus Centre, Seven and 400 Power Centre, Piazza al Sole, Woodbridge Square. • The Colossus Movie Theatre
Steeles Avenue between Jane Street and Keele Street	• York University and Seneca College • Black Creek Pioneer Village
Keele Street	• Key transit transfer area
Centre Street/Bathurst Street	• Promenade Mall
Bathurst Street/New Westminster Drive	• Westmount Collegiate • Benjamin Vaughan Complex
Chalmers Road to Commerce Valley Drive East	• Commercial area • Office area
Woodbine Avenue	• Key transit transfer area

Location	Characteristics
Fairburn Drive / Montgomery Court	• Woodside Centre, First Markham Place • Cineplex Odeon Movie Theatre
Warden Avenue	• Key transit transfer area • Markham Town Square
McCowan Road and Bullock Drive intersections	• Markville Shopping Centre • Strip malls and fast food restaurants
Main Street Markham	• Small Town feel with stores fronting Main Street, north of Highway 7. • On-street parking on north approach of intersection.

The following are major industrial areas on Highway 7 and the other proposed Rapid Transit routes that are also high pedestrian generators.

Exhibit 3-7-High Pedestrian Areas - Industrial

Industrial Centre	Area
West Woodbridge Industrial Park	Highway 7 from Highway 27 to Martin Grove Road
Pine Valley Business Park	South of Highway 7 from Pine Valley Drive to Weston Road
Canadian National Freight Classification Yard	Highway 7 from Jane Street to Bowes Road
Steeles East Industrial Area	Steeles Avenue between Jane Street and Keele Street
Langstaff Business Park	Highway 7 from North Rivermede to Dufferin Road
Bayview Glen Business Park	Highway 7 between Red Maple Road and Bayview Avenue
Beaver Creek Business Park	North of Highway 7 from West Beaver Creek to Highway 404
Buttonville Airport Industrial Park	Highway 7 from Highway 404 to Woodbine Avenue
IBM	Town Centre Boulevard south of Cedarland Drive

3.4.2 PEDESTRIAN FACILITIES

Pedestrian signal heads are provided at the majority of the signalized intersections in the study area. At the following locations Audible Pedestrian Signals (APS) have been installed to accommodate the visually challenged:

- Bullock Drive / Markham Mews Plaza / Highway 7; and
- McCowan Road / Highway 7.

3.4.3 CYCLING DEMAND

During field investigations, minimal bicycle travel was observed on Highway 7. Given the volume and speed of traffic on Highway 7, bicycle travel is limited to commuter/recreational intermediate to serious riders, i.e., inexperienced, casual and young cyclist would generally not be comfortable riding on Highway 7.

An off-road recreational cycling route exists along the east side of the Don River, which runs through the City of Vaughan. The pathway intersects Highway 7 west of Centre Street between the Keele Industrial Area and Langstaff Business Park. Another off-road cycling route is provided on the east side of Hunter's Point Drive from Highway 7 north through the South Richvale neighbourhood.

The Bikeway Implementation Strategy Phase 1 Report prepared by Marshall Macklin Monaghan for the Town of Markham, designates Town Centre Boulevard as a bicycle route to Cedarland Drive.

Highway 7 is not designated as an on-road route within the Town of Markham.

3.5 Existing Traffic Operations

3.5.1 OPERATIONAL RESTRICTIONS

Included in **Exhibit 3-8** is a summary of the prohibited movements on Highway 7 and other proposed Rapid Transit routes during all hours of the day. These movements prohibit right turns on red and have been simulated accordingly for existing conditions.

Exhibit 3-8-Prohibited Movements

Location	Movement Restricted
Jane Street and Interchange Way	Northbound left turn
Highway 7 and Centre Street / North Rivermede Road	Eastbound right turn
Highway 7 and Islington Avenue	Westbound right turn
Highway 7 and Famous Avenue	Eastbound right turn
Highway 7 and Hunter's Point Drive	Southbound right turn

In addition to the right turn restrictions, several intersections on Highway 7 operate with protected left turns. The following is a list of the intersections with fully protected left turn movements on Highway 7.

Exhibit 3-9-Protected Movements

Location	Fully Protected Left Turn
Highway 7/Highway 50	Southbound
Highway 7/Famous Avenue	Westbound
Highway 7/Highway 27	Eastbound/Westbound
Highway 7/Weston Road	Eastbound/Westbound
Highway 7/Keele Street	Eastbound/Westbound
Highway 7/Thornhill Woods	Eastbound
Highway 7/Bathurst Street	Eastbound
Highway 7/Hunter's Point Drive	Eastbound

Location	Fully Protected Left Turn
Highway 7/Yonge Street	Eastbound
Highway 7/Red Maple Road	Eastbound
Highway 7/Silver Linden Drive	Eastbound
Highway 7/Bayview Avenue	Eastbound
Highway 7/Woodbine Avenue	Eastbound/Westbound
Highway 7/Fairburn Road/Montgomery Court	Northbound
Highway 7/Main Street Markham	Eastbound/Westbound
Highway 7/Centre Street	Northbound
Dufferin Street/Centre Street	Northbound/Southbound

3.5.2 EXISTING INTERSECTION OPERATIONS

Intersection capacity analysis was undertaken using the Highway Capacity Manual (HCM) methodology and in particular, the Synchro 6.0 software package. A calibration exercise was conducted to ensure the results of the Synchro analysis best reflected the peak hour field observations. The saturation flows, peak hour factor and lost times were adjusted to simulate the existing conditions.

An intersection's overall operating conditions are typically characterized by two standard measures: the volume to capacity ratio (v/c) and the level of service (LOS). Taken together, they provide an indication of delay and the number of vehicles that can be accommodated through an intersection. The v/c ratio is an indication of the volume of traffic attempting to make a specific movement through an intersection (i.e., northbound left, westbound straight through), versus the theoretical capacity of that movement given the lane configurations, operating conditions and signal timings provided at the intersection. A v/c ratio of 1.0 represents a condition where all available capacity for a particular movement is being used.

The level of service (LOS) of the overall intersection or of a particular movement is a measure of the average vehicle delay experienced by the motorists attempting to travel through the intersection. LOS is measured from "A" to "F" with peak hour LOS in the "A" to "D" range being considered acceptable by most and a LOS of F representing unacceptable delays.

The analysis reflects recent turning movement counts, current signal timings, and existing lane configurations. The AM and PM peak hour analysis results for the signalized intersections are included in **Exhibit 3-10** and **Exhibit 3-11**, respectively. Full analysis summaries are included in **Appendix C**. The critical movements are defined as, turning movements approaching a v/c of 1.0 and/or Level of Service "E" or "F" (LOS).

Exhibit 3-10-Existing AM Peak Intersection Operations

Signalized Intersection Operations Existing AM Peak						
Intersection Reference	Overall		Critical			Comments
Highway 7 @	Delay	LOS	Delay	LOS	V/C	
Highway 50	188	F	705	F	>1.10	SB left is operating at capacity. EB through is approaching capacity.
Highway 427 S-E/W Off Ramp	26	C	82	F	1.07	NB right is operating at capacity.
Vaughan Valley Boulevard / Roybridge Gate	20	B	16	B	0.90	WB through is approaching capacity.
Highway 27	33	C	102	F	0.97	WB left is approaching capacity.
Hy and Zel Plaza / Leisure Lane	2	A	38	-	-	No capacity constraints.
Martin Grove Road	35	D	440	F	>1.10	NB left is operating at capacity.
Woodstream Boulevard / Parkfield Court	8	A	37	-	-	No capacity constraints.
Kipling Avenue	108	F	429	F	1.07	SB approach is operating at capacity. WB through is approaching capacity.
Islington Avenue	92	F	177	F	>1.10	EB through lanes are operating at capacity.
Bruce Street	24	C	65	-	-	No capacity constraints.
Helen Street / Wigwoss Drive	5	A	35	-	-	No capacity constraints.
Pine Valley Drive	27	C	80	F	0.93	WBL is approaching capacity.
Marycroft Avenue / Aberdeen Avenue	13	B	73	E	0.94	WB left is approaching capacity.
Whitmore Road / Ansley Grove road	35	D	64	-	-	No capacity constraints.
Nova Star Drive	7	A	48	-	-	No capacity constraints.
Weston Road	34	C	59	-	-	No capacity constraints
Famous Avenue	8	A	45	-	-	No capacity constraints.
Colossus Drive / Highway 400 N-E/W Ramp	20	B	49	-	-	No capacity constraints.
Highway 400 S-E/W Ramp	37	D	39	D	0.91	NB right is approaching capacity.
Edgeley Boulevard / Interchange Way	28	C	44	E	0.90	EB left is approaching capacity.
Millway Avenue	5	A	32	-	-	No capacity constraints.
Jane Street	64	E	116	F	1.10	EB through and NB left are operating at capacity. WB and SB left and SB through are approaching capacity.
Creditstone Road	26	C	35	-	-	No capacity constraints.

Signalized Intersection Operations **Existing AM Peak**						
Intersection Reference	Overall		Critical			Comments
Highway 7 @	Delay	LOS	Delay	LOS	V/C	
Keele Street	69	E	513	F	1.10	WB left is operating at capacity. NB and SB left are approaching capacity.
Baldwin Avenue / Bowes Road	15	B	38	-	-	No capacity constraints.
Centre Street / North Rivermede Road	20	C	44	-	-	No capacity constraints.
Rivermede Road	10	A	76	-	-	No capacity constraints.
Langstaff Road	13	B	42	-	-	No capacity constraints.
Thornhill Woods Drive	4	A	59	-	-	No capacity constraints.
Bathurst Street Connection Road	15	B	50	-	-	No capacity constraints.
Hunter's Point Drive	10	A	47	-	-	No capacity constraints.
Yonge Street Connection Road	16	B	58	-	-	No capacity constraints.
Red Maple Road	11	B	50	-	-	No capacity constraints.
Silver Linden Drive	24	C	35	D	0.92	WB through is approaching capacity.
Bayview Connection Road	23	C	44	-	-	No capacity constraints.
Chalmers Road / South Park Drive	14	B	36	-	-	No capacity constraints. South approach closed to traffic.
Saddlecreek Drive	71	B	109	-	-	No capacity constraints. South and north approaches closed to through traffic.
Valleymede Drive / Times Avenue	28	C	52	-	-	No capacity constraints.
Commerce Valley Drive West / West Beaver Creek	27	C	106	F	>1.10	EB left is operating at capacity.
Leslie Street	48	D	78	F	1.07	EB through will operate at capacity.
Commerce Valley Drive East / East Beaver Creek	60	E	103	F	>1.10	EB through will operate at capacity.
Highway 404 N-E/W Off-Ramp	39	D	80	F	0.97	SB left and right are approaching capacity.
Highway 404 S-E/W Off-Ramp	32	C	63	E	1.02	NB left is operating at capacity. NB right is approaching capacity.
Allstate Parkway / Valhalla Drive	20	C	52	D	0.95	EB left is approaching capacity.
Frontenac Drive / Cochrane Drive	13	B	38	-	-	No capacity constraints.
Woodbine Avenue	41	D	67	F	>1.10	WB left is operating at capacity and NB left is approaching capacity.

Signalized Intersection Operations **Existing AM Peak**						
Intersection Reference	Overall		Critical			Comments
Highway 7 @	Delay	LOS	Delay	LOS	V/C	
Lunar Crescent	3	A	39	-	-	No capacity constraints.
Montgomery Court/Fairburn Drive	15	B	27	-	-	No capacity constraints.
Rodick Road	22	C	50	-	-	No capacity constraints.
Town Centre Boulevard	19	B	108	F	0.93	NB left is approaching capacity.
Warden Avenue	38	D	69	F	0.93	WB through and left and SB through are approaching capacity.
Verclair Gate	8	A	36	-	-	No capacity constraints.
Village Parkway	10	A	52	-	-	No capacity constraints.
Shoppes of Unionville Plaza	6	A	36	-	-	No capacity constraints.
Main Street Unionville	15	B	35	-	-	No capacity constraints.
Kennedy Road	32	C	75	-	-	No capacity constraints.
Swansea Road	8	A	16	-	-	No capacity constraints.
Bullock Drive / Plaza	15	B	34	-	-	No capacity constraints.
Markville Mall Main Entrance	4	A	40	-	-	No capacity constraints.
McCowan Road	39	D	222	F	1.03	NB left is operating at capacity and WB left is approaching capacity.
Laidlaw Boulevard / Conservation Avenue	11	B	97	-	-	No capacity constraints.
Robinson Street / St. Patrick School Entrance	7	A	27	-	-	No capacity constraints.
Grandview Boulevard / Galsworthy Drive	5	A	32	-	-	No capacity constraints.
Main Street Markham	42	D	133	-	-	No capacity constraints.
Albert Street / Cosburn Road	8	A	43	-	-	No capacity constraints.
Wooten Way	15	B	31	-	-	No capacity constraints.
9th Line	44	D	251	F	>1.10	NB left and SB through are operating at capacity.
Markham By-Pass	10	B	34	-	-	No capacity constraints.
Reesor Road	54	D	299	F	>1.10	NB left is operating at capacity.
York Durham Line/Regional Road 30	26	C	42	-	-	No capacity constraints.
Intersection Reference	Overall		Critical			Comments
Jane Street @	Delay	LOS	Delay	LOS	V/C	
Interchange Way	9	A	34	-	-	No capacity constraints.
Highway 407 N/S-W and E-N/S Ramp	9	A	25	-	-	No capacity constraints.
Highway 407 W-N/S Ramp	10	B	27	-	-	No capacity constraints.
Steeles Avenue	66	E	113	F	>1.10	EB through, NB through and SB left are operation at capacity.

Signalized Intersection Operations **Existing AM Peak**						
Intersection Reference	Overall		Critical			Comments
Steeles Avenue @	Delay	LOS	Delay	LOS	V/C	
Founders Road	16	B	27	-	-	No capacity constraints.
Intersection Reference	Overall		Critical			Comments
Keele Street @	Delay	LOS	Delay	LOS	V/C	
Steeles Avenue	34	C	57	-	-	No capacity constraints.
Snidercroft Road / Ron Rose Drive	18	B	210	F	>1.10	NB left is operating at capacity.
Highway 407 W-N/S Ramp	11	B	32	-	-	No capacity constraints.
Highway 407 E-N/S Ramp	13	B	37	-	-	No capacity constraints.
Jardin Drive / Doney Crescent	11	B	33	-	-	No capacity constraints.
Intersection Reference	Overall		Critical			Comments
Centre Street @	Delay	LOS	Delay	LOS	V/C	
Dufferin Street	31	C	51	-	-	No capacity constraints.
Concord Road / Wade Gate	7	A	40	-	-	No capacity constraints.
Vaughan Boulevard / Carl Tennen Road	9	A	45	-	-	No capacity constraints.
New Westminster Drive	30	C	67	-	-	No capacity constraints.
North Promenade	4	A	36	-	-	No capacity constraints.
Bathurst Street	38	D	126	F	1.10	EB left is operating at capacity. NB left is approaching capacity.
Intersection Reference	Overall		Critical			Comments
Bathurst Street @	Delay	LOS	Delay	LOS	V/C	
Westminster Drive / Atkinson Avenue	29	C	66	E	0.90	EB left is approaching capacity.
Worth Boulevard / Flamingo Road	26	C	38	-	-	No capacity constraints.
Highway 407 W-N/S Ramp	7	A	30	-	-	No capacity constraints.
Highway 407 E-N/S Ramp	6	A	43	-	-	No capacity constraints.
Bathurst Connection Road	11	B	49	-	-	No capacity constraints.
Intersection Reference	Overall		Critical			Comments
Woodbine Road @	Delay	LOS	Delay	LOS	V/C	
Lanark Road/Yorktech Drive	50	D	88	F	1.09	SB through is operating at capacity.
Intersection Reference	Overall		Critical			Comments
Warden Avenue @	Delay	LOS	Delay	LOS	V/C	
Enterprise Drive	18	B	59	-	-	No capacity constraints.
Intersection Reference	Overall		Critical			Comments
Kennedy Road @	Delay	LOS	Delay	LOS	V/C	
Helen Avenue	39	D	56	E	1.05	SB through is operating at capacity.
Unionville Gate	17	B	42	-	-	No capacity constraints.
Avoca Drive	12	B	37	-	-	No capacity constraints.

Exhibit 3-11-Existing PM Peak Intersection Operations

Signalized Intersection Operations Existing PM Peak						
Intersection Reference **Highway 7** @	Overall		Critical			Comments
	Delay	LOS	Delay	LOS	V/C	
Highway 50	41	D	137	E	1.00	SB double left is operating at capacity. WB left and WB through are approaching capacity.
Highway 427 S-E/W Off Ramp	82	F	293	F	>1.10	NB right is operating at capacity and NB left is approaching capacity.
Vaughan Valley Boulevard / Roybridge Gate	32	C	423	F	>1.10	EB left is operating at capacity. EB through and WB through are approaching capacity.
Highway 27	40	D	95	F	1.03	NB through is operating at capacity. EB dual left if approaching capacity.
Hy and Zel Plaza / Leisure Lane	13	B	43	-	-	No capacity constraints
Martin Grove Road	35	C	270	F	>1.10	SB and EB left are operating at capacity. WB through is approaching capacity.
Woodstream Boulevard / Parkfield Court	5	A	39	-	-	No capacity constraints
Kipling Avenue	46	D	206	F	0.97	EB left and WB through are approaching capacity.
Islington Avenue	87	F	390	F	>1.10	EB through and NB left are operating at capacity. WB and NB through are approaching capacity.
Bruce Street	20	B	41	-	-	No capacity constraints
Helen Street / Wigwoss Drive	5	A	40	-	-	No capacity constraints
Pine Valley Drive	67	E	226	F	>1.10	WB left, WB through, and NB left are operating at capacity. EB left and NB through are approaching capacity.
Marycroft Avenue / Aberdeen Avenue	34	C	361	F	>1.10	EB and WB left movements are operating at capacity.
Whitmore Road / Ansley Grove road	22	C	68	-	-	No capacity constraints.
Nova Star Drive	28	C	67	-	-	No capacity constraints.
Weston Road	119	F	411	-	-	No capacity constraints.
Famous Avenue	81	F	226	F	>1.10	EB through and NB right are operating at capacity.
Colossus Drive / Highway 400 N-E/W Ramp	22	C	43	-	-	No capacity constraints.
Highway 400 S-E/W Ramp	17	B	12	B	0.91	WB through is approaching capacity.
Edgeley Boulevard / Interchange Way	72	E	197	F	>1.10	SB right and WB through are operating at capacity.
Millway Avenue	8	A	43	-	-	No capacity constraints.

Signalized Intersection Operations Existing PM Peak						
Intersection Reference **Highway 7** @	Overall		Critical			Comments
	Delay	LOS	Delay	LOS	V/C	
Jane Street	48	D	156	F	>1.10	WB, NB, and SB left and SB through are operating at capacity. EB through is approaching capacity.
Creditstone Road	30	C	91	F	0.91	NB left is approaching capacity.
Keele Street	66	E	202	F	>1.10	NB, WB and SB left and NB through are operating at capacity. SB through is approaching capacity.
Baldwin Avenue / Bowes Road	16	B	43	-	-	No capacity constraints.
Centre Street / North Rivermede Road	38	D	66	E	1.00	NB through is operating at capacity and EB through is approaching capacity.
Rivermede Road	6	A	41	-	-	No capacity constraints.
Langstaff Road	23	C	43	-	-	No capacity constraints.
Thornhill Woods Drive	4	A	56	-	-	No capacity constraints.
Bathurst Street Connection Road	20	B	70	-	-	No capacity constraints.
Hunter's Point Drive	12	B	53	-	-	No capacity constraints.
Yonge Street Connection Road	19	C	90	F	0.97	EB left is approaching capacity.
Red Maple Road	17	B	62	-	-	No capacity constraints.
Silver Linden Drive	22	C	74	-	-	No capacity constraints.
Bayview Connection Road	32	C	71	F	1.04	WB through is operating at capacity. EB left is approaching capacity.
Chalmers Road / South Park Drive	23	C	52	-	-	No capacity constraints. South approach closed to traffic.
Saddlecreek Drive	7	A	30	-	-	No capacity constraints. South and north approaches closed to through traffic.
Valleymede Drive / Times Avenue	18	B	224	F	>1.10	EB left is operating at capacity.
Commerce Valley Drive West / West Beaver Creek	31	C	375	F	>1.10	WB left is operating at capacity.
Leslie Street	55	D	180	F	>1.10	SB left is operating at capacity. WB left is approaching capacity.
Commerce Valley Drive East / East Beaver Creek	85	F	142	F	>1.10	EB through, WB through and NB are operating at capacity.
Highway 404 N-E/W Off-Ramp	11	B	43	-	-	No capacity constraints.
Highway 404 S-E/W Off-Ramp	22	C	42	-	-	No capacity constraints.
Allstate Parkway / Valhalla Drive	66	E	220	F	>1.10	SB right is operating at capacity.
Frontenac Drive / Cochrane Drive	11	B	58	-	-	No capacity constraints.
Woodbine Avenue	39	D	66	-	-	No capacity constraints

Signalized Intersection Operations **Existing PM Peak**						
Intersection Reference	Overall		Critical			Comments
Highway 7 @	Delay	LOS	Delay	LOS	V/C	
Lunar Crescent	7	A	45	-	-	No capacity constraints.
Montgomery Court/Fairburn Drive	30	C	90	F	1.04	NB left is operating at capacity.
Rodick Road	18	B	49	-	-	No capacity constraints.
Town Centre Boulevard	34	C	185	F	>1.10	NB left is operating at capacity.
Warden Avenue	45	D	98	F	0.97	EB through, NB through, and SB left are approaching capacity.
Verclair Gate	5	A	38	-	-	No capacity constraints.
Village Parkway	17	B	45	-	-	No capacity constraints.
Shoppes of Unionville Plaza	7	A	37	-	-	No capacity constraints.
Main Street Unionville	17	B	53	-	-	No capacity constraints.
Kennedy Road	44	D	306	F	>1.10	EB through and SB left are operating at capacity.
Swansea Road	6	A	63	-	-	No capacity constraints.
Bullock Drive / Plaza	13	B	39	-	-	No capacity constraints.
Markville Mall Main Entrance	12	B	49	-	-	No capacity constraints.
McCowan Road	59	E	406	-	-	No capacity constraints.
Laidlaw Boulevard / Conservation Avenue	14	B	63	-	-	No capacity constraints.
Robinson Street / St. Patrick School Entrance	4	A	14	-	-	No capacity constraints.
Grandview Boulevard / Galsworthy Drive	6	A	30	-	-	No capacity constraints.
Main Street Markham	60	E	381	E	1.05	EB through is operating at capacity and NB left is approaching capacity.
Albert Street / Cosburn Road	8	A	44	-	-	No capacity constraints.
Wooten Way	12	B	36	-	-	No capacity constraints.
9th Line	30	C	54	-	-	No capacity constraints.
Markham By-Pass	22	C	33	-	-	No capacity constraints.
Reesor Road	14	B	34	-	-	No capacity constraints.
York Durham Line/Regional Road 30	33	C	46	-	-	No capacity constraints.
Intersection Reference	Overall		Critical			Comments
Jane Street @	Delay	LOS	Delay	LOS	V/C	
Interchange Way	26	C	67	E	0.92	EB right is approaching capacity.
Highway 407 N/S-W and E-N/S Ramp	15	B	39	-	-	No capacity constraints.
Highway 407 W-N/S Ramp	7	A	33	-	-	No capacity constraints.
Steeles Avenue	50	D	297	F	>1.10	NB left and SB left are operating at capacity. EB left is approaching capacity.
Intersection Reference **Steeles Avenue** @						
Founders Road	13	B	40	-	-	No capacity constraints.

Signalized Intersection Operations **Existing PM Peak**						
Intersection Reference	Overall		Critical			Comments
Keele Street @	Delay	LOS	Delay	LOS	V/C	
Steeles Avenue	47	D	92	F	1.02	WBL and WB through are operating at capacity. EBL, NB through are approaching capacity.
Snidercroft Road / Ron Rose Drive	15	B	26	-	-	No capacity constraints.
Highway 407 W-N/S Ramp	7	A	27	-	-	No capacity constraints.
Highway 407 E-N/S Ramp	9	A	26	-	-	No capacity constraints.
Jardin Drive / Doney Crescent	12	B	36	-	-	No capacity constraints.
Intersection Reference	Overall		Critical			Comments
Centre Street @	Delay	LOS	Delay	LOS	V/C	
Dufferin Street	46	D	210	F	>1.10	WB left is operating at capacity and EB through is approaching capacity.
Concord Road / Wade Gate	13	B	38	-	-	No capacity constraints.
Vaughan Boulevard / Carl Tennen Road	20	B	166	F	>1.10	WB left is operating at capacity.
New Westminster Drive	20	B	39	-	-	No capacity constraints.
North Promenade	12	B	42	-	-	No capacity constraints.
Bathurst Street	32	C	59	E	0.93	EB left is approaching capacity.
Intersection Reference	Overall		Critical			Comments
Bathurst Street @	Delay	LOS	Delay	LOS	V/C	
Westminster Drive / Atkinson Avenue	25	C	47	-	-	No capacity constraints.
Worth Boulevard / Flamingo Road	25	C	415	F	>1.10	SB left is operating at capacity.
Highway 407 W-N/S Ramp	10	B	47	-	-	No capacity constraints.
Highway 407 E-N/S Ramp	13	B	20	-	-	No capacity constraints.
Bathurst Connection Road	21	C	53	-	-	No capacity constraints.
Intersection Reference	Overall		Critical			Comments
Woodbine Avenue @	Delay	LOS	Delay	LOS	V/C	
Lanark Road/Yorktech Drive	37	D	50	D	1.02	NB through is operating at capacity.
Intersection Reference	Overall		Critical			Comments
Warden Avenue @	Delay	LOS	Delay	LOS	V/C	
Enterprise Drive	18	B	59	-	-	No capacity constraints.
Intersection Reference	Overall		Critical			Comments
Kennedy Road @	Delay	LOS	Delay	LOS	V/C	
Helen Avenue	37	D	61	D	1.00	NB through is operating at capacity.
Unionville Gate	80	E	143	-	-	No capacity constraints.
Avoca Drive	95	F	455	F	>1.10	NB left is operating at capacity and EB left is approaching capacity.

The following locations on Highway 7 are operating at an acceptable level of service during the AM and PM peak hours with v/c ratios below 1.0.

- Hy and Zel Plaza / Leisure Lane;
- Woodstream Boulevard / Parkfield Court;
- Bruce Street;
- Helen Street / Wigwoss Drive;
- Whitmore Road / Ansley Grove Road;
- Nova Star Drive;
- Weston Road;
- Colossus Drive / Highway 400 N-E/W Off-Ramp;
- Highway 400 S-E/W Off-Ramp;
- Millway Avenue;
- Creditstone Road;
- Baldwin Avenue / Bowes Road;
- Rivermede Road;
- Langstaff Road;
- Thornhill Woods Drive;
- Bathurst Street Connection Road;
- Hunter's Point Drive;
- Yonge Street Connection Road;
- Red Maple Road;
- Silver Linden Drive;
- Chalmers Road / South Park Drive;
- Saddlecreek Drive;
- Highway 404 N-E/W Off-Ramp;
- Frontenac Drive / Cochrane Drive;
- Lunar Crescent;
- Rodick Road;
- Warden Avenue;
- Verclair Gate;
- Village Parkway;
- Shoppes of Unionville Plaza;
- Main Street Unionville;
- Swansea Road;
- Bullock Drive / Plaza;
- Markville Mall Main Entrance;
- Laidlaw Boulevard / Conservation Avenue;
- Robinson Street / St. Patrick School Entrance;
- Grandview Boulevard / Galsworthy Drive;
- Albert Street / Cosburn Road;
- Wooten Way;
- Markham By-Pass; and
- York Durham Line.

The following locations on the proposed by-pass routes are operating at acceptable levels of service during the AM and PM peak hours with v/c ratios below 1.0.

- Jane Street and Interchange Way;
- Jane Street and Highway 407 N/S-W and E-N/S Ramp;
- Jane Street and Highway 407 W-N/S Ramp;
- Steeles Avenue and Founders Road;
- Keele Street and Highway 407 W-N/S Ramp;
- Keele Street and Highway 407 E-N/S Ramp;
- Keele Street and Jardin Drive / Doney Crescent;
- Centre Street and Concord Road / Wade Gate;
- Centre Street and New Westminster Drive;
- Centre Street and North Promenade;
- Bathurst Street and Westminster Drive / Atkinson Avenue;
- Bathurst Street and Highway 407 W-N/S Ramp;
- Bathurst Street and Highway 407 E-N/S Ramp;
- Bathurst Street and Bathurst Street Connection Road; and
- Kennedy Road and Unionville Gate.

Based on a review of the analysis and from field observations, the following overall deficiencies are apparent:

- The majority of the capacity constraints are located at the major arterial roadways.

- During the peak hours long east-west queues are observed at Islington Avenue. The AM peak hour shows eastbound queues spilling back occasionally to Kipling Avenue and during

the PM peak hour westbound queues extend to Bruce Street. This section of Highway 7 consists of a four lane cross section;

- The Highway 7 corridor between Weston Road through the Highway 400 Interchange-to-Interchange Way / Edgeley Boulevard represents a key constraint in the road network in the AM and PM peak hours;

- The Highway 7 corridor in the Beaver Creek Business Park area from the intersection of Valleymede Drive / Times Avenue through the Highway 404 Interchange to Allstate Parkway / Valhalla Drive experiences long delays and frequent queues during the peak hours; and

- The northbound left movements in the east limits at Reesor Road and 9th Line during the AM peak period experience frequent queues and long delays as a result of home to work oriented trips.

Provided below is a summary of existing operational constraints or issues within the study area.

Highway 7 / Highway 50

The southbound dual left on Highway 50 carries high volumes in excess of 1,700 during the AM peak hour and 940 vehicles during the PM peak hour. This movement is operating at capacity during these peaks with approximately 35 seconds of protected green time. The eastbound approach is operating at capacity during the AM peak hour and the westbound approach is operating at capacity during the PM peak hour.

Highway 7 / Highway 427 S-E/W Off-Ramp

The intersection is currently operating at a cycle length of 90 seconds with 40 seconds allocated to the south approach (off-ramp). The northbound right is operating at capacity during the AM and PM peak hour and the NB left is approaching capacity during the PM peak hour. Additional green time and a longer cycle length are required to clear the south approach and improve intersection operations.

Highway 7 / Vaughan Valley Boulevard / Roybridge Gate

The westbound through is approaching capacity during the AM peak hour. The eastbound left is operating at capacity during the PM peak hour. The westbound and eastbound through lanes are approaching capacity during the PM peak hour as the volumes exceed 3,500 vehicles per direction. The north-south phase requires a minimum green time of 43 seconds to provide sufficient time for pedestrians to cross Highway 7. As a result the competing east-west movements do not have a sufficient amount of remaining green time for vehicles to clear. The eastbound left is operating at capacity, as the existing timings do not provide an advance for this movement.

Highway 7 / Highway 27

The westbound protected left turn movement is operating at capacity in the AM peak hour and is approaching capacity during the PM peak hour. The northbound through lanes are operating at capacity during the PM peak hour.

Highway 7 / Martin Grove Road

The northbound left is operating at capacity as it is timed as permissive only and insufficient gaps are provided in the opposing southbound traffic to accommodate the northbound left demands during the AM peak hour. The southbound left is operating at capacity during the PM peak hour; it operates under permissive control with heavy opposing flows. During the PM peak hour, the eastbound left is operating at capacity and the WB through is approaching capacity.

Highway 7 / Kipling Avenue

The southbound approach is operating at capacity during the AM peak hour, as there is an insufficient number of through lanes to support the heavy volumes. The eastbound left turn is operating at capacity as a result of 430 vehicles turning left during the PM peak hour.

Highway 7 / Islington Avenue

Significant eastbound queues at Islington Avenue are observed during the AM peak hour and queue west of the CP railway lines, sometimes extending to Kipling Avenue. The two eastbound lanes are operating at capacity with volumes in excess of 2,400 vehicles. It should be noted that this section of Highway 7 consists of a four lane cross section.

During the PM peak hour the south and east-west approaches accommodate heavy volumes, the capacity demands cannot be met based on the existing operations. The northbound left turn lane is operating at capacity as a result of 426 vehicles turning left and the northbound through volumes are also relatively high impacting the operation of the northbound through movement. The eastbound and westbound through lanes are approaching capacity with volumes of 1,960 and 1,550 vehicles, respectively.

Highway 7 / Pine Valley Drive

The westbound left is operating at capacity during the AM peak hour. The northbound and westbound left turn lanes operate at capacity during the PM peak hours due to heavy turning movement volumes and an insufficient amount of left turn lane capacity.

Highway 7 / Aberdeen Avenue / Marycroft Avenue

The westbound left turn lane is approaching capacity during the AM peak hour. No advance phase is provided at the intersection for the westbound left volumes and minimal gaps are created in the 1,400 eastbound opposing vehicles resulting in capacity constrained conditions. The eastbound and westbound left turn lanes operate at capacity during the PM peak hours. This is primarily due to the fact that these movements are operating under permissive control.

Highway 7 / Whitmore Road / Ansley Grove Road

The westbound left turn volumes into the Pine Valley Business Park are high during the AM peak hour and are operating at capacity. There is an insufficient amount of green time provided to the westbound advance in order to meet the high traffic demands.

Highway 7 / Weston Road

This intersection accommodates heavy left turning volumes and eastbound/westbound through volumes during the peak hours as it accommodates heavy trips making from adjacent commercial areas and through volumes from direct access to Highway 400. Accordingly, it is a challenge to

provide sufficient green time for the turning movements, while maintaining adequate green time for the through movements. During the AM and PM peak hours, long vehicle queues are observed in the peak travel direction.

Highway 7 / Famous Avenue

The northbound right operates in conjunction with the westbound left as a protected phase. The heavy east-west demand prevents more green time to be allocated to these movements and therefore the northbound right operates at capacity during the PM peak hour in addition to the eastbound through.

Highway 7 / Highway 400 S-E/W Off-Ramp

The northbound dual right is approaching capacity during the AM peak hour with volumes in excess of 1,300. The double right turn lane operates at capacity as the competing through movements do not allow additional green time to be allocated to the ramp movements. During the PM peak hour the three westbound through lanes are approaching capacity with volumes approaching 3,000 vehicles.

Highway 7 / Interchange Way / Edgeley Boulevard

During the AM peak hour no major capacity concerns were noted.

The southbound right movement is operating at capacity during the PM peak hour as a result of the 950 to 1,000 vehicles leaving the industrial and commercial area in the north. The heavy westbound through volumes and westbound queues do not provide sufficient gaps for the vehicles turning right to exit. The eastbound left turn movement operates at capacity, as vehicles are unable to turn left during the main phase due to insufficient gaps and westbound queues are unable to clear the intersection, preventing a full advance phase.

Highway 7 / Jane Street

During the AM peak hour, the left turn movements in all approaches are operating at capacity. There is little opportunity to provide the left turn movements with additional green time as the eastbound and southbound movements are also operating at capacity during this period.

The westbound, northbound and southbound left turn movements operate above capacity during the PM peak hour as all the left turn volumes are exceeding 270 vehicles per hour. Jane Street is a major north-south roadway in the Region and both approaches require substantial green time. Therefore the intersection is approaching its theoretical capacity during the peak hours.

Highway 7 / Creditstone Road

During the AM peak hour no major capacity constraints were noted. Creditstone Road is a major collector providing access to the Canadian National Freight Classification Yard and surrounding industrial area. During the PM peak hour the northbound left is approaching capacity due to a high amount of vehicles leaving the area.

Highway 7 / Keele Street

Keele Street is a major north-south arterial roadway in the Region of York and as a result high volumes are observed on all approaches during the peak hours. The eastbound double left and

westbound left turn movements are protected. During the AM peak hour the westbound left turn lane is operating at capacity.

During the PM peak hour, the northbound left and through movements are operating at capacity. The southbound left and westbound left volumes exceed 230 vehicles per hour and operate at capacity. The westbound left operates as a protected left turn in conjunction with the eastbound dual left.

Highway 7 / Centre Street / North Rivermede Road

During the AM peak hour no major capacity constraints were noted. The three northbound through lanes on Highway 7 and eastbound through lanes are approaching capacity during the PM peak hour. The existing signal timings allocate a majority of the green time to the Centre Street / North Rivermede Road approaches, specifically the dual left on Centre Street. This leaves little available green time for the Highway 7 approaches.

Highway 7 / Bathurst Street Connection Road

During the AM peak hour, the intersection at the Bathurst Street Connection Road and Highway 7 has no major capacity constraints. The protected eastbound left turn is approaching capacity during the PM peak hour.

Highway 7 / Yonge Street Connection Road

During the AM peak hour no capacity constraints were noted at the intersection. The eastbound protected left turn movement is operating at capacity during the PM peak hour. The existing signal timing allocates 20 seconds per cycle for the 375 vehicles to turn left during the PM peak hour. The competing through movements does not allow additional green time to be allocated to the left movements.

Highway 7 / Bayview Connection Ramp

The eastbound protective left has approximately 550 to 650 vehicles during the PM peak hour and is operating at capacity. The westbound through movement is approaching capacity. Additional green time is required to be allocated to the east-west main phase.

Highway 7 / Valleymede Drive / Times Avenue

No capacity constraints were noted during the AM peak hour. During the PM peak hour the eastbound left turn is operating at capacity as the competing through movements do not allow additional green time to accommodate all left turn demands.

Highway 7 / Commerce Valley Drive West / West Beaver Creek

During the AM peak hour the eastbound left is operating at capacity as it exceeds 450 vehicles per hour. During the PM peak hour the westbound left operates at capacity due to the competing heavy eastbound through volume, which do not allow additional green time to be allocated to the left movements or create a sufficient amount of gaps in the traffic flow.

Highway 7 / Leslie Street

During the AM peak hour, the westbound left operates at capacity due to the high volume destined to work in the Commerce Valley Drive area. During the PM peak hour, the southbound left operates

at capacity as employees depart from the Beaver Creek Business Park destined to Highway 404 and other points east.

Highway 7 / East Beaver Creek / Commerce Valley Drive East

During the AM and PM peak hours, the Highway 7/East Beaver Creek/Commerce Valley Drive intersection represents a primary bottleneck in the Highway 7/Highway 404 areas. The north south movements operate with split phases to accommodate the heavy southbound left movements.

During the AM peak hour, the westbound left and through, queue from the Highway 404 N-E/W off-ramp intersection. For a limited number of cycles, the westbound vehicle queues extend beyond the N-E/W ramp intersection.

During the PM peak hour, the northbound right and eastbound through movements operate at capacity due to the high number of vehicles exiting the business park destined to Highway 404 and Highway 7 east. Long vehicular queues were observed on Commerce Valley Drive West of vehicles waiting to turn right on Highway 7. As the eastbound volume is high, the northbound right volumes are restricted to the north-south phase as there are minimal gaps provided during the east-west phase.

Highway 7 / Highway 404 N-E/W Off-Ramp

During the AM peak hour, the southbound ramp movements are approaching capacity and the westbound queues extend back from the Highway 7/East Beaver Creek intersection temporarily inhibiting vehicles from proceeding through the intersection. During the PM peak hour the intersection is operating under acceptable operating conditions.

Queues on Highway 7 are observed in the westbound direction during the AM peak period and eastbound direction during the PM peak period. This area is a high generator of traffic mainly due to the business area developments or high-density office space located east and west of the Highway 404 interchange.

Highway 7 / Highway 404 S-E/W Off-Ramp

The northbound left on the Highway 404 northbound off-ramp is currently operating at capacity and the northbound right is approaching capacity during the AM peak hour. The queuing in the westbound through lanes from intersections west of the interchange temporarily prevents westbound through and northbound left turn vehicles from time to time from proceeding through the intersection during the AM peak. During the PM peak hour, no capacity constraints were noted.

Highway 7 / Allstate Parkway/East Valhalla Drive

During the AM peak hour, the eastbound left to Allstate Parkway is approaching capacity due to the morning arrival of employees destined for office uses north of the intersection. Long eastbound left queues were observed in the field. An eastbound advance of 39 seconds is designated to the 670 vehicles turning left during the AM peak hour.

In the PM peak hour, the southbound right, the reverse movement, is operating at capacity with volumes exceeding 1,080 vehicles. The southbound right turn and westbound through movements are hindered from proceeding through the intersection, from time to time, due to downstream westbound intersection queues and congestion caused by merging traffic attempting to access the E-S Highway7/Highway 404 ramp.

Highway 7 / Woodbine Avenue

During the AM peak hour the westbound left is operating at capacity with volumes exceeding 350 vehicles per hour. The east-west left advance is operating as protected only. During the PM peak hour no capacity constraints were noted.

Highway 7 / Fairburn Drive / Montgomery Court

During the AM peak hour no capacity constraints were noted. During the PM peak hour the northbound left is operating at capacity with volumes exceeding 490 vehicles per hour exiting from the First Markham Place / Woodside Centre.

Highway 7 / Town Centre Boulevard

During the AM peak hour the northbound left is approaching capacity. During the PM peak hour an insufficient amount of green time is provided for the northbound left turning volumes as a result of the competing through movements, which do not allow additional green time to be allocated to the left movements.

Highway 7 / Warden Avenue

Warden Avenue is a major north-south arterial with heavy traffic demands from all approaches. During the AM peak hour, the southbound through, westbound left and westbound through movements are approaching capacity. The southbound and northbound left and eastbound through are approaching capacity during the PM peak hour.

Highway 7 / Kennedy Road

The intersection is operating without any capacity constraints during the AM peak hour. During the PM peak hour the eastbound through and southbound left are operating at capacity. The southbound left is operating under permissive control and is at capacity as there are an insufficient amount of gaps in the northbound traffic to allow vehicles to clear the intersection.

Highway 7 / McCowan Road

The McCowan Road / Highway 7 intersection generates a significant amount of traffic due to it's proximity to the Markville Shopping Centre. During the AM peak hour, the northbound left is operating at capacity and the westbound left is approaching capacity. The advance phases for these movements are not sufficient to accommodate the high volumes. During the PM peak hour, no capacity constraints were noted.

Highway 7 / Main Street Markham

During the AM peak hour, no capacity constraints were noted. The northbound left during the PM peak hours is approaching capacity, as the competing through movements do not allow additional green time to be allocated to the left movements. The eastbound through lane is operating at capacity during the PM peak with volumes exceeding 1,100 vehicles per hour.

Highway 7 / 9th Line

The area surrounding the 9th Line / Highway 7 intersection is currently fairly undeveloped with the exception of the Markham Stouffville Hospital located northeast of the intersection. As a result, the intersection carries relatively high volumes during both peak periods.

During the AM peak hour the southbound shared through-right turn lane operates at capacity as it facilitates approximately 700 southbound through vehicles approximately 130 southbound right vehicles. The northbound left also operates at capacity under permissive control due to the heavy opposing volume and minimal gaps provided. During the PM peak hour, no capacity constraints were noted.

Highway 7 / Reesor Road

The northbound left is operating at capacity during the AM peak hour under permissive control as a result of an inadequate amount of gaps provided in the southbound direction. During the PM peak hour, no capacity constraints were noted.

Jane Street / Interchange Way

During the AM peak hour, no capacity constraints were noted. During the PM peak hour, the eastbound right is approaching capacity as volumes exceed 400 vehicles per hour.

Jane Street / Steeles Avenue

During the AM peak hour, the southbound left volume exceeds 300 vehicles per hour and operates at capacity. The northbound through and eastbound through volumes operate at capacity with volumes exceeding 990 vehicles and 1,490 vehicles respectively.

During the PM peak hour, the northbound and southbound left movements operate at capacity and the eastbound left is approaching capacity. The northbound left operates under permissive control.

Keele Street / Steeles Avenue

During the AM peak hour, no capacity constraints were noted. During the PM peak hour, the westbound left and through are operating at capacity as well as the northbound through and eastbound left are approaching capacity.

Keele Street / Snidercroft Road / Ron Rose Drive

During the AM peak hour, the northbound left is operating at capacity under permissive control as the opposing southbound through volume is heavy and does not allow additional green time to be allocated to the left movements.

Centre Street / Dufferin Street

During the AM peak hour, no capacity constraints at the intersection were noted. During the PM peak hour the westbound left movement is operating at capacity with volumes exceeding 300 vehicles per hour. The eastbound through movement is approaching capacity during the PM peak hour.

Centre Street / Vaughan Boulevard / Carl Tennen Road

During the AM peak hour, no capacity constraints at the intersection were noted. The westbound left operates under permissive control during the PM peak hour and operates at capacity.

Centre Street / Bathurst Street

The northbound and eastbound left turn movements are operating at capacity during the AM peak hour as the competing through movements do not allow additional green time to be allocated to the left turn movements. The eastbound left is approaching capacity in the PM peak hour.

Bathurst Street / Westminster Drive / Atkinson Avenue

The eastbound left is approaching capacity during the AM peak hour. During the PM peak hour, no capacity constraints were noted.

Bathurst Street / Worth Boulevard / Flamingo Road

During the AM peak hour, no capacity constraints were noted. During the PM peak hour, the southbound left is operating at capacity as the competing northbound through volume is heavy does not allow additional green time to be allocated to the left movements.

Woodbine Avenue / Lanark Road / Yorktech Drive

During the AM peak hour, the southbound through lanes are operating at capacity. During the PM peak hour, the northbound through lanes are operating at capacity.

Kennedy Road / Helen Avenue

During the AM peak hour, the southbound through is operating at capacity, as the competing east-west movements do not allow additional green time to be allocated to the north-south phase. The northbound through is operating at capacity during the PM peak hour.

Kennedy Road/Avoca Drive

During the AM peak hour, no capacity constraints were noted. The northbound left is operating at capacity and the eastbound left is approaching capacity in the PM peak hour.

3.5.3 EXISTING NEIGHBOURHOOD TRAFFIC CONCERNS

Based on field investigations and through discussions with area municipality staff, a number of roadways and neighbourhoods were identified as having potential neighbourhood traffic concerns. Provided below is a summary of the primary locations/neighbourhoods identified.

Monsheen Drive/Wigwoss Drive Neighbourhood

The Monsheen Drive/Wigwoss Drive Neighbourhood in Woodbridge includes the areas bounded by Highway 7, Islington Avenue, Pine Valley Drive and Willis road to the north. Under existing conditions, traffic diverts to these local roadways during the peak hours to avoid congestion along Highway 7 and specifically the Islington Avenue/Highway 7 intersection. Motorists attempting to negotiate a southbound left turn at Islington Avenue/Highway 7 intersection may use Monsheen Drive, Wigwoss Avenue, Arrowhead Drive to gain access to the southbound left at the Helen Street/Highway 7 intersection.

Willis Road/Chancellor Drive Neighbourhood

The Willis Road/Chancellor Drive neighbourhood in Woodbridge is bounded by Highway 7, Islington Avenue, Weston Road and Langstaff Road. Traffic speed and volume concerns are generally

associated with traffic along Willis Road and Chancellor Drive as it is a wide two-lane collector road with direct residential access. These roadways are used as alternates to Highway 7 for commuter traffic to avoid traffic congestion between Islington Avenue and Weston Road during peak periods. During the weekday peak hours the Highway 7/Islington Avenue and Highway 7/Pine Valley Drive intersections operate at capacity. As a result of these congested conditions, motorists choose to use the neighbourhood streets to circumvent the intersections.

Embassy Drive/Blue Willow Drive Neighbourhood

Embassy Drive is a residential collector road that runs parallel to Highway 7 on the north side between Pine Valley Drive and Ansley Grove Road. From Ansley Grove Road, the road name changes to Blue Willow Drive continuing easterly to Weston Road. This road provides driver's destined to/from Pine Valley Drive north from Highway 7 east with an opportunity to avoid several signals on Highway 7 and in particular the intersection of Pine Valley Drive and Highway 7.

Wilshire Neighbourhood

The Wilshire neighbourhood is located between Dufferin Street and Bathurst Street, north of Centre Street. The collector roads Beverley Glen Boulevard, Concord Road, Worth Boulevard and New Westminster Drive in the neighbourhood provide accessible routes for vehicles travelling to and from Centre Street west and to and from Bathurst Street north. By utilizing Concord Road, Beverley Glen Boulevard and Worth Boulevard or New Westminster Drive, motorists can avoid the Bathurst Street / Centre Street intersection thus decreasing their travel time.

Yorktech Drive to Warden Avenue Ramps

Yorktech Drive connects Woodbine Avenue to the south end of South Town Centre Boulevard at IBM. The road runs through a commercial area at Woodbine Avenue and is mainly industrial towards South Town Centre Boulevard. It provides drivers with an alternative east-west route avoiding several signalized intersections on Highway 7 between Woodbine Avenue and Warden Avenue.

Historic Unionville Area

Historic Unionville is located north of Highway 7 between Kennedy Road and Warden Avenue. Main Street Unionville is a two-lane collector road with on-street parking and has direct access to a variety of land uses including many heritage buildings. Traffic infiltration issues are associated with excessive travel along Carleton Road, an east-west collector road north of Highway 7 and existing and future north-south travel through the neighbourhood. A neighbourhood traffic management committee, the Unionville Community Coalition, has been established for this neighbourhood and current initiatives have focused on the potential for north-south travel through the neighbourhood resulting from the future development of the Markham Centre. Improvements along Village Parkway and Carleton Road have been identified as key components of the traffic calming plan as well as key traffic calming measures such as medians, curb extensions, bike lanes and through prohibitions and turn restrictions. Potential north-south restrictions that may or may not result from the traffic management plan have not been included in the short or long-term analysis.

4. YORK RAPID TRANSIT PLAN

For a majority of the study area, the preferred route will operate on Highway 7; however, in some areas the route will by-pass Highway 7 and operate in areas where there is a potential for high transit usage. The transit vehicle will travel along Highway 7 with the following exceptions:

Vaughan North-South Link – The north-south link will connect Highway 7 to York University via Keele Street and Jane Street. The transit system will travel in an exclusive median transit way south on Jane Street to a proposed new east-west road south of the CN Halton railway line to the proposed York Bus Terminal at Steeles Avenue. The route then will travel on Steeles Avenue in mixed traffic to the York University Bus Terminal. It will connect to Keele Street and continue in mixed traffic to Highway 7. Transit vehicles will continue to operate on Highway 7 between Jane Street and Keele Street in a dedicated transit right-of-way.

Centre Street / Bathurst Street – From Highway 7 the bus will travel in an exclusive transit way in the median of Centre Street where it will turn north on Bathurst Street and continue in the median to just south of the Highway 407. It will transition to mixed traffic south of Highway 407 and return to Highway 7 and a dedicated transit right-of-way via the Bathurst Connection Ramp.

Markham Town Centre – From Highway 7 the route will operate in the centre median on Town Centre Boulevard. On Town Centre Boulevard, south of the IBM intersection the transit way will run easterly crossing Warden Avenue north of Enterprise Boulevard. From this location, the rapid transit route will travel through Markham Centre separate from the road network and connect to Kennedy Road opposite Helen Avenue where it will continue north to Highway 7 via a centre median transitway.

Markham Stouffville Hospital – From Highway 7 the route will access the Markham Stouffville Hospital via Burr Oak Avenue where it will travel in exclusive transit lanes and circle the hospital before returning to Burr Oak Avenue and Highway 7. Burr Oak Avenue will extend southerly to Highway 7 between Ninth Line and the Markham By-pass.

4.1 Preferred Alternative

4.1.1 PLANNED TRANSPORTATION NETWORK

This report reflects the Highway 7 corridor and Vaughan North-South Link preferred alternatives produced by the YRTP and presented at the third and final public information centre in September 2004. Provided below is a preliminary assessment of the effects of this project and our understanding of the current operational methods being considered from a transportation perspective.

4.1.2 LOCAL TRANSIT OPERATIONS

Under existing operations, York Region and GO Transit operate a number of routes along Highway 7. The routes represent long distance commuter bus travel, as well as, local bus operations. With the YRTP in place, the need for local bus routes to provide extended service along Highway 7, will be reduced. Given the nature of the service for local bus operations (i.e., frequent stops at shorter intervals), there is little justification for local transit services to utilize/access the Rapid Transit (RT) right-of-way.

All analysis completed for the transportation assessment has assumed that transit vehicles will not be turning into or out of the RT right-of-way, except at transitions with the mixed-traffic operations.

4.2 Overview of General Effects

The operation of a Rapid Transit System on a dedicated right-of-way in the centre of Highway 7 will have a number of operational impacts on access, intersection operations, and pedestrian movements. It is the intent of the transportation analysis to quantify the major impacts noted below.

4.3 Transit Facility Operations

Based on the preferred alternative, the transit system will operate for the most part in its own right-of-way down the centre of Highway 7 with near and far side stops. The opposing transit lanes or division of the right-of-way will be delineated or protected by some form of a physical concrete barrier or landscaped area such that motorists will not traverse the transit right-of-way, with the exception of signalized intersections. The transit right-of-way lanes will consist of a different colour of pavement and will be separated from the general traffic lanes by a rumble strip.

To accommodate Emergency Response Services (ERS), the transitway design assumes 3.5 metre wide crossing every 100 metres where semi mountable curbs will replace the barrier/landscaped area. These crossings will be signed to enforce ERS vehicles only and to prohibit regular vehicular traffic from crossing.

At signalized intersections, main street left turns and side street movements cannot be permitted in conjunction with the transit phase, as they will conflict. Accordingly, a review was undertaken to determine the best means of facilitating bus movements at the signalized intersections, while maintaining adequate “green time” for vehicular traffic. These options are outlined in **Sections 4.3.1 and 4.3.2**.

4.3.1 FULLY PROTECTED MAIN STREET LEFT TURNS

Under this operation the main street left turn movements would operate under a fully protected left turn phase. In some cases where the transit vehicle will operate on east-west links such as Highway 7, Steeles Avenue, Centre Street or Enterprise Drive, this would include the eastbound and westbound left turns. However, on the proposed north-south route links where the transit vehicle will operate in a dedicated right-of-way such as Jane Street, Bathurst Street, Town Centre Boulevard or Warden Avenue and Kennedy Road, this would include fully protected northbound and southbound left turn lanes. Where the transit vehicle is to operate in a dedicated transit right-of-way, the proposed route link will be referred to as the main street. The main street left protected only phase would be called followed by a eastbound/westbound main phase, which would accommodate through, right turn and transit movements.

Based on existing travel patterns and roadway hierarchy, eastbound/westbound Highway 7 traffic is provided with the majority of the “green time” compared to all other phases. This is particularly true for the signalized intersections at collector roadways. Permitting transit movements during the east/west main phase will provide the RT with an acceptable level of service.

In addition to Highway 7, fully protected left turn movements would be implemented on Jane Street, Steeles Avenue, Centre Street, Bathurst Street, Town Centre Boulevard or Warden Avenue and Kennedy Road. As these roads are major arterial roads, a majority of the “green time” would be provided to their corresponding phases.

4.3.2 PROTECTED-PERMISSIVE MAIN STREET LEFT TURNS

Under this scenario the transit vehicles would operate on their own phase. During transit "green time" all other movements at the intersection would be presented with a red indication. The transit only phase would be "callable" and potentially could be inserted into the cycle at various points (demand responsive).

Under these operations, the transit phase would be "called" as a transit vehicle approached the intersection; however, it would not pre-empt the phasing, i.e., the transit phase would be inserted at an appropriate point in the cycle, once the current phasing is complete. For example, if a transit vehicle arrives during the main phase, the transit vehicle would be delayed until the main phase has completed its duration. The probability of delay is much greater under this operational model.

4.3.3 TRANSIT PRIORITY

Traffic signals will account for the majority of the transit vehicle delay in the preferred alternative design. There may be locations where changes to the traffic signal operations can be made to give priority to the transit vehicles and reduce the delay. The analysis included in this report reflects a "passive priority" operation, where transit vehicles proceed with the main street green indication, which is generally Highway 7 and which receives the majority of the green time in the signal. Through signal progression of the general traffic lanes, the transit vehicles would receive "passive priority".

For many of the study intersections, passive priority will yield adequate operating conditions for the transitway, while maintaining an acceptable level of service to the general traffic lanes. There are intersections at major cross streets and interchange ramps, where existing main street green times have been reduced to provide capacity to the side street. At these locations, active priority may be required to attain adequate transit travel times. Active priority would require upstream detection of transit vehicle arrivals and would involve a predetermined modification to the signal timing plan to:

- Extend the main street/transitway green time to allow an approaching vehicle to proceed; or
- Truncate the side street phase to display main street green for the approaching transit vehicle.

With the projected transit vehicle volumes on the Highway 7 and Vaughan North-South corridors, care must be taken that benefits provided to a transit vehicle in one direction do not reappear as a delay to another. It is recommended that the need for transit priority at a limited number of locations, be reviewed during implementation/design of the signal system associated with the preferred alternative.

Regardless, there are situations where transit priority phases are required for operational and safety reasons to separate conflicting or merging manoeuvres between transit vehicles and the general traffic lanes, i.e., the transition area between mixed traffic operations and median transitway. The operations at these locations are outlined in **Section 6.3**.

4.3.4 SUMMARY

Based upon a review of the above transit operational opportunities, the fully protected main street left turn phase operations with "passive priority" appears to be the most suited to the majority of the intersections in the corridor. The exact operational mode and transit priority logic will need to be

established during the design and implementation stage. The analysis of the future traffic operations has been undertaken assuming fully protected-left turn phasing with right turn overlap.

4.4 Intersection Operations

4.4.1 MAIN STREET LEFT TURNS

Under current conditions the majority of the main street left turns along the planned corridor operate under protected-permissive or permissive phases. A permissive left turn phase will not be allowed with the operation of the planned transit system. Accordingly, with the planned Rapid Transit operations, the main street left turns will operate under protected only phases. These operations will reduce the capacity of the left turn movements and may result in additional green time requirements. These changes will result in three potential impacts:

- Side street green time will be reduced to accommodate additional main street left turn requirements;
- Main street green time will be reduced to accommodate additional main street left turn requirements; and/or
- Main street left turn capacity will be reduced.

4.4.2 HIGHWAY 7 AND OTHER PROPOSED RAPID TRANSIT ROUTE ACCESS

The dedicated transit right-of-way will restrict left turn access to/from existing unsignalized intersections and private accesses. It has been assumed that motorists needing to adjust to these changes will complete one of the following:

Exhibit 4-1-Potential Impacts of Restricted Left Turn Access

Restricted Manoeuvre	Modification	Effect
Left turn from Main Street into roadway/access	Travel to the next signalized intersection, complete a U-turn and make a right turn into the roadway/access	Increase demand for U-turns at downstream intersection
	Change entire travel pattern and arrive from alternative direction	Change in Highway 7 and other proposed Rapid Transit routes travel patterns – indeterminate impacts
Left turn from side street/access	Negotiate right turn and make a subsequent U-turn at adjacent intersection.	Increase demand for left turn at adjacent intersection Potential weaving concerns
	Use internal road network to access signalized intersection	Traffic infiltration potential Increase in left turn volumes at adjacent signalized intersection
	Change entire travel pattern and depart roadway/access via right turn	Change in Highway 7 and other proposed Rapid Transit routes travel patterns – indeterminate impacts.

Restricted Manoeuvre	Modification	Effect
	Change entire travel pattern and access other major north-south	Traffic infiltration potential Increased volumes on alternative routes and through associated intersections

In many cases above, traffic will be diverted to adjacent signalized intersections resulting in additional left turn or u-turn demands at these intersections. Left turn movements on some of the approaches to the signalized intersections will require additional green time.

Traffic reassignments of this traffic have been undertaken for the future total traffic volumes (Refer to **Section 6.1.**)

4.4.3 TRANSITION AREAS: RAPID TRANSIT LANES TO/FROM MIXED TRAFFIC

Through an assessment of alternative design methods, a number of sections within the Highway 7 and Vaughan North-South link transit system would have the transit vehicles operating within the general traffic lanes to avoid major cost or property impacts associated with the provision of dedicated transitway lanes. Provided in the following sections is a discussion of operational options at the transition areas.

4.4.3.1 Transition Options

A preliminary review of the general transition options indicated that the transition of transit vehicles to/from exclusive Rapid Transit median lanes to mixed traffic, in most case, must occur at signalized intersections to provide the transit vehicle a dedicated phase to make a safe transition. This determination was based on the following:

- In some cases, the transit vehicle would be required to merge to the right into general traffic lanes to leave the dedicated median transitway to enter the adjacent travel lane. This manoeuvre is undertaken by transit and tour buses on freeway facilities or major arterial roadways; however, they typically have greater merge distances and are travelling from one general traffic lane to another; and

- In general, one cannot rely on the motoring public to yield to a transit vehicle in the merge areas even though a new provincial law effective January 2004 stipulates that drivers must yield the right-of-way to buses leaving bus bays to merge with traffic.

4.4.3.2 Transition Methods

The transition areas will include a combination of physical and operational functional components.

Diverge from transitway to mixed traffic - Approaching the transition intersection in the dedicated transit right-of-way, a short taper area will be provided for the transitway on the far side of the intersection. Transit vehicles will use the taper area to merge into the median lane where it will remain until it re-enters the transitway. The diverge manoeuvre from the dedicated transitway lanes to mixed traffic will function by stopping the adjacent general traffic lanes travelling in the same direction. A transit phase will be displayed for five seconds of green, three seconds of amber and two seconds of all red; a total of ten seconds. The advance phase could be inserted in advance of the main or side street main phases. A few exceptions to this will occur at the following locations:

- Kipling Avenue, eastbound transit vehicles must transition from the dedicated transit right-of-way at the intersection to a far side curb lane transit stop;
- Islington Avenue, westbound transit vehicles must transition from the dedicated transit right-of-way at the intersection to a far side curb lane transit stop;
- Hunter's Point Drive, westbound transit vehicles must transition from dedicated transitway to channelized right curb lane at Bathurst Connection Road;
- Red Maple Road, westbound transit vehicles must transition from dedicated transitway to channelized right curb lane at Yonge Connection Road; and
- Bayview Avenue, eastbound transit vehicles must diverge into mixed traffic and transition to curb lane stop east of intersection.

Merge from mixed traffic to dedicated transitway – Approaching the transition intersection; a taper to the transitway will be provided on the near side of the intersection. As the transit vehicle approaches, the operator will merge to the left and, cross the rumble strip and enter the transitway. A few exceptions to this will include occur at the following locations:

- Kipling Avenue, westbound transit vehicles must merge from the near side curb lane transit stop in mixed traffic to the median dedicated transitway. This would occur on a dedicated "transit-only" phase;
- Islington Avenue, eastbound transit vehicles must merge from the near side curb lane transit stop to the dedicated median transitway;
- North West Gate at Steeles Avenue, the transit vehicle will exit the York Bus Terminal heading southbound and must merge into dedicated transitway before turning left onto Steeles Avenue;
- Bowes/Centre Street transition areas, the eastbound transit vehicle proceeds to the channelized right turn lane onto Centre Street and must proceed to merge from the curb lane to the dedicated transitway before Dufferin Street;
- Yonge Connection ramp, transit vehicles exiting the Intermodal Station destined west will merge from the southbound channelized right turn lane to dedicated transitway lanes on Highway 7; and
- Bayview Avenue, westbound transit vehicles must merge into dedicated transitway lanes from near side curb lane stops east of the intersection.

At each intersection, capacity issues were examined to determine if the advance phase green time should be taken from the main phase or the minor street phase. The specific transition areas have been described in more detail in **Section 6.3.**

4.5 Transit Right-Of-Way Signing and Markings

In addition to the standard roadway signage and markings, the following special transitway related signage/markings would be required:

- Permissive u-turn signs/markings;

- Transit signal head designations; and
- Transit only designations within the transitway.

Each of these applications is outlined below.

Transitway Designation

The ultimate transitway designation and design will be undertaken during the detail design of the system. Preliminary station and RT right-of-way drawings illustrate and current discussions with YRTP Staff indicate that the right-of-way designation will include coloured pavement for the RT right-way and a rumble strip to delineate the lane utilization.

According to the HTA, special lane designations must be marked or signed to be enforceable. Pavement colour and rumble strips cannot be used to assign a lane designation. Accordingly, it is recommended that the RT right-of-way be illustrated marked with pavement markings with a specific symbol, such as the white diamond used for HOV lanes. In addition, at locations such as intersections where the lane utilization is not obvious to a prudent driver, appropriate regulatory signing should be installed. This is particularly important where the dedicated transitway is initiated, terminated or turns onto a perpendicular roadway.

The Manual of Traffic Control Devices for Canada includes a “Reserve Lane Sign” (RB-80) to indicate that lanes are reserved for use by specific vehicles such as buses. In addition, warning signs and pavement markings are provided to reinforce the regulatory signs and provide additional guidance to motorists travelling parallel to or crossing the transitway facility.

Specific signing and marking requirements, along with any associated by-laws will need to be established during the preliminary design stage of the preferred alternative.

U-Turn Operations

Within the future operations of the preferred design, vehicles in the general traffic lanes will be permitted to negotiate u-turns around the median transitway from the shared left turn/u-turn lane. At some intersections it will be recommended to prohibit u-turns due to high traffic volumes and capacity constraints. It is suggested that in areas where u-turns are permitted that signing be provided to reinforce the permitted movement. **Exhibit 4-2** includes examples of permissive u-turn signing that could be considered in the Rapid Transit corridor to reinforce the availability of this movement.

The development of a signing strategy for the u-turn movements should be coupled with a public education program and should be undertaken during the preliminary design stage.

Transit Signal Head

Due to the proximity of the transitway and the general traffic lanes, it would be difficult to orient/shield the signal heads for one operation from view from the other road user. These signal designation challenges exists on a number of roadway facilities where:

- Exclusive signal displays are provided for left or right turn movements, where these movements operate under a protected-only mode of control. For example, “left turn signal” information sign;
- Parallel bicycle lanes or trails exist and are provided with their own signal indication; and/or

- Transit vehicles, such as buses or streetcars are given priority or require separate phasing for safety or operational purposes, i.e., “transit signal” information signs.

In these cases, motorists and other road users are provided with visual cues or supplemental signs to permit them to make the distinction between the signal indications for the various users, turning movements or lanes, including:

- Distinct signal lense colour, head size and/or backboard colours;
- Alternative mounting heights; and/or
- Supplemental information signs.

The MUTCD for Canada includes provisions for a transit priority signal designation consisting of a vertical lunar white rectangle, which is typically mounted above the red indication on a traffic signal head.

Exhibit 4-2-Examples of Permissive U-Turn Signing

4.6 Neighbourhood Access and Traffic Infiltration Potential

As noted in the previous section, full turns access to neighbourhoods and other land uses will result, in some instances, in diversion of traffic to the internal road network. Left turn movements to/from major unsignalized intersections and private accesses along Highway 7 and the other proposed Rapid Transit routes were counted or estimated to determine magnitude of the potential traffic diversion. Traffic was reassigned to the most probable alternative route and potential traffic infiltration issues were identified. Included in **Section 6.6**, is an assessment of potential traffic infiltration issues.

4.7 Pedestrian Facilities

In cases where the pavement width is increased to accommodate the dedicated transit right-of-way and associated facilities, the pedestrian crossing times at the signalized intersections will increase. The additional crossing may be accommodated by one of the following:

- Reducing the green time of other phases; and
- Provide a two-stage pedestrian crossing to reduced required side street green time.

The latter remedial measure significantly reduces the level of service provided to the pedestrians. The use of this measure will be considered only as required. Included in **Section 6.4**, is a summary of the pedestrian impacts resulting from the RT design.

5. FUTURE OPERATIONS WITH RAPID TRANSIT PROPOSAL

An assessment of the future road network and Rapid Transit operations was undertaken to review the impacts of the proposed improvements on the transportation system. As with existing conditions, the capacity of the road network will be, in most cases, a function of intersection capacity. Provided below is a summary of this assessment.

5.1 Transit Vehicle Forecasts

The transit vehicle forecasts were generated from ridership forecasts and EMME/2 travel forecasts. The predicted number of transit passengers during the AM peak hour was converted to transit vehicles based on a vehicle capacity of 80 passengers per vehicle. Included in **Exhibit 5-1** is a summary of the vehicle volumes anticipated at thirteen key service locations along Highway 7. These counts do not include existing local bus routes on Highway 7 that may continue to operate in 2021, only the new transit vehicles generated by the bus Rapid Transit System.

Exhibit 5-1-Predicted 2021 AM Peak Hour Transit Vehicle Forecasts for YRTP Routes on Highway 7

Screenline	Transit Passengers		Transit Vehicles	
	EB	WB	EB	WB
East of Highway 50	480*	*	6	6
East of Highway 27	456	105	6	6
East of Islington Avenue	971	194	12	12
West of Weston Road	1142	441	14	14
West of Jane Street	1428	954	18	18
East of Keele Street	236	1601	20	20
East of Bathurst Street	736	1136	14	14
West of Leslie Street	1564	1635	21	21
East of Woodbine Avenue	968	1743	21	21
East of Kennedy Road	398	2162	27	27
West of Main Street Markham	277	1441	18	18
West of Markham By-Pass	*	1441*	18	18
West of York-Durham Line	*	1441*	18	18

*Note: Estimated based on estimated demand forecasts.

It is assumed that the opposing direction to the peak flow will generate the same number of transit vehicles. The PM peak hour is expected to generate similar transit volumes. The forecasted transit vehicle volumes have been incorporated into the through volumes in the areas where they will operate in mixed traffic. Mixed traffic operations are proposed on/through:

Exhibit 5-2-Proposed Locations with Mixed Traffic Operations

Roadway	Direction	From	To
Highway 50	Southbound	Highway 7	Huntington Road
Huntington Road	Northbound	Highway 50	Highway 7
Highway 7	Eastbound/Westbound	Kipling Avenue	Islington Avenue
Jane Street	Northbound/Southbound	CN Halton Railway Line	New Proposed East-West Road in Hydro corridor
New Proposed East-West Road in Hydro corridor	Eastbound/Westbound	Jane Street	Proposed York Bus Terminal
North West Gate	Northbound/Southbound	Proposed York Bus Terminal	Steeles Avenue
Steeles Avenue	Eastbound/Westbound	North West Gate	Proposed TTC and RT entrance
Keele Street	Northbound/Southbound	Chimney Stack Road	Highway 7
Highway 7	Eastbound/Westbound	Baldwin Avenue/Bowes Road	Centre Street
Bathurst Street	Northbound/Southbound	South of Highway 407	Centre Street
Highway 7	Westbound	Bathurst Street Connection Road	Hunter's Drive Point Drive
Highway 7	Westbound	Intermodal Station	Yonge Street connection Road
Highway 7	Westbound	Red Maple Road	Intermodal Station
Highway 7	Eastbound/Westbound	Bayview Connection Road	West of Doncrest Road
Highway 7	Eastbound/Westbound	Highway 404 N-EW off ramp	Highway 404 S-EW off ramp
Highway 7	Eastbound/Westbound	Grandview Boulevard/Galsworthy	West of Wooten Way
Bur Oak Avenue	Northbound/Southbound	Highway 7	Markham Stouffville Hospital
Highway 7	Eastbound/Westbound	East of Reesor Road	York-Durham Line

The operation of the transition areas between the dedicated transit way and the mixed traffic areas are discussed in **Section 6.3**.

5.2 Future Analysis Scenarios

As the exact implementation date of the entire Rapid Transit System is not known, the transportation assessment was tailored to account for the effects of future demands and the transportation system improvements that may materialize over the next 20 years.

In establishing transportation effects of the Rapid Transit proposal, it must be recognized that the Highway 7 area through York Region varies considerably from mature areas such as Highway 7/Keele Street to developing areas such as Highway 7/Ninth Line and Highway 7/Highway 427. In comparing an intersection such as Highway 7/Islington Avenue to Highway 7/Ninth Line, it is safe to assume that the intersection at Ninth Line will experience a higher growth rate within the next 20 years, as the surrounding lands will be built out. Whereas, the intersection at Islington Avenue which presently operates at capacity during the peak hours will not likely experience much growth simply because of the lack of residual capacity through the intersection during the peak hours.

Therefore, the proposed design and operations of the Rapid Transit System was analysed under a nonspecific implementation date to determine the immediate impacts of the rapid transit on the existing operating conditions. To account for areas where high traffic growth is expected, a 2021 horizon was analyzed to determine long term road network needs and operational requirements.

We have tailored our analysis to review the transportation effects of the system implementation in both cases. Included in **Exhibit 5-3** is a summary of the transportation considerations and how they have been assessed in the immediate and 2021 planning horizons. A detailed explanation of the assessment is included in **Section 6** (immediate conditions) and **Section 7** (2021 conditions).

Exhibit 5-3-Transportation Effects Considerations

Transportation Component	Immediate Considerations	2021 Considerations
Intersection Operations	Ensure that adequate intersection operations are maintained for all road users with the implementation of the Rapid Transit plan.	Demonstrate long-term transportation benefits, person-capacity of the corridor with the Rapid Transit implementation. In areas where significant growth is expected review: ▪ Additional traffic demands on Highway 7; ▪ Increased volume on side streets; ▪ New side streets that will be constructed; ▪ Changes to major accesses; and ▪ Effect from major road improvements.

Transportation Component	Immediate Considerations	2021 Considerations
Roadway/Transitway Design	Provide a design to ensure that adequate operating conditions are provided for the transitway, transition areas and intersections, including storage lengths.	Identify any modifications to design required as a result of planned roadway improvements or future development potential.
Transit Operations	Ensure the transit vehicle delay is minimized through passive priority and adequate provision of main street green time.	Determine any changes, from the short-term considerations, in transit operations that are required as result of future demands and transportation improvements.
Access	Reasonable access is provided to existing land uses and neighbourhoods.	Identify areas where high u-turn volumes are expected and possible mitigating measures.
Pedestrian Operations	Adequate pedestrian facilities are provided across the Rapid Transit System.	Sufficient pedestrian crossing times are provided at the signalized intersections.
Neighbourhood Effects	Access modifications and intersection operations resulting from RT implementation do not cause traffic infiltration issues.	Addressed under short-term considerations.

6. IMMEDIATE EFFECTS

The immediate effects were assessed to determine the incremental effect of the Rapid Transit System if it were to be implemented based on:

- The current road network; and
- The current traffic volumes.

By evaluating these conditions, the effects of the Rapid Transit system can be compared to the existing conditions without the implications of other factors such as traffic growth, road improvements or other transit improvements, i.e., a simple demonstration of how the rapid transit implementation will change “business-as-usual” conditions on the preferred route.

To incorporate the Rapid Transit system into the current road network and current traffic volumes the following inputs/assumptions were made:

- Redistribution of current traffic volumes associated with the access modifications at unsignalized intersections and accesses to other commercial/retail establishments;

- Implementation of fully protected left turn and u-turn operations at the signalized intersections;
- Addition of two dedicated median transitway lanes along the preferred route of the Rapid Transit System including revised main street storage lengths from preferred design;
- The operations of the transition areas required to facilitate the transfer of transit vehicles between the dedicated right-of-way and mixed-traffic conditions; and
- Adequate pedestrian crossing times at all signalized intersections.

In some areas, the preferred route travels or crosses proposed roads or new intersections that do not currently exist. In these cases, it was necessary to account for a number of road improvements and developmental traffic in these areas in order for the entire preferred route to be analysed under the immediate implementation conditions. The following exhibit is a summary of the intersections and the modifications made to the current conditions:

Exhibit 6-1-Summary of Modifications Made to Current Conditions

Intersections	Road Improvements	Volume Adjustments
Jane Street/Beechwood Cemetery Entrance	Implementation of signal timings	No volume adjustments
Jane Street/Proposed East-West Road south of Hydro corridor	New signalized intersection	Includes volumes for the proposed bus terminal and park and ride facilities.
Steeles Avenue/North West Gate/Proposed Street C	New north approach and implementation of signal timings	Property Protection for Steeles Rapid Transit Terminal Facilities dated January 2001 Cansult Ltd.
Keele Street/Proposed East-West Road south of Hydro Corridor	New signalized intersection	
Centre Street/Commercial Access	Implementation of signal timings	Reassigned volumes from adjacent accesses.
Bathurst Street/Beverley Glen Boulevard	Implementation of signal timings	Projected 10-year volumes. Thornhill City Centre – Proposed Residential Development Master Plan dated February 2004 by Cansult Ltd.
Highway 7/Circa Boulevard	New intersection	Projected 2009 traffic volumes from Stringbridge Traffic Study dated December 2004 by iTrans
Highway 7/Hilton Suites	New intersection	Projected 10 year volumes from Warden Avenue / Highway 7 Mixed use Development Traffic Study dated May 2004 by iTrans

Intersections	Road Improvements	Volume Adjustments
Town Centre Boulevard/Clegg Road	Implementation of signal timings and extension of Clegg Road easterly. Full moves intersection, exclusive left turn lanes on Town Centre Blvd.	No volume adjustment
Town Centre Boulevard/Cedarland Drive	Implementation of signal timings. Exclusive left turn lanes on Town Centre Blvd.	
Town Centre Boulevard/IBM	Implementation of signal timings. Exclusive left turn lanes on Town Centre Blvd.	
Warden Avenue/Enterprise Drive	Extension of Enterprise Drive easterly	No volume adjustment
Enterprise Drive/West Valley Drive	New intersection	New road network
Midblock crossings of north-south roads in Markham Centre	New roadways	New road network
Future Connection Road/Helen Avenue	New signalized intersection	Current traffic count data on Helen Avenue was used as well as projected 2011 traffic volumes from the Markham Centre West Master Plan Transportation Study dated December 2001 by iTrans
Highway 7/Proposed Bur Oak extension	New full moves signalized intersection	Projected Cornell Community Traffic from the Cornell Community Transportation Study Update dated October 2003 by iTrans

Based on the analysis scope for the immediate and 2021 analysis conditions identified in **Section 5.2**, the immediate analysis scenario includes an assessment of:

- Immediate intersection impacts (**Section 6.2**);
- Transition area operations where transit vehicles will transition to/from the median transitway and mixed traffic operations (**Section 6.3**);
- Pedestrian facility operations (**Section 6.4**);
- Roadway and access issues where access to Highway 7 is modified through the implementation of the Rapid Transit plan (**Section 6.5**); and
- Potential traffic infiltration issues (**Section 6.6**).

While the 2021 intersection operations in **Section 7.0** analyse specific areas where high growth is expected and where the long-term road network improvements such as the Highway 427 extension are expected.

6.1 Traffic Redistribution

As noted in **Section 4.4.2**, a number of the unsignalized intersections and accesses will be restricted to right-in and right-out manoeuvres with the implementation of the transitway. It has been assumed that the existing traffic will continue to access these roadways and driveways from the same general direction, i.e. travel to the next downstream intersection and negotiate a u-turn.

It should be recognized that, in most cases, frequent users of Highway 7 and other routes where the transitway will physically restrict left turn access, would change their travel patterns to account for the turn restrictions at the unsignalized intersections and accesses. As it would be difficult to account for the "wholesale" change in driving patterns, the analysis of future conditions with the RT design in place is conservative.

A manual reassignment of redistributed traffic was undertaken based on general knowledge of the intersection operations, area road network and engineering judgement.

6.1.1 RESIDENTIAL REASSIGNMENT

Residential roadway access to/from Highway 7 at unsignalized locations was modified to reflect one of the following changes:

- Existing left turns would be accommodated by undertaking a u-turn at the downstream signalized intersection, in conjunction with a right turn to/from the roadway; or

- For low volume roadways accommodating local traffic, residential trips were assigned through the neighbourhood to access adjacent signalized intersections.

The following table summarizes the residential reassignment for unsignalized intersections on Highway 7 that have been incorporated into the analysis. These changes also apply to the roadway links where the Rapid Transit System will by-pass Highway 7 and operate in exclusive median lanes including Jane Street, Centre Street, Bathurst Street, Town Centre Boulevard and Kennedy Road. A summary of the reassignment assumptions for the major unsignalized residential intersections on these roadway links is included in **Exhibit 6-2**.

Exhibit 6-2-Residential Traffic Reassignment

Street Name	Traffic Reassignment	
Jersey Street / Sylvain Brook / Highway 7	INBOUND	EB and WB inbound left turns reassigned to Helen Street.
	OUTBOUND	NB left reassigned to Marycroft Avenue and SB left reassigned to Helen Street. U-turns at Pine Valley Drive were avoided.
Maplecrete Road / Highway 7	INBOUND	WB left reassigned to WB left at Creditstone Road

Street Name	Traffic Reassignment	
	OUTBOUND	NB left reassigned to NB left at Creditstone Road
Costa Road / Highway 7	INBOUND	WB left reassigned to WB left at Creditstone Road
	OUTBOUND	NB left reassigned to NB left at Creditstone Road
Doughton Road / Jane Street	INBOUND	SB left reassigned to SB left at Interchange Way
	OUTBOUND	WB left reassigned to WB left at Interchange Way
Westmount Blvd / Bathurst Street	INBOUND	NB left reassigned to NB left at Worth Blvd.
	OUTBOUND	EB left reassigned to EB left at Worth Blvd.
Castan Avenue / Kennedy Road	INBOUND	SB left reassigned to SB left at Avoca Drive.
	OUTBOUND	WB left reassigned to WB left at Avoca Drive.
Eton Street / Kennedy Road	INBOUND	NB left reassigned to NB left at Avoca Drive. SB left reassigned to u-turn at Avoca Drive.
	OUTBOUND	WB left reassigned to WB left at Avoca Drive.
Thatcher's Mill Way	INBOUND	EB left reassigned to u-turn at Robinson Street/School Entrance.
	OUTBOUND	NB right reassigned to u-turn at Grandview / Galsworthy Drive.
Ovida Boulevard	INBOUND	WB left reassigned to u-turn at Grandview / Galsworthy Drive.
	OUTBOUND	NB left reassigned to NB left at Grandview.
Jonquil Crescent	INBOUND	EB left reassigned to EB left at Galsworthy Drive.
	OUTBOUND	SB left reassigned to SB left at Galsworthy Drive.

6.1.2 COMMERCIAL REASSIGNMENT

As with the residential uses, the potential traffic diversion from commercial and other non-residential land uses were reassigned to adjacent signalized intersection. The following exhibit provides a description of the traffic reassignment assumptions that have been incorporated into the analysis of future conditions.

Exhibit 6-3-Commercial Traffic Reassignment

Description of Land Use Area	Location From West to East Limits	Traffic Reassignment	
Hillcrest Cemetery	East of Islington Avenue, north side of	INBOUND	Eastbound left reassigned to u-turn at Bruce Street

Description of Land Use Area	Location From West to East Limits	Traffic Reassignment	
	Highway 7	OUTBOUND	Southbound left reassigned to u-turn at Islington Avenue
Commercial Development – 6 accesses	West of Kipling Avenue, north and south side of Highway 7	INBOUND	Westbound left reassigned to u-turn at Kipling Avenue. Eastbound left reassigned to u-turn at Woodstream Blvd.
		OUTBOUND	Southbound left reassigned to u-turn at Woodstream Blvd. Northbound left reassigned to u-turn at Kipling Avenue.
Big Box / Tim Horton's	West of Parkfield / Woodstream on south side of Highway 7	INBOUND	Westbound left reassigned to u-turn at Kipling Avenue.
		OUTBOUND	Northbound left reassigned to u-turn at Kipling Avenue.
Retail – north side Car Dealership – south side	East of Leisure Lane	INBOUND	Westbound left reassigned to u-turn at Leisure Lane. Eastbound left reassigned to u-turn at Martin Grove Road.
		OUTBOUND	Southbound left reassigned to u-turn at Leisure Lane. Northbound left reassigned to u-turn at Martin Grove Road.
Commercial development	West of Pine Valley on north side of Highway 7	INBOUND	Westbound left reassigned to u-turn at Pine Valley Drive
		OUTBOUND	Southbound left reassigned to u-turn at Helen Street
Restaurants / Commercial	East of Pine Valley Drive on south side of Highway 7	INBOUND	Westbound left reassigned to u-turn at Pine Valley Drive
		OUTBOUND	Northbound left reassigned to u-turn at Marycroft Avenue / Aberdeen Avenue
Pine View Motors	West of Weston Road on north side of Highway 7	INBOUND	Westbound left reassigned to u-turn at Weston Road
		OUTBOUND	Southbound left reassigned to u-turn at Nova Star
Honeygrove Plaza and Concord Plaza	North side of Centre Street, East of Dufferin	INBOUND	EB left reassigned to u-turn at Concord Drive
		OUTBOUND	SB left reassigned to u-turn at Dufferin Street
10 private residential driveways	North side of Centre Street from Concord to Carl Tennen	INBOUND	EB left reassigned to u-turn at Carl Tennen Street
		OUTBOUND	SB left reassigned to u-turn at Concord Drive.
Restaurants	East of McCowan Road, north of	INBOUND	EB left reassigned to u-turn at Laidlaw Boulevard

Description of Land Use Area	Location From West to East Limits	Traffic Reassignment	
	Highway 7	OUTBOUND	SB left reassigned to u-turn at McCowan Road
Greenhouse, Tim Hortons	East of Wooten Way, south of Highway 7	INBOUND	WB left reassigned to u-turn at Wooten Way
		OUTBOUND	NB left reassigned to u-turn at Ninth Line
Health Complex / Fast Food Restaurants	West of Ninth Line, south of Highway 7	INBOUND	WB left reassigned to u-turn at Wooten Way
		OUTBOUND	NB left reassigned to u-turn at Ninth Line

6.2 Immediate Intersection Operations

The immediate intersection operations were analyzed using the Synchro 6.0 model developed for the assessment of the existing conditions. The current road network with the RT lanes and revised traffic volumes accounting for reassignment were incorporated into the model. Intersection analysis assumptions were maintained from the existing capacity analysis to review the relative impacts of the immediate conditions of the Rapid Transit system. These assumptions included saturation flow rates, lost times, amber and all red periods, etc.

In the analysis of the immediate traffic conditions, the following objectives were considered:

- Provide sufficient pedestrian walk times to cross the study intersections;
- Ensure that all advance phases are a minimum of ten seconds; and
- Maximize green time for Highway 7 or other arterial roads on which the RT system will operate.

Included in **Exhibit 6-4** and **Exhibit 6-5** are summaries of the future AM and PM peak hour operations at the study intersections.

Exhibit 6-4-Immediate Conditions AM Peak Intersection Operations

Immediate Conditions AM Peak Hour Signalized Intersection Operations						
Intersection Reference **Highway 7** @	Overall		Critical			Comments
	Delay	LOS	Delay	LOS	V/C	
Highway 50	196	F	707	F	>1.10	SB double left and EB through are operating at capacity.
Highway 427 S-E/W Off Ramp	20	C	25	-	-	No capacity constraints.
Vaughan Valley Boulevard / Roybridge Gate	40	D	55	C	0.95	WB through is approaching capacity.
Highway 27	31	C	96	F	1.00	WB left is operating at capacity.
Hy and Zel Plaza / Leisure Lane	3	A	85	-	-	No capacity constraints.
Martin Grove Road	29	C	90	F	0.99	EB through and right, WB left, and SB through and right are approaching capacity.
Woodstream Boulevard / Parkfield Court	20	B	44	-	-	No capacity constraints.
Kipling Avenue	118	F	363	F	1.04	WB through and the SB approach are operating at capacity.
Islington Avenue	164	F	315	F	>1.10	EB through and SB left lanes are operating at capacity. WB through and NB left are approaching capacity.
Bruce Street	17	B	41	C	0.91	Shared EB through-right is approaching capacity.
Helen Street / Wigwoss Drive	14	B	96	-	-	No capacity constraints.
Pine Valley Drive	38	D	103	F	0.96	EB through and right and WB left are approaching capacity.
Marycroft Avenue / Aberdeen Avenue	22	C	52	-	-	No capacity constraints.
Whitmore Road / Ansley Grove Road	31	C	59	-	-	No capacity constraints.
Nova Star Drive	14	B	69	-	-	No capacity constraints.
Weston Road	35	C	69	-	-	No capacity constraints
Famous Avenue	6	A	44	-	-	No capacity constraints.
Colossus Drive / Highway 400 N-E/W Ramp	20	C	47	-	-	No capacity constraints.
Highway 400 S-E/W Ramp	24	C	29	-	-	No capacity constraints.
Edgeley Boulevard / Interchange Way	32	C	133	F	0.99	EB left and WB through are approaching capacity.
Millway Avenue	15	B	103	-	-	No capacity constraints.
Jane Street	112	F	266	F	>1.10	EB through, WB left, SB left and NB left are operating at capacity.
Creditstone Road	31	C	78	-	-	No capacity constraints.
Keele Street	76	E	394	F	>1.10	EB, WB, and NB left are operating at capacity.
Baldwin Avenue / Bowes Road	16	B	75	-	-	No capacity constraints.

Immediate Conditions **AM Peak Hour Signalized Intersection Operations**						
Intersection Reference **Highway 7** @	Overall		Critical			Comments
	Delay	LOS	Delay	LOS	V/C	
Centre Street / North Rivermede Road	24	C	47	-	-	No capacity constraints.
Bathurst Street Connection Road	11	B	57	-	-	No capacity constraints.
Hunter's Point Drive	9	A	53	-	-	No capacity constraints.
Yonge Street Connection Road	18	B	71	-	-	No capacity constraints.
Red Maple Road	20	B	79	E	0.93	WB through is approaching capacity.
Silver Linden Drive	13	B	64	-	-	No capacity constraints.
Bayview Connection Road	29	C	80	F	0.95	EB left and through are approaching capacity.
Chalmers Road / South Park Drive	27	C	60	-	-	No capacity constraints.
Saddlecreek Drive	10	B	27	-	-	No capacity constraints.
Valleymede Drive / Times Avenue	31	C	66	E	0.97	SB left is approaching capacity.
Commerce Valley Drive West / West Beaver Creek	40	D	222	F	1.01	EB left is operating at capacity and WB through is approaching capacity.
Leslie Street	50	D	138	F	>1.10	EB through, NB left and SB left are operating at capacity. WB through is approaching capacity.
Commerce Valley Drive East / East Beaver Creek	134	F	386	F	>1.10	EB and WB left, EB and WB through are operating at capacity.
Highway 404 N-E/W Off-Ramp	22	C	71	E	1.01	SB right is operating at capacity.
Highway 404 S-E/W Off-Ramp	37	D	50	E	1.02	NB left is operating at capacity. NB right is approaching capacity.
Allstate Parkway / Valhalla Drive	46	D	181	F	>1.10	EB left is operating at capacity.
Frontenac Drive / Cochrane Drive	18	B	82	-	-	No capacity constraints.
Woodbine Avenue	40	D	64	E	0.96	WB and NB left are approaching capacity.
Lunar Crescent	5	A	39	-	-	No capacity constraints.
Fairburn Drive / Montgomery Court	20	B	75	-	-	No capacity constraints.
Rodick Road	28	C	66	-	-	No capacity constraints.
Circa Boulevard	16	B	59	-	-	No capacity constraints.
Town Centre Boulevard	50	D	77	-	-	No capacity constraints.
Kennedy Road	46	D	155	F	>1.10	WB left and NB left are operating at capacity.
Swansea Road	13	B	73	-	-	No capacity constraints.
Bullock Drive / Plaza	17	B	107	-	-	No capacity constraints.
Markville Mall Main Entrance	8	A	74	-	-	No capacity constraints.
McCowan Road	52	D	146	F	>1.10	WB and NB left are operating at capacity. SB through is approaching capacity.

Immediate Conditions **AM Peak Hour Signalized Intersection Operations**						
Intersection Reference	Overall		Critical			Comments
Highway 7 @	Delay	LOS	Delay	LOS	V/C	
Laidlaw Boulevard / Conservation Avenue	29	C	33	C	0.94	WB through is approaching capacity.
Robinson Street / St. Patrick School Entrance	13	B	82	-	-	No capacity constraints.
Grandview Boulevard / Galsworthy Drive	18	B	55	-	-	No capacity constraints.
Main Street Markham	32	C	67	-	-	No capacity constraints.
Albert Street / Cosburn Road	8	A	44	-	-	No capacity constraints.
Wooten Way	25	C	53	-	-	No capacity constraints.
9th Line	40	D	68	F	0.91	SB through is approaching capacity.
Bur Oak	8	A	60	-	-	No capacity constraints.
Markham By-Pass	14	B	46	-	-	No capacity constraints.
Reesor Road	39	D	84	F	0.99	NB left is approaching capacity.
York Durham Line/Regional Road 30	28	C	50	-	-	No capacity constraints.
Intersection Reference	Overall		Critical			Comments
Jane Street @	Delay	LOS	Delay	LOS	V/C	
Interchange Way	18	B	43	-	-	No capacity constraints.
Highway 407 N/S-W and E-N/S Ramp	14	B	45	-	-	No capacity constraints.
Highway 407 W-N/S Ramp	14	B	38	-	-	No capacity constraints.
Beechwood Cemetery Entrance	13	B	57	-	-	No capacity constraints.
Proposed East-West Road	55	D	103	F	1.10	NB through is approaching capacity.
Proposed East-West Road/Proposed Street C	25	C	35	-	-	No capacity constraints
Intersection Reference	Overall		Critical			Comments
Steeles Avenue @	Delay	LOS	Delay	LOS	V/C	
Northwest Gate/Proposed Street C	73	E	277	F	1.06	EB through, WB left and NB left are operating at capacity. The EB left is approaching capacity.
Founders Road	12	B	22	-	-	No capacity constraints.
Proposed Street F	29	C	55	-	-	No capacity constraints.
Intersection Reference	Overall		Critical			Comments
Keele Street @	Delay	LOS	Delay	LOS	V/C	
Steeles Avenue	33	C	38	-	-	No capacity constraints
Proposed East-West Road	6	A	34	-	-	No capacity constraints
Snidercroft Road / Ron Rose Drive	175	F	30	-	-	No capacity constraints
Highway 407 W-N/S Ramp	15	B	28	-	-	No capacity constraints
Highway 407 E-N/S Ramp	13	B	28	-	-	No capacity constraints
Jardin Drive / Doney Crescent	13	B	31	-	-	No capacity constraints

Immediate Conditions **AM Peak Hour Signalized Intersection Operations**						
Intersection Reference	Overall		Critical			Comments
Centre Street @	Delay	LOS	Delay	LOS	V/C	
Dufferin Street	31	C	70	-	-	No capacity constraints.
Concord Road / Wade Gate	20	B	53	-	-	No capacity constraints.
Vaughan Boulevard / Carl Tennen Road	9	A	59	-	-	No capacity constraints.
No Frills/Plaza Entrance	14	B	67	-	-	No capacity constraints.
New Westminster Drive	39	D	55	-	-	No capacity constraints.
North Promenade	12	B	71	-	-	No capacity constraints.
Bathurst Street	38	D	80	-	-	EB left and SB through are approaching capacity.
Intersection Reference	Overall		Critical			Comments
Bathurst Street @	Delay	LOS	Delay	LOS	V/C	
Beverley Glen Boulevard	14	B	52	-	-	No capacity constraints
Westminster Drive / Atkinson Avenue	32	C	74	-	-	EB and SB left are approaching capacity.
Worth Boulevard / Flamingo Road	96	F	131	F	>1.10	NB and SB through are operating at capacity.
Highway 407 W-N/S Ramp	8	A	42	-	-	No capacity constraints.
Highway 407 E-N/S Ramp	6	A	43	-	-	No capacity constraints.
Bathurst Connection Road	10	A	50	-	-	No capacity constraints.
Intersection Reference	Overall		Critical			Comments
Town Centre Boulevard @	Delay	LOS	Delay	LOS	V/C	
Clegg Road	17	B	72	-	-	No capacity constraints.
Cedarland Drive	16	B	33	-	-	No capacity constraints.
IBM	15	B	32	-	-	No capacity constraints.
Enterprise Drive	16	B	42	-	-	No capacity constraints
Intersection Reference	Overall		Critical			Comments
Helen Avenue @	Delay	LOS	Delay	LOS	V/C	
Future Connection Road	15	B	32	-	-	No capacity constraints
Kennedy Road	46	D	65	E	0.96	SB through is approaching capacity.
Intersection Reference	Overall		Critical			Comments
Kennedy Road@	Delay	LOS	Delay	LOS	V/C	
Unionville Gate	23	C	65	-	-	No capacity constraints
Avoca Drive	54	D	83	F	1.03	WB left and SB through is operating at capacity.

Exhibit 6-5-Immediate Conditions PM Peak Intersection Operations

Immediate Conditions PM Peak Hour Signalized Intersection Operations						
Intersection Reference **Highway 7** @	Overall		Critical			Comments
	Delay	LOS	Delay	LOS	V/C	
Highway 50	42	D	73	F	1.00	SB double left is operating at capacity. EB left, EB through and WB through are approaching capacity.
Highway 427 S-E/W Off Ramp	42	D	51	-	-	NB right and NB left are approaching capacity.
Vaughan Valley Boulevard / Roybridge Gate	68	E	110	-	-	WB through is operating at capacity. EB through is approaching capacity.
Highway 27	37	D	101	-	-	EB left, WB left, WB through, and NB through are approaching capacity.
Hy and Zel Plaza / Leisure Lane	16	B	77	-	-	No capacity constraints
Martin Grove Road	43	D	261	F	0.95	EB left and WB through are approaching capacity.
Woodstream Boulevard / Parkfield Court	8	A	79	-	-	No capacity constraints
Kipling Avenue	57	E	156	F	>1.10	EB left and WB through are operating at capacity. EB through is approaching capacity.
Islington Avenue	1295	F	365	F	>1.10	EB through, WB through and NB left are operating at capacity. The EB left and SB left are approaching capacity.
Bruce Street	19	B	42	-	-	No capacity constraints
Helen Street / Wigwoss Drive	17	B	60	-	-	No capacity constraints
Pine Valley Drive	74	E	216	F	>1.10	EB left, EB through, WB left, WB through, and NB left are operating at capacity.
Marycroft Avenue / Aberdeen Avenue	50	D	74	E	1.05	WB through is operating at capacity. WB left is approaching capacity.
Whitmore Road / Ansley Grove road	30	C	72	-	-	No capacity constraints.
Nova Star Drive	20	B	99	-	-	EB left and SB left are approaching capacity.
Weston Road	135	F	135	F	0.94	SB left and NB left are approaching capacity.
Famous Avenue	58	E	102	F	>1.10	EB through and NB right are operating at capacity. WB through is approaching capacity.
Colossus Drive / Highway 400 N-E/W Ramp	23	C	40	-	-	No capacity constraints.
Highway 400 S-E/W Ramp	18	B	37	-	-	No capacity constraints.

Immediate Conditions **PM Peak Hour Signalized Intersection Operations**						
Intersection Reference **Highway 7** @	Overall		Critical			Comments
	Delay	LOS	Delay	LOS	V/C	
Edgeley Boulevard / Interchange Way	72	E	307	F	>1.10	EB left and SB right are operating at capacity. WB through is approaching capacity.
Millway Avenue	19	B	68	-	-	No capacity constraints.
Jane Street	88	F	357	F	>1.10	EB left, EB through, WB left, NB left and SB left are operating at capacity. WB through is approaching capacity.
Creditstone Road	37	D	105	F	1.04	EB through, WB and NB lefts are operating at capacity.
Keele Street	63	E	545	F	>1.10	EB left, EB through, WB left, NB left and SB left are operating at capacity. NB through is approaching capacity.
Baldwin Avenue / Bowes Road	41	D	75	-	-	No capacity constraints.
Centre Street / North Rivermede Road	45	D	85	F	1.02	SB through is operating at capacity. EB through is approaching capacity.
Bathurst Street Connection Road	23	C	53	-	-	No capacity constraints.
Hunter's Point Drive	23	C	68	-	-	No capacity constraints.
Yonge Street Connection Road	26	C	56	C	0.91	WB through is approaching capacity.
Red Maple Road	43	D	137	F	1.07	EB left and the WB through are operating at capacity.
Silver Linden Drive	15	B	60	-	-	No capacity constraints
Bayview Connection Road	45	D	199	F	>1.10	EB left is operating at capacity. WB through is approaching capacity.
Chalmers Road / South Park Drive	47	D	138	F	1.10	EB left is operating at capacity. WB through is approaching capacity.
Saddlecreek Drive	10	A	70	-	-	No capacity constraints.
Valleymede Drive / Times Avenue	40	D	52	D	0.94	WB through is approaching capacity.
Commerce Valley Drive West / West Beaver Creek	38	D	106	-	-	EB left, EB through, WB through and right, and SB right are approaching capacity.
Leslie Street	50	D	138	F	>1.10	EB through, NB left and SB left are operating at capacity. WB through is approaching capacity.
Commerce Valley Drive East / East Beaver Creek	167	F	119	F	>1.10	EB through and WB through are operating at capacity. WB left is approaching capacity.
Highway 404 N-E/W Off-Ramp	14	B	40			No capacity constraints.
Highway 404 S-E/W Off-Ramp	28	C	48			No capacity constraints.

Immediate Conditions **PM Peak Hour Signalized Intersection Operations**						
Intersection Reference	Overall		Critical			Comments
Highway 7 @	Delay	LOS	Delay	LOS	V/C	
Allstate Parkway / Valhalla Drive	55	E	93	F	>1.10	SB right and WB through are operating at capacity.
Frontenac Drive / Cochrane Drive	12	B	75	-	-	No capacity constraints.
Woodbine Avenue	34	C	63	-	-	No capacity constraints.
Lunar Crescent	5	A	42	-	-	No capacity constraints.
Fairburn Drive / Montgomery Court	29	C	55	-	-	No capacity constraints.
Rodick Road	40	D	105	D	0.93	EB through is approaching capacity
Circa Boulevard	10	B	67	-	-	No capacity constraints.
Town Centre Boulevard	55	D	95	F	>1.10	EB through is operating at capacity.
Kennedy Road	53	D	125	F	1.10	EB through, WB left and NB through are operating at capacity. NB left is approaching capacity.
Swansea Road	10	B	71	-	-	No capacity constraints.
Bullock Drive / Plaza	27	C	91	F	1.07	EB left is operating at capacity.
Markville Mall Main Entrance	14	B	98	-	-	No capacity constraints.
McCowan Road	41	D	103	F	0.98	EB, WB, and NB left are approaching capacity.
Laidlaw Boulevard / Conservation Avenue	28	C	79	D	0.95	EB through is approaching capacity.
Robinson Street / St. Patrick School Entrance	13	B	56	-	-	No capacity constraints.
Grandview Boulevard / Galsworthy Drive	27	C	97	F	0.98	EB left is approaching capacity.
Main Street Markham	36	D	62	-	-	No capacity constraints.
Albert Street / Cosburn Road	7	A	42	-	-	No capacity constraints.
Wooten Way	31	C	80	-	-	No capacity constraints.
9th Line	46	D	46	F	1.05	EB left is operating at capacity. NB through and SB through are approaching capacity.
Bur Oak	15	B	62	-	-	No capacity constraints
Markham By-Pass	24	C	42	-	-	No capacity constraints.
Reesor Road	26	C	65	-	-	No capacity constraints.
York Durham Line/Regional Road 30	26	C	74	-	-	No capacity constraints.
Intersection Reference	Overall		Critical			Comments
Jane Street @	Delay	LOS	Delay	LOS	V/C	
Interchange Way	23	C	67	D	>1.10	WB left-through is operating at capacity.
Highway 407 N/S-W and E-N/S Ramp	16	B	51	-	-	No capacity constraints.
Highway 407 W-N/S Ramp	6	A	32	-	-	No capacity constraints.
Beechwood Cemetery	29	C	57	-	-	No capacity constraints.
Proposed East-West Road	57	E	62	-	-	No capacity constraints
Proposed East-West Road/Street C	28	C	44	-	-	No capacity constraints

Immediate Conditions **PM Peak Hour Signalized Intersection Operations**						
Intersection Reference	Overall		Critical			Comments
Steeles Avenue @	Delay	LOS	Delay	LOS	V/C	
Northwest Gate/Proposed Street C	35	D	50	-	-	No capacity constraints
Founders Road	21	C	41	-	-	No capacity constraints
Proposed Street F	32	C	86	F	1.01	SB left is operating at capacity.
Intersection Reference	Overall		Critical			Comments
Keele Street @	Delay	LOS	Delay	LOS	V/C	
Steeles Avenue	54	D	105	F	1.04	EB left and WB through are operating at capacity. NB through, WB left and EB through are approaching capacity
Proposed East-West Road	14	B	60	-	-	No capacity constraints.
Snidercroft Road / Ron Rose Drive	11	B	29	-	-	No capacity constraints.
Highway 407 W-N/S Ramp	6	A	27	-	-	No capacity constraints.
Highway 407 E-N/S Ramp	9	A	25	-	-	No capacity constraints.
Jardin Drive / Doney Crescent	12	B	32	-	-	No capacity constraints.
Intersection Reference	Overall		Critical			Comments
Centre Street @	Delay	LOS	Delay	LOS	V/C	
Dufferin Street	43	D	105	F	1.06	SB left is operating at capacity. EB through, WB left, and NB through-right are approaching capacity.
Concord Road / Wade Gate	21	C	80	-	-	No capacity constraints.
Vaughan Boulevard / Carl Tennen Road	15	B	72	-	-	No capacity constraints.
No Frills/Plaza	13	B	74	-	-	No capacity constraints.
New Westminster Drive	31	C	67	-	-	No capacity constraints.
North Promenade	11	B	80	-	-	No capacity constraints.
Bathurst Street	38	D	87	F	0.99	NB left and NB through are approaching capacity.
Intersection Reference	Overall		Critical			Comments
Bathurst Street @	Delay	LOS	Delay	LOS	V/C	
Beverley Glen Boulevard	18	B	47	-	-	No capacity constraints
Westminster Drive / Atkinson Avenue	28	C	80	F	0.97	EB left is operating at capacity
Worth Boulevard / Flamingo Road	75	E	124	F	>1.10	NB through is operating at capacity. SB left and through are approaching capacity.
Highway 407 W-N/S Ramp	15	B	44	-	-	No capacity constraints.
Highway 407 E-N/S Ramp	14	B	40	-	-	No capacity constraints.
Bathurst Connection Road	22	C	47	-	-	No capacity constraints.
Intersection Reference	Overall		Critical			Comments
Town Centre Boulevard @	Delay	LOS	Delay	LOS	V/C	
Clegg Road	10	B	59	-	-	No capacity constraints
Cedarland Drive	26	C	38	-	-	No capacity constraints
IBM	18	C	32	-	-	No capacity constraints.
Enterprise Drive	17	B	37	-	-	No capacity constraints

Immediate Conditions **PM Peak Hour Signalized Intersection Operations**						
Intersection Reference	Overall		Critical			Comments
Helen Avenue @	Delay	LOS	Delay	LOS	V/C	
Future Connection Road	20	C	41	-	-	No capacity constraints.
Kennedy Road	49	D	68	E	1.05	NB through is operating at capacity.
Intersection Reference	Overall		Critical			Comments
Kennedy Road @	Delay	LOS	Delay	LOS	V/C	
Unionville Gate	38	D	61	D	0.92	NB left and through are approaching capacity.
Avoca Drive	108	F	348	F	1.09	EB left and NB through are operating at capacity. NB left is approaching capacity.

Summary of Immediate Operations

Based on a comparison of the analysis of the existing operations with the immediate operations of the Rapid Transit system, the following effects have been noted. The study area intersections not summarized below represent those that will operate at a satisfactory level of service or those that will benefit with the transitway in place. Only those intersections exhibiting potential operational deficiencies are noted below. Note that the analysis of the immediate effects with the Rapid Transit system in operation is based on current traffic volumes and lane configuration with the exception of roads that currently do not exist. These areas have been based on projected traffic counts and lane configurations and are noted in **Exhibit 6-1** and below in their respective summaries.

<u>Highway 7/Highway 50</u>

During the AM peak hour, the southbound left turn movement will operate at capacity and the eastbound through and westbound left will be approaching capacity. During the PM peak hour, the southbound left will operate at capacity and the eastbound left and through movements will approach capacity.

The intersection at Highway 7/Highway 50 will represent the west end termination of the dedicated transit way in the Region of York. As such, the preferred alternative has the westbound transit vehicle negotiating a westbound left turn onto Highway 50 to travel to Huntington Road where it will return to the Highway 7 eastbound route.

Two operational methods to accommodate the westbound left turn of the transit vehicle were reviewed:

- A dedicated westbound transit phase of 10 seconds to permit the transit vehicle to negotiate a left turn into the general traffic lanes, separate from the westbound traffic;
- A dual westbound left turn with transit vehicles and the general traffic left turn proceeding on the same phase.

To reduce impacts on future intersection operations, a westbound dual left turn is recommended, i.e., the westbound left turn for general traffic and the westbound left turn of the dedicated transitway.

Presently, there is an eastbound and westbound advance during the AM peak hour of 10 seconds. There is only an eastbound advance provided during the PM peak hour. Under future conditions, the addition of a westbound protected left turn phase is required. The bus will continue southbound and turn left on Huntington Road in mixed traffic.

Highway 7/Huntington Road

The eastbound buses will re-enter the transitway subsequent to negotiating a northbound right turn from Huntington Road on to Highway 7. The transit vehicle will be required to merge across two eastbound through lanes and over the rumble strip into the exclusive transitway lanes. Approximately 500 metres are available for this transition before the bus approaches the Highway 427 interchange.

Highway 7/Highway 427 S-E/W off ramp

There are no projected capacity constraints expected during the AM peak hour. During the PM peak hour the ramp volumes are heavy and therefore a majority of the green time is allocated to the northbound movements. Specifically, 51 seconds is allocated to the ramp approach and the remaining 39 seconds to the east-west approaches. The intersection is operating on a cycle length of 90 seconds.

In an attempt to decrease transit delays at this intersection, future operations were modelled with a 120 second cycle length during the PM peak hour to determine if the green time in the east-west direction could be increased. The results show that a large portion of the green time will still be necessary for the ramp movements to maintain acceptable operating conditions. To mitigate the delay to transit vehicles waiting for the east-west phase, transit priority could be considered at this location, during the detailed design phase.

Highway 7/Roybridge Road/Vaughan Valley Boulevard

Under the immediate operating conditions, the north-south main phase was increased from the present 41 second split to 51 seconds to accommodate pedestrian crossing times. This time requirement reduces the amount of time to be provided to the east-west main street movements during pedestrian calls. During the AM and PM peak hours the westbound through movements will operate at or near capacity.

Existing pedestrian volumes at this intersection are relatively low as the area is still under development. Future pedestrian volumes should be monitored over time to determine the opportunity to provide a two-stage crossing for pedestrians and thus allocate additional green time to the east-west main phase. A vehicle minimum on the side street could be used with the pedestrian minimum being called only with the activation of a pedestrian push button.

It should be recognized, that should Highway 427 be extended to the north in the future, some of the east-west movements along Highway 7 associated with Highway 427 access would be diverted to other east-west parallel routes to the north. This is discussed further in **Section 7.0**.

Highway 7/Highway 27

With the proposed operational changes, the north-south green time has been increased from 35 seconds in the AM peak (37 seconds in PM peak) to 46 seconds to accommodate the minimum pedestrian crossing times.

The westbound left turn movement is operating at capacity in the AM peak hour. This capacity issue results from a high turning movement volume of 370 vehicles per hour, which currently exists today.

As with the Highway 7/Roybidge Gate/Vaughan Valley Boulevard intersection, the future extension of Highway 427 north of Highway 7 will have major impacts on the existing turning movement demands at the Highway 27 intersection.

Highway 7 – Kipling Avenue to Islington Avenue

Within this section of Highway 7, the transit vehicles will travel in mixed-traffic along Highway 7. Therefore, the Kipling Avenue and Islington Avenue intersections represent transition intersections and their unique operations are described in **Section 6.3.1.**

Highway 7/Pine Valley Drive

At present, the Highway 7/Pine Valley Drive intersection has a number of movements that operate at or are approaching capacity during the AM and PM peak hours. These include the westbound left during the AM peak hour and the westbound left, northbound left and westbound through movements in the PM peak hour.

The future RT modifications will result in additional north-south pedestrian crossing times and protected-only eastbound and westbound left turns. During the peak hours, the number of permissive left turns is limited due to the heavy east west through volumes.

Under future operations, the westbound left turn will continue to approach capacity during the AM peak hour. During the PM peak hour the eastbound, westbound and northbound left turn movements will operate at capacity.

Highway 7/Famous Avenue

During the AM peak hour the intersection is expected to operate without any capacity constraints. Under existing and future PM peak hour operating conditions, the eastbound through and northbound right turn movements will operate at capacity.

Highway 7/ Interchange Way

During the AM peak hour the intersection will operate at a satisfactory level of service; however, the eastbound left and westbound through movements will approach capacity. During the PM peak hour, the southbound right and eastbound left will operate at capacity.

Highway 7/Jane Street

Within this section of Highway 7, the transit vehicles will travel to the York Bus Terminal and York University via Jane Street in a dedicated transit right-of-way along Jane Street. Therefore, the Highway 7 / Jane Street intersection represents a transition intersection and its unique operations is described in **Section 6.3.2**.

Highway 7/Keele Street

This intersection represents a transition area from mixed traffic conditions on Keele Street to dedicated transitway lanes along Highway 7. Therefore, operations of these intersections are described in **Section 6.3.3**.

Highway 7/Creditstone Road

The Highway 7/Creditstone Road intersection will operate with an acceptable level of service in the future AM peak hour. In the PM peak hour, the westbound through and northbound lefts and the eastbound through movements will operate at capacity. The future side street minimum split is 46 seconds and is considerably high for the traffic volume on Creditstone Road, therefore a two-stage pedestrian crossing should be considered during the detailed design stage.

Highway 7 – Bowes Road to Centre Street

Within this section of Highway 7 the transit vehicles will travel in mixed-traffic. Therefore, the Bowes Road and Centre Street intersections represent transition intersections and their unique operations are described in **Section 6.3.5.**

Centre Street/New Westminster Drive

The Center Street/New Westminster Drive intersection will operate with an acceptable level of service in the future AM and PM peak hours. It should be recognized that residential and commercial development applications exist to the north of the intersection for the lands between New Westminster Drive and Bathurst Street.

Centre Street/North Promenade

The Center Street/North Promenade intersection will operate with an acceptable level of service in the future AM and PM peak hours. Under the 2021 conditions, North Promenade will be extended northwards (Disera Drive) and the intersection will operate with four approaches. This is discussed further in **Section 7**.

At present, the York Transit terminal is accessed via an unsignalized bus-only access west of the Centre Street/North Promenade intersection. Upon implementation of the RT system or during the detail design phase, a detailed operational/safety review should be conducted to determine the effects of permitting the local York Region Transit routes to access the Terminal without the provision of a traffic signal.

Centre Street/Bathurst Street

The preferred alignment is designed such that the transit vehicles will be required to negotiate an eastbound left turn or southbound right turn in the dedicated transit right-of-way at the Centre Street/Bathurst Street intersection. These manoeuvres will be accommodated with a dedicated 10-second transit phase. As the eastbound vehicles, left and through, do not conflict with the eastbound left and southbound right turn transit movements, these movements will also be permitted during the 10-second phase.

During the PM peak hour, the intersection will operate at capacity as 10 seconds was allocated to the transit movements and removed from the north-south phase. The eastbound left, northbound left and southbound through will be approaching capacity. All the left turn lanes will operate under protected-permissive phases as the transit phase will operate under an exclusive phase.

Bathurst Street/Beverley Glen Boulevard

Under the immediate conditions this intersection was analysed with a traffic signal. At present the intersection operates with stop controls on Beverley Glen Boulevard. However, as the area

develops this intersection is planned for signal timings. During both the AM and PM peak hour conditions, this intersection will operate at a good level of service.

Bathurst Street – Worth Boulevard/Flamingo Road to Highway 7/ Hunter's Point Drive

Within this section of Bathhurst Street the transit vehicles will travel in mixed-traffic. Therefore, the Bathurst Street/Worth Boulevard and Highway 7/Bathurst Street connection ramp intersection and Highway 7/Hunter's Point Drive will represent transition intersections and their unique operations are described in **Section 6.3.6**.

Yonge Street – Intermodal Station to Red Maple Road

Within this section, the transit vehicles will divert to/from Highway 7 to access the Intermodal Station located via the Yonge Street Connection Road. Therefore, the section from the Intermodal Station on the Yonge Street Connection Road to Highway 7 / Red Maple Road will represent transition intersections and are described in **Section 6.3.7.**

Highway 7/Silver Linden Drive

The intersection is expected to operate at a good level-of-service during the AM peak hour. During the PM peak hour the eastbound left is expected to operate at capacity. The westbound through will also approach capacity.

Highway 7 – Bayview Connection Ramp to Chalmers Road

Within this section of Highway 7 the transit vehicles will travel in mixed-traffic. Therefore, the Bayview Connection ramp and Chalmers Road intersections represent transition intersections and their unique operations are described in **Section 6.3.8.**

Highway 7 - South Park Road/Chalmers Road to Saddlecreek Drive

On the south side of Highway 7 within this area, a large residential development including condominiums and townhouses are currently being constructed. Therefore, the immediate operations were analyzed with their current "t" intersection configuration and will operate at a good level-of-service. Ultimate build-out of these intersections and the surrounding development will be analysed in further detail under the long-term traffic conditions in **Section 7**.

Highway 7/Leslie Street

Under future operating conditions, the westbound left will operate at capacity during the AM peak hour. During the PM peak hour, the westbound left and southbound left will operate at capacity and the eastbound left, eastbound through and northbound left will approach capacity.

The north-south movements will require a minimum split of 49 seconds to serve pedestrian crossing times; therefore, they will have residual capacity available. Opportunities to reduce the minimum north-south split, such as a two-stage pedestrian crossing, should be pursued as other critical phases require the additional green time. Specifically the westbound left during the AM peak and left turns in all approaches during the PM peak hour.

Highway 7/East Beaver Creek/Commerce Valley Drive East

Under future operating conditions, the eastbound and westbound left turns will operate at capacity due to the protected only phases.

Presently, the north-south phases are split which minimizes the residual green time for the east-west phase with 46 seconds allocated to the southbound phase and 17 seconds allocated to the northbound phase.

Traffic congestion at this intersection is attributed to vehicles accessing the Beaver Creek and Commerce Valley Business Parks. A Municipal Class EA is currently underway to select a preferred location for the Highway 404 Mid-block crossing between Highway 7 and 16th Avenue. It is expected with the construction of an additional interchange north of Highway 7 at Highway 404 that traffic patterns will change volumes will likely decrease through this section of Highway 7. This intersection is discussed further in **Section 7** under long-term traffic conditions.

Highway 7 – Highway 404 N-EW to S-EW Ramps

Within this section of Highway 7, the transit vehicles will travel in mixed-traffic. Therefore, the two ramp terminals represent transition intersections and their unique operations are described in **Section 6.3.9.**

Highway 7/Allstate Parkway/East Valhalla

During the AM peak hour, the eastbound left will operate at capacity. The traffic volume for this turning movement is 666 vehicles per hour, which opposes 1750 westbound through vehicles. Accordingly, an extended eastbound advance phase is required, which impacts the east-west available green time.

During the PM peak hour the southbound right will operate above capacity. It is recommended that the implementation of a channelized southbound right turn lane be examined as well as a dual eastbound left turn lane to improve the operation of the intersection.

Presently, the northbound lanes are not in operation. The recommended design illustrates that northbound vehicles will continue to be prohibited on East Valhalla at Highway 7.

Highway 7/Town Centre Boulevard

Through the Highway 7 Environmental Assessment, the preferred alternative is to provide a dedicated median transitway on Town Centre Boulevard for the York Rapid Transit Plan (YRTP) network. The planned operations of the median transitway will restrict full moves access across the transitway, to signalized intersections only. .

The Town Centre alignment would have the transit vehicles negotiating an eastbound right turn and northbound left turn in the dedicated transit right-of-way, which will be accommodated with a dedicated ten second transit phase. As the westbound vehicles, do not conflict with the eastbound right and northbound left turn transit movements; these movements will also be permitted during the ten-second-transit phase. The westbound left will operate as protected only in order to prohibit westbound left vehicles from operating with the westbound through volumes during the transit phase. During the AM peak hour the intersection will operate without any capacity constraints. During the PM peak hour the eastbound through will operate at capacity.

The intersections on Town Centre Boulevard at Clegg Road, Cedarland Drive and at IBM will be signalized. Based on current traffic conditions and lane configuration with the exception of exclusive north-south left turn lanes, these intersections will operate without any capacity constraints during both peak hours.

Markham Centre West

The subject lands referred to the Markham Centre West mainly include the lands between Warden Avenue and Kennedy Road south of Highway 7. Full build out of these lands is expected to be completed by 2021 and will consist of the extension of Enterprise Drive east to Kennedy Road as well as north south collector roads such as Verclair Gate, Village Parkway and Sciberras Road.

The transitway will cross the north-south collector roads in three locations. The north-south roads will operate under free flow conditions with the exception of when a bus is detected in the east-west transitway approaching the road. Traffic signal control will be used to separate the two vehicle flows. These locations have not been analysed as the transitway will have minimal impact to the north-south traffic and likely delay general traffic by less then 10 to 20 seconds (sufficient time for the transit vehicle to cross the roadway safely).

Helen Avenue/Future Connection Road

An exclusive transit only phase will be required to permit the transit vehicle to enter/exit the dedicated median transitway lanes on Helen Avenue. The transition will occur at the intersection of Helen Avenue and a new future connection road to Enterprise Drive/Unionville Gate located approximately 350 metres west of Main Street Unionville. Two bridge structures will be required to allow the transitway to travel across Enterprise Drive and the GO Stouffville Line (Refer to the Highway 7 EA recommended design. A transit stop will be provided west of the GO Stouffville Station. Under immediate conditions, this intersection was analysed based on current volumes on Helen Avenue and estimated traffic volumes on the future connection road obtained from the 2011 traffic volumes in the Markham Centre West Transportation Study. During both peak hours, the intersection is expected to operate without any capacity constraints.

Helen Avenue/Kennedy Road

A transit phase of 10 seconds was incorporated into the signal timings to operate in conjunction with the eastbound left and through movements. The west to north transition of the transit vehicle will not conflict with this movement. During the AM peak hour the southbound through will approach capacity. During the PM peak hour the northbound through will operate at capacity.

Kennedy Road/Avoca Drive

The northbound and southbound left turn lanes are operating as protected left phases due to the transitway. The westbound left turn and southbound through movement will operate at capacity during the AM peak hour.

During the PM peak hour the eastbound left and northbound through will operate at capacity.

Highway 7/Kennedy Road

A ten second advance for the transit vehicles to turn left on to Kennedy Road and turn right from Kennedy Road will be required. During this phase the westbound through volumes will also be permitted. A two-stage pedestrian crossing is necessary to meet the minimum split requirements in both directions.

Highway 7/Bullock Drive/Commercial Access

The Highway 7/Bullock Drive/Commercial Access intersection operates at an acceptable level of service during the AM peak hour. During the PM peak hour the eastbound left turn lane will operate at capacity as a protected left turn phase.

Highway 7/McCowan Road

During the AM peak hour the north-south and east-west main phases are operating at their minimum split of 44 seconds and 37 seconds respectively, as the westbound left and northbound lefts require green time. These left turns are operating above capacity. To improve operating conditions, a two-stage pedestrian crossing should be investigated in both directions during the detailed design stage.

The intersection of McCowan Road at Highway 7 is operating at a satisfactory level-of-service during PM peak hour.

Highway 7 – Grandview Boulevard to Wooten Way

Within this section of Highway 7, the transit vehicles will travel in mixed-traffic. Therefore, the Grand Boulevard and Wooten Way intersections represent transition intersections and their unique operations are described in **Section 6.3.10**.

Highway 7/Markham By-Pass

The Highway 7/Markham By-Pass intersection will operate with an acceptable level of service in the AM and PM peak hours. As the lands to the north and south of the intersection are planned for future development, this section of Highway 7 is discussed further in **Section 7** under long-term traffic conditions.

Highway 7/Bur Oak Avenue to Markham Stouffville Hospital

Within this section from Highway 7 to the Markham Stouffville Hospital, it is likely that the transit vehicles will travel in mixed-traffic. At this time, these operations are not yet confirmed. However for the purposes of this report it has been assumed that the intersection at Highway 7/Bur Oak Avenue will represent a transition intersection and therefore is described in **Section 6.3.11**.

Highway 7/Reesor Road

From Reesor Road easterly to the York-Durham Line, the transit vehicles will travel in mixed-traffic. Therefore, the Reesor Road intersection represents a transition intersection and its unique operations are described in **Section 6.3.12**.

6.3 Transition Areas on Highway 7

As noted in **Section 4.4.3**, there are a number of locations that require the transit vehicles to operate within the general traffic lanes. Refer to **Section 4.4.3** for a general discussion of how the transition areas will be configured and operated.

The operations from the west to the east study limits, the transition areas are as follows:

6.3.1 KIPLING AVENUE AND ISLINGTON AVENUE

Preferred Alternative

As proposed in the preferred alternative, transit vehicles will operate in mixed traffic under the CP Mactier mainline bridge and over the Humber River Bridge; to avoid widening the structures to provide dedicated transit lanes.

The west transition area between dedicated transitway and mixed-traffic operations will occur at the Highway 7/Kipling Avenue intersection. The eastbound transition will occur at the Highway 7/Islington Avenue intersection.

Transit Operations

In the eastbound direction, the transit vehicles will be required to stop at the Highway 7/Kipling Avenue intersection, (hereafter in this section referred to as the Kipling Avenue intersection), wait for the transit phase and then proceed into the curb lane of the general traffic lanes to the far side transit stop. A 10 second transit phase will be provided to facilitate this movement. Through the mixed-traffic section, the transit vehicle will remain in the curb lane where it will stop curbside near side at the Islington Avenue intersection. An advance transit phase will be provided prior to the next phase change at the intersection to allow the transit vehicle to proceed into the dedicated median transitway on the far side of the intersection.

In the westbound direction, the transit vehicle will approach the Islington Avenue intersection in the dedicated transitway and will be required to stop until the next signal phase change. A ten second transit phase will be provided prior to the next signal phase change, to facilitate the transit vehicle merge into the curb lane of the general traffic lanes, to stop curb side at the far side transit stop. The exclusive eastbound right turning vehicles will be permitted in conjunction with the eastbound and westbound transit phase. The westbound right turn is shared and therefore would not be permitted during the transit phase.

Between the Islington Avenue far side curb lane transit stop and the Kipling Avenue intersection, the transit vehicle will remain in the curb lane. The transit vehicle will stop at Kipling Avenue at the near side transit stop in the curb lane until the next phase change at the intersection. A ten second transit advance phase for the westbound right turn movement will be called prior to the next phase change, where the transit vehicle will be permitted to enter the dedicated transit way lanes. During this phase the westbound right turning traffic is permitted, as they share the lane with the transit vehicle and would be required to clear the intersection. This advance phase will operate in conjunction with the eastbound advance transit phase.

There are a number of unsignalized public intersections and accesses within this mixed-traffic section. The transit vehicle should not experience any considerable delays at these unsignalized locations.

Future Intersection Operations

The above signal provisions were modelled in Synchro and are summarized in the following table. The minimum amount of green time for transit priority is five seconds. In the analysis an advance phase of ten seconds has been designated to the bus movement.

Signalized Intersection	Intersection Overall LOS		Critical Movement	AM Peak Hour		PM Peak Hour	
	AM	PM		LOS	V/C	LOS	V/C
Highway 7/Kipling Avenue	F	E	EBL	-	-	F	1.10

			EBT	C	0.91	E	1.01
			WBT	D	1.00	E	1.09
			SBT	F	1.04	-	-
Highway 7/Islington Avenue	F	F	EBL	-	-	F	0.91
			EBT	F	>1.10	F	>1.10
			WBT	D	0.99	F	>1.10
			NBL	F	0.92	F	>1.10
			SBL	F	1.31	-	0.92

Highway 7/Kipling Avenue

The intersection of Kipling Avenue with an additional transit phase of ten seconds will continue to operate at capacity under future conditions. Split phasing will be required at this intersection to allocate additional green time to the east-west phase as the north-south phase will operate at a minimum split of 38 seconds. Another option to improve operations would be to implement exclusive lanes in the southbound approach for example an exclusive left, through and right turn lane.

During the AM peak hour, the westbound through and the southbound approach will operate at capacity. The eastbound through will be approaching capacity. During the PM peak hour approximately 430 vehicles will turn left in the eastbound direction and the movement will operate at capacity.

Highway 7/Islington Avenue

The intersection at Islington Avenue will continue to operate at capacity. An additional transit only phase of ten seconds was implemented to give the westbound through buses on Islington Avenue a queue jump to merge into the through lanes and access the far side transit stop in the curb lane. The eastbound transit vehicle will operate during this phase as well to merge from the near side transit stop in the curb lane or right turn lane and merge into the dedicated transit lanes. This transit phase is especially critical for buses given the grade of Highway 7 east of the intersection.

This ten second phase takes green time away from the westbound phase and left turn advances and increases their v/c ratios. The north and south left turns will remain as protected only due to the vertical and horizontal alignment of Islington Avenue at Highway 7. The eastbound and westbound through movements will operate at capacity in addition to the northbound left during the PM peak hour and the southbound left during the AM peak hour.

Pedestrian split phasing would be beneficial on the north-south phase to generate additional green time for the east-west movements.

6.3.2 JANE STREET AND HIGHWAY 7

Preferred Alternative

As part of the Vaughan North South Link, transit vehicles will access the proposed York Transit Terminal and York University at North West Gate and Steeles Avenue. Two route alternatives were analysed:

- Rerouting from Highway 7 at Interchange Way; or
- Rerouting from Highway 7 at Jane Street.

Based on a review of existing operations the preferred alternative is to operate the transitway through the Jane Street and Highway 7 intersection as a result of an overall decrease in the projected travel time for the transit vehicle. It was decided that the routing through the Jane Street/Highway 7 would be preferred due to:

- The transit vehicle would be travelling in mixed traffic on Interchange Way which may result in slower travel times;
- Less turning movements required versus Interchange Way route; and
- Increased ridership expected at Jane Street/Highway 7 intersection.

From a traffic perspective, it was recommended that the transit system avoid the intersection of Jane Street and Highway 7 and use Interchange Way. The bus would operate in mixed traffic on Interchange Way to Jane Street and diverge into the transitway on Jane Street. The recommendation was based on the following:

- Eastbound transit vehicles would experience less delay negotiating an eastbound right turn at Interchange Way versus Jane Street from Highway 7 and would have less impact on the operation of the intersection;
- The northbound left at Interchange Way versus Jane Street, is less congested and would result in better travel times;
- The northbound left on Jane Street at Interchange Way would be restricted to buses only decreasing auto cut-through volume on Interchange Way;
- The eastbound diverge into the southbound transit lanes on Jane Street, would be negotiated relatively easily with an eastbound advance permitting the buses to merge and avoiding some of the westbound left turn volume; and
- From the analysis it was determined that the intersection of Interchange Way and Highway 7 would operate at capacity with the additional 10-second transit phase.

The preferred alternative was with the routing from Highway 7 to Jane Street and will consist of the following transit movements:

- East-west routes on Highway 7 in dedicated transitway lanes;
- North to west routes from Jane Street to Highway 7 east, to/from dedicated transitway lanes;
- West to south routes from Highway 7 west, to/from dedicated transitway lanes on Jane Street.

Transit platforms will be situated in the centre lane on the west approach of the intersection.

Transit Operations

The east-west transit routes on Highway 7 will continue to operate during the east-west main phase; therefore, the eastbound and westbound lefts will operate as protected phases only.

Transit will operate east west along Highway 7, as well as, turn to operate along Jane Street. Therefore, a ten second transit phase is required to facilitate these movements which could operate with either the northbound general traffic or the westbound general through traffic. The volumes were analysed during both peak hours at the intersection to determine which movement was the more critical. During both peak hours, the westbound through vehicles were determined to require additional green time. As a northbound exclusive right turn lane is provided at the intersection, this movement will be permitted during the transit phase, as it will not conflict with the westbound vehicles.

The transit vehicle will operate in dedicated transitway lanes on Jane Street south to the entrance to Beechwood Cemetery located approximately 250 metres south of the Highway 407 eastbound off-ramp where it will transition to mixed traffic to access the proposed York Region Intermodal Station.

Future Intersection Operations

The above signal provisions were modelled in Synchro and are summarized in the following table. The minimum amount of green time for transit priority is five seconds. In the analysis an advance phase of ten seconds including five seconds green, three seconds amber and two seconds red has been designated to the bus movement. Jane Street has been analysed under the current four-lane cross section and six lane cross section at Highway 407. The Region of York capital program includes Jane Street to be widened from four lanes to six lanes from Steeles Avenue to Highway 7 in 2012.

Signalized Intersection	Intersection Overall LOS		Critical Movement	AM Peak Hour		PM Peak Hour	
	AM	PM		LOS	V/C	LOS	V/C
Highway 7/Jane Street	F	F	EBL EBT WBL WBT NBL SBL	F F F - F -	0.97 >1.10 >1.10 - >1.10 1.01	E F F C F F	1.00 >1.10 >1.10 0.97 >1.10 >1.10
Jane Street/Interchange Way	B	C	WBLT	D	-	D	>1.10
Jane Street/Highway 407 North Ramp	B	C	SBT	-	-	C	0.94
Jane Street/Highway 407 South Ramp	B	A	-	-	-	-	-
Jane Street/Beechwood Cemetery Entrance	B	C	-	-	-	-	-

Highway 7/Jane Street

The intersection of Highway 7 and Jane Street will operate at capacity during both peak periods. Several of the critical movements operate at capacity under existing conditions. With the ten second transit phase/westbound advance some time is removed from the eastbound and westbound left advance phase.

It is recommended that split phasing be considered during the detailed design phase, as the north-south pedestrian movement will require a minimum split of 45 seconds. It is expected that split pedestrian phasing will slightly improve operations.

Jane Street / Interchange Way

The transitway will have minimal impact to the operation of the intersection. The only modification required to the signal timing is operating the southbound left movement, as protected only as northbound left turns are not permitted. The east-west movement is adjusted to operate at the minimum pedestrian split.

During the PM peak hour, the westbound left through will operate at capacity. An exclusive left turn lane or possibly a dual left turn lane is required as there will be approximately 590 vehicles turning left. This would improve operations at the intersection.

Jane Street / Highway 407 North and South ramp

Both intersections are expected to operate at good level-of-service with the RT system. The northbound left movement at the north ramp to/from Highway 407 will operate as a protected left with the RT system.

Jane Street / Beechwood Cemetery Entrance

A ten second exclusive transit phase was implemented in the signal timing to transition the transit vehicle to/from mixed traffic. This intersection is expected to operate without any capacity constraints. The volumes generated by the cemetery were estimated to analyse the intersection operations.

6.3.3 PROPOSED YORK REGION INTERMODAL TERMINAL

The proposed York Region Intermodal Terminal will be located in the northeast quadrant of Steeles Avenue and Northwest Gate. The preferred alternative through this section will travel along a Proposed East-West Road and future extension of Northwest Gate to access the transit terminal. The route will continue along Streeles Avenue to a Future Street F, west of Keele Street where it will access York University. This transition area is included in **Section 7.3.5 and Section 7.4.5** under the 2021 Effects as it would be redundant to analyse under both scenarios given that future volumes and road network must be utilized.

6.3.4 KEELE STREET AND HIGHWAY 7

Preferred Alternative

At the Keele Street intersection, the transit system will operate on Highway 7 in dedicated transitway lanes. In addition to the transit system operating on Highway 7, transit vehicles will be operating on Keele Street in mixed traffic south of Highway 7 to access the York Transit Terminal and York University. Therefore the following transit movements will occur at the intersection of Keele Street and Highway 7:

- East-west routes on Highway 7 in dedicated transitway lanes;
- Northbound right from Keele Street to Highway 7 from mixed traffic to dedicated median transitway lanes; and
- Westbound left from Highway 7 to Keele Street from dedicated median transitway lanes to mixed traffic on Keele Street.

Transit Operations

To accommodate the various transit routes and transition to/from dedicated lanes to/from mixed traffic exclusive signal phases will be required. The east-west routes on Highway 7 will continue to operate during the east-west main phase resulting in the eastbound and westbound lefts to operate as protected only phases. Approximately 80 metres of the dedicated transit right-of-way will be provided on Keele Street to facilitate the northbound right from Keele Street and westbound left from Highway 7. The transit vehicle will transition from mixed traffic on Keele Street to the dedicated transit lanes as it approaches Highway 7 and the westbound left will transition from dedicated transit lanes to the 80 metres of dedicated transitway on Keele Street before merging into the general traffic lanes. A ten second-transit phase will accommodate both movements and will operate in conjunction with the westbound general traffic.

Future Intersection Operations

The above operational requirements were incorporated into the intersection analysis and assessed. During the PM peak hour, all the left turn movements will operate at capacity due to the protected east and west left phase as well as the high north south minimum split of 52 seconds. If this phase was split, additional green time could be allocated to the critical movements and improve the advance phases.

During the AM peak hour the eastbound dual left and westbound left will operate at capacity with volumes of approximately 580 vehicles and 440 vehicles respectively. Additional green time or road network improvements will be required to facilitate these heavy movements.

Signalized Intersection	Intersection Overall LOS		Critical Movement	AM Peak Hour		PM Peak Hour	
	AM	PM		LOS	V/C	LOS	V/C
Highway 7/Keele Street	E	F	EBLL	F	>1.10	F	1.07
			EBT	-	-	D	0.99
			WBL	F	>1.10	F	>1.10
			NBL	F	1.02	F	>1.10
			NBT	-	-	D	0.95
			SBL	-	-	F	>1.10

6.3.5 BOWES ROAD / BALDWIN AVENUE AND CENTRE STREET

Preferred Alternative

The current plan includes a transition area to mixed traffic between Centre Street and Bowes Road in order to prevent from having to widen the two structures over the GO Bradford Railway Line and over the West Don River.

The eastbound transit vehicle will transition to mixed traffic at Bowes Road and remain in mixed traffic, in the curb lane through the channelized right turn lane at the Highway 7/Centre Street/North Rivermede Road intersection, where they will diverge into the transitway downstream of the intersection. The preferred plan is based on the following:

- Eastbound transit vehicles will experience less delay by negotiating a relatively unrestricted northbound right turn, in mixed traffic, at the Highway 7/Centre Street intersection;

- The eastbound diverge on Centre Street into the transit lanes, can be negotiated in a relatively non congested section of roadway, without the delay of the intersection; and

- The westbound dual left turn lane on Centre Street at Highway 7 can be maintained.

The following analysis has been undertaken with the above operational modification in place.

Transit Operations

In the eastbound direction, the transit vehicles will be required to stop at the Highway 7/Bowes Road intersection, wait for the transit phase and then proceed into the curb lane of the general traffic lanes. A ten second transit phase will be provided. Through the mixed-traffic section, the transit vehicle will merge into the curb lane, proceed through the northbound right turn lane at the Highway 7/Centre Street intersection, and then merge into the median transitway.

In the westbound direction, transit vehicles will approach the Highway 7/Centre Street intersection in the dedicated transitway, will receive a ten second advance phase to negotiate a westbound left turn and merge into the median lane of the general traffic lanes. Approaching the Highway 7/Bowes Road intersection, the transit vehicle will diverge into the transitway prior to the intersection and will proceed on the next east-west green phase.

Future Intersection Operations

The above operational requirements were incorporated into the intersection analysis and assessed. The Highway 7/Center Street intersection currently operates with four phases. Centre Street and North Rivermede operate with split phases, where east and west traffic proceed on their own green phase.

The above signal provisions were modelled in Synchro and are summarized in the following table. The minimum amount of green time for transit priority is five seconds. In the analysis an advance phase of five seconds with three seconds amber and two seconds red has been designated to the bus movement.

Signalized Intersection	Intersection Overall LOS		Critical Movement	AM Peak Hour		PM Peak Hour	
	AM	PM		LOS	V/C	LOS	V/C
Highway 7/Bowes Road/Baldwin Avenue	B	D	-	-	-	-	-
Highway 7/Centre Street	C	D	NBT EBT	- -	- -	E E	0.92 0.98

Highway 7/Bowes Road/Baldwin Avenue

The intersection is expected to operate at good level-of-service with the RT system.

Highway 7/Centre Street/North Rivermede

The westbound approach on Centre Street is presently operating at a satisfactory level-of-service with a dual left turn lane, through lane and a channelized right turn lane. The signal timings were modelled similar to existing conditions with split phasing in the east-west direction. Under future conditions, the westbound approach will include the bus transitway movement, which was modelled to operate in conjunction with the westbound general traffic. With the westbound right channelized lane and northbound right channelized lane the pedestrian crossing times are reduced decreasing

the minimum splits in both approaches. This allows the intersection to operate at a satisfactory level of service.
During the PM peak hour, the northbound through and eastbound through are approaching capacity. These movements will not impact the operation of the transitway.

Minimal delays or queues are expected between the two intersections.

6.3.6 BATHURST STREET - WORTH BOULEVARD/FLAMINGO ROAD TO BATHURST CONNECTION RAMP

Preferred Alternative

As proposed in the preferred alternative, transit vehicles will operate in mixed traffic through the Highway 407 and Highway 7 grade separations, to avoid widening the structure to provide dedicated transit lanes.

The south transition area between dedicated transitway and mixed-traffic operations will occur at the Bathurst Street/Worth Boulevard/Flamingo Road intersection. The north transition will occur at the Highway 7/Bathurst Street connection ramp.

Transit Operations

In the northbound direction, the transit vehicles will stop at the Bathurst Street/Worth Boulevard intersection, wait for the ten-second-advance transit phase and then proceed into the curb lane of the general traffic lanes. Through the mixed-traffic section, the transit vehicle will travel in the curb lane to negotiate a northbound right turn at the Bathurst Street/Connection Ramp. The transit vehicle will then transition into dedicated transit lanes stopping at a near side centre lane transit stop prior to Highway 7. The transit vehicle will proceed with the southbound left turn phase remaining in the dedicated transit right-of-way on Highway 7 eastbound.

In the westbound direction, transit vehicles will transition from dedicated transit lanes to mixed traffic at the Highway 7/Hunter's Point Drive intersection. They will receive a ten second-advance phase to negotiate this merge. This manoeuvre can be conducted in conjunction with the eastbound through advance for general traffic. The transit vehicle will then proceed to the Bathurst Connection ramp in the curb lane in mixed traffic utilizing the westbound channelized right turn lane. A transit lay by will exist to access a curb side stop approximately 60 metres north of Highway 7. The transit vehicle will then remain in mixed traffic and negotiate a westbound left turn at the Bathurst Street/Connection Ramp intersection proceeding in the median lane of the general traffic lanes. Approaching the Bathurst Street/Worth Boulevard intersection, the transit vehicle will diverge into the dedicated transit lanes and will proceed on the next north-south main/transit phase.

Future Intersection Operations

The above signal provisions were modelled in Synchro and are summarized in the following table.

Signalized Intersection	Intersection Overall LOS		Critical Movement	AM Peak Hour		PM Peak Hour	
	AM	PM		LOS	V/C	LOS	V/C
Bathurst Street/Worth Boulevard	F	F	NBT SBL SBT	F - F	>1.10 - >1.10	F F C	>1.10 0.92 1.01
Bathurst Street/Highway 407 E-NS	A	B	-	-	-	-	-
Bathurst Street/Highway 407 W-NS	A	B	-	-	-	-	-
Bathurst Street/Bathurst Street Connection Ramp	B	B	-	-	-	-	-
Highway 7/Bathurst Street Connection Ramp	B	B	-	-	-	-	-
Highway 7/Hunter's Point Drive	B	C	-	-	-	-	-

Bathurst Street/Flamingo Road/Worth Boulevard

As this is a transition intersection where the northbound bus merges into mixed traffic, a southbound advance for the through volumes of ten seconds is permitted. The northbound through volumes will operate at capacity and the southbound through volumes are expected to approach capacity.

Additional green time is required in the north-south direction and therefore split phasing may need to be considered during the detailed design stage.

The Region of York has long-term plans to widen Bathurst Street from four lanes to six lanes, which will provide additional capacity in the north-south direction and improve operations at the intersection.

Bathurst Street/Highway 407 Off Ramps and Bathurst Street Connection Ramp

No capacity constraints.

Highway 7/Bathurst Street Connection Road

Three southbound lanes will be provided including the transitway southbound left turn lane and the two general traffic left turn lanes. In addition, a dual eastbound left turn lane will be provided in the future design. The transit vehicles will utilize the centre left turn lane, which will be dedicated to transit vehicles. The near side transit stop will be located between the southbound left transit lane and the dual southbound left turn lane for general traffic. Approximately 50% of the cycle length will be designated to the southbound phase to decrease travel times through the intersection.

Highway 7/ Hunter's Point Drive

No capacity constraints.

6.3.7 YONGE STREET – LANGSTAFF INTERMODAL STATION TO RED MAPLE ROAD

The preferred design at the intersection at the Yonge Street Connection Road and Highway 7 will consist of exclusive transitway lanes in all approaches. However, the westbound right transit movement from Highway 7 and the southbound right transit movement from the Yonge Connection Road will operate in mixed traffic utilizing the channelized right turn lanes.

The projected traffic volumes generated by the Intermodal Station and the residential area north of Red Maple Road have not been included in the immediate effects but in **Section 7.3.7** and **Section 7.4.7** under the 2021 Effects. The immediate conditions have been based on the current traffic conditions and roadway geometrics.

Transit Operations

Westbound transit vehicles will transition from the dedicated transitway to mixed traffic at the Red Maple Road intersection to access the Langstaff Intermodal Station from the Yonge Street Connection Road. Eastbound transit vehicles from the Langstaff Intermodal Station will remain in dedicated transitway lanes. West of the Yonge Connection Road, transit vehicles travelling westbound will transition from mixed traffic to the dedicated transitway lanes, slowly merging from the general traffic lanes.

The Yonge Street Connection Road/Highway 7 intersection will not warrant exclusive signal phases as the eastbound left transit movement on Highway 7 will operate in conjunction with the eastbound left auto traffic and similarly for the southbound left transit movement operating as a triple left with the dual southbound left auto traffic. Signal priority will likely be implemented to detect buses in the transitway and activate the appropriate phases to avoid long delays and prevent the buses from doubling up.

An advance eastbound through phase was implemented into the signal timing at Red Maple Road to permit the westbound transit vehicle to transition to mixed traffic. To enforce the eastbound through only, the eastbound left movement will operate as protected only.

Future Intersection Operations

The above signal provisions were modelled in Synchro and are summarized in the following table.

Signalized Intersection	Intersection Overall LOS		Critical Movement	AM Peak Hour		PM Peak Hour	
	AM	PM		LOS	V/C	LOS	V/C
Highway 7/Yonge Connection Ramp	B	C	EBL	-	-	E	0.93
Highway 7/Red Maple Road	C	D	EBL WBT	- -	- 0.93	F E	1.06 1.07

Highway 7/Red Maple Road

The Highway 7/Red Maple Road intersection will operate at an acceptable level of service during the AM peak hour with the westbound through approaching capacity.

During the PM peak hour the eastbound left and the westbound through are expected to operate at capacity. The phasing in the north approach has been set to the minimum of 37 seconds.

6.3.8 BAYVIEW AVENUE AND SOUTH PARK ROAD/CHALMERS ROAD

Preferred Option

As proposed in the preferred alternative, transit vehicles will operate in mixed traffic under the Bayview Avenue structure across Highway 7, to avoid widening the structure to provide dedicated transit lanes.

The west transition area between dedicated transitway and mixed-traffic operations will occur at the Highway 7/Bayview Avenue connection ramp. The eastbound transit are will occur at the Chalmers Road intersection.

Transit Operations

In the eastbound direction, the transit vehicles will required to stop at the Highway 7/Bayview Avenue connection ramp intersection, (hereafter in this section referred to as the Bayview Avenue intersection), wait for the transit phase and then proceed into the median lane of the general traffic lanes. A ten second-transit phase will be provided to facilitate this movement. Through the mixed-traffic section, the transit vehicle will remain in the median lane where it will diverge into the transitway lanes just west of the Highway 7/Chalmers Road intersection.

In the westbound direction, similar operations will occur as describe with the entering and exiting intersections in the eastbound direction.

There are no other intersections within this mixed-traffic section. Transit platforms will be located curbside midway between Bayview Avenue and South Park Road/Chalmers Road. Additional transit stops will be located far side in the centre lane at the South Park Road/Chalmers Road intersection.

Future Intersection Operations

The above signal provisions and intersection operations were modelled in Synchro and are summarized in the following table. The minimum amount of green time for transit priority is five seconds. In the analysis an advance phase of five seconds with three seconds amber and two seconds red has been designated to the bus movement.

Signalized Intersection	Intersection Overall LOS		Critical Movement	AM Peak Hour		PM Peak Hour	
	AM	PM		LOS	V/C	LOS	V/C
Highway 7/Bayview Avenue Ramp Connection	C	D	EBL	E	0.95	F	>1.10
Highway 7/Chalmer Drive	C	D	EBL WBT	- -	- -	F E	>1.10 0.99

Highway 7/Bayveiw Connection Ramp

During the AM peak hour the eastbound through is approaching capacity. The detailed design phase should review the possibility of implementing a dual eastbound left turn lane and/or split phasing for pedestrians to address capacity issues at the intersection.

Highway 7/South Park Road/Chalmers Road

A minimum split of approximately 49 seconds is required in the north-south phase. This in addition to the ten-second advance allocated to the transit movements, result in the east-west phase to operate at capacity during the PM peak hour. The eastbound left and westbound through movements will operate at capacity.

In order to provide additional east-west green time, pedestrian split phasing would permit the green time in the north-south phase to be reduced.

6.3.9 HIGHWAY 404 SOUTHBOUND AND NORTHBOUND OFF RAMPS

Future Transit Volumes

The current estimates from the forecast modelling indicates that approximately 21 buses per direction will be generated in 2021 east of Leslie Street, with full implementation of the YRTP plan. Therefore, headways of approximately one bus for every 2.5 minutes are expected.

Transitway System Operations Through Highway 404

As currently proposed, the two Highway 404 ramp terminals will represent the transition points for the Highway 7 transit vehicles to operate in mixed traffic through the interchange. The primary means of permitting the merge manoeuvres at the transitions is to stop the adjacent general traffic lanes for a short period of time and permit the transit vehicle to proceed into mixed traffic. Provided below are the anticipated traffic and transit operations during the AM and PM peak periods.

Westbound transit vehicles will proceed to the Highway 7/Highway 404 S-E/W intersection on an exclusive right-of-way. At the signalized intersection, transit vehicles will be required to merge into the general traffic lanes, proceed under Highway 404 and then diverge into the transitway prior to the Highway 7/Highway 404 N-E/W intersection. The transit vehicle will proceed through the Highway 7/Highway 404 intersection within an exclusive transitway.

In the eastbound direction, the transit vehicles will negotiate similar operations through the two ramp terminals and mixed traffic conditions.

The following is an assessment of the various control and operational methodologies that could be employed within this area to minimize impacts on the critical intersection operations while providing a reasonable level of service to the transit movements.

Highway 7/Highway 404 N-E/W Intersection

At the Highway 7/Highway 404 N-E/W intersection, westbound transit vehicles will diverge from the general traffic lanes, into the dedicated transitway approximately 100 meters east of the intersection. The transit vehicles will be given a green indication in conjunction with the westbound traffic.

The eastbound transit vehicles will merge with the general traffic lanes by inserting a transit only phase of five seconds green with a three seconds amber and two seconds red, into the current timing plan at the intersection. Under this scenario, the eastbound general traffic lanes will be stopped; however, the westbound through lanes will run concurrently, as they do not represent a conflicting movement.

The time for the advance transit phase can either be taken from the east-west main phase or the southbound main phase. During the AM peak hour, it is recommended that the time be taken from

the east-west phase, recognizing that only eastbound through traffic will be stopped to create the gap for the transit vehicle to merge. The eastbound through movement does not represent a critical movement in the AM peak hour. In the PM peak hour and the off-peak periods, it is recommended that the time required for the transit phase be taken from the southbound main phase, as these movements do not represent the critical movement in the these periods. The advance transit phase could be effected at the beginning or the end of either of the main phases, with time being taken from movements noted above.

Upstream and stop bar detection of the transit vehicle should be provided to allow the controller with advance warning (upstream detector) and confirmation (stop bar detector) that a transit vehicle requires the advance transit phase. Provided below are the results of the analysis that demonstrates that the provision of the eastbound transit advance phase will have little or no impact on the overall operations at the Highway 7/Highway 404 N-E/W intersection.

Highway 7/Highway 404 S-E/W Intersection

The operations of the transitway transition at the Highway 7/Highway 404 S-E/W intersection will be similar to that of the N-E/W interchange ramp with the eastbound diverge from the general traffic lanes to the dedicated transitway being unhindered and the westbound merge into mixed traffic being effected through a transit advance phase (five seconds green time with three second amber and two seconds all red) at the intersection.

During the AM peak hour the northbound and westbound movements represent the critical movements at the intersection. From time to time westbound vehicle queues approach the Highway 7/Highway 404 S-E/W intersection due to upstream congestion at the Commerce Valley/East Beaver Creek and Highway 404 N-E/W intersections. It is recommended that the time required for the advance transit phase be taken from the westbound general traffic lane green time, as the critical intersections are downstream of this location and they will be the determinants of delay for westbound traffic.

During the PM peak and the off-peak periods, it is recommended that the transit advance phase time be taken from the northbound movement, as it does not represent a critical movement during these times. Provided below are the results of the analysis that demonstrates that the provision of the eastbound transit advance phase will have little or no impact on the overall operations at the Highway 7/Highway 404 N-E/W intersection.

<u>Future Intersection Operations</u>

The above signal provisions were modelled in Synchro and are summarized in the following table. The minimum amount of green time for transit priority is five seconds. In the analysis an advance phase of five seconds with three seconds amber and two seconds red has been designated to the bus movement.

Signalized Intersection	Intersection Overall LOS		Critical Movement	AM Peak Hour		PM Peak Hour	
	AM	PM		LOS	V/C	LOS	V/C
Highway 404 N-E/W Off-Ramp/Highway 7	C	B	SBR	E	1.01	D	0.56
Highway 404 S-E/W Off-Ramp/Highway 7	D	C	NBL	E	1.02	D	0.91

The analysis shows that by implementing an advance phase of ten seconds, the overall peak hour operations of the intersections are not impacted. The ramp movements are critical during the AM

peak hour and therefore the additional green time for the advance was taken from the main east-west phase. This was done for both intersections during the morning and evening peak hours to minimize queuing on the ramps. Alternatively, in the PM peak hour, the green time could be taken from the green time designated to the ramps as both ramps are operating under capacity.

Estimated Transit Vehicle Travel Time

Based on a review of the existing operating conditions, the westbound transit travel time will exceed the eastbound travel time through the mixed traffic section of Highway 404 during the morning and afternoon peak periods. This difference in delay is due to the westbound vehicle queues caused by the operations of the Highway 7/East Beaver Creek/Commerce Valley Drive intersection.

Westbound Direction – AM Peak

In the westbound direction, the delay at the S-E/W ramp terminal would be a function of when the bus arrived in the cycle. A worse case scenario would be if the bus arrived during the beginning of the main east-west phase. The bus would be required to wait for the advance for approximately 55 seconds (the 62 second east-west green time would be truncated to 52 seconds to permit the insertion of the ten second transit phase as a lagging phase). Likewise, if the transit vehicle arrived at the beginning of the northbound phase (ramp), it could potential be delayed 58 seconds until it is given the advance prior to the east-west main phase.

On average, the transit vehicle would be delayed approximately 28 seconds during the AM peak hour at the Highway 7/Highway 404 S-E/W intersection (1/2 the average of the east-west and northbound main phases).

Within the mixed traffic to the Highway 7/Highway 404 N-E/W intersection, the transit vehicle could be delayed by the signal at the N-E/W ramp terminal and the associated queues. Based on visual observations and the future analysis, it is anticipated that the vehicle would typically be able to proceed on the next east-west main phase. In a limited number of cases in the AM peak hour vehicle queues and delays downstream of the N-E/W ramp terminal may cause the transit vehicle to be delayed one east-west green phase.

The average delay to westbound transit vehicles at the N-E/W ramp terminal would be one half the southbound main phase or 19 seconds.

In a limited number of cases, the transit vehicle would reach the N-E/W ramp terminal intersection on the first available east-west main phase and would proceed on the second east-west main phase. This would result in a delay of 120 seconds (the cycle length at the intersection).

Travel time between the two intersections is estimated to be 44 seconds, assuming an average travel speed of 30 km/h, including time spent while queued.

In summary, average travel time through the mixed-traffic section, including the delays at the two ramp terminals is estimated to be approximately 90 seconds (28 + 19 + 44 seconds). In a limited number of cases the westbound travel time could be 148 seconds (28 + 120 seconds), due to downstream congestion.

Westbound Direction – PM Peak

Based on an analysis of future PM peak hour operations, the delays to westbound traffic would be less than those experienced in the AM peak hour.

Eastbound Direction

Likewise, the eastbound direction experiences much less congestion than that of the westbound flow along Highway 7; therefore, the eastbound transit travel times will be less than those reported above for the westbound direction.

Advance Control Options

Should the resultant delays to transit vehicles be considered excessive, transit vehicle priority could be employed at both the transition intersections to advance the traffic signal display in anticipation of the arrival of the transit vehicle.

6.3.10 GRANDVIEW BOULEVARD/GALSWORTHY DRIVE AND WOOTEN WAY

Preferred Option

As proposed in the preferred alternative, transit vehicles will operate in mixed traffic through the Old Main Street area of Markham to avoid property impacts/requirements.

The west transition area from dedicated transit lanes will occur at the Highway 7/Grandview Boulevard/Galsworthy Drive intersection and the east end transition area will occur at the Highway 7/Wooten Way intersection.

Transit Operations

In the eastbound direction, the transit vehicles will required to stop at the Highway 7/Grandview Boulevard/Galsworthy Drive intersection, wait for the transit phase and then proceed into the median lane of the general traffic lanes. A ten second-transit phase will be provided to facilitate this movement. Through the mixed-traffic section, the transit vehicle will remain in the median lane where it will diverge into the transitway lanes at the Highway 7/Wooten Way intersection.

In the westbound direction, similar operations will occur as describe with the entering and exiting intersections in the eastbound direction.

Transit vehicles will be required to stop at the Highway 7/Main Street intersection, within intersection, and wait for a green indication. Transit vehicles will be generally unimpeded at the unsignalized intersection on Highway 7, through this mixed-traffic section.

Future Intersection Operations

The above signal provisions were modelled in Synchro and are summarized in the following table. The minimum amount of green time for transit priority is five seconds.

Signalized Intersection	Intersection Overall LOS		Critical Movement	AM Peak Hour		PM Peak Hour	
	AM	PM		LOS	V/C	LOS	V/C
Highway 7/Grandview Boulevard	C	C	-	-	-	-	-
Highway 7/Main Street Markham	F	E	WBL WBT NBL	F D -	1.10 0.90 -	F - E	0.91 - 0.96
Highway 7/Albert Street	A	A	-	-	-	-	-
Highway 7/Wooten Way	C	C	-	-	-	-	-

Highway 7/Grandview Boulevard/Galsworthy Drive

During both peak hours the additional ten second transit phase permitting the transit vehicles to merge in and out of the transitway, does not significantly impact the operation of the intersection. The intersection is expected to operate at an acceptable level-of-service.

Highway 7/Main Street Markham

The east-west main phase is reduced significantly due to the pedestrian crossing time requirements to cross Highway 7. This results in the westbound left to operate at capacity during the AM peak hour. During the PM peak hour, the westbound left and northbound left will be approaching capacity.

Highway 7/Wooten Way

The intersection is expected to operate at an acceptable level of service with the inclusion of the ten second transit phase.

6.3.11 BUR OAK AVENUE

Preferred Option

The Rapid Transit System will divert to/from Highway 7 at Bur Oak Avenue to access the Markham Stouffville Hospital. Presently, Bur Oak Avenue currently terminates at Riverlands Avenue in the community of Cornell but scheduled to be extended to Highway 7. To analyse the intersection under immediate conditions, the proposed lane configuration and Cornell Community Traffic volumes obtained from the Cornell Community Transportation Study Update were utilized. Under the immediate analysis, the intersection was analysed as a T-intersection, however under the analysis of the full build-out conditions of the area discussed further in **Section 7.4.13** the intersection is analysed as a full moves intersection.

Transit Operations

It is not yet confirmed if the transit vehicle will operate in a dedicated transitway on Bur Oak Avenue or in mixed traffic. For the purposes of this report, it has been assumed that the transit vehicle will operate in mixed traffic transitioning to/from a dedicated transitway at the Highway 7 intersection.

Therefore the following transit movements will occur at the intersection of Bur Oak Avenue and Highway 7:

- Eastbound transit vehicles accessing the Stouffville Hospital will transition from dedicated transitway lanes to the general traffic lanes with the eastbound left turning vehicles;
- Southbound left turning transit vehicles heading eastbound on Highway 7 will transition from mixed traffic to dedicated transitway lanes on Highway 7 with the southbound left turning vehicles;
- Westbound right turning transit vehicles from dedicated lanes on Highway 7 to mixed traffic will operate in conjunction with the southbound phase; and
- The southbound right turning transit vehicles in mixed traffic will merge into the transitway on Highway 7.

Future Intersection Operations

The above signal provisions were modelled in Synchro and are summarized in the following table. The minimum amount of green time for transit priority is five seconds.

Signalized Intersection	Intersection Overall LOS		Critical Movement	AM Peak Hour		PM Peak Hour	
	AM	PM		LOS	V/C	LOS	V/C
Highway 7/ Bur Oak Avenue	A	A	-	-	-	-	-

The intersection of Bur Oak Avenue and Highway 7 is expected to operate without any capacity constraints.

6.3.12 REESOR ROAD

Preferred Option

Between the east study limits at the York-Durham Line to Reesor Road, the transit vehicles will operate in mixed traffic with the transition from mixed traffic to dedicated transit lanes occurring at the Reesor Road intersection.

An exclusive transit signal phase of ten seconds will be required to transition the eastbound transit vehicle to mixed traffic, which will operate in conjunction with the westbound through general traffic.

Highway 7 will narrow from four lanes to two lanes east of the Reesor Road intersection.

Transit Operations

In the eastbound direction, the transit vehicles will required to stop at the Highway 7/Reesor Road intersection, wait for the transit phase and then proceed into the median lane of the general traffic lanes. A ten second-transit phase will be provided to facilitate this movement. Through the mixed-traffic section, the transit vehicle will remain through the rest of the Highway 7 corridor within York Region

In the westbound direction, similar operations will occur as describe with the transit vehicle entering the dedicated transit lanes on the east approach of Ressor Road.

Transit vehicles will be generally unimpeded at the unsignalized intersection on Highway 7, through this mixed-traffic section. Both transit platforms are located on the west approach in the centre lane.

Future Intersection Operations

The above signal provisions were modelled in Synchro and are summarized in the following table. The minimum amount of green time for transit priority is five seconds. In the analysis an advance phase of five seconds with three seconds amber and two seconds red has been designated to the bus movement.

Signalized Intersection	Intersection Overall LOS		Critical Movement	AM Peak Hour		PM Peak Hour	
	AM	PM		LOS	V/C	LOS	V/C
Highway 7/Reesor Road	C	C	-	-	-	-	-

With the implementation of the ten-second-transit phase, the operation of Highway 7/Reesor Road will not be significantly impacted.

6.4 Pedestrian Facilities

6.4.1 PEDESTRIAN CROSSING SIGNAL TIMINGS

Pedestrian crossing times within the study area, have been calculated in accordance with the Region of York's current practice of a walk interval of seven seconds plus a don't walk interval. The don't walk interval is based on a walking speed of 1.2 m/s and is calculated by dividing the widest curb to curb distance by the walking speed and subtracting the amber time. The following is a list of intersections where the walk intervals vary. At these intersections the walk time has remained consistent under future conditions.

Exhibit 6-6-Specific Walk Time Locations

Highway 7 @	Walk Times
Albert Street / Cosburn Street	5 and 6 seconds
Bullock Drive	15 and 13 second
Main Street Markham Road	18 and 17 second
Markham By-Pass	16 and 15 second
Ninth Line	16 and 19 second
Reesor Road	15 second
Wooten Way	16 second
Durham Road 30	17 and 16 second

The walk time or pedestrian walk phase has been increased at several of the intersections, which would increase the amount of walk time shown on the pedestrian signal. The walk time is increased where heavy pedestrian volumes are observed and would not decrease the flash don't walk time. This would increase the minimum splits at the intersection.

At a number of locations along Highway 7, the demands of the required pedestrian crossing time exceed that required to service the side street traffic. In these cases, east-west main phase green time may be substantially reduced to accommodate the time for a pedestrian to completely traverse Highway 7 during one cycle.

In these cases, a two-stage crossing has been identified, if required. Slower pedestrians would be required to cross one half of Highway 7 during a single signal cycle, wait in a suitable refuge area in the centre of the roadway, and cross the second half of the roadway in the subsequent cycle.

The signalized intersections that may require two-stage crossings in the future include:

Exhibit 6-7-Potential Two-Stage Crossing Locations

Intersection	Direction	Required Minimum Split
Vaughan Valley Boulevard / Roybridge Gate / Highway 7	North-South	51 seconds
Highway 27 / Highway 7	North-South	46 seconds
Jane Street / Highway 7	North-South	56 seconds
Creditstone Road / Highway 7	North-South	46 seconds
Keele Street / Highway 7	North-South	52 seconds
Aberdeen Avenue / Marycroft Avenue / Highway 7	North-South	4two seconds
Worth Boulevard / Flamingo Road / Bathurst Street	East-West	40 seconds
South Park / Chalmers Road / Highway 7	North-South	49 seconds
Leslie Street / Highway 7	North-South	49 seconds
Commerce Valley Drive East / East Beaver Creek / Highway 7	North-South	46 seconds
Town Centre Boulevard / Highway 7	North-South	57 seconds
Kennedy Road / Avoca	East-West	38 seconds
Kennedy Road / Highway 7	North-South	49 seconds
McCowan Road / Highway 7	North-South	44 seconds

6.4.2 OTHER PEDESTRIAN CONSIDERATIONS

The Canadian National Institute for the Blind (CNIB) and the Community Home Assistance to Seniors (CHAT) were contacted to determine if any intersections were of a concern within the study area. No intersections were identified as requiring special provisions for pedestrians.

In addition, slower walking speeds have not been identified for locations on the study area corridors within the City of Vaughan, Town of Markham and the Town of Richmond Hill and therefore a walking speed of 1.2 m/s has been utililized for the entire study area.

6.5 Roadway and Private Drive Access Issues

With the provision of the median transit facilities, left turn access at a number of unsignalized roadways and private driveways will be restricted. In many cases, alternative access or provisions were available. Provided below is a summary of the key impact locations that were identified for detailed review.

Hillcrest Cemetery east of Islington Avenue/Highway 7

The primary access to the cemetery is located on the north side of Highway 7, east of Islington Avenue. The access is located on a hill sloping upwards from Islington Avenue intersection restricting site lines for left turns in/out of the site.

With the proposed RT design, left turn access to/from the site will be prohibited. It is unlikely that vehicles are capable of negotiating left turns during peak hour and possibly during off peak hours under current conditions due to the site line restrictions and heavy volumes on Highway 7. As the access is essentially operating with little left turn permissive movements, reverting the access to a right-in/out will have minimal impact on the operation of the access. Therefore, providing improved access treatments for the restricted movements are not being considered.

Beechwood Cemetery

Beechwood Cemetery is located at 7241 Jane Street, south of Highway 407 and is part of the Mount Pleasant Group of Cemeteries. All access to the cemetery is via an unsignalized access on Jane Street located approximately 275 metres south of the Highway 407 eastbound off ramp.

With the proposed RT design, left turn access to/from the site would be prohibited under unsignalized intersection controls. Therefore a signalized intersection will be provided under the preferred alternative to allow the access to operate similarly to existing conditions.

Brown's Corners Church and Cemetery, Markham

Brown's Corners Church is located at 2830 Highway 7 between Allstate Parkway and Highway 404 on the north side of Highway 7. The church is currently accessible via a full turns access on Highway 7 and an access to Frontenac Drive. The access on Highway 7 will be restricted to a right-in/out with the proposed RT design.

As a result vehicles entering the site from the west will be forced to turn left at Frontenac Drive to enter the site. Vehicles exiting to the east would be required to turn right on Frontenac Drive, as it is restricted to one-way and travel north to Centurian Drive to access Allstate Parkway. The other option would be to exit and conduct a u-turn at Allstate Parkway, as Centurian Drive is located approximately 300 metres north of Highway 7.

Several options will accommodate the restricted movements and therefore no additional improvements are being recommended.

6.6 Traffic Infiltration Issues

Through the assessment of access provisions/restrictions, a number of locations were identified as potential traffic infiltration issues. Provided below is a list of locations and the associated issues to be addressed/considered. For the following locations it is recommended that future traffic volumes through the various neighbourhoods be monitored before and after the implementation of the preferred alternative to determine if additional measures are required to reduce traffic infiltration.

Exhibit 6-8-Potential Traffic Infiltration Issues

Location/ Development	Traffic Infiltration Issue
Monsheen Drive Neighbourhood	As previously noted, Monsheen Drive and Wigwoss Drive are currently used as a short-cut route to circumvent Highway 7 in the vicinity of Islington Avenue. With further constraints placed on the Highway 7/Islington Avenue intersection, it may prove more beneficial for Islington Avenue traffic to utilize these local roadways.
Willis Road/Chancellor Drive	Willis Road/Chancellor Drive, are east-west routes through the Woodbridge area north of Highway 7 between Islington Avenue and Weston Road. It provides an attractive route for vehicles avoiding Highway 7 and specifically the Islington Avenue/Highway 7 intersection. With restrictions at the unsignalized intersections, more emphasis will be put on the signalized intersections on Highway 7, resulting in vehicles destined to/from the north choosing an alternative east-west route such as Willis Road and Chancellor Drive.
Westminster Drive / Beverley Glen Boulevard	Westminster Drive is similar to a ring road and is an alternative route to the Centre Street/Bathurst Street intersection. Atkinson Avenue connects to Westminster Drive at Bathurst Street and continues to Centre Street east of Bathurst Street. Non-residential traffic may use Westminster Drive to seek alternative access to Bathurst Street avoiding Promenade Mall traffic and the eastbound left at Bathurst/Centre Street intersection as the lands east of Westminster Drive are to be developed. Beverley Glen Boulevard is a residential road that runs parallel to Centre Street through a school zone and provides a connection from Dufferin Street to Bathurst Street. It is also an attractive route for cut-through traffic as it avoids the Dufferin Street/Centre Street intersection as well as commercial traffic on Centre Street.
South Park Drive/Commerce Valley Drive East and West	As this area becomes fully developed, South Park Road may become a potential traffic infiltration route to circumvent the congestion along Highway 7 between West and East Commerce Valley Drive.
Kennedy Road – Avoca Drive to Swansea Road	The operational and physical changes at the Highway 7/Kennedy Road intersection will reduce the capacity of the intersection and may result in motorists attempting to circumvent this congestion via Avoca Drive.
Historic Unionville	As previously noted, a traffic management study was recently completed to mitigate cut-through volumes and reduce traffic speeds. Carleton Road is being considered for key traffic calming devices such as curb extensions and through prohibitions. With proposed restrictions at Highway 7, additional cut-through volumes may result through the area.

7. 2021 CONSIDERATIONS

The 2021 considerations and effects of the Rapid Transit system include ultimate build-out of the adjacent lands that will generate traffic along the preferred Rapid Transit route and bull build-out of the planned road network. As some areas within the preferred route are currently operating at capacity and will likely not experience any further growth, they have not been included in the 2021 analysis. The analysis in **Section 6,** (the immediate effects section), should be referenced for these areas to determine the effects of the Rapid Transit system at those particular intersections. The following sections describe the 2021 road network (**Section 7.1**), 2021 traffic demand (**Section 7.2**) and the proposed development areas along the preferred route (**Section 7.3**), which will experience a substantial amount of growth. All of which have been included in the 2021 analysis to determine the long-term effects of the Rapid Transit system included in **Section 7.4**.

7.1 2021 Road Network

The 2021 road network incorporated into the 2021 operational analysis including the roadway cross-sections, lane arrangements and storage lane lengths and traffic signal control are outlined in the design alternative (functional plans) conducted for the Highway 7 Environmental Assessment.

The Region of York capital programs for planned improvements within the Highway 7 corridor include the following roadways and corresponding schedule for construction to begin.

Exhibit 7-1-Planned Roadway Improvements

Road Link	Description	Scheduled Construction Year
Markham Bypass – Phase 1 – Highway 407 to Highway 7	Construction of 4-lane roadway from Highway 407 to Highway 7	Under construction
Markham Bypass – Phase 1 – Highway 407 to Highway 7	Construction of new interchange at Highway 407	2004
Highway 50 from Highway 7 to Rutherford Road	Widening from 4 lanes to 6 lanes	2005
Warden Avenue from Highway 407 to Apple Creek Boulevard	Widening from 4 lanes to 6 lanes	2005
Markham Bypass – Phase 3 – Highway 7 to 16th Avenue	Construction of 4-lane roadway	2005
Bayview Avenue from Highway 407 to 16th Avenue	Widening from 4 to 6 lanes with continuous centre left turn lane and right turn lanes at intersections	2006
Ninth Line from Highway 407 to Markham Bypass	Widening from 2 to 4 lanes with turning lanes at intersections	2006
Dufferin Street from Steeles Avenue to Glen Shields North	Widening from 4 to 6 lanes	2006

Road Link	Description	Scheduled Construction Year
York/Durham Line from Steeles Avenue to Highway 7	Road widening from 2 lanes to 4 lanes.	2007
Highway 400/Highway 7 Interchange Work – Vaughan Corporate Centre	Reconfiguration of interchange for Phase 1 of Vaughan Corporate Centre	2007
Highway 404 Crossing north of Highway 7	Construction of 4-lane collector road crossing of Highway 404 north of Highway 7 connection employment areas	2007
Highway 7 from Rouge River to Warden Avenue	Road widening from 4 lanes to 6 lanes.	2007
Highway 7 from Warden Avenue to Sciberras Road	Road widening from 4 lanes to 6 lanes.	2007
Keele Street from Steeles Avenue to Highway 407	Widening from 4 lanes to 6 lanes.	2008
Kennedy Road from Highway 407 to Highway 7	Road widening from 4 lanes to 6 lanes.	2009
Weston Road from Steeles Avenue to Highway 7	Road widening from 4 lanes to 6 lanes including turning lanes.	2011
Bayview Avenue from Highway 7 to John Street	Widening from 4 lanes to 6 lanes.	2011
Jane Street from Steeles Avenue to Highway 7	Road widening from 4 lanes to 6 lanes.	2012
Dufferin Street from Highway 407 to Major Mackenzie	Widening of roadway to 7 lanes	2012
Bathurst Street from North of Highway 7 to Rutherford Road	Widening from 4 lanes to 6 lanes.	2012
Leslie Street from Highway 7 to Highway 407	Widening from 4 lanes to 6 lanes.	2012
McCowan Road from 14th Avenue to 16th Avenue	Widening from 4 lanes to 6 lanes	2012
Markham Bypass from Highway 407 to Morningside Avenue	Construction of 4-lane urban road	2012
Weston Road from Highway 7 to Rutherford Road	Widening from 4-lanes to 6-lanes	2013

These road improvements have been incorporated into the analysis of the 2021 conditions with the Rapid Transit System in place. It should be noted that none of these road improvements were included in the immediate considerations in **Section 6**.

7.2 2021 Traffic Demand

The analysis that follows reflects the turning movement volumes used in the analysis of the immediate conditions (**Section 6**). These volumes included current turning movement volumes adjusted to reflect reassigned traffic for major changes in access resulting from the preferred alternative.

Future demands on the Highway 7 corridor and major cross-street locations, were reviewed with in the context of ensuring that:

- Auxiliary left turn lanes along Highway 7 are properly designed to accommodate growth associated with adjacent development potential;
- Unmitigated "bottlenecks" in the Regional road network are not created by the operation of the transitway;
- Overall traffic assessment findings do not substantially change with future demands, i.e., capacity constraints and opportunities will be the similar to the short-term effects.

7.3 2021 Proposed Major Developmental Areas

The following are sections adjacent to the Highway 7 corridor and other proposed Rapid Transit routes that are expected to undergo high growth and development before the ultimate completion of the Rapid Transit System. This section includes an analysis of the full build-out development scenario in which development and road improvements from the present to the 2021-planning horizon are taken into consideration. Several traffic studies have been obtained from the various municipalities to determine the projected traffic volumes in the major developmental areas. A description of the development and impact to the Highway 7corridor and other proposed Rapid Transit links are described below.

7.3.1 YORK/PEEL BOUNDARY AREA

The Boundary Area Transportation Study was completed by iTrans in June 2002 for the Regions of York and Peel. The study documents proposed developments and potential road network improvements for 2006 and 2031. Within the 2006 planning horizon, the applicable developments to impact Highway 7 in the Region of York will include:

- Huntington Business Park – to include 280 acres of industrial development to be situated between Highway 50 and Highway 427, and Langstaff Road and Highway 407. The development will generate approximately 2,090 trips during the AM peak hour and 2,020 trips during the PM peak hour.
- Vaughan West Business Park – will include 675,690 m^2 of industrial, office and commercial development and will be bounded by Langstaff Road to the north, Highway 427 to the west, south of Highway 7 and Highway 27 to the east. The development is expected to generate approximately 4,110 AM peak hour trips and 4,660 PM peak hour trips.
- Sears-Vaughan Distribution Centre – is a proposed 311,600 m^2 warehouse and office building located on 77 acres of land at the northeast corner of Highway 50 and Rutherford Road adjacent to the Canadian Pacific Railway Intermodal Terminal.

- Bram East Phase 1 Development Area – is expected to included 3,170 residential dwelling units in addition to 815, 000 ft^2 of non-residential development encompassing the west side of Highway 50 north of Highway 7 and generate approximately 3,040 AM peak hour trips and 3,610 PM peak hour trips.

The study forecasts future road network improvements. The following are proposed improvements relevant to the Highway 7 EA:

- The extension of Highway 427 with interchanges at Highway 7, Rutherford Road or Highway 50, King Street and Highway 9.
- Highway 7 widened to six lanes west of Highway 50
- Highway 407 widened to ten lanes from within Peel Region to east of Martin Grove Road.

7.3.2 HUNTINGTON BUSINESS PARK

A transportation analysis conducted in September 1999 by Dillon Consulting, examined the proposed impact of the Huntington Business Park on the surrounding road network. The 805 acres of light industrial is proposed for the area bounded by Langstaff Road to the north, Highway 427 to the east, Highway 407 to the south and Highway 50 to the west. The report forecasted completion of the development by 2011 with employment for approximately 14,105 employees.

The study incorporated the Highway 427 extension to Rutherford Road with a full interchange at Highway 7. A collector and local road network is proposed for the study area with a new signalized north-south road between Huntington Road and Highway 427. Traffic volumes at Highway 50 and Highway 7 were reassigned to account for the Highway 427 extension, therefore the westbound right turn volume and southbound left volumes were reduced as these volumes will likely shift to alternate routes.

7.3.3 HIGHWAY 427 EXTENSION

In November 2001, McCormick Rankin completed a Transportation Needs Assessment for the extension of Highway 427 to determine the future north-south traffic demands within the next 20 and 30 years using the MTO travel demand model.

It was determined from 2031 transportation demand that the Highway 400 and Highway 427 corridors will require an additional ten to 14 expressway lanes in the south portion of York Region. It was concluded that Highway 427 be extended as far north as Highway 89 to include an additional six to ten lanes north of Highway 7 to Kirby Sideroad.

7.3.4 VAUGHAN CORPORATE CENTRE

Cansult Ltd. conducted a Transportation/Transit Planning and Functional Design Study in October 2000 for the Vaughan Corporate Centre. It was estimated that the mixed development would consist of residential, office, light industry, big box retail and specialty retail generating 10,730 trips during the AM peak hour and 21,500 trips during the PM peak hour. A majority of these trips were distributed to Highway 400 north and south.

The study proposed a ring road to divert traffic from Highway 7 west of Edgeley Boulevard to Maplecrete Road. The ring road would operate parallel to Highway 7 on the north and south side with roundabouts on Highway 7 at Maplecrete Road and west of Edgeley Boulevard. Highway 7

within these locations would be converted to a downtown main street. Outside of the ring road, Highway 7 would remain unchanged.

Two options were presented in terms of increasing the east-west capacity across Highway 400. The extension of Pensylvania Avenue and Applewood Crescent, north of Highway 7 were proposed with full interchanges at Highway 400. With the proposed ring road the following changes are projected to the existing road network:

- Edgeley Boulevard would be widened to include four travel lanes;
- Millway Avenue would be modified to two travel lanes with on-street parking;
- Highway 400-ramp system would be modified with the northbound off-ramp crossing Highway 7 and connecting to the north ring road. The E-N on-ramp would be relocated to the north ring road. The existing Colossus Road connection with the N-E/W off-ramp would be converted to a ring road connection to Weston Road south of Highway 7.

The study estimated traffic volumes for the 2021-planning horizon.

7.3.5 YORK BUS TERMINAL

Cansult Limited conducted a study in January 2001 in conjunction with Tranplan Associates entitled *Property Protection for Steeles Rapid Transit Terminal Facilities, Rapid Transit Extension and York University*. The report identifies a preferred alternative for the bus terminal location and the required amount of property to facilitate a commuter parking lot, off-street bus terminal, kiss-n-ride area, east-west Proposed East-West Road and a North-South collector road.

The Steeles Rapid Transit Station or York Bus Terminal as it is referred to on the proposed Highway 7 EA alignment drawings for the Vaughan North-South Link, is proposed north of Steeles Avenue west of the North West Gate extension.

A commuter parking lot with 3,000 spaces is proposed in the Hydro Corridor opposite Proposed Street C, which is the extension of Northwest Gate north of Steeles Avenue. The parking lot is expected to generate 1,100 vehicles during the morning peak hour with three accesses on the Proposed East-West Road, which will run north of Steeles Avenue connecting to Jane Street, Keele Street and Proposed Street C to facilitate operation.

The bus terminal will consist of three accesses: a full moves access on the Proposed East-West Road, a right-in/right-out on Steeles Avenue and an exit to Northwest Gate. A kiss-n-ride facility is proposed in the southeast corner of Northwest Gate and Steeles Avenue.

The proposed new roadway links in the study recognized the need for signals on the Proposed East-West Road at Jane Street and at Keele Street. With the extension of Northwest Gate, the intersection at Steeles Avenue and at the Proposed Street C would also require signals.

The volumes generated from this study based on the 18 bus bay terminal, commuter parking lot and kiss and ride facility were incorporated into the intersections on Northwest Gate and the Proposed East-West Road at Jane Street and at Keele Street.

7.3.6 THORNHILL CENTRE STREET STUDY

IBI Group completed a study in September 2004 on behalf of the City of Vaughan to determine the potential for additional development and growth on Centre Street from west of Dufferin Street to east of Bathurst Street. The transportation assessment component analysed the recommended

land use plan by highlighting the potential future road network deficiencies and examining possible mitigative measures for the 10 and 20 year planning horizons.

Under the 20-year planning horizon or full build-out scenario, the proposed land uses will include a mix of residential, retail, office and institutional developments. The road network improvements included in **Exhibit 7-1** were incorporated in the long-term traffic conditions as well as the following summarized in **Exhibit 7-2**.

Exhibit 7-2-Planned Roadway Improvements

Location	Planned Improvement
North Promenade Mall extension to form Desira Drive	Connection between Centre Street and Beverley Glen Boulevard.
Bathurst Street/Beverley Glen Boulevard	Implement traffic signal control as a function of development related demands.
New signal between New Westminster Drive and Vaughan Boulevard	A traffic signal will provide access to the commercial area on the north side of Centre Street.

The volumes generated from the 20-year planning horizon were incorporated into the intersections on Centre Street between Dufferin Street and Bathurst Street. The volumes were also included at the signalized intersections on Bathurst Street at Beverley Glen Boulevard and New Westminster Drive/Atkinson Avenue.

7.3.7 LANGSTAFF INTERMODAL STATION

The Langstaff Intermodal Terminal will connect the transit systems from York Region, the Bus Rapid Transit System on Yonge Street, the Rapid Transit System on Highway 7, the GO Transit Rail and the GO Transit 407 express bus. It also will facilitate a park and ride and kiss and ride areas. The Langstaff Intermodal Terminal will be located on the northeast side of the Yonge Street Connection Road between Yonge Street and Highway 7 adjacent to the CN Line and Langstaff GO Station. A full moves access will be located at the current right-in/out access to the Silver City Movie Cineplex.

It is estimated that approximately 14 buses west of Yonge Street and 21 buses east of Yonge Street will be generated per direction in 2021. This is based on passenger ridership projections of 1140 passengers east of Yonge Street and 1635 passengers west of Yonge Street.

The expected traffic generated from the Langstaff Terminal Station was obtained from the Traffic Impact Study conducted by IBI Group and is summarized in the following exhibit.

Exhibit 7-3-Proposed Traffic Generated from the Langstaff Intermodal Station

	AM Peak Hour		PM Peak Hour	
	Inbound	**Outbound**	**Inbound**	**Outbound**
Park N Ride	329	225	225	329
Kiss N Ride	72	72	72	72
Total	401	297	297	401

7.3.8 BAYVIEW GLEN

The Bayview Glen Transportation Study was prepared by Marshall Macklin Monaghan and submitted to the Town of Richmond Hill in July of 2002. The development bounded by 16th Avenue, Bayview Avenue, Highway 7 and Red Maple Road is expected to be completed by 2007.

7.3.9 SOUTH PARK DEVELOPMENT

The Leitchcroft Lands traffic impact study for this development was not available at the time of this analysis and therefore traffic generation from the development was estimated. The development encompasses the lands located on the south side of Highway 7 adjacent to South Park Road. Presently, the development is partially completed however obtained traffic counts for the Saddlecreek Drive and South Park Road/Chalmers Road intersections do not generate counts for the south approaches.

7.3.10 EAST BEAVER CREEK BUSINESS PARK

Earth Tech Canada Inc. conducted a report entitled the Transportation Infrastructure Requirement Study for the East Beaver Creek Business Park in May 2002 for the Town of Richmond Hill. The report evaluated the impacts of the development on the surrounding road network and recommended improvements. The business park expected to develop within the next ten years will consist of industrial / warehouse, retail / restaurants and office /commercial uses and will be located within north of Highway 7 between Highway 404 and Leslie Street.

The development is expected to generate approximately 7,100 trips during the AM peak hour and 6,700 trips during the PM peak hour. The recommended road network improvement pertaining to the Highway 7 EA include implementing a dual westbound left turn lane and southbound right turn lane at East Beaver Creek and Highway 7 and a dual eastbound and westbound left turn lane at Leslie Street and Highway 7. A mid-block collector is also recommended connecting East Beaver Creek to Allstate Parkway over Highway 404.

7.3.11 SENECA COLLEGE OF APPLIED ARTS AND TECHNOLOGY

A transportation impact study was conducted for ten Allstate Parkway in which the potential transportation impacts were assessed for converting a 27-acre property to community college uses. The current office building will be converted to 26 classrooms and 25 laboratories and accommodate approximately 3,000 students per annum or 1,410 students at any one time. Approximately 150 to 200 staff are expected to be employed at the facility. The development is expected to be completed by 2008 and will include dual right turn lanes for the southbound right turn movement from Allstate Parkway to Highway 7 to be implemented by 2005.

Other potential road improvements that are planned or approved in the study include:

- The Highway 404 mid-block crossing between Highway 7 and 16th Avenue, which is an Environmental Assessment study currently, being undertaken jointly by York Region, the Town of Markham and the Town of Richmond Hill. The study is reviewing three alternative alignments; and

- The Highway 404 northbound off-ramp be extended to the Highway 404 mid-block crossing or Allstate Parkway at Centurian Drive. The extension would significantly reduce the 350 eastbound left vehicles during the morning peak hour and 900 southbound right vehicles during the afternoon peak hour.

7.3.12 MARKHAM CENTRE WEST

The Markham Centre West Master Plan Transportation Study was prepared by iTRANS Consulting in December 2001 and includes the lands bounded by Highway 7 to the north, Warden Avenue to the west, Highway 407 to the south and Kennedy Road to the east. The study area will consist of the following:

- 3,465 residential units;
- 359,700 square metres of commercial office/prestige industrial floor area;
- 69,600 square metres of commercial retail floor area; and
- 85,600 square metres of institutional floor area.

The future 2021 forecasted volumes of approximately 4,940 inbound and 2,310 outbound trips during the AM peak hour and 3,600 inbound and 5,630 outbound trips during the PM peak hour were assigned to the road network.

The proposed future road network improvements under the jurisdiction of the Town of Markham and within the Markham Centre study limits are as follows:

- North-south extension of Rodick Road from Highway 7 to Enterprise Drive;
- Verclair Gate extended south from Highway 7 to Enterprise Drive;
- Birchmount Road will be extended south from Village Parkway at Highway 7 to Enterprise Drive;
- Sciberras Road extended from Highway 7 to Enterprise Drive;
- Enterprise Drive will connect Yorktech Drive in the west at Rodick Road to two connections at Unionville Gate at Main Street Unionville and the west approach on Helen Avenue at Kennedy Road in the east; and
- The study also considers the extension of Clegg Road easterly to Warden Avenue where it would connect with Riverside Drive; a proposed east-west collector road ending at Sciberras Road.

In addition to the proposed road extensions, the study of this report includes road improvements set forth in the Region of York capital programs listed in **Section 7.1**. The Region of York Capital Programs within the Markham Centre study area include Kennedy Road to be widened to 6 lanes between Highway 407 and Highway 7 by 2007 and Warden Avenue from Highway 407 to Apple Creek Boulevard to be widened from four lanes to six lanes scheduled for 2005.

The intersections within the Markham Centre impacted by the Rapid Transit System have been increased to reflect the 2021 Total Traffic Volumes in the Markham Centre West Master Plan Transportation Study. The intersections on Highway 7 impacted by the traffic generation from the Markham Centre West Master Plan from Montgomery Court/Fairburn Drive to Sciberras Road are addressed in **Section 8,** as they comprise the area for the needs and justification phase of the Highway 7 widening EA.

The remaining intersections on South Town Centre Boulevard, Warden Avenue, Enterprise Drive and Kennedy Road where the preferred Rapid Transit Route is expected to operate have been increased to reflect traffic generated from the Markham Centre West Master Plan.

7.3.13 CORNELL COMMUNITY

The Cornell Community Transportation Study Update was conducted by iTrans and submitted to the Town of Markham in October 2003. The study was conducted to determine the impact of permitting 10,000 residential units, 249,000 square feet of retail and 1,043,000 square feet of office development within the 2021 planning horizon.

The development area is located north of Highway 7, bounded by the future Markham By-Pass to the north and east and Ninth Line to the west. Several additional intersections are proposed on Highway 7 between Ninth Line and the Markham By-Pass. This includes the extension of Bur Oak Avenue and removal of the temporary existing Markham By-Pass at Highway 7. Other road improvements include:

- Construction of the Future Markham By-Pass from Highway 407 to Highway 7 to connect to the Markham By-Pass at 16th Avenue; and
- Widening of Ninth Line from Highway 407 to 16th Avenue from two lanes to four lanes.

A total of 4,300 and 4,920 trips will be generated during the weekday AM and PM peak hours respectively. The future volumes have been incorporated into the long-term traffic conditions at the intersections of Ninth Line, Bur Oak Avenue, Existing Markham By-Pass and Future Markham By-Pass.

7.3.14 MARKHAM BY-PASS EXTENSION AND SURROUNDING AREA

In addition to the Cornel Community development, additional traffic will be generated to the surrounding road network by the Markham By-Pass Extension, which will extend from Major Mackenzie Drive in the north to Morningside Drive in the south. Travel forecast modelling was undertaken to estimate the projected growth generated from the road extension during the AM peak hour with the Rapid Transit System in operation.

Exhibit 7-4-Proposed Traffic Generated from the Markham By-Pass Extension

Location	Existing Conditions		2021 Conditions with RT	
	Northbound	Southbound	Northbound	Southbound
South of Highway 7	N/A	N/A	1410	1690
North of Highway 7	370	250	1700	1410

The exhibit shows that volumes will grow by approximately 7% per annum in the north-south direction on Markham By-pass north of Highway 7. The existing volumes were increased to represent the predicted growth. The volumes south of Highway 7 were reversed to represent the PM peak hour.

The north-south roads adjacent to the Markham By-pass including Ninth Line, Reesor Road and the York-Durham Line were also increased by a growth rate of 3% per annum in the north-south direction to reflect estimated volumes from the modelling software. On Highway 7 at Ninth Line and Markham By-Pass the east-west volumes were increased by a growth rate of 2% per annum and east of the Markham By-Pass a growth rate of 3% per annum was used.

7.4 2021 Intersection Operations

An analysis of the 2021 projected volumes generated from the transportation studies listed in the previous section under full build-out conditions of the Rapid Transit System and road network improvements has been conducted and included in the following section from west to east.

7.4.1 YORK/PEEL BOUNDARY AREA

The Boundary Area Transportation Study for the Regions of Peel and York conducted by iTrans in June 2002 based the traffic forecasts on the York Region EMME/2 model for various planning horizons up to and including 2031. The short-term analysis indicated major constraints within the Highway 7 corridor specifically at the Highway 50/Highway 7 and Highway 27/Highway 7 intersections. The 2031 screenline analysis showed significant deficiencies in the north-south and east-west directions with the Highway 427 extension and other road network improvements. To address these issues the study recommended the following road improvements pertaining to Highway 7:

- Highway 7 from Airport Road to Highway 50 widened to six lanes;
- Highway 50 from Highway 7 to Castlemore Road/Rutherford Road widened to six lanes;
- Intersection improvements such as dual left turn lanes and channelized right turn lanes at Highway 50/Highway 7; and
- Highway 427 extension as a 4-lane arterial road from Highway 7 to Fogal Road.

The short-term transit improvements identified included an express bus route on Highway 407 and trunk routes on Highway 50 and Huntington Road. Potential transfer locations have been shown at the Highway 27/Highway 7 and Huntington Road/Highway 7 intersections.

The long-term improvements expected to be implemented by 2031 show Highway 427 extended north of Fogal Road with an eight lane cross section south of Highway 7 tapering to six lanes north of Highway 7 and interchanges at major east-west arterials. The report also shows Highway 407 with a ten lane cross section, Highway 27 with a six lane cross section and Highway 50 with a six lane cross section.

7.4.2 HUNTINGTON BUSINESS PARK

The 2011 AM and PM peak hour volumes on Highway 7 at Highway 50, the new midblock signalized intersection and the Highway 427 southbound and northbound off ramps were generated from the Huntington Business Park and analysed with the Rapid Transit System.

The proposed road network improvements including the Highway 427 extension to Rutherford Road with a full interchange at Langstaff Road, were incorporated into the analysis in addition to the widening of the Highway 400 S-EW off ramp from three lanes to four lanes.

The projected volumes generated from the Huntington Business Park were analysed to represent the long-term conditions. The intersection timings were adjusted to accommodate the York Region Rapid Transit lanes.

Signalized Intersection	Intersection Overall LOS		Critical Movement	AM Peak Hour		PM Peak Hour	
	AM	PM		LOS	V/C	LOS	V/C
Highway 7/Highway 50	F	E	EBL	F	1.04	F	1.04
			EBT	D	0.91	-	-
			WBL	F	0.94	-	-
			WBT	E	1.01	E	1.04
			NBT	-	-	F	1.03
			SBL	F	0.95	F	1.03
			SBT	E	1.02	-	-
Highway 7/New Midblock Road	F	D	EBL	E	0.96	-	-
			EBT	D	1.04	-	-
			WBT	F	>1.10	D	0.92
			SBL	-	-	F	>1.10
Highway 7/Highway 427 N-EW off-ramp	F	F	WBT	F	0.97	-	-
Highway 7/Highway 427 S-EW off ramp.	E	C	WBT	F	1.08	-	-
			NBR	F	1.09	-	-

Highway 7/Highway 50

During the AM peak hour the eastbound left, westbound and southbound through lanes will operate at capacity. During the PM peak hour the eastbound left, westbound through, northbound through and southbound left will operate at capacity. The impact of the Rapid Transit System to the intersection will be negligible, as the transit vehicle will operate in conjunction with the westbound left. The signals were modified to account for a protected only westbound left.

Highway 7/New Midblock Road

During the AM peak hour the eastbound left, eastbound through and westbound through lanes are expected to operate at capacity. This is attributed mainly to the amount of green time required in the north south direction, which could be reduced by implementing pedestrian split phasing. During the PM peak hour, the southbound left is expected to operate with in excess of 800 vehicles and therefore will operate at capacity as the competing east-west movements and transit vehicles do not allow additional green time to be allocated to the left movement.

Highway 7/Highway 427 N-EW off-ramp

During the AM peak hour the westbound through will approach capacity. No capacity constraints are expected during the PM peak hour.

Highway 7/Highway 427 S-EW off-ramp

Regardless of the widening of Highway 427 S-EW ramp from three lanes to four lanes to include two dual left and right turn lanes are expected to operate at capacity during the AM peak hour. A substantial amount of green time is required to accommodate the heavy volumes on the off-ramp, which may impact the travel time of the transit vehicle if detection is not implemented. No capacity constraints are expected during the PM peak hour.

7.4.3 HIGHWAY 427 EXTENSION

The traffic impacts of the Highway 427 extension are covered in the Huntington Business Park and York/Peel Boundary area reports.

7.4.4 VAUGHAN CORPORATE CENTRE

The Vaughan Corporate Centre report identifies the following road network modifications:

- Implementation of two roundabouts on Highway 7 at Maplecrete Road and west of Edgeley Boulevard;
- Construction of a ring road at the roundabouts north and south of Highway 7;
- Extension of the Highway 400 Northbound and Southbound off-ramps to connect with the ring road and Weston Road respectively;
- Widening of Edgeley Boulevard to a four lane cross section;
- Modification of Millway Avenue to a two lane cross section with on-street parking;
- Widening of Highway 7 to an eight lane cross section over Highway 400;
- Conversion of Highway 7 between the proposed roundabouts to a downtown main street; and
- Potential construction of an additional east west crossing of Highway 400 at Pennsylvania Avenue or Applewood Crescent.

The preferred design for the Rapid Transit lanes will operate on Highway 7 in a dedicated right-of-way in the median lanes through this section of Highway 7. If the roundabouts are adopted, they would have to be designed to allow the transit vehicles to efficiently travel through the roundabouts without impacting travel time. Discussions with the City of Vaughan are required during the detail design phase to determine what measures can be taken to ensure efficient travel times through this section of Highway 7 under the proposed road network changes.

An analysis was conducted at the intersections on Highway 7 at Weston Road, Famous Avenue, the northbound and southbound off-ramps with Highway 400 and Creditstone Road to determine the impact of the generated volumes expected from the Vaughan Corporate Centre with the Rapid

Transit System. The proposed relevant road network improvements have been incorporated into the analysis. The remaining intersections such as Edgeley Boulevard/Interchange Way and Jane Street have not been analysed as the future volumes on Highway 7 at these intersection are significantly reduced as a result of the ring road design.

Signalized Intersection	Intersection Overall LOS		Critical Movement	AM Peak Hour		PM Peak Hour	
	AM	PM		LOS	V/C	LOS	V/C
Highway 7/Weston Road	F	F	EBL EBT WBLL WBR NBL SBLL	- F F F - F	- >1.10 >1.10 1.04 - >1.10	F - F F F F	0.92 - 1.02 >1.10 >1.10 >1.10
Highway 7/Famous Avenue	E	D	WBT	B	0.90	D	0.97
Highway 7/Highway 400 N-EW off ramp	C	C	-	-	-	-	-
Highway 7/Highway 400 S-EW off ramp	C	C	NBLL	B	0.95	-	-
Highway 7/Creditstone Road	C	C	-	-	-	-	-

Highway 7/Weston Road

During both peak hours the intersection is expected to operate at capacity. A significant increase in volumes is expected for the dual southbound westbound left turn movements with volumes ranging from 600 to 1,000 vehicles per hour. The high traffic demand from all approaches does not permit additional green time to be allocated to the critical movements.

Highway 7/Famous Avenue

During both the AM and PM peak hours, the westbound is expected to approach capacity.

Highway 7/Highway 400 N-EW off-ramp

No capacity constraints are expected during the AM peak hour. During the PM peak hour the westbound through and northbound right will operate at capacity. The eight lane cross section will permit the protected northbound right turn lane to operate in conjunction with the southbound phase therefore eliminating the existing requirement to provide split phasing in the north-south directions. The timing was optimized to provide a majority of the green time to the east-west direction to reduce travel times for the transit vehicle.

Highway 7/Highway 400 S-EW off-ramp

During the AM peak hour the northbound dual left will approach capacity. No capacity constraints are expected during the PM peak hour.

Highway 7/Creditstone Road

No capacity constraints are expected during the AM and PM peak hours.

7.4.5 YORK BUS TERMINAL

The proposed bus terminal and road network improvements including the Proposed East-West Road connecting Jane Street to Keele Street was incorporated into the preferred alignment drawings for the Rapid Transit System.

The transit vehicle will operate in mixed traffic on Jane Street south from Black Creek to the Proposed East-West Road. The transit vehicles destined or originating on Highway 7 west will continue to operate in mixed traffic and enter/exit the York Bus Terminal via the Proposed East-West Road west of Northwest Gate.

The York Bus Terminal will consist of the following accesses to service the transit vehicles;

- Full moves access on the Proposed East-West Road west of Northwest Gate servicing transit vehicles to/from Highway 7 west via Jane Street.
- Right-in driveway on Steeles Avenue west of Northwest Gate servicing transit vehicles from York University and Highway 7 east via Keele Street.
- Right-out driveway west of right-in driveway servicing transit vehicles exiting the terminal destined to Steeles Avenue west.
- Right-out driveway on Proposed Street C between the Proposed East-West Road and Steeles Avenue servicing transit vehicles exiting the York Bus Terminal destined to Highway 7 east via Keele Street with an intermediate stop at York University.

The future intersections at Proposed Street C/Northwest Gate/Steele Avenue, Proposed East-West Road/Northwest Gate and Proposed East-West Road/Jane Street will operate under signal control. The transit vehicles will remain in mixed traffic from Northwest Gate travelling east/west on Steeles Avenue to/from Future Street F located approximately 300 metres west of Keele Street. On Future Street F the transit vehicle will enter/exit the future York University Bus Terminal via Chimneystack Road, Ian MacDonald Boulevard and York Boulevard.

The transit vehicles destined from Highway 7 east via Keele Street will travel southbound on Keele Street in mixed traffic accessing York University via Chimney Stack Road to Ian MacDonald Boulevard. The future York University Bus Terminal access is proposed on the north side of York Boulevard between Keele Street and Ian Mac Donald Boulevard. Transit vehicles destined to Highway 7 east will exit the York University Terminal via Chimney Stack Road.

The projected volumes generated from the commuter parking lots, kiss ‘n’ ride facilities and the transit terminal were incorporated and analysed under the preferred Rapid Transit alignment.

Signalized Intersection	Intersection Overall LOS		Critical Movement	AM Peak Hour		PM Peak Hour	
	AM	PM		LOS	V/C	LOS	V/C
Jane Street/Proposed East-West Road	D	E	SBL NBT WBR	F D -	1.00 0.94 -	- - D	- - 0.90
Proposed Street C/Proposed East-West Road	C	C	-	-	-	-	-
Proposed East-West Road/Northwest Gate/Steeles Avenue	E	C	EBL EBT WBL NBL	F F F E	1.00 1.10 1.07 0.90	- - -	- - -
Founders Road/Steeles Avenue	C	B	-	-	-	-	-
Future Street F/Steeles Avenue	D	D	EBL WBT NBT SBL	E E D E	0.93 0.98 0.95 0.96	- D - E	- 0.92 - 0.91
Steeles Avenue/Keele Street	D	D	WBT NBT	D -	0.91 -	D D	0.95 0.90
Keele Street/ Proposed East-West Road	A	A	-	-	-	-	-

Jane Street/Proposed East-West Road

During the AM peak hour the southbound left will require a significant amount of green time as approximately 550 vehicles are expected to enter the Terminal. As a result the southbound left will operate at capacity and the northbound through will approach capacity. It is recommended that traffic volumes be monitored to determine if a southbound dual left turn lane will be required to facilitate the heavy volume during the morning period. The opposing westbound right movement during the PM peak hour is expected to approach capacity.

Northwest Gate/Steeles Avenue

The southbound left will operate as a dual left with one lane designated to transit vehicles. This movement will be designated as protected only. During the AM peak hour the intersection will operate at capacity as the eastbound left, eastbound through and westbound left turn movements are expected to carry an upwards of 300 vehicles per hour.

7.4.6 THORNHILL CENTRE STREET STUDY

The intensification of the Centre Street corridor between Dufferin Street and Bathurst Street will increase traffic volumes by approximately 4,030 trips from the 20-year Recommended Land Use Option during the PM peak hour.

In addition to the improvements included in **Exhibit 7-1**, the planned north-south collector road (Desira Drive) was considered within the existing network. Desira Drive will consist of a 4-lane cross section connecting North Promenade Drive at Centre Street to Abbeywood Gate at Beverley Glen Boulevard.

The intersections on Highway 7 between Dufferin Street and Bathurst Streeet in addition to New Westminster Drive/Bathurst Street and Beverley Glen Boulevard/Bathurst Street were analysed under the 20-year Recommended land Use Option with the Rapid Transit System in operation.

From the analysis the following conclusions were made:

- The majority of the intersections are expected to operate with no capacity constraints;
- The eastbound through, westbound left, northbound through and southbound left is expected to operate at capacity at the intersection of Centre Street/Dufferin Street;
- The widening of Bathurst Street is expected to attract additional trips from Dufferin Street; and
- The provision of a signalized intersection on Centre Street west of New Westminster Drive is required to facilitate left turn movements in/out of the numerous commercial establishments.

7.4.7 LANGSTAFF INTERMODAL STATION

The preferred design at the intersection at the Yonge Street Connection Road and Highway 7 will consist of exclusive transitway lanes in all approaches. However, the eastbound right transit movement from Highway 7 and the southbound right transit movement from the Yonge Connection Road will operate in mixed traffic utilizing the channelized right turn lanes.

Future Intersection Operations

The proposed design will not warrant exclusive signal phases as the eastbound left transit movement on Highway 7 will operate in conjunction with the eastbound left auto traffic and similarly for the southbound left transit movement operating as a triple left with the dual southbound left auto traffic. Signal priority will likely be implemented to detect buses in the transitway and activate the appropriate phases to avoid long delays and prevent the buses from doubling up.

All the buses will be accessing the Langstaff Terminal Station putting emphasis on the turning movements. Therefore, giving a majority of the green time to the east-west main phase will not be a priority. The bus movements are expected to operate at a satisfactory level of service with minimal delays.

The additional volumes generated from the Langstaff Terminal Station will slightly increase the delay in the westbound through and eastbound left movements. The eastbound left advance was increased in both the AM and PM peak hours therefore decreasing the green time in the westbound through or east-west main phase. This does not have a large impact as both the AM and PM peak hour will continue to operate below an overall v/c ratio of 1.0. Therefore, there will not be any capacity issues resulting from the transitway lanes and additional trips generated by the Langstaff Intermodal Station.

Signalized Intersection	Intersection Overall LOS		Critical Movement	AM Peak Hour		PM Peak Hour	
	AM	PM		LOS	V/C	LOS	V/C
Highway 7/Yonge Connection Ramp	C	C	EBL WBT	- -	- -	E D	0.97 0.99

Southbound Triple Left at Yonge Connection Ramp

The existing double southbound left will operate in conjunction with the buses turning left in the transitway lane. It is a concern, however, for drivers conducting the left turn in the centre lane to observe a bus on their left. This may result in driver confusion from the simultaneous three left-turn manoeuvre and result in fears of sideswipe collisions in the middle lane. However, the buses will turn directly into a transitway lane on Highway 7 and therefore for the general traffic the movement will operate as a double left: similar to existing conditions.

It is recommended that the proper steps be taken to ensure adequate turning radii are designated to the southbound left turn movement for buses. This will prevent the buses from encroaching into the general traffic lanes. As there are three eastbound receiving lanes for the general traffic, there is adequate clearance between the buses and the autos and vehicle weaving downstream is not a concern.

7.4.8 BAYVIEW GLEN

The proposed development will generate traffic on Highway 7 at Red Maple Road and Silver Linden Drive. The area south of High Tech Road will include the Bayview Glen Business Park and the area north of High Tech Road will consist of mainly residential development. The following 2007 future volumes were incorporated into the long-term intersection analysis, which is summarized below. The intersections will operate with protected eastbound lefts to accommodate the Rapid Transit lanes.

Signalized Intersection	Intersection Overall LOS		Critical Movement	AM Peak Hour		PM Peak Hour	
	AM	PM		LOS	V/C	LOS	V/C
Highway 7/Red Maple Road	C	E	SBR EBL WBT	D - -	0.95 - -	- F F	- >1.10 >1.10
Highway 7/Silver Linden Drive	B	C	EBL WBT	-	-	F D	1.06 1.06

Highway 7/Red Maple Road

During the AM peak hour the southbound right turn movement will approach capacity as the movement is expected to operate with in excess of 500 vehicles during the AM peak hour.

During the PM peak hour the eastbound left is expected to generate approximately 626 vehicles and the opposing westbound through volume is expected to be heavy at 2356 vehicles. As a result, the intersection will operate at capacity with the eastbound left operating at level of service F and a delay of 140 seconds. The phasing in the north approach has been set to the minimum of 37 seconds.

Due to the high eastbound left volumes during the PM peak hour, it is recommended that this movement be monitored to determine if a dual left turn lane is required.

Highway 7/Silver Linden Drive

No capacity constraints are expected during the AM peak hour. During the PM peak hour, the protected eastbound left and westbound through movements are expected to operate at capacity.

7.4.9 SOUTH PARK DEVELOPMENT

As the Leitchcroft Traffic Impact study was unavailable from the Town of Markham, projected volumes were estimated to enter and exit the development at the Saddlecreek Drive and South Park Road/Chalmers Road intersections on Highway 7. It was estimated that the condominium/townhouse development would develop approximately 1200 units or approximately 5200 trips during the AM peak hour and 640 trips during the PM peak hour based on the ITE Trip Generation Manual for Condominiums and Townhouses.

Signalized Intersection	Intersection Overall LOS		Critical Movement	AM Peak Hour		PM Peak Hour	
	AM	PM		LOS	V/C	LOS	V/C
Highway 7/South Park Drive/Chalmers Road	B	C	WBT	-	-	D	1.03
Highway 7/Saddlecreek Drive	A	B	-	-	-	-	-

Highway 7/South Park Drive/Chalmers Road

No capacity constraints are expected during the AM peak hour. During the PM peak hour the westbound through will operate at capacity, as the north-south movements require approximately 49 seconds of green time therefore leaving an inadequate amount of green time to accommodate the east-west movements.

Highway 7/Saddlecreek Drive

No capacity constraints are expected during the AM and PM peak hours.

7.4.10 EAST BEAVER CREEK BUSINESS PARK

The 2011 AM and PM peak hour volumes generated by the East Beaver Business Park were applied to the intersections of:

- Highway 7/Commerce Valley Drive West/West Beaver Creek;
- Highway 7/Leslie Street; and
- Highway 7/Commerce Valley Drive East/East Beaver Creek.

The intersections were analysed with the projected future volumes expected on Highway 7 within this area with the dedicated Rapid Transitway operating in the centre lanes.

Signalized Intersection	Intersection Overall LOS		Critical Movement	AM Peak Hour		PM Peak Hour	
	AM	PM		LOS	V/C	LOS	V/C
Highway 7/Commerce Valley Drive West/West Beaver Creek	F	E	EBL	-	-	F	>1.10
			EBT	F	>1.10	-	-
			WBT	D	0.99	F	1.11
			NBL	-	-	F	>1.10
Highway 7/Leslie Street	F	F	EBL	F	>1.10	F	>1.10
			EBT	F	>1.10	F	>1.10
			WBL	F	>1.10	F	>1.10
			WBT	E	1.02	F	>1.10
			NBL	F	1.11	F	>1.10
			SBL	F	>1.10	F	>1.10
Highway 7/Commerce Valley Drive East/East Beaver Creek	F	F	EBL	F	>1.10	F	>1.10
			EBT	F	>1.10	F	>1.10
			WBL	F	>1.10	F	>1.10
			WBT	-	-	F	>1.10
			WBR	F	>1.10	-	-
			NBT	-	-	F	>1.10
			SBL	-	-	F	>1.10

Highway 7 / Commerce Valley Drive West / West Beaver Creek

During the AM peak hour the eastbound through lanes are expected to operate at capacity with expected volumes in excess of 3,400 vehicles per hour. The three through lanes provided in the eastbound direction are not adequate to support the heavy volumes projected during the AM peak hour. During the PM peak hour the eastbound left, westbound through and northbound left are expected to operate at capacity. The northbound left turn movement is competing with the high through traffic demand on Highway 7, which do not allow additional green time to be allocated to the left movements.

Highway 7 / Leslie Street

The eastbound left, eastbound through, westbound left, westbound through, northbound left and southbound left movements are expected to operate at capacity under future traffic conditions during the AM peak hour. There is an inadequate amount of green time to support the heavy through and left turn movements. The westbound left movement is expected to operate with an excess of 700 vehicles per hour. During the PM peak hour, the eastbound left, eastbound through, westbound left, westbound through, northbound left and southbound left movements will continue to operate at capacity.

Highway 7 / Commerce Valley Drive East / East Beaver Creek

During the AM peak hour the eastbound left, eastbound through, westbound left and westbound right turn movements are expected to operate at capacity. A minimum split of 46 seconds is required in the north-south direction, which prevents additional green time from being allocated to the east-west direction. During the PM peak hour, movements from all approaches are operating at capacity, as there is an insufficient amount of lane capacity to support the future volumes.

7.4.11 SENECA COLLEGE

The projected 2008 traffic volumes generated by Seneca College will impact the intersection of Highway 7/Allstate Parkway/East Valhalla Drive. The intersection was analysed with the provision of protected left turn lanes to accommodate the transit vehicles operating during the main east-west phase. No other road improvements were included in the analysis.

Signalized Intersection	Intersection Overall LOS		Critical Movement	AM Peak Hour		PM Peak Hour	
	AM	PM		LOS	V/C	LOS	V/C
Highway 7/Allstate Parkway/East Valhalla Drive	F	E	EBL WBT SBR	F F -	>1.10 >1.10 -	F D F	0.97 0.95 >1.10

Highway 7/Allstate Parkway/East Valhalla Drive

During the AM peak hour the eastbound left and westbound through movements will operate at capacity as the competing through movements do not allow additional green time to be allocate to the left movement. During the PM peak hour the southbound right will operate at capacity with projected hourly volumes in excess of 1,000 vehicles.

Potential road improvements such as a mid-block crossing of Highway 404 between Highway 7 and 16th Avenue and the possible extension of the Highway 404 northbound off-ramp to Allstate Parkway would significantly reduce operational deficiencies.

7.4.12 MARKHAM CENTRE WEST

The intersections on the preferred Rapid Transit route located on Town Centre Boulevard, Warden Avenue, Enterprise Drive, Helen Avenue and Kennedy Road have been analysed under the 2021 full build-out traffic conditions of the Markham Centre West development. The 2021 analysis of the intersections on Highway 7 between Fairburn Drive/Montgomery Court and Sciberras Road impacted by the Markham Centre West study are included in **Section 8** as they are incorporated in the needs justification section for the Highway 7 widening.

7.4.12.1 Town Centre Boulevard Alignment

Through the Highway 7 Environmental Assessment, the preferred design is to provide a dedicated median transitway on Town Centre Boulevard for the York Rapid Transit Plan (YRTP) network.

The Clegg Road EA, currently being undertaken by the Town of Markham, includes the extension of Clegg Road, as a collector road, to Verclair Gate, Village Parkway and Sciberras Road east of Warden Avenue. The proposed road network is expected to intersect Town Centre Boulevard and Warden Avenue as signalized intersections. The current planning is to modify Cedarland Drive to a signalized intersection at Town Centre Boulevard and for it to remain unsignalized at Warden Avenue. Town Centre Boulevard is expected to operate with a four lane cross section with the Rapid Transit System in operation.

Maintaining full turns access at the Clegg Road, Cedarland Drive and the IBM road access will result in substandard signal spacing along Town Center Boulevard. Provided below are the approximate separation distances from centre line to centre line:

- Highway 7 to Clegg Road – 220 metres;

- Clegg Road to Cedarland Drive – 140 metres; and
- Cedarland Drive to IBM intersection – 130 metres.

The recommended distance between signalized intersections on a minor arterial roadway is a minimum of 200 metres according to the Transportation Association of Canada's Geometric Design Guide for Canadian Roads in order to allow for signal progression. In addition to the traffic progression implications, the left turn storage lengths required to accommodate the maximum queue lengths resulting from the projected volumes may spill back into the through lanes. Although two through lanes per direction are provided on Town Centre Boulevard, it is recommended that if the Town Centre Boulevard alternative is approved that left turn traffic volumes be monitored to determine if dual lefts may be required.

Based on a review of the projected volumes produced by Cansult for the Clegg Road EA and through discussions with Town of Markham Staff, it is apparent that Town Centre Boulevard and the east-west collector road system will function as a "ring road" or by-pass to Highway 7, specifically the Highway 7/Warden Avenue intersection. The volumes have been analysed based on the proposed road network.

Signalized Intersection	Intersection Overall LOS		Critical Movement	AM Peak Hour		PM Peak Hour	
	AM	PM		LOS	V/C	LOS	V/C
Town Centre Boulevard / Clegg Road	C	D	WBT	D	0.91	-	-
			SBL	-	-	E	0.92
			EBL	-	-	E	0.90
			NBL	-	-	E	0.94
Town Centre Boulevard / Cedarland Drive	C	D	-	-	-	-	-
Town Centre Boulevard / IBM	B	B	-	-	-	-	-
Warden Avenue / Enterprise Drive	E	F	EBL	-	-	F	1.00
			EBT	F	>1.10	F	0.94
			WBL	F	>1.10	F	0.95
			WBT	-	-	F	1.04
			NBT	F	1.06	-	-

The traffic assignment to Town Centre Boulevard appears to be high. With the transitway in place, these "through" volumes cannot be accommodated in the southbound left turn movements at Clegg Road and Cedarland Drive. With the poor operating conditions anticipated for the southbound left turn movements, eastbound traffic may choose to proceed to the Highway 7/Warden Avenue intersection and negotiate an eastbound right turn. Alternatively, motorists may choose to travel further south on Town Centre Boulevard and negotiate a southbound left turn at the IBM intersection.

Southbound left turn requirements dominate the intersection operations at Clegg Road / Town Centre Boulevard and Cedarland Drive / Town Centre Boulevard intersections. This "by-pass" type traffic is effectively reducing the green time available to through movements along Town Centre Boulevard. A transit only phase was implemented of ten seconds for the buses to turn left from Town Centre Boulevard. The north south through volumes were simulated with the transit phase.

Town Centre Boulevard / Clegg Road

During the AM peak hour the westbound through lane is approaching capacity. During the PM peak hour the southbound, eastbound and northbound left turn movements are approaching capacity as they are competing with the through movements which do not allow additional green tie to be allocated to the left movements.

Town Centre Boulevard / Cedarland Drive

No capacity constraints are expected at the intersection.

Town Centre Boulevard / IBM

No capacity constraints are expected at the intersection.

Enterprise Drive/Warden Avenue

The intersection at Warden Avenue/Enterprise Drive will represent the north end transition of the rapid transit vehicle linking the Highway 7 corridor to the Markham North South corridor. As such, an exclusive transit phase will be required, as the transit vehicles from both routes will be turning to/from-dedicated lanes located directly north of Enterprise Drive. A ten second phase will be required to maneuver the transit vehicle to/from Enterprise Drive and Warden Avenue. The Highway 7 transit vehicles will travel to/from the northwest quadrant (IBM/Town Centre Boulevard) continuing to/from the east just north of Enterprise Drive. The Markham North South transit vehicles will travel to/from the south on Warden Avenue.

No other vehicles will be permitted during this phase. The northbound left u-turns and westbound and southbound right-turns-on-red will not be permitted at the intersection in order not to conflict with the transit movements.

The future lane configuration for the Enterprise Drive/Warden Avenue intersection was based on the Markham Centre West Master Plan Transportation Study in which the east approach consists of a dual left and through right turn lane and the west approach consists of an exclusive left, through and right turn lane. Based on this lane configuration, the intersection will operate at capacity during the AM peak hour and PM peak hour. This is mainly a result of the high projected volumes to be generated by Markham Centre West.

Helen Avenue and Kennedy Road Alignment

The proposed Markham Centre West development will also generate additional volumes on Helen Avenue and Kennedy Road. The preferred Rapid Transit plan is to continue the dedicated transitway from Enterprise Drive crossing under the GO Stouffville Line to connect to Helen Avenue. From Helen Avenue, the proposed RT System will head north on Kennedy Road and continue easterly on Highway 7 in a dedicated median transitway.

The following road improvements are projected for the area and have been incorporated into the analysis with the future volumes and full build-out of the RT system:

- The Region of York's capital program sites Kennedy Road to be widened from four lanes to six lanes from Highway 407 to Highway 7 in 2008;
- Enterprise Drive extended to Kennedy Road north of Helen Avenue and operate as a future signalized intersection;

- GO Stouffville expansion of facilities including revised layout of parking facility and driveways; and

- A new north-south connection road from Enterprise Drive to Helen Avenue.

Signalized Intersection	Intersection Overall LOS		Critical Movement	AM Peak Hour		PM Peak Hour	
	AM	PM		LOS	V/C	LOS	V/C
Helen Avenue/Proposed North-South Connection	D	C	EBL SBL	E -	0.92 -	- E	- 0.98
Helen Avenue/Kennedy Road	F	E	NBL SBT EBR WBL	F F - -	>1.10 >1.10 - -	F - F F	>1.10 - >1.10 0.98
Kennedy Road/Unionville Gate	E	D	NBL	-	-	F	0.95
Kennedy Road/ Avoca Drive	C	F	WBL EBL NBL	E - -	0.95 - -	F F F	0.98 0.94 0.97
Kennedy Road/Highway 7	D	E	WBT EBL EBT	F - -	>1.10 - -	- F F	- >1.10 >1.10

Helen Avenue/Proposed North-South Connection

During the AM peak hour the eastbound left movement is expected to approach capacity. During the PM peak hour the southbound left movement is expected to approach capacity. An exclusive transit phase of approximately 10 to 15 seconds will be provided to permit the transit vehicle to cross from the northwest quadrant to the east approach in dedicated transitway lanes.

Helen Avenue/Kennedy Road

During the AM peak hour the northbound left and southbound through movements will operate at capacity. An exclusive transit phase of ten seconds to permit the eastbound left and southbound right transition in dedicated median transitway lanes will be implemented in conjunction with the northbound through-right movements on Kennedy Road.

During the PM peak hour, the transit vehicle will operate in conjunction with the eastbound left, through and right turn movements. The volumes from the GO Stouffville Station will result in the eastbound right and northbound right to operate at capacity. The westbound left will approach capacity.

During both peak hours, the northbound left on Kennedy Road is expected to carry in excess of approximately 500 vehicles.

Kennedy Road/Unionville Gate

During the AM and PM peak hour, the intersection is expected to operate at a satisfactory level of service with the implementation of the RT system and proposed volumes.

Kennedy Road/Avoca Road

During the AM peak hour, the westbound left from Avoca Road is expected to approach capacity. During the PM peak hour, the northbound left and eastbound left will approach capacity. The northbound left protected only phase requires a significant amount of green time to accommodate the 500 left turning vehicles during the PM peak hour.

Kennedy Road/Highway 7

A separate advance phase of ten seconds was designated to the transit system. The eastbound through volumes including the eastbound left and southbound right will operate in conjunction with the transit advance phase as the movements will not conflict or cause any driver expectation issues.

The additional ten-second transit phase to transition the transit vehicle from the northbound right and westbound left movement will affect the minimum splits at the intersection. The pedestrian minimum splits will operate below the requirement. It is recommended during the detailed design phase that the intersection be considered for pedestrian split phasing. During the AM peak hour the westbound through lanes will operate at capacity. During the PM peak hour the eastbound left and through lanes will operate at capacity.

7.4.13 CORNELL COMMUNITY AND MARKHAM BY-PASS EXTENSION

The future volumes generated for the 2021 traffic conditions from the Cornell Community Transportation Study were incorporated into the analysis of the dedicated Rapid Transit System. The additional traffic from the Cornell Community will impact the intersections on Highway 7 east of Ninth Line to and including the new Markham By-Pass Extension (referred to as the Markham By-Pass Extension). The existing Markham By-Pass Extension will remain; however it will become a local residential road.

With the new Markham By-Pass Extension, additional traffic growth will be added to Ninth Line, Reesor Road and York-Durham Line based on projections from the EMME/2 York Region Model. A 3% per annum growth rate was applied to the north-south movements on York/Durham Line and a 2% per annum growth rate applied to Ninth Line to estimate the projected growth in traffic volumes generated from the Markham By-Pass Extension. The north-south volumes on Reesor Road were not adjusted as the road is not scheduled for widening according to the York Region Capital Plan and currently operates at capacity during the AM peak hour. Therefore, it is unlikely that it will generate additional volumes but be expected to decrease. The through volumes on Highway 7 at these intersections were balanced through from Bur Oak Avenue and the Markham By-Pass Extension and at York/Durham Line increased by 3% per annum.

The 2021 volumes generated in the Cornell Community Transportation Study were applied to the remaining intersections at Bur Oak Avenue, Existing Markham By-Pass Extension and the Markham By-Pass Extension.

The Rapid Transit System from Ninth Line to the Future Markham By-Pass extension will operate in a dedicated right-of-way on Highway 7 and will transition to mixed traffic travelling on Bur Oak Avenue to the Markham Stouffville Hospital. The road improvements outlined in **Section 7.1** including widening Ninth Line to four lanes with auxiliary lanes at major intersections, extending Bur Oak Avenue south of Highway 7, extending the Markham By-Pass to Major Mackenzie in the north and Morningside Avenue in the south and widening York/Durham line from two lanes to four lanes have been incorporated into the 2021 analysis.

Signalized Intersection	Intersection Overall LOS		Critical Movement	AM Peak Hour		PM Peak Hour	
	AM	PM		LOS	V/C	LOS	V/C
Highway 7/Ninth Line	D	D	EBL WBL NBT	- F -	- 0.93 -	F - D	0.97 - 0.93
Highway 7/Bur Oak Avenue	C	C	-	-	-	-	-
Highway 7/Existing Markham By-Pass Extension	C	C	-	-	-	-	-
Highway 7/Future Markham By-Pass Extension	E	D	EBT WBL WBT NBT SBL	E D - F F	1.01 1.00 - 1.03 1.05	- - E - E	- - 1.01 - 1.01
Highway 7/Reesor Road	D	B	WBT NBL SBT	E E E	0.90 0.96 0.95	- - -	- - -
Highway 7/York/Durham Line	D	C	WBT NBL	E F	1.02 1.07	- -	- -

Highway 7/Ninth Line

During the AM peak hour, the eastbound left, southbound through, northbound left and westbound through will approach capacity. The eastbound and westbound left movements will operate as protected only with the operation of the Rapid Transit System. During the PM peak hour the eastbound left and northbound through will operate at capacity with the northbound left and westbound through movements approaching capacity.

Highway 7/Bur Oak Avenue

It is not yet confirmed if the transit vehicle will operate in a dedicated transitway on Bur Oak Avenue or in mixed traffic. For the purposes of this report, it has been assumed that the transit vehicle will operate in mixed traffic transitioning to/from a dedicated transitway at the Highway 7 intersection. Under the 2021 conditions, the intersection of Highway 7/Bur Oak Avenue will likely operate as a full moves intersection as additional development is proposed south of Highway 7. Therefore, an additional exclusive transit phase was implemented to permit the westbound right transit movement to operate in conjunction with the eastbound through general traffic. A protected eastbound left movement will facilitate transit vehicles destined to the Markham Stouffville Hospital and the transition to mixed traffic on Bur Oak Avenue. The southbound transit movements will operate in mixed traffic and travel through the intersection with the general traffic.

No capacity constraints are expected at the intersection of Bur Oak Avenue and Highway 7 under future conditions.

Highway 7/Existing Markham By-Pass Extension

The existing Markham By-Pass extension is expected to operate without any capacity constraints during both peak hours under future conditions.

Highway 7/Future Markham By-Pass Extension

During the AM and PM peak hours the southbound left will operate at capacity as it is competing with the heavy through movements which do not allow additional green time to be allocated to the left movements. It is recommended that this intersection be considered for exclusive right turn lanes in all approaches.

Highway 7/Reesor Road

During both peak hours, it is expected that this intersection will operate without any capacity constraints.

Highway 7/York/Durham Line

During the AM peak hour the westbound through and northbound left are expected to operate at capacity. During the PM peak hour the intersection is expected to operate at a satisfactory level of service.

8. HIGHWAY 7 WIDENING

As part of the Highway 7 and Vaughan North-South Link Environmental Assessment for the York Rapid Transit Plan: Highway 7 in the vicinity of Warden Avenue has been identified as a high growth area with the development of the Markham Centre West area, which was described in **Section 7.4.12**.

The following section forms the traffic component of the needs and justification for widening Highway 7 from Montgomery Court/Fairburn Drive to Sciberras Road as well assesses the resulting operating conditions. Analysis was undertaken to determine improvements required to support the future growth on Highway 7.

A six-lane cross-section currently narrows to four lanes approximately 230 metres east of the Fairburn Drive/Mongomery Court intersection and continues easterly through Markham.

Using the YRTP model, an analysis was conducted to evaluate the 2011 and 2021 future conditions. For the purposes of the needs and justification component, both diversions to South Town Centre Boulevard and Warden Avenue have been analysed with the Rapid Transit System during the 2021 future conditions.

8.1 Background Studies

The following transportation related studies have been referenced in completing the analysis.

Stringbridge Traffic Study, December 2004.

ITrans Consulting Inc. conducted this traffic study on behalf of Stringbridge Developments Limited to analyse the effects of a mixed use development. The development proposes a future public, Circa Boulevard located between Rodick Road and Town Centre Boulevard. The 2009 Site Total Traffic Volumes from the report were utilized at the proposed Circa Boulevard intersection.

Highway 7 / Warden Avenue Mixed-Use Development Traffic Study, May 2004.

iTrans Consulting Inc. prepared this report on behalf of the Liberty Development Corporation to determine the impact on the surrounding road network of the proposed mixed-use development of 1,798 residential units, 263,000 square feet of commercial office uses and 55,000 square feet of commercial retail uses. The development is proposed in the area bounded by Warden Avenue, Cedarland Drive, Town Centre Boulevard and Highway 7 adjacent to the Hilton Suites. A 2009 planning horizon was analyzed to assess the future conditions.

Markham Centre West Master Plan Transportation Study, December 14, 2001.

iTrans Consulting Inc. prepared this report on behalf of the Remington Group to complete a transportation assessment of the 258-acre development bounded by Warden Avenue in the west, Highway 407 in the south, and the Rouge River in the north and the CN Uxbridge Line in the east. A 2011 and 2021 planning horizon was analysed to assess the future road network. The site traffic generated from the Highway 7 / Warden Avenue development has been included in the Markham Centre West Master Plan Study.

8.2 Existing Conditions

This section of Highway 7 includes mix residential and commercial retail/office developments. The lands between Warden Avenue and Sciberras Road are presently partially vacant on the south side of Highway 7. Major areas of development within this corridor include the First Markham Place located east of Fairburn Drive, the Anthony Roman Centre and Markham Theatre and Town Hall northeast of Town Centre Boulevard and Highway 7 and the Markham Town Square located northeast of Warden Avenue/Highway 7.

Recent count data for this section was obtained from Regional turning movement counts and recent transportation studies. The following exhibit summarizes the year of the obtained counts and the source from which the counts were obtained.

Exhibit 8-1-Collected Traffic Data

Intersections on Highway 7 at:	Year	Source
Montgomery Court/Fairburn Drive	2002	York Region
Rodick Road	2003	York Region
Town Centre Boulevard	2002	iTrans Liberty Development Corporation May 2004 Traffic Study
Warden Avenue	2002	York Region
Verclair Gate	2002	York Region
Village Parkway	1999	York Region
Sciberras Road	2002	iTrans Markham Centre West Master Plan Transportation Study January 2003

The existing transit, pedestrian and cycling network as well as the adjacent land uses and annual average daily traffic (AADT) volumes for the Highway 7 corridor within the area between Montgomery Court and Sciberras Road is included in Sections 3.

8.2.1 COLLISION HISTORY

To identify the any potential safety concerns within this section of Highway 7, collision data reports were obtained from the Region of York from 1999 to 2003 for the intersections as well as the roadway links between the intersections. Within the entire section, a total of 456 collisions occurred from 1999 to 2003 of which 1(0.2%) collision was fatal, 66(14.5%) were injury related and 389(85.3%) involved property damage only. The following exhibit summarizes the number of collisions within the five-year period by class to occur at the intersections.

Exhibit 8-2-Number of Collisions at Intersections

Highway 7 at:	Number of Collisions from 1999 to 2003			
	Fatal	Injury	Property Damage	Total
Montgomery Court	0	9	41	50
Rodick Road	0	14	64	78
Town Centre Boulevard	1	8	35	44
Warden Avenue	0	14	82	96
Verclair Gate	0	3	18	21
Village Parkway	0	3	13	16
Total	1	51	253	305

The collision data reported on Highway 7 between the intersections are summarized in Exhibit 8-3.

Exhibit 8-3-Number of Collisions on Roadway Links

Roadway Link on Highway 7 between:	Number of Collisions from 1999 to 2003			
	Fatal	Injury	Property Damage	Total
Montgomery Court and Rodick Road	0	4	34	38
Rodick Road and Town Centre Boulevard	0	0	10	10
Town Centre Boulevard and Warden Avenue	0	0	18	18
Warden Avenue and Verclair Gate	0	2	25	27
Verclair Gate and Village Parkway	0	0	15	15
Village Parkway and Shops of Unionville	0	7	34	41
Total	0	15	136	151

One fatality collision within the study area was noted at the intersection of Town Centre Boulevard/Highway 7. The collision occurred in 2000 between the hours of midnight and 5 a.m. in dry conditions. The type of collision was classified and described as a single moving vehicle (SMV) other involving an automobile, where the driver was driving properly.

The intersections at Warden Avenue and Rodick Road have the highest number of collisions within this section of Highway 7. A majority of the intersections at Warden Avenue involved vehicles whereby the drivers were following too closely resulting in 47% of the total collisions being rear end type collisions. However, from 1999 to 2003 the number of collisions has decreased from 23 per year to 9 per year. At Rodick Road, approximately 57% of the total collisions were also rear end collisions with 24 of the collisions involving drivers following too closely. At both intersections most

of the intersections described the driver maneuvers as going ahead with turning left and slowing or stopping resulting in the second most number of collisions.

The roadway link from Village Parkway to the Shops of Unionville (east of Sciberras Road) had a total of 41 collisions from 1999 to 2003 of which 15 involved driver's failing to yield the right of way. Rear end and angle collisions were the most common type of collisions recorded with 77% of the collisions occurring between the hours of 10 a.m. to 7 p.m.

From the collision data, York Region screens the data based on the intersections or roadways link potential for safety improvement (PSI) from 0 to 15.8, which is the highest rating given in the Region. A rating of 0 signifies that the intersection is operating on average throughout the region with any positive value above 0 indicating that the intersection is operating above the average. A low rating of 1 or 2 would indicate that minor improvements such as signage at the intersection would help mitigate the number of collisions where a rating of 6 or higher, the intersection would require more costly improvements such as geometric modifications. The following exhibit illustrates the PSI values for the intersections and roadway links within the section of Highway 7.

Exhibit 8-4-PSI Rating of Collisions on Roadway Links

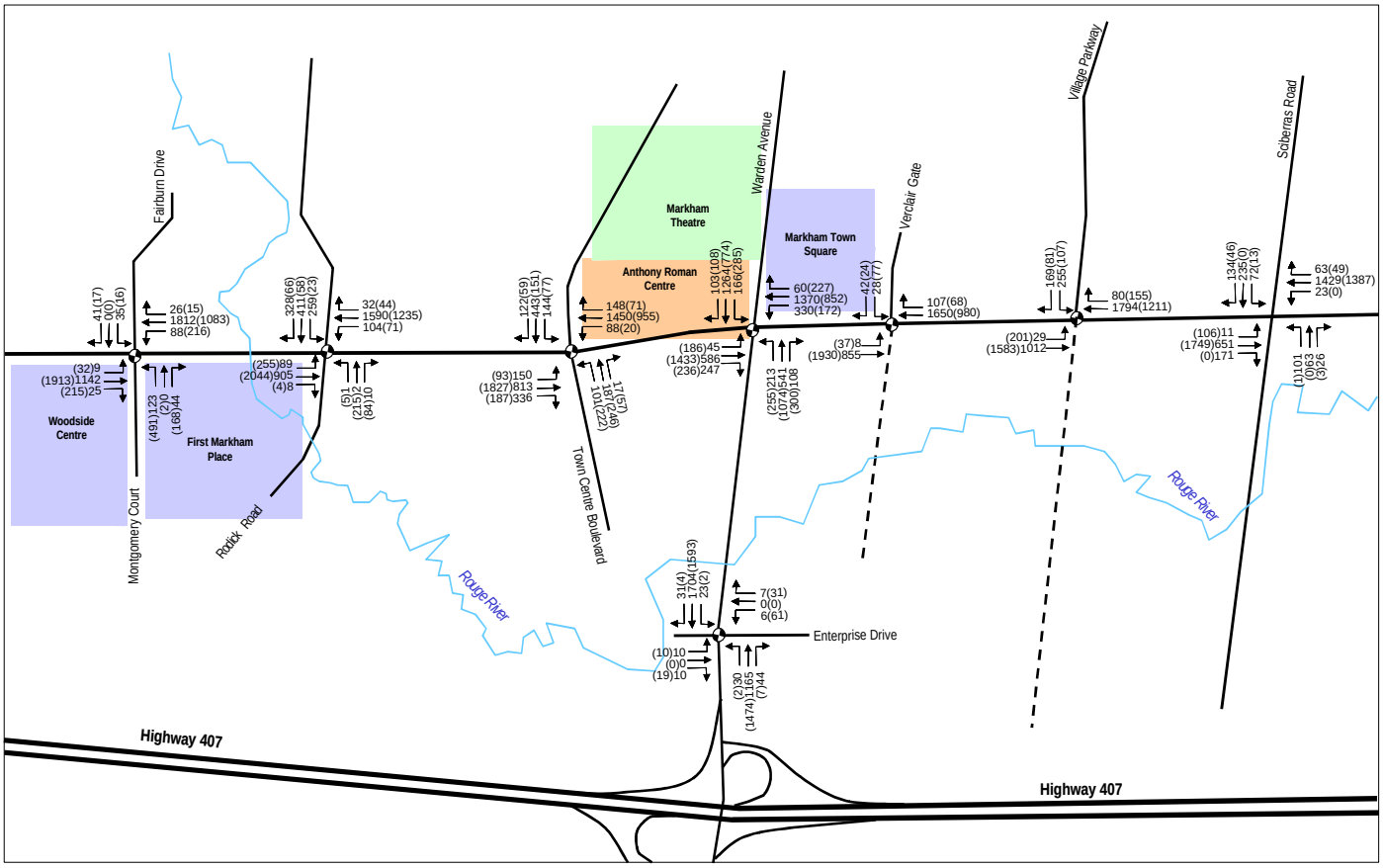
Location on Highway 7	PSI
Montgomery Court	0
Rodick Road	6.04
Town Centre Boulevard	0
Warden Avenue	0
Verclair Gate	0
Village Parkway	0
Montgomery Court to Rodick Road	3.12
Rodick Road to Flaska Drive	0
Flaska Drive to Warden Avenue	0.21
Warden Avenue to Verclair Gate	0.70
Verclair Gate to Village Parkway	1.86

The intersection of Rodick Road/Highway 7 has a PSI rating of 6.04 based on the number of traffic volumes, road geometrics etc. and the number of collisions at the intersection. A majority of the collisions at the intersection were rear-end collisions resulting from vehicles following too closely. Further development activity and an increase in volumes may reduce speeds, decreasing the likelihood of additional collisions. A rating of six indicates that the intersection has a relatively high potential for safety improvements.

8.2.2 EXISTING INTERSECTION COUNTS

The existing conditions were based on turning movement counts obtained from the Region of York. The existing AM and PM peak hour volumes are illustrated in **Exhibit 8-5**.

Exhibit 8-5-Existing AM (PM) Traffic Volumes



8.2.3 EXISTING SCREENLINE VOLUME AND CAPACITY

The York Region model was used to analyse two north-south screenlines east of Woodbine Avenue and West of Main Street Unionville. Based on the 2001 base conditions and a lane capacity of 1,000 vehicles per lane, Highway 7 is operating at a volume to capacity (v/c) ratio of 0.85 east of Woodbine Avenue and 0.82 west of Main Street Unionville in the westbound direction during the AM peak hour.

A total of approximately 7,370 westbound vehicles utilize 16th Avenue, Highway 7 and Highway 407 east of Woodbine Avenue during the AM peak hour for a combined volume to capacity ratio of 92% based on a total capacity of 8,000 vehicles per hour. West of Main Street the total volume to capacity ratio is slightly higher at 94% based on the same total capacity.

Exhibit 8-6-Existing Screenline Volume and Capacity

Road	East of Woodbine			West of Main Street		
	2001-Cap	2001-Vol	2001-v/c	2001-Cap	2001-Vol	2001-v/c
16th Avenue	2000	1640	0.82	2000	1790	0.90
Highway 7	2000	1710	0.85	2000	1650	0.82
Highway 407	4000	4020	1.00	4000	1050	1.01
Total	**8000**	**7370**	**0.92**	**8000**	**7490**	**0.94**
Screenline Lane Deficiency			**0**			**0**

From the existing screenline volume to capacity ratios the westbound direction on 16th Avenue, Highway 7 and Highway 407 are approaching capacity during the AM peak hour with approximately an overall 6 to 8% of available capacity.

8.2.4 EXISTING INTERSECTION OPERATIONS

The existing operations of the signalized intersections on Highway 7 between Montgomery Court and Sciberras Road are summarized in **Section 3.5.2** and are based on existing lane configuration and signal timings. Sciberras Road currently operates as an unsignalized intersection and therefore has not been included in the analysis of the existing conditions.

Based on a review of the existing analysis, the following have been concluded with regards to traffic operations on Highway 7 between Montgomery Court and Sciberras Road:

- The northbound left on Fairburn Drive/Montgomery Court is operating at capacity during the PM peak hour;
- The northbound left on Town Centre Boulevard is approaching capacity during the AM peak hour. During the PM peak hour the northbound left at Town Centre Boulevard operates at capacity;
- The westbound left and southbound through movements at Warden Avenue are approaching capacity during the AM peak hour. The eastbound through, northbound through and southbound left are approaching capacity at Warden Avenue during the PM peak hour; and
- No capacity constraints were noted at Rodick Road, Verclair Gate and Village Parkway during the AM and PM peak hours.

Although the overall level of service of the Highway 7 corridor is satisfactory with the present 4-lane cross section, it is expected to worsen with the future traffic projections forecasted for the area.

8.3 Future Conditions

The future conditions have been analysed for the 2011 and 2021 horizon year, a number of assumptions with regards to the future road network conditions were considered to be implemented by 2011 and transit services were considered to be implemented by 2021.

8.3.1 2011 AND 2021 PEDESTRIAN AND BICYLING NETWORK

The future road network includes the provision of a two lane, three metre wide cycling path along the south side of Highway 7 from Warden Avenue to east of Sciberras Road. The cycling path will be located between the edge of pavement and the sidewalk with an approximate 3.2 metre boulevard. Sidewalks will be provided on both sides of Highway 7 from Montgomery Court to Sciberras Road.

8.3.2 2011 AND 2021 VOLUME FORECASTS

The projected volumes have been based on the Markham Centre West Master Plan Transportation Study. The 2011 and 2021 volumes based on the Markham Centre West Master Plan Transportation Study included the following developments:

- Embassy Suites Hotel Expansion;
- IBM Phase 1 and 2;
- Liberty Development;
- ORC Office and YMCA Developments;
- Stringbridge;
- Tenstone;
- Tridel;
- South Unionville;
- Woodside Centre/First Markham Place expansion;
- Motorola;
- Bowood Development; and
- Burger King.

These developments are expected to be fully built out by 2011. A growth rate of 0 to 1.5% per annum was also applied to the existing traffic volumes to forecast the volumes from 2001 to 2021.

The future 2011 and 2021 volumes for the AM and PM peak hours are illustrated in **Exhibit 8-7** and **Exhibit 8-8**.

Exhibit 8-7-Future 2011 AM (PM) Peak Hour Volumes

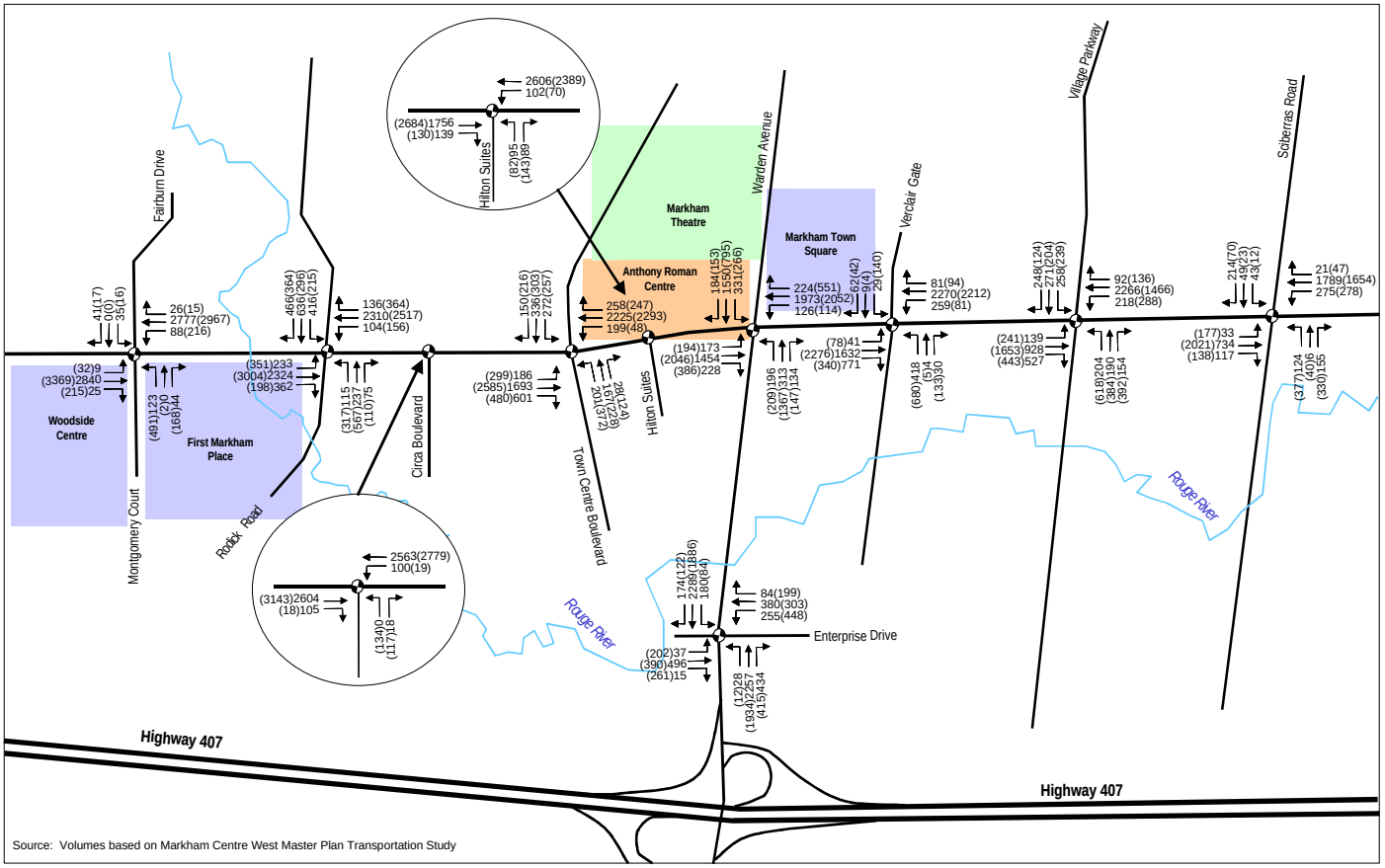
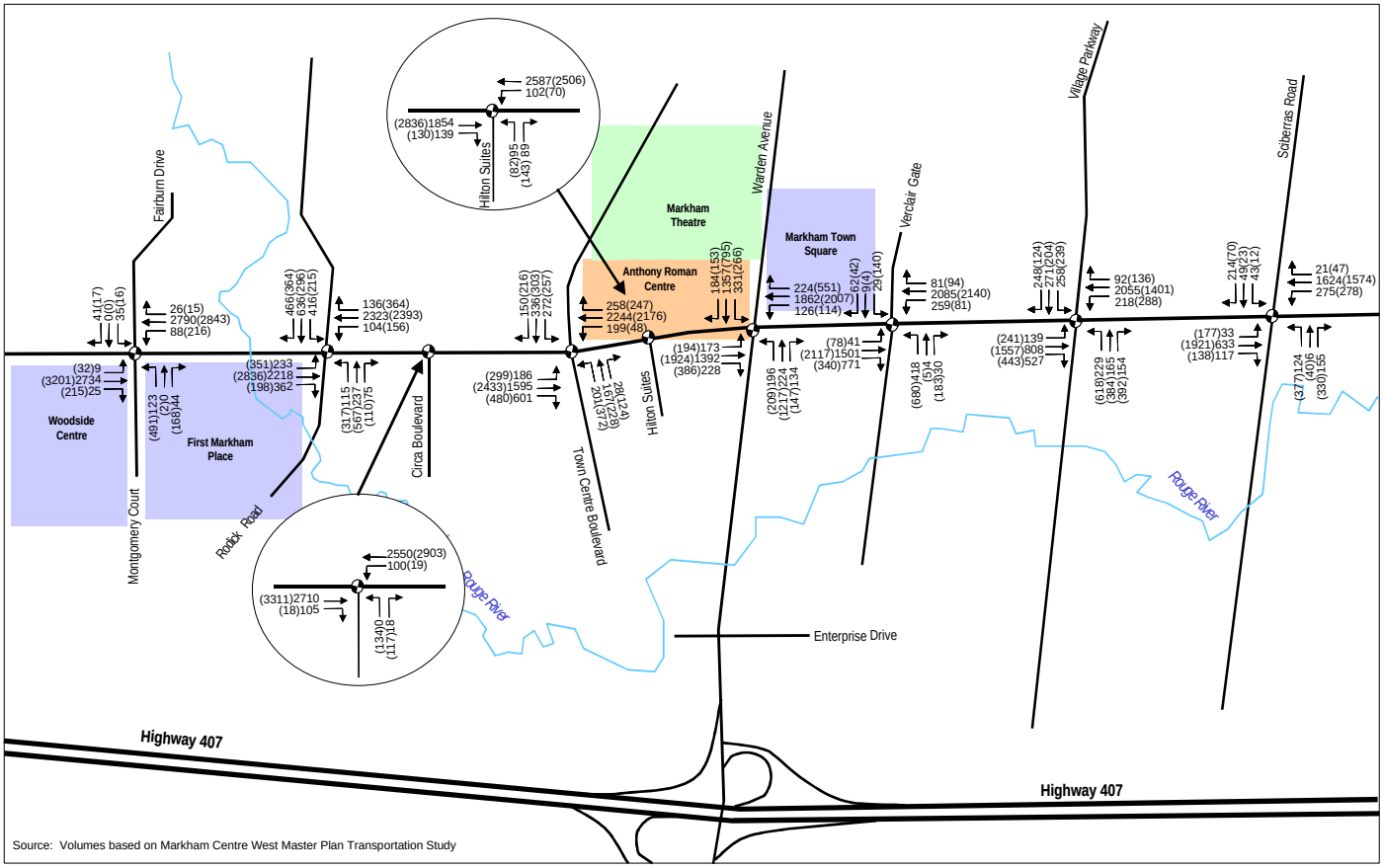


Exhibit 8-8-Future 2021 AM (PM) Peak Hour Volumes



8.3.3 2011 AND 2021 ROAD NETWORK

The 2011 and 2021 road network was based on road improvements assumed in the Markham Centre West Master Plan Transportation Study. A majority of the road improvements are expected to be completed by 2011 with the exception of the extension of Yorktech Drive from Rodick Road to Warden Avenue.

The following road network improvements were included:

- Rodick Road –extended from Fairburn Drive to Miller Avenue south of 14th Avenue;
- Warden Avenue – widened from four lanes to six lanes from Highway 407 to Applecreek Boulevard north of Highway 7;
- Kennedy Road – widened from four lanes to six lanes from Highway 407 to Highway 7;
- Birchmount Road – extended from 14th Avenue to Highway 7 to connect to Village Parkway with a four lane cross section;
- Sciberras Road – extended south of Highway 7 to Enterprise Drive with a two lane cross section; and
- Verclair Gate – extended south to Birchmount Road with a two-lane cross-section.

In addition to the road improvements mentioned above the following new signalized intersections are proposed within the relevant section of Highway 7:

- Circa Boulevard – located approximately 225 metres (stop bar to stop bar) east of Rodick Road and approximately 275 metres west of Town Centre Boulevard. This intersection will operate as a full moves intersection with exclusive left turn lanes on Highway 7.

- Hilton Suites Hotel Driveway – located approximately 160 metres (stop bar to stop bar) east of Town Centre Boulevard and approximately 225 metres west of Warden Avenue. This intersection will operate as a T-intersection with an exclusive westbound left turn lane.

The following new unsignalized intersections are proposed within the relevant section of Highway 7:

- Future Street B intersection – located approximately 190 metres (stop bar to stop bar) east of Village Parkway / Birchmount Road intersection and approximately 345 metres east of Sciberras Road. This intersection will operate as a full moves intersection with exclusive left turn lanes provided on Highway 7.

8.3.4 FUTURE SCREENLINE VOLUME AND CAPACITY

The 2011 and 2021 future conditions were analysed based on a screenline basis using the York Region model. The 2021 conditions represent full build-out conditions with the implementation of the York Region Transit system. The 2011 conditions are based on full development of the Markham Centre West without the implementation of the York Region Transit system.

The screenline analysis was conducted to determine the operation of the east-west roadways based on the existing lane configuration. **Exhibit 8-9** and **Exhibit 8-10** summarize the results of the screenline analysis for the 2011 and 2021 future conditions.

Exhibit 8-9-2011 Future Screenline Volume to Capacity Analysis

Road	East of Woodbine			West of Main Street		
	2011-Cap	**2011-Vol**	**2011-v/c**	**2011-Cap**	**2011-Vol**	**2011-v/c**
16th Avenue	2000	1980	0.99	2000	1930	0.97
Highway 7	2000	2140	1.07	2000	2100	1.05
Highway 407	4000	4400	1.10	4000	4050	1.01
Total	**8000**	**8520**	**1.07**	**8000**	**8080**	**1.01**
Screenline Lane Deficiency			**1**			**1**

Exhibit 8-10-2021 Future Screenline Volume to Capacity Analysis

Road	East of Woodbine			West of Main Street		
	2021-Cap	2021-Vol	2021-v/c	2021-Cap	2021-Vol	2021-v/c
16th Avenue	2000	2170	1.09	2000	2600	1.30
Highway 7	2000	2160	1.08	2000	2070	1.03
Highway 407	4000	4400	1.10	4000	4810	1.20
Total	**8000**	**8730**	**1.09**	**8000**	**9480**	**1.18**
Screenline Lane Deficiency			**1**			**2**

The 2011 screenline analysis shows that the current 4-lane cross section will be insufficient to accommodate the projected 2011 traffic demand. The analysis predicts that without the Rapid Transit System implemented and with the Markham Centre West development, east of Woodbine Avenue and west of Main Street both westbound lane capacities will be deficient by one lane. The total screenline 2011 v/c ratio will exceed capacity at 107% east of Woodbine Avenue and 101% west of Main Street.

With the Rapid Transit System, the 2021 forecasts illustrate that the existing lane configuration in the westbound direction is insufficient to accommodate the future volumes of 8,730 vehicles east of Woodbine Avenue and 9,480 vehicles west of Main Street Unionville. The screenline east of Woodbine Avenue is deficient by one lane in the westbound direction at a volume to capacity ratio of 109%. The screenline west of Main Street Unionville is expected to operate at a volume to capacity ratio of 118% and requires two additional westbound lanes in order to improve operations.

Based on the above findings, there is an evident shortage of capacity between Woodbine Avenue and Main Street Unionville within York Region. It is also evident that the implementation of the Rapid Transit Plan will not alleviate the need to increase road capacity in the east-west direction.

A more detailed analysis based on projected turning movement counts is included in the following section.

8.4 Identification and Selection of Transportation Alternatives

In order to determine the extent of future volumes generated from the Markham Centre West Study on the operations of Highway 7, the following roadway alternatives were considered and analysed:

- Four lane; and
- Six lane cross section.

The 4-lane cross section on Highway 7 has been based on the existing lane configuration with updated left and right turn storage lengths reflecting the revised drawings. Two planning horizons were analyzed based on future volumes generated from the Markham Centre West Study for the 2011 planning horizon and 2021 planning horizon. Under the 2011 planning horizon, it is assumed that the Rapid Transit System will not be in operation.

For the purposes of the Highway 7 widening and under the 2021-planning horizon, it has been assumed that the Rapid Transit System will be fully built out and operational. Both the four lane

and six lane cross sections have included the addition of two lanes in the median dedicated to the Rapid Transit System.

8.4.1 2011 TRAFFIC OPERATIONS

Under the 2011 traffic conditions, all of the development proposed by the Markham Centre West Master Plan will be fully built out. It was assumed that the Rapid Transit System would not be in operation.

Under the four and six lane cross-section options, the width of Highway 7 will change. This impacts the pedestrian crossing times in the north-south direction and the length of "green time" allocated to the minor crossing road (north-south), as the minimum green time or minimum split is increased with an additional two lanes on Highway 7 to allow additional time for pedestrians to cross Highway 7 safely. This reduces the "green time" for the critical moves, which may or may not impact the overall operation of the intersection depending on the vehicular demand on Highway 7 in comparison to the crossing street.

It should be noted that with the construction of the six lane cross section on Highway 7 an additional two lanes would exist in the centre median lanes as a landscaped area to protect for future development of the Rapid Transit lanes and also for "streetscaping" as part of the Town of Markham initiative east of Warden Avenue to create a downtown Main Street/pedestrian friendly environment. This requirement further increases the required green time to be allocated to the north-south streets. This operational constraint may result in pedestrian split phasing at some of the more critical intersections in order to allow more green time to be allocated to the critical movements on Highway 7.

The landscaped median will also restrict unsignalized intersections or accesses to right-in / right-out movements. To accommodate access/egress from these accesses, vehicles will be permitted to conduct u-turns at signalized intersections such as Verclair Gate, Village Parkway and Sciberras Road. The wide median lane will provide some storage and a sufficient turning radius to permit vehicles to turn into the adjacent median lane.

Cyclists utilizing the bike path provided on the south side of Highway 7 will be required to cross the minor streets in conjunction with the pedestrians and to obey the pedestrian signals. Adequate "green time" in the east-west direction will be allocated for pedestrians to cross and therefore also accommodate the cyclists.

The analysis under the 2011 future conditions is summarized in the following exhibit for the AM and PM peak hour for the four and six lane cross sections on Highway 7.

Exhibit 8-11-Future 2011 Traffic Conditions during the AM Peak Hour

Signalized Intersection	2011 - AM PEAK HOUR CONDITIONS						
	Intersection Overall LOS		Critical Movement	4-Lane		6-Lane	
	4-Lane	6-Lane		LOS	V/C	LOS	V/C
Fairburn Road / Montgomery Court	E	D	EBT	C	1.09	-	-
			WBT	B	1.01	-	-
Rodick Road	F	E	EBL	F	>1.10	D	0.91
			EBT	F	>1.10	D	1.06
			WBT	F	>1.10	F	1.08
			NBT	F	>1.10	F	1.02
			SBL	F	>1.10	-	-
Circa Boulevard	F	F	EBT	F	>1.10	-	-
			WBT	F	0.93	-	-
Town Centre Boulevard	F	C	EBT	E	>1.10	-	-
			WBT	F	>1.10	C	0.99
			NBL	F	>1.10	F	1.00
Hilton Suites Hotel	F	B	WBT	F	0.97	-	-
Warden Avenue	D	D	EBL	E	0.94	-	-
			WBT	D	1.02	0.91	D
			NBL	F	0.99	-	-
			SBT	E	0.99	-	-
Verclair Gate	F	D	EBT	F	>1.10	D	0.97
			WBT	F	1.02	-	-
			NBL	F	>1.10	F	>1.10
Village Parkway/Birchmount Road	D	D	WBT	D	1.03	-	-
			NBL	E	1.02	-	-
Sciberras Road	C	B	-	-	-	-	-

Exhibit 8-12-Future 2011 Traffic Conditions during the PM Peak Hour

Signalized Intersection	2011 - PM PEAK HOUR CONDITIONS						
	Intersection Overall LOS		Critical Movement	4-Lane		6-Lane	
	4-Lane	6-Lane		LOS	V/C	LOS	V/C
Fairburn Road / Montgomery Court	F	F	EBT	F	>1.10	F	>1.10
			WBL	F	>1.10	D	0.97
			WBT	F	>1.10	C	0.90
			NBL	F	>1.10	-	-
Rodick Road	F	F	EBL	F	>1.10	E	1.01
			EBT	F	>1.10	F	>1.10
			WBT	F	>1.10	F	>1.10
			NBL	F	>1.10	E	0.90
			NBT	F	1.08	-	-
			SBL	F	1.04	E	0.95
			SBR	F	1.11	-	-
Circa Boulevard	F	E	EBT	F	>1.10	-	-
			WBT	F	1.04	-	-
Town Centre Boulevard	F	E	EBL	F	>1.10	E	1.01
			EBT	F	>1.10	E	1.10
			WBT	F	>1.10	E	1.10
			NBL	F	>1.10	F	>1.10

Signalized Intersection	2011 - PM PEAK HOUR CONDITIONS						
	Intersection Overall LOS		Critical Movement	4-Lane		6-Lane	
	4-Lane	6-Lane		LOS	V/C	LOS	V/C
Hilton Suites Hotel	F	D	-	-	-	-	-
Warden Avenue	D	D	EBL	E	1.06	F	1.06
			EBT	B	0.98	D	0.99
			WBT	E	1.11	-	-
			SBL	F	>1.10	F	0.98
Verclair Gate	F	E	EBT	F	>1.10	C	0.97
			WBT	F	>1.10	-	-
			NBL	F	>1.10	F	>1.10
Village Parkway/Birchmount Road	F	E	EBL	D	0.92	-	-
			EBT	F	>1.10	E	1.08
			WBL	F	>1.10	F	0.92
			WBT	E	0.97	-	-
			NBL	F	>1.10	F	>1.10
Sciberras Road	E	C	EBT	F	>1.10	D	0.94
			WBL	F	1.01	-	-
			NBL	F	>1.10	E	0.96

From the AM and PM peak hour analysis, it is apparent that the six lane cross section improves the 2011 overall operations of the intersection. From the analysis, the overall level of service is slightly improved between the four lane and six lane scenarios with most of the improvement evident in comparing the operation of the critical movements. The six lane cross section minimizes a majority of the critical movements from v/c ratios greater than a v/c 1.10 to v/c ratios equal to or less then 1.0. This improvement is evident in both AM and PM peak hour conditions.

For both scenarios, the future north-south lane configuration has been applied with Verclair Gate, Village Parkway and Sciberras Road operating as full-moves four legged signalized intersections.

From the above analysis, the following movements have been identified as operating at capacity regardless of whether Highway 7 is widened to six lanes:

- The northbound left at the intersection at Highway 7/Verclair;
- The eastbound and westbound through at the intersection of Highway 7/Rodick Road; and
- The northbound left at the intersection of Highway 7/Town Centre Boulevard.

From the simulation, it is evident that the critical area of Highway 7 is between Rodick Road and Town Centre Boulevard, as the north-south movements at these two intersections require a substantial amount of green time during the PM peak hour. Based on a comparison of the four lane cross section to the six lane cross section on Highway 7, the following have been concluded:

- Additional east-west capacity with the six lane cross section, provides a surplus of green time which can be allocated to critical movements therefore improving operation;
- By widening Highway 7, the overall intersection operation improves significantly;

- With a four lane cross section the queues from the intersections are expected to conflict, as the four lanes do not provide an adequate amount of capacity to support the volumes; and

- The north-south green time provided at these intersections should be minimized to allow optimum signal progression on Highway 7 between the intersections.

It is evident from the 2011 analysis, that widening Highway 7 to a six lane cross section within this planning horizon is required to support the future traffic volumes generated by the Markham Centre West developments.

8.4.2 2021 TRAFFIC OPERATIONS

Under the 2021 conditions, the Rapid Transit (RT) system will be fully implemented diverting from the Highway 7 corridor at Town Centre Boulevard. The intersection at Town Centre Boulevard will include the RT system with the following transit movement:

- RT traveling west-south on Town Centre Boulevard.

The RT alignments through the intersection at Warden Avenue will include:

- RT traveling northwest-east across Warden Avenue proceeding to Enterprise Drive.

The analysis under the 2021 future conditions is summarized in the following exhibit for the AM and PM peak hour for the four and six lane cross sections on Highway 7.

Exhibit 8-13-Future 2021 Traffic Conditions during the AM Peak Hour

Signalized Intersection	2021 - AM PEAK HOUR CONDITIONS						
	Intersection Overall LOS		Critical Movement	4-Lane		6-Lane	
	4-Lane	6-Lane		LOS	V/C	LOS	V/C
Fairburn Road / Montgomery Court	F	E	EBT	F	>1.10	-	-
			WBT	D	1.05	-	-
Rodick Road	F	E	EBL	F	>1.10	F	0.96
			EBT	F	>1.10	E	1.09
			WBL	E	0.95	-	-
			WBT	F	>1.10	F	>1.10
			SBL	F	>1.10	F	1.07
Circa Boulevard	F	C	EBT	F	>1.10	C	0.94
Town Centre Boulevard	F	F	EBL	F	>1.10	F	1.08
			EBT	F	>1.10	F	>1.10
			WBL	F	>1.10	F	>1.10
			WBT	F	>1.10	F	1.08
			NBL	F	>1.10	F	0.96
			SBL	F	0.90	-	-
Hilton Suites	F	F	WBT	F	1.02	-	-
Warden Avenue	D	D	EBL	F	0.95	-	-
			WBT	E	1.09	D	0.93
			NBL	F	0.99	-	-

Signalized Intersection	2021 - AM PEAK HOUR CONDITIONS						
	Intersection Overall LOS		Critical Movement	4-Lane		6-Lane	
	4-Lane	6-Lane		LOS	V/C	LOS	V/C
Verclair Gate	F	D	EBT	F	>1.10	D	1.02
			WBT	F	1.10	-	-
			NBL	F	>1.10	F	>1.10
Village Parkway/Birchmount Road	F	D	WBL	E	0.91	-	-
			WBT	F	>1.10	-	-
Sciberras Road	C	C	-	-	-	-	-

Exhibit 8-14-Future 2021 Traffic Conditions during the PM Peak Hour

Signalized Intersection	2021 - PM PEAK HOUR CONDITIONS						
	Intersection Overall LOS		Critical Movement	4-Lane		6-Lane	
	4-Lane	6-Lane		LOS	V/C	LOS	V/C
Fairburn Road / Montgomery Court	F	F	EBT	F	>1.10	F	>1.10
			WBL	F	>1.10	F	>1.10
			WBT	F	>1.10	C	0.93
			NBL	F	0.93	-	-
Rodick Road	F	F	EBL	F	>1.10	F	>1.10
			EBT	F	>1.10	F	>1.10
			WBL	E	0.96	-	-
			WBT	F	>1.10	F	>1.10
			NBL	F	0.98	E	0.90
			SBL	F	1.10	E	0.95
Circa Boulevard	F	F	EBT	F	>1.10	F	0.99
			WBT	F	>1.10		
Town Centre Boulevard	F	F	EBL	F	>1.10	F	>1.10
			EBT	F	>1.10	F	>1.10
			WBT	F	>1.10	F	>1.10
			NBL	F	>1.10	F	>1.10
Hilton Suites	F	E	-	-	-	-	-
Warden Avenue	F	D	EBL	F	1.06	F	0.98
			EBT	F	>1.10	F	0.92
			WBT	F	>1.10	F	1.04
			SBL	F	>1.10	F	1.02
Verclair Gate	F	E	EBT	F	>1.10	D	1.03
			WBT	F	>1.10	C	0.91
			NBL	F	>1.10	F	>1.10
Village Parkway/Birchmount Road	F	F	EBL	E	1.02	-	-
			EBT	F	>1.10	E	1.06
			WBL	F	>1.10	F	1.05
			WBT	F	1.00	-	-
			NBL	F	>1.10	F	>1.10
Sciberras Road	F	C	EBL	D	0.93	-	-
			EBT	F	>1.10	D	0.97
			WBL	F	>1.10	-	-
			WBT	C	0.92	-	-
			NBL	E	0.93	E	0.99

From Highway 7, the transit vehicle would turn to Town Centre Boulevard south remaining in a dedicated transit right-of-way. The west to south and south to west movements would be accommodated with a westbound advance phase operating in conjunction with the westbound through, westbound right, northbound right and eastbound right movements. A transit phase of 10 seconds has been implemented in the above intersection analysis. The east-west left turn movements will be required to operate as a protected left to prevent the left turn vehicles from operating with the advance transit phase.

Under full build-out conditions in 2021, it is evident that all of the intersections will operate at capacity with four lanes provided on Highway 7 during both peak hours with the exception of Sciberras Road during the AM peak hour. The six lane cross section improves the operation of the critical movements at the various intersections. However, some of the movements will continue to operate at capacity. From the above exhibits, a majority of the critical movements will operate at a v/c ratio of 1.10 or less with the six-lane cross-section. With the four lane cross section, a majority of the critical movements will operate at 1.10 or greater.

From the above analysis, the following movements have been identified as operating at capacity with the six lane cross section on Highway 7:

- The eastbound and westbound through at the intersection of Highway 7/Rodick Road;
- The eastbound left, eastbound through and westbound through at the intersection of Highway 7/Town Centre Boulevard;
- The eastbound through and northbound left at the intersection at Highway 7/Verclair Gate; and
- The northbound left at the intersection of Highway 7/Village Parkway.

With the six-lane cross section, the intersections at Fairburn Road/Montgomery Court, Hilton Suites, Warden Avenue, Village Parkway/Birchmount Road and Sciberras Road are expected to operate below capacity during the AM peak hour. Under the four- lane cross-section, only the intersection at Sciberras Road will operate without movements exceeding capacity. During the PM peak hour, the intersections at Circa Boulevard, Hilton Suites and Sciberras Road will operate below capacity with six lanes provided on Highway 7. With a four-lane cross-section, Hilton Suites is the only intersection with vehicular movements exceeding capacity.

In comparing the 2011 conditions to the 2021 conditions, it is apparent that with the implementation of the RT system, the operations are not significantly effected. The following results were noted:

- The north-south movements are improved under the 2021 conditions with the 4-lane cross section in comparison to the 2011 conditions as a result of the additional green time required to satisfy the minimum split for pedestrians crossing Highway 7; and
- Additional critical movements in the east-west direction are effected as a result of the wider cross section in 2021 versus 2011.

It is evident from comparing the 2021 conditions with Highway 7 as a four lane cross section versus a six lane cross section, that widening Highway 7 is justified before the 2021 planning horizon and likely required by 2011 as a majority of the intersections are expected to operate at capacity in 2011.

8.5 Conclusions and Recommendations

Based on the work undertaken for the Highway 7 widening component of the Environmental Assessment from Fairburn Road/Montgomery Court to Sciberras Road, it is evident that Highway 7 will require widening to six lanes within the 2011-planning horizon. The six lane cross section will be necessary to accommodate the future volumes generated from the Markham Centre West development. The future projections from the development are expected to be mostly built out by 2011 and therefore it is recommended that the widening of Highway 7 be completed in order to support the proposed development.

8.5.1 ROADWAY NETWORK

It is evident that with the future roadway improvements set forth by the York Region's capital plan and the proposed new road network planned for the Markham Centre West development, that road improvements such as widening Warden Avenue from four lanes to six lanes or extending Enterprise Drive easterly are not adequate enough to support the projected traffic volumes. Collector roadways proposed such as Clegg Road and Enterprise Drive that will run parallel to Highway 7 will help alleviate some local traffic volumes. As well, the implementation of the RT system through the Markham Centre West development is expected to reduce vehicular traffic.

8.5.2 COLLISIONS

The intersection of Rodick Road and Highway 7 has been identified as requiring improvements due to a relatively high PSI rating of 6.04 based on collisions recorded from 1999 to 2003. The section of Highway 7 from Montgomery Court to Rodick Road also has a relatively high PSI ration of 3.12.

It is recommended that these areas be closely monitored as volumes increase from the Markham Centre West development. It is likely that with the implementation of the RT system, severe collisions such as head on collisions or angle collisions resulting from left turning traffic conflicting with opposing through volumes on Highway 7 will be reduced as the left turns will operate with protected signal phasing. In addition, an increase in traffic volumes from adjacent developments will likely result in a decrease in operating speeds which may reduce the number of collisions.

It is recommended that the detail design phase ensure that sufficient storage lengths and good visibility of the signal heads are provided.

8.5.3 SCREENLINE ANALYSIS

A screenline analysis was conducted for the Existing, 2011 and 2021 conditions at two locations: East of Woodbine Avenue and West of Main Street Unionville. From the existing analysis, the westbound arterial road network including 16th Avenue, Highway 7 and Highway 407 are operating slightly below capacity during the AM peak period.

The 2011 screenline analysis showed an average volume of 8,300 westbound vehicles and a total capacity of 8,000 passenger cars per hour per lane, which results in a v/c ratio of 1.04. This results in an average lane deficiency of one lane in the westbound direction at both screenline locations. The 2021 screenline analysis showed a deficiency of one lane east of Woodbine Avenue and two lanes west of Main Street Unionville.

From the screenline analysis, it was concluded that Highway 7 would require widening to six lanes within the 2011-planning horizon.

8.5.4 TRAFFIC OPERATIONS

From the 2011 and 2021 intersection analysis, comparing the intersection operations with a four lane cross section on Highway 7 to a six lane cross section, it was evident that the four lane cross section would not support the proposed traffic volumes generated by the Markham Centre West development. Specifically, critical movements at the intersection were improved with the six lane cross section as additional "green time" was available to be allocated to the heavier movements. This did not have a significant impact on the overall level of service at the intersection however decreased the vehicular delays and queuing at the intersection.

The Markham Centre West development is expected to generate a significant amount of traffic. As a result specific movements will operate at capacity regardless of the planned road improvements and potential widening of Highway 7. These movements may require additional geometric improvements such as implementing an exclusive right turn lane or dual left turn lanes. The following summarizes the critical movements at each intersection that will require monitoring for potential future improvements as the Markham Centre West development progresses.

- The eastbound and westbound through at the intersection of Highway 7/Rodick Road;
- The eastbound left, eastbound through and westbound through at the intersection of Highway 7/Town Centre Boulevard;
- The eastbound through and northbound left at the intersection at Highway 7/Verclair Gate; and
- The northbound left at the intersection of Highway 7/Village.

To decrease the minimum split requirements for the north-south main phase with the implementation of the RT lanes, the wide landscaped median and potential widening of Highway 7 to six lanes, it is also suggested that pedestrian split phasing be considered at the following intersections to permit additional "green time" to be allocated to the east-west phase as well as ensuring pedestrian safety.

- Highway 7/Rodick Road; and
- Highway 7/Town Centre Boulevard.

8.5.5 PEDESTRIAN AND BICYCLING NETWORK

The three metre wide cycling path along the south side of Highway 7 between Warden Avenue and Sciberras Road as well as the sidewalks proposed on both sides of Highway 7 are expected to support the expected pedestrian cycling demand. In addition, it is recommended that all new intersections be furnished with pedestrian signal heads.

Overall, it was concluded that the expected traffic volumes to be generated in the immediate and surrounding areas would be substantially high such that significant road improvements will be required to support them. This includes the widening of Highway 7 from four lanes to six lanes from Montgomery Court/Fairburn Road to Sciberras Road within the 2011-planning horizon.

9. NORTH-SOUTH RESIDUAL CAPACITY AND ACCOMMODATION OF FUTURE GROWTH

9.1.1 DEMAND FORECASTING

The York Region modelling forecasts were compared to determine the implications of traffic growth with and without the preferred design of the Rapid Transit System in operation. The modelling forecasts were conducted during the AM peak hour and considered east-west screenlines across collector and arterial roadways as well as north-south screenlines across Highway 7 at key locations within the study limits of the Highway 7 Environmental Assessment study. Provided below are a few locations showing representative east-west screenline growths, with the York Rapid Transit Plan and its associated primary corridors in place.

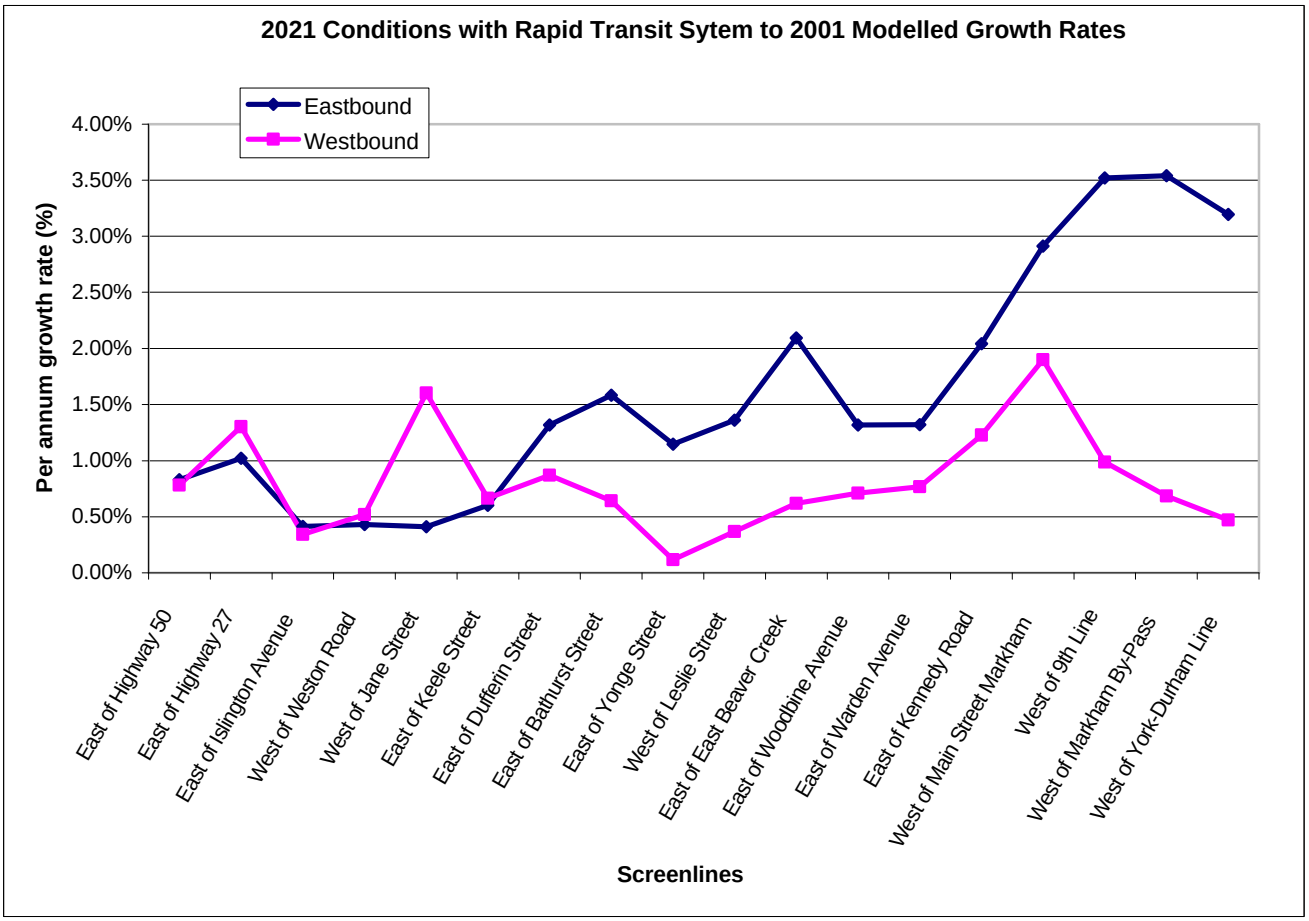
Exhibit 9-1-The Implication on East-West Traffic Growth With and Without the Rapid Transit System on Highway 7

Screenline	2001 Modelled	2021 – Base	2021 YRTP	Difference 2021-Base to 2021 YRTP
Eastbound				
East of Highway 27	7,220	9,310	8,940	-370
East of Bathurst Street	7,360	10,870	10,230	-640
West of Leslie Street	9,990	13,650	13,260	-390
West of Main Street Markham	2,860	5,630	5,220	-400
Westbound				
East of Highway 27	1,720	2,400	2,260	-140
East of Bathurst Street	8,860	10,300	10,130	-170
West of Leslie Street	8,810	9,670	9,520	-150
West of Main Street Markham	7,340	11,430	10,900	-530

The 2021 York Rapid Transit Plan will see a reduction in vehicular demand on Highway 7 in the east west direction in comparison to the 2021 base conditions. Overall, the difference ranged from approximately 100 to 650 vehicles averaging approximately 450 vehicles in the eastbound direction and 250 vehicles in the westbound direction. High differences in excess of 1000 vehicles were noted in proximity to the Markham By-Pass and Ninth Line in the westbound direction.

The growth rates on a per annum basis were determined between the 2021 Conditions with the Rapid Transit System to the 2001 Modelled Conditions. The growth was calculated based on the direction of travel. The following exhibit summarizes the growth rates expected on Highway 7.

Exhibit 9-2-Growth Rates on Highway 7



Screenline East of Highway 27

The area east of Highway 27 is expected to grow at a relatively low rate between the 2001-modelled conditions and 2021 conditions with the Rapid Transit System. Growth rates per annum on a screenline basis will average between 1.02% in the eastbound direction and 1.3% in the westbound direction during the AM peak period. Growth without the Rapid Transit System is expected to be slightly higher with 1.2% per annum in the eastbound direction and 1.6% per annum in the westbound direction.

The Rapid Transit System is expected to decrease the eastbound traffic or peak directional traffic across the screenline by approximately 370 vehicles in 2021. The existing eastbound volumes on Highway 7 are approximately 1,470 vehicles, which are expected to increase to 2,030 vehicles under base 2021 conditions and 1,970 vehicles with the Rapid Transit System.

Screenline East of Bathurst Street

Growth rates in this area average approximately 1.2% per annum in the eastbound direction on Highway 7.

The existing 2001 volumes east of Bathurst Street across the screenline are approximately 8,860 vehicles in the westbound direction. These volumes are expected to increase to approximately 10,300 (without Rapid Transit) and 10,130 (with Rapid Transit) in 2021. This results in a growth rate of 0.7% per annum from 2001 to 2021 without Rapid Transit and a 0.6% per annum growth rate with Rapid Transit.

Screenline West of Leslie Street

The growth rate from 2001 to 2021 will vary from 1.5% per annum without the Rapid Transit and 1.4% with the Rapid Transit. In the westbound direction, traffic growth will increase from Yonge Street to West of Main Street Markham. A steady growth at Leslie Street of 0.4% per annum is illustrated on the graph to 1% per annum at Warden Avenue. In the eastbound direction, the growth increases rapidly from Leslie Street at 1.4% per annum to Kennedy Road at approximately 2% per annum in the eastbound direction and 1.25% per annum in the westbound direction.

The YRTP Conditions will decrease traffic by 390 vehicles in the eastbound direction and 160 vehicles in the westbound direction in the vicinity of Leslie Street. On Highway 7 the eastbound traffic will decrease by 110 vehicles and 130 vehicles with Rapid Transit under 2021 conditions in the vicinity of Leslie Street.

Screenline West of Main Street Markham

There is a distinct peak direction of traffic during the a.m. peak period within this area of Highway 7. With approximately 70 to 80% of the traffic travelling westbound with volumes expected to increase by a growth rate of approximately 1.9% per annum with the Rapid Transit System in operation. This growth rate is higher at approximately 2.1% per annum without the Rapid Transit System.

The volumes on Highway 7 are expected to increase at a higher growth rate in comparison to the screenline growth, ranging from 8 to 15% per annum in proximity to 9th Line, Markham By-Pass and the York Durham Line when the Rapid Transit System is in operation. The Rapid Transit System is expected to decrease traffic volumes on Highway 7 by approximately 50 to 120 vehicles. This amount increases across the screenline to approximately 500 vehicles.

The screenlines in the north-south direction were also compared at locations south of Langstaff Road / 16th Avenue / Rutherford Road, north of Highway 7 and south of Highway 7. Traffic volumes at key locations such as Highway 7, Islington Avenue, Weston Road, Jane Street, Keele Street, Bathurst Street, Bayview Avenue, Warden Avenue, Kennedy Road, Main Street Markham, 9th Line and York-Durham Line were used to give an overall comparison of north-south volumes.

Exhibit 9-3-The Implication on North South Traffic Growth With and Without the Bus Rapid Transit System

Screenline	2001 Modelled	2021 – Base	2021 YRTP	Difference 2021-Base to 2021 YRTP
	NB	NB	NB	NB
South of Langstaff Road / 16th Avenue / Rutherford Road	3,813	7,295	7,085	-210
North of Highway 7	6,697	9,367	9,238	-129
South of Highway 7	6,870	11,477	10,947	-530
Screenline	SB	SB	SB	SB
South of Langstaff Road / 16th Avenue / Rutherford Road	14,862	21,160	20,306	-854
North of Highway 7	16,891	24,504	23,566	-938
South of Highway 7	15,060	22,095	21,045	-1,050

During the AM peak period, the Rapid Transit System will have a significant impact on the southbound traffic reducing traffic flow by 1,050 vehicles south of Highway 7 and 940 vehicles north of Highway 7 compared to the 2021 base conditions. In the northbound direction, the traffic flow will decrease from 11,480 vehicles to 9,240 vehicles south of Highway 7. Higher growth is expected in the north-south directions with volumes expected to grow at an average of 2% per annum with the Rapid Transit System. The growth rates are expected on average across Highway 7 to be higher south of Highway 7 and south of Langstaff Road with lower growth expected north of Highway 7 of 1.5% per annum in both directions. This is based on a screenline basis and therefore some major north-south arterials may experience higher growth north of Highway 7.

9.1.2 ARTERIAL ROAD THROUGH CAPACITIES

Highway 7 and the intersecting arterial roadways represent an integral component for longer distance inter and intra-regional trips, the ability to maintain through capacity is an important factor. In addition, the ability of the planned transit system to improve passenger throughput must be compared to any reduction in general traffic capacity. For these purposes, an assessment of scenarios “with” and “without” the planned transit system in place has been undertaken. This analysis was undertaken to identify critical locations where the intersection operations and/or east west through capacity on Highway 7 may be severely impacted by access or operational changes created by the RT preferred alternative.

Provided below is a summary of representative key intersections and the theoretical eastbound and westbound through capacities under existing conditions and future operations. The bolded values in the table represent the theoretical changes in east-west capacity in the peak direction for the AM and PM peak periods. Capacity impacts were reviewed in detail at all the study intersections.

Exhibit 9-4-North-South Intersection Through Capacities

Intersection	Peak Period	Existing Conditions		Future Conditions With Growth				Difference between with or without Rapid Transit System	
				Without Rapid Transit System		With Rapid Transit System			
		EB/NB	WB/SB	EB/NB	WB/SB	EB/NB	WB/SB	EB/NB	WB/SB
Highway 50	AM	1,890	1,790	2,250	1,900	2,200	1,900	-50	0
	PM	1,850	1,450	2,230	2,160	2,200	2,110	-30	-50
Islington Avenue	AM	1,840	1,650	2,030	1,770	1,840	1,250	**-190**	**-520**
	PM	1,690	1,670	1,990	1,750	1,710	1,260	**-280**	**-490**
Centre Street / Bathurst Street	AM	930	1,080	1,030	810	1,030	810	**0**	**0**
	PM	920	800	1,050	760	1,230	760	**180**	**0**
Red Maple Road	AM	3,800	3,290	3,300	2,520	3,250	2,550	-50	30
	PM	3,780	2,990	3,770	2,400	3,620	2,400	-150	0
Commerce Valley Drive East	AM	2,530	2,420	2,030	2,140	1,770	1,840	**-260**	**-300**
	PM	2,600	2,100	1,860	2040	1,770	1,830	**-90**	**-210**
Helen Street / Kennedy Road	AM	2,200	1,710	3,210	2,080	3,210	2,080	0	0
	PM	2,060	1,810	3,290	1,560	3,040	1560	**-250**	**0**
Ninth Line	AM	660	1,330	1,210	1,010	890	980	-320	-30
	PM	1,440	1,150	1,070	640	1,190	640	0	-90
Reesor Road	AM	1,190	1,250	1,350	1,410	1,260	1,380	-90	-30
	PM	1,290	1,240	2,110	1,840	2,000	1,410	-110	-430

Note:
All values represent vehicles per hour for the through movements at each intersection.
Bolded values represent peak hour peak direction volumes

Based on a review of the above analysis and the reviews undertaken at the other study intersections, the following conclusions have been reached:

- The reduction in east-west and north-south capacities due to the RT operations varies considerably from one intersection to the next;

- The AM and PM capacity reductions at Islington Avenue intersection is a result of additional green time demands for the westbound bus to transition to mixed traffic on Highway 7. The eastbound traffic is permitted in conjunction with the westbound bus advance and as a result the green time for the westbound traffic is reduced. The east-west capacity reductions are also related to the additional north-south green time required to accommodate pedestrians.

- The capacity reductions at Centre Street / Bathurst Street are minimal as dedicated bus transit phase does not reduce the westbound green time but removes green time from the northbound left phase.

- At the intersection of Commerce Valley Drive East and Highway 7, the reduction in east-west capacity is mainly attributed to the additional north-south green time required to accommodate pedestrians. A two-stage pedestrian crossing should be considered at the Commerce Valley Drive intersection to reduce side street green time demands.

- The capacity is only reduced during the PM peak hour in the northbound direction on Kennedy Road at Helen Avenue. The northbound phase is slightly reduced to account for the higher pedestrian crossing time in the east-west direction.

- The Reesor Road/Highway 7 intersection represents a key area where growth is expected. The impact on east west through capacity through the intersection is relatively low, with the exception of the PM peak hour where the westbound capacity is reduced due to the increased demand of the eastbound left protected phase required with the RT system.

9.1.3 LEFT TURN LANE CAPACITY

A key consideration in the roadway/RT design is to ensure that proper eastbound and westbound left turn storage lengths are provided. In the assessment of left turn lane storage requirements, the following have been considered:

- Existing left turn requirements;
- Redistributed traffic volumes resulting from RT operations; and
- Future growth associated with demand to/from side street roadways and north-south arterials

In mature areas where the adjacent land uses are well established, the turning movements from the side streets are representative of fully built out conditions. In these cases, left turn lane storage requirements were based on existing turning movement demands plus any reassignment from the RT.

In other cases, such as major north-south arterials with growth potential or arterial/collector side streets with future development potential, turning movements to/from these streets will grow over time. In these cases, the left turn storage needs to be reviewed to ensure that future demands are being met. The following locations were identified for detailed review as development proceeds:

- Highway 50;
- Vaughan Valley Boulevard;
- Highway 27;
- Islington Avenue;
- Pine Valley Drive;
- Weston Road;
- Edgeley Boulevard / Interchange Way;
- Jane Street;
- Keele Street;
- Centre Street / North Rivermede Road;
- Centre Street / Dufferin Street;
- Centre Street / New Westminster Drive;
- Centre Street / Bathurst Street;
- Bathurst Street / New Westminster Drive;
- Red Maple Road;
- Silver Linden Drive;
- Bayview Avenue;

- Commerce Valley Drive West;
- Leslie Street;
- Commerce Valley Drive East;
- Woodbine Avenue;
- Rodick Road;
- Town Centre Boulevard;
- Kennedy Road;
- McCowan Road;
- Ninth Line;
- Markham By-Pass; and
- Reesor Road.

The recommended storage lengths for the above locations were based on projected traffic volumes and the potential of the area to further develop. The east-west advance phases at these intersections were based on protected only phasing due to the Rapid Transit system where main street green times have been maximized to result in efficient travel times for the transit vehicle. These storage lengths, included in **Appendix E** are based on preliminary analysis and should be investigated in further detail under the detail design phase.

Several intersections on Highway 7 are restricted in terms of the amount of storage available. In these cases, it is recommended that the storage length be maximized to accommodate the future volumes in the space available. These locations include:

- Westbound dual left at Famous Avenue;
- Eastbound and Westbound left at Millway Avenue;
- Eastbound and Westbound left at Chalmers Road / South Park Drive;
- Westbound left at Saddlecreek Drive;
- Eastbound left and Westbound left at Times Avenue / Valleymede Drive;
- Northbound left on Jane Street at Highway 407 north ramp;
- Eastbound left and Northbound left at Kennedy Road and Helen Avenue.

As noted in **Section 6.1**, motorists attempting to access a private driveway or unsignalized roadway may, in some cases, negotiate a u-turn at a downstream intersection. In general, these u-turn volumes will be low. There are some instances where the u-turn volume is expected to be greater than one per cycle. These are as follows:

Exhibit 9-5-U-Turn Volumes at Key Locations

Intersection	Movement/Peak Period	Estimated U-Turn Volume (Vehicles)	Comments
Highway 7/Town Centre Boulevard	Northbound Left – AM Peak Northbound Left – PM Peak	114 8	Residential Reassignment
Town Centre Boulevard/ Cedarland Dr	Southbound – AM Peak Southbound – PM Peak	64 109	Residential Reassignment
Kennedy Road/Avoca Drive	Southbound – AM Peak Southbound – PM Peak	30 58	Residential Reassignment
Highway 7/Laidlaw Boulevard/ Conservation	Eastbound – AM Peak Eastbound – PM Peak	104 104	Commercial Reassignment
Highway 7/Wooten Way	Westbound Left – AM Peak Westbound Left – PM Peak	136 136	Commercial Reassignment
Highway 7/Ninth Line	Eastbound – AM Peak Eastbound – PM Peak	172 172	Commercial Reassignment

At these locations, follow-up monitoring should be undertaken to review the interaction between the u-turn movement and any opposing cross-street right-turn-on-red movements.

10. MITIGATING MEASURES

10.1 Intersection Operations

In general, the analysis has demonstrated that the intersections in the study area can continue to serve, a high volume of vehicular traffic, the needs of a broad range of pedestrians; and, adjacent businesses with the implementation of the preferred RT design.

Intersections of potential concern or key bottleneck areas are summarized below:

Islington Avenue/Highway 7	• Several movements will operate at capacity and the surrounding lands prevent road network improvements.
Leslie Street/Highway 7	• Several movements at the intersection will continue to operate at capacity. Long-term conditions expect high vehicular volumes in all approaches. Additional road improvements are insignificant due to high traffic demands from Highway 404 and surrounding future developments.
East Beaver Creek/Commerce Valley Drive East/Highway 7	• Heavy volumes and proximity to the Highway 404 interchange result in capacity conditions with minimal improvement from minor remedial measures.

The above intersections are currently operating at capacity during the peak periods and will get progressively congested with future adjacent development and with the implementation of the Rapid Transit System. They represent areas where road improvements are not possible due to land/grade constraints or would not improve operating conditions due to excessively high volumes.

Therefore, these intersections represent key locations where minor remedial measures are not possible such as dual left turn lanes or signal modifications. Major improvements such as implementing an additional interchange for example whereby travel patterns are changed/reduced are required to improve operations.

10.2 U-Turn Operations

At the following locations, follow-up monitoring should be undertaken to review the interaction between the u-turn movement and any opposing cross-street right-turn-on-red movements.

- Highway 7/Helen Street
- Highway 7/Town Centre Boulevard
- Town Centre Boulevard/ Cedarland Dr
- Kennedy Road/Avoca Drive
- Highway 7/Robinson Street/St Patrick School Entrance
- Highway 7/ Grandview/Galsworthy Drive
- Highway 7/McCowan Road
- Highway 7/Laidlaw Boulevard/ Conservation
- Highway 7/Wooten Way
- Highway 7/Ninth Line

Based on the post-operation reviews, a right-turn-on-red prohibition may need to be enacted to reduce conflicts at these intersections.

10.3 Pedestrian Crossings

Standard pedestrian crossing times of 7 seconds have been incorporated into the analysis of all future analysis scenarios, with the exception of eight intersections. The adjusted walk times at these locations have been incorporated into the future analysis.

Several intersections have been identified for a two-stage crossing in the future to accommodate heavy main street volume. Reducing the minor street minimum split would allow additional green time to be allocated to critical movements and improve the operation at the intersection. The intersections that may require two-stage crossings in the future include:

- Vaughan Valley Boulevard / Roybridge Gate / Highway 7;
- Highway 27 / Highway 7;
- Jane Street / Highway 7;
- Creditstone Road / Highway 7;
- Keele Street / Highway 7;

- Islington Avenue / Highway 7;
- Aberdeen Avenue / Marycroft Avenue / Highway 7;
- Worth Boulevard / Flamingo Road / Bathurst Street;
- South Park / Chalmers Road / Highway 7;
- Leslie Street / Highway 7;
- Commerce Valley Drive East / East Beaver Creek / Highway 7;
- Town Centre Boulevard / Highway 7;
- Kennedy Road / Avoca Drive;
- Kennedy Road / Highway 7; and
- McCowan Road / Highway 7.

The decision to implement these special provisions should be deferred until post-operation conditions are monitored and the need is identified.

10.4 Access Provisions

Left turn access to a number of sites will be restricted by the presence of the RT right-of-way. In many cases, alternative access can be obtained to a site via another site access or an adjacent roadway with signalized access to Highway 7. The analysis of the preferred alternative reflects these changes in travel patterns for the major traffic generators along Highway 7.

In other cases, motorists may need to proceed to the downstream-signalized intersection on Highway 7 and negotiate a u-turn to enter/exit a site to/from their intended direction of travel. Traffic volumes from major generators have been reassigned to these adjacent intersections to account for the travel patterns.

10.5 Neighbourhood Impacts

A monitoring program should be set-up to determine traffic volume changes for the following roadways/neighbourhoods:

- Monsheen Drive Neighbourhood;
- Willis Road/Chancellor Drive;
- Westminster Drive;
- Beverley Glen Boulevard;
- South Park Drive/Commerce Valley Drive East and West; and
- Kennedy Road from Avoca Drive to Swansea Road.

10.6 Overall Roadway Capacity

The analysis demonstrates that, in general, overall intersection capacity for vehicular traffic in the study area will be reduced due to the required operational changes and access related traffic

redistribution. At the critical locations this reduction is approximately 350 per hour peak vehicles in the peak direction. This represents 420 person trips, assuming vehicle occupancy of 1.2 persons. In contrast, the RT has the potential to carry passenger volumes in excess of 4,000 passengers at its least utilized section.

Comparing 2021 traffic projections "with" and "without" the RT service network in place demonstrates that north-south vehicular demand will be decreased on Yonge Street, Bayview Avenue and Bathurst Street with the improved transit service. Accordingly, excessive traffic diversion from Yonge Street to parallel routes such as Bayview Avenue and Bathurst Avenue is not expected due to the implementation of the RT preferred alternative.

Mitigative measures such as extending storage lengths or providing exclusive right turn lanes have been incorporated into the preferred design. It is recommended that traffic volumes be monitored at the intersections along the preferred route and be reassessed in more detail during the detail design phase when additional proposed developments have become approved. Upon such time possible additional mitigative measures may be explored to improve intersection operations.

11. CONCLUSIONS

Based on the analysis above, the following have been concluded:

1) The preferred alternative maintains the equivalent number of east west through lanes for general traffic as what currently exists.

2) The implementation of a median transitway will:

   - Increase the person carrying capacity along the Highway 7 corridor;
   - Generally operate during the main street green phase and thus will not require a dedicated transit phase;
   - Require dedicated transit phases at transition points between mixed-traffic operations and median transitway operations;
   - Require longer pedestrian crossing times across the transitway corridor due to the wider roadway/transitway cross-section;
   - Require protected-only left turn movements from the roadways with the median transitway; and
   - Reduce the vehicular capacity at the primary intersections due to the operational requirements noted above.

3) The widening of Highway 7 from Fairburn Drive/Montgomery Court to Sciberras Road will:

   - Increase east-west through capacity through the Markham Centre;
   - Address a number of the projected deficiencies at the Highway 7 intersections within this road section; and
   - Permit residual green time to be allocated to critical intersection movements.

4) Key constraint points in the road network include:

   - Highway 7/Islington Avenue as the intersection is currently full-built out and represents a transition area requiring a dedicated transit phase; therefore, it will see a net reduction in east west through vehicle capacity.
   - Highway 7/East Beaver Creek as the intersection is currently operating at capacity and future developments are proposed in the area.
   - Highway 7/Leslie Street as the intersection expects high vehicular volumes under long-term conditions.

5) Follow-up and monitoring activities recommended include:

   5.1) Monitoring of traffic infiltration at the following locations:

   - Willis Road/Chancellor Drive;

- Westminster Drive and Beverley Glen Boulevard; and
- Historic Unionville area.

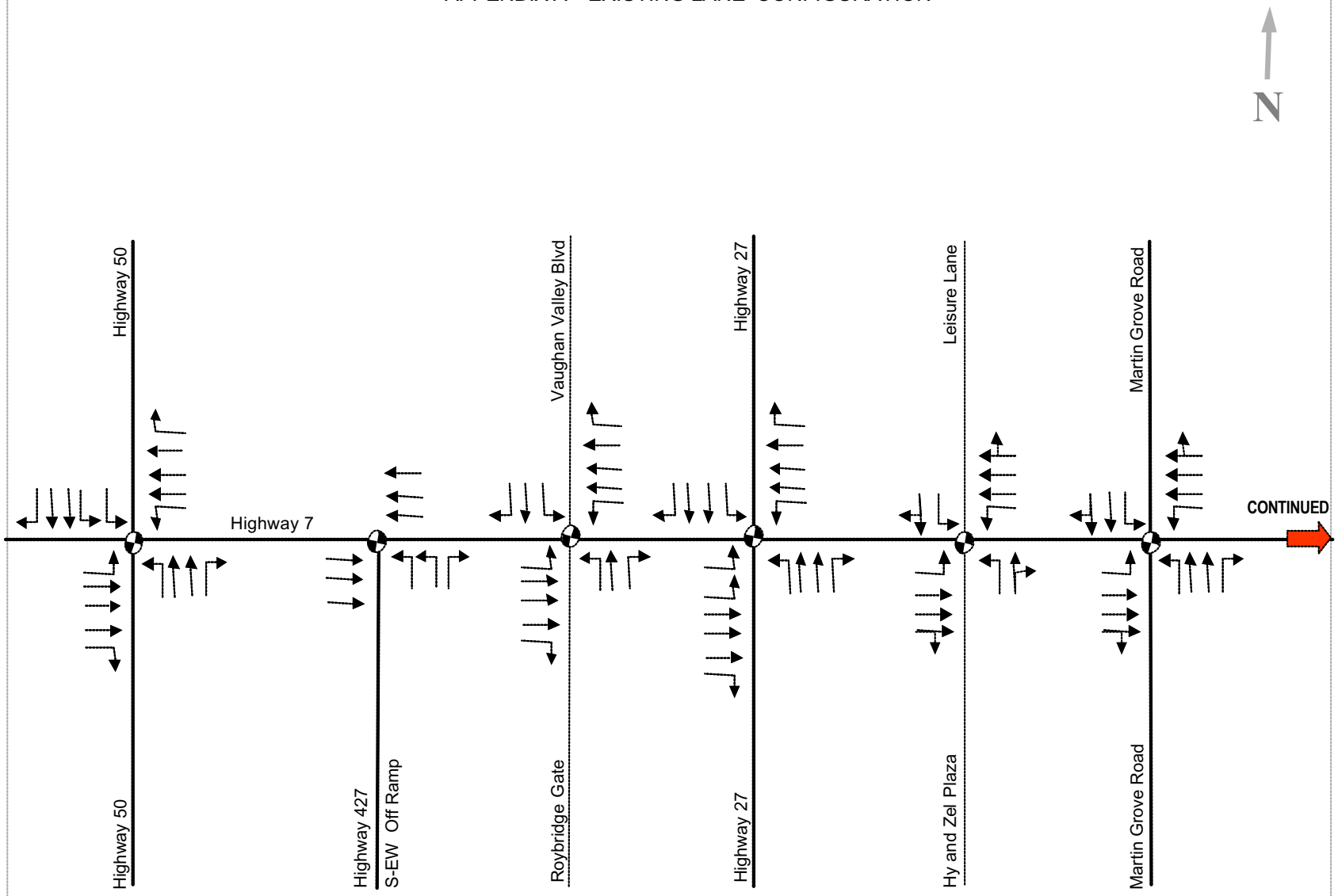
5.2) Monitoring for active signal priority is required at the following locations:

- Highway 427 S-E/W off-ramp/Highway 7 as the intersection requires a substantial amount of green time to accommodate the heavy volumes on the off-ramp;
- Highway 400 interchange/Highway 7 as the area generates a significant amount of traffic and operates under capacity conditions between Weston Road to Jane Street during the peak periods; and
- Highway 404 interchange/Highway 7 as the corridor is currently congested from East Beaver Creek to Allstate Parkway during the peak periods.

APPENDIX A

EXISTING LANE CONFIGURATION

APPENDIX A - EXISTING LANE CONFIGURATION



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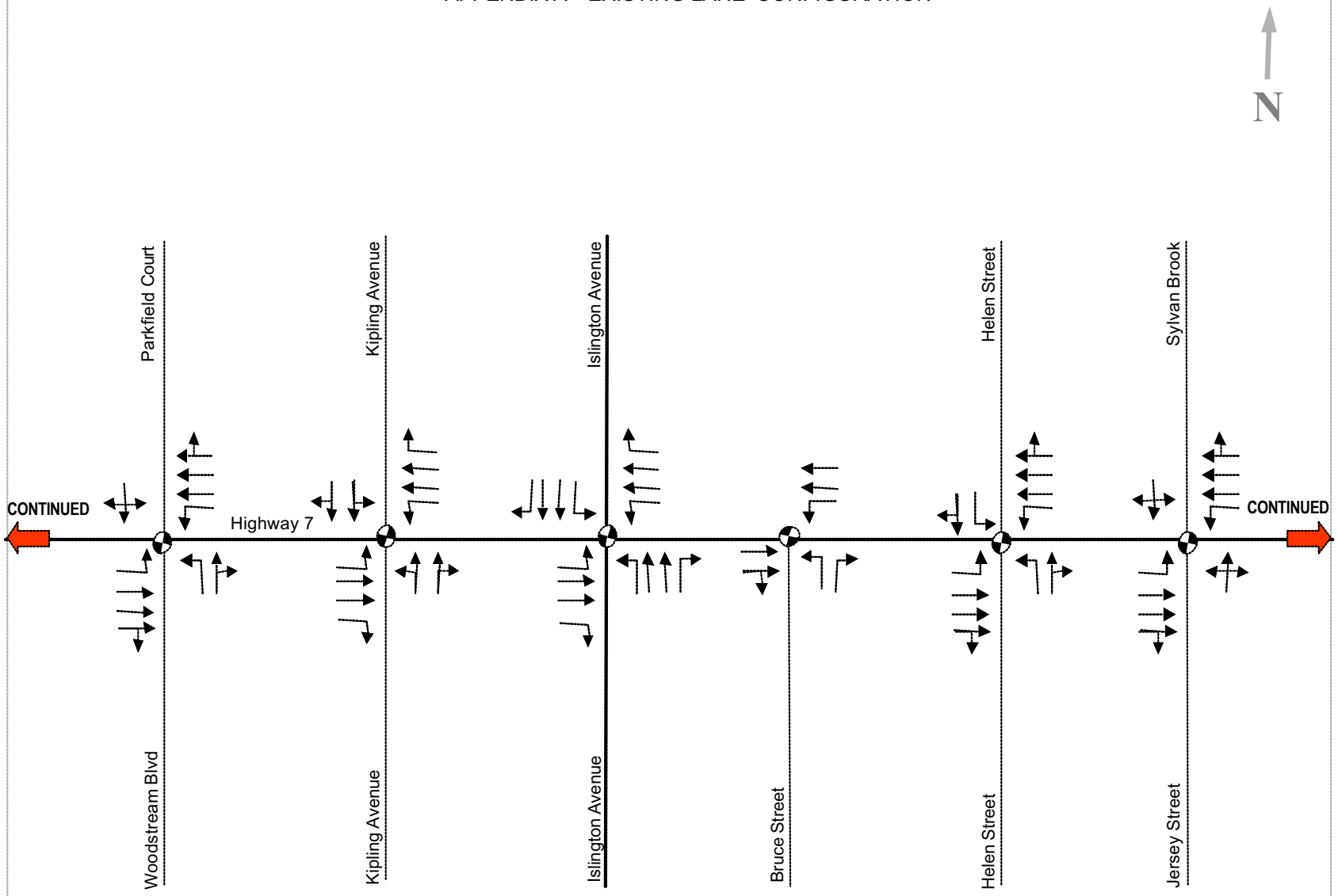

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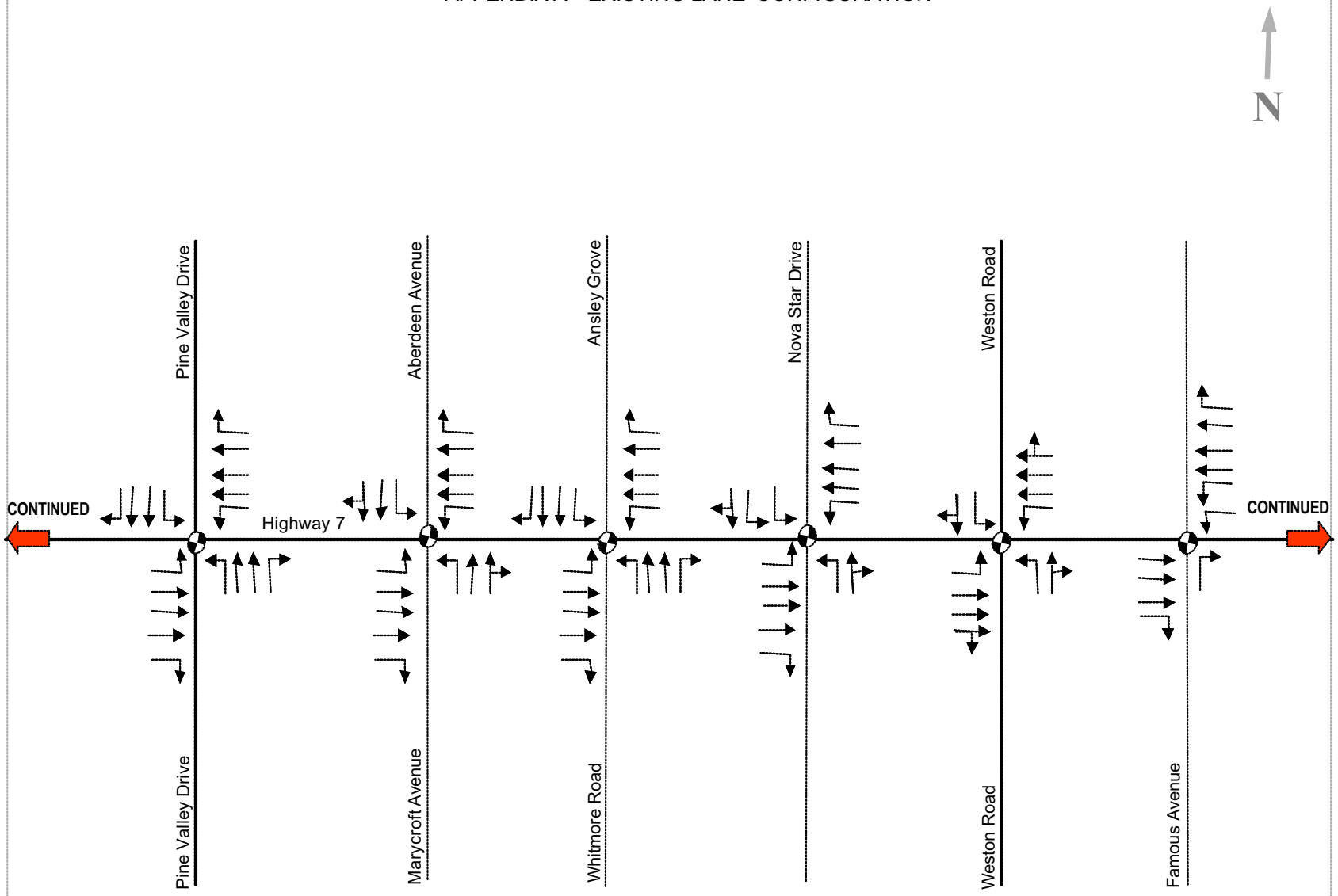

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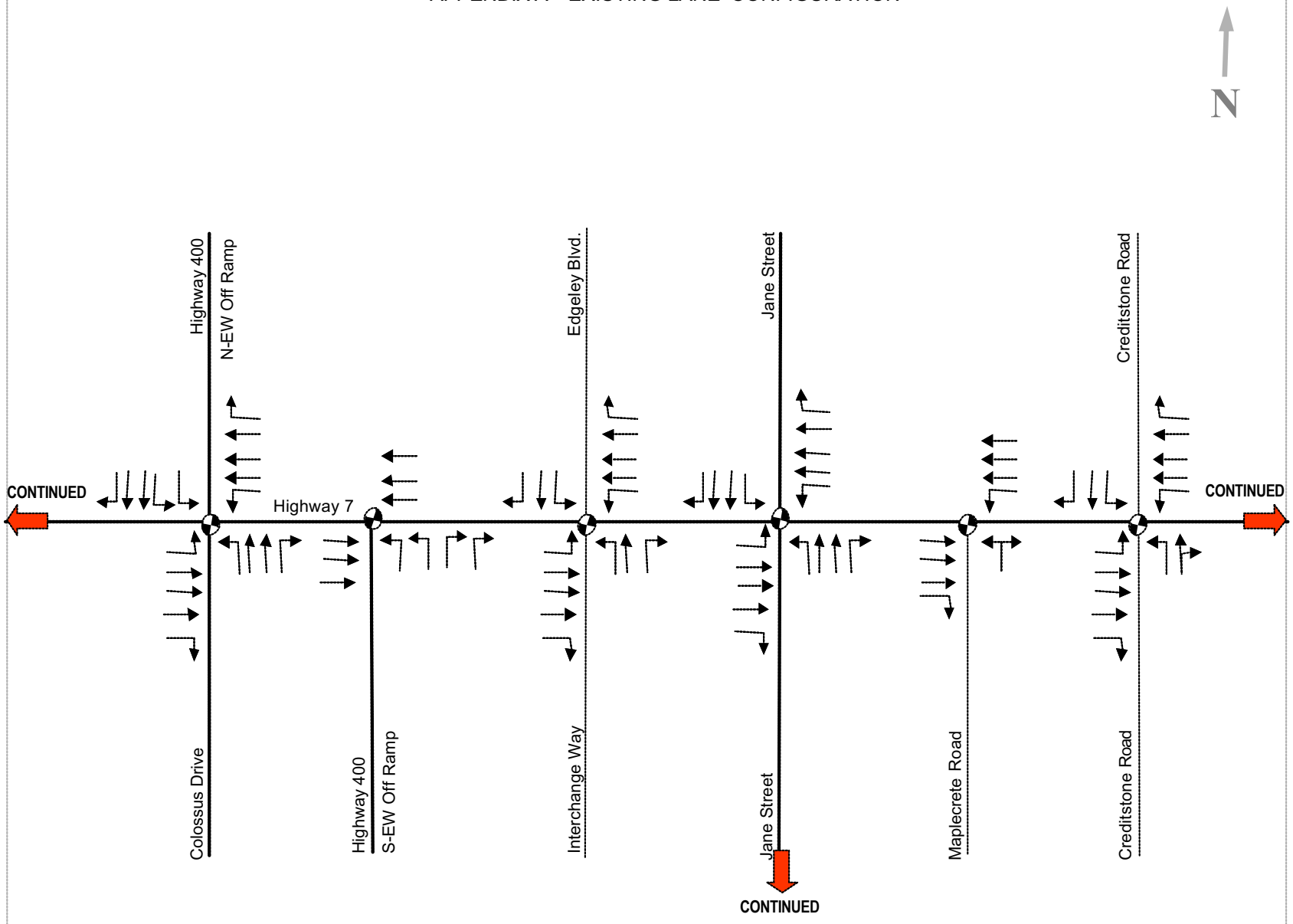

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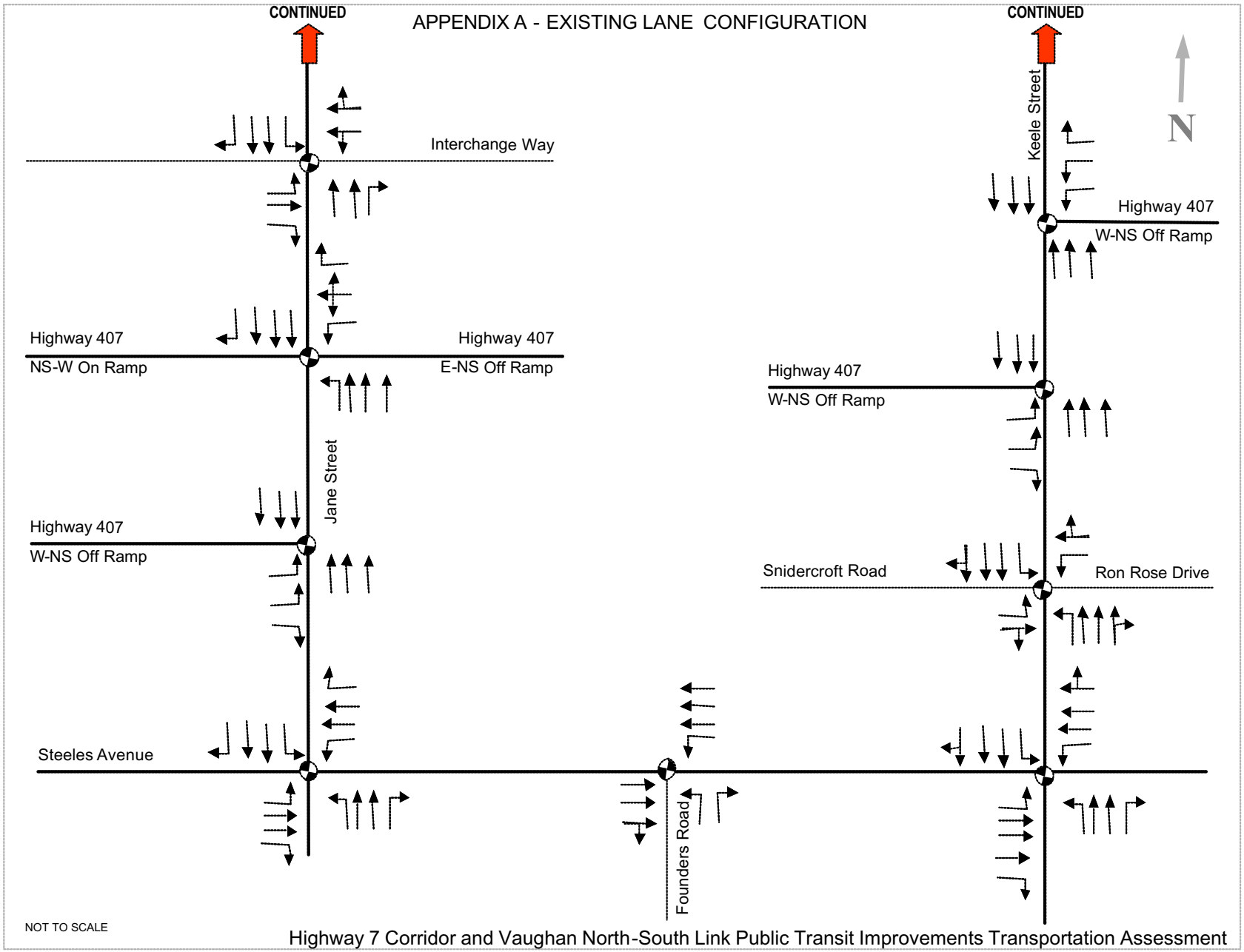

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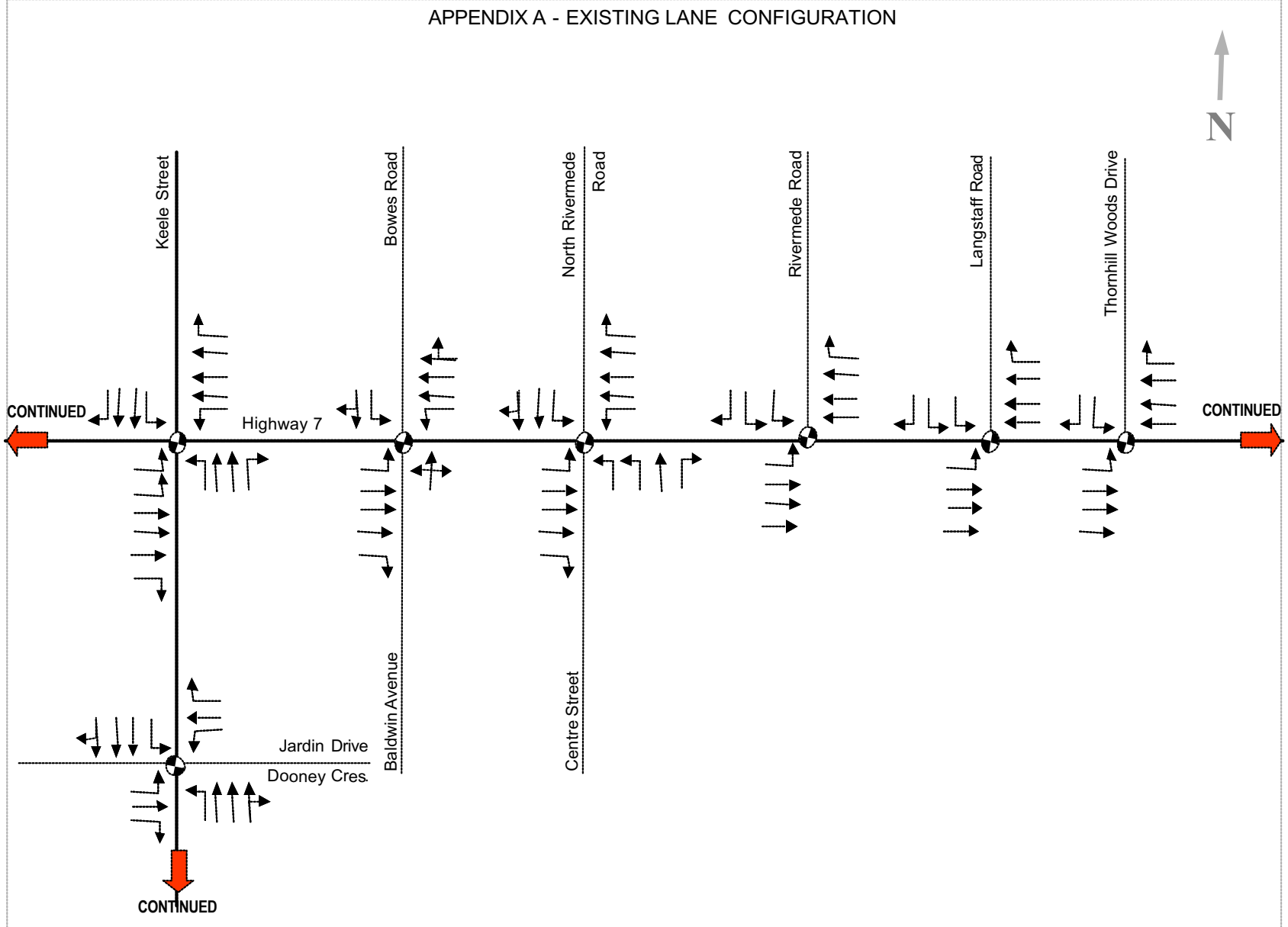

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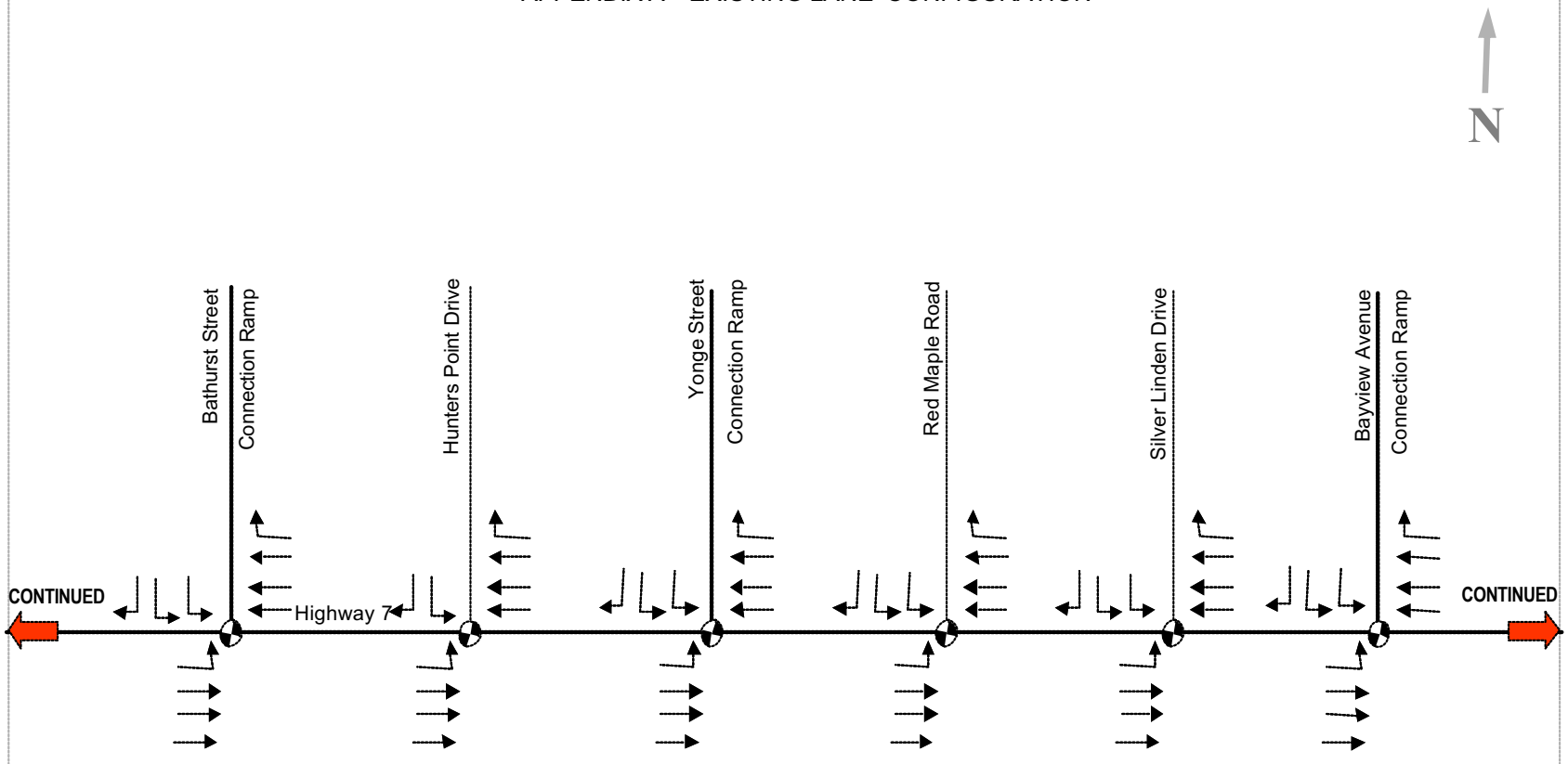

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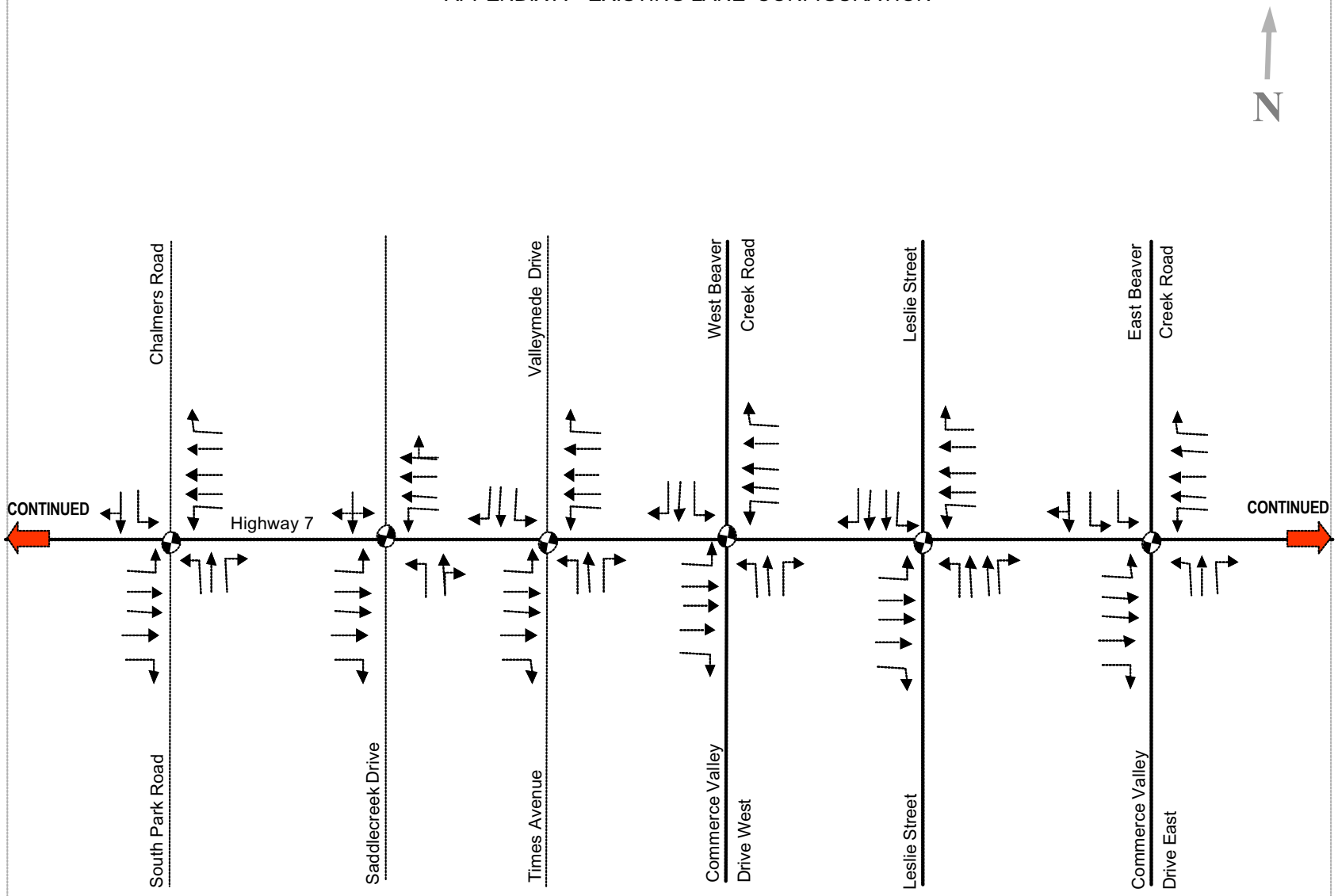

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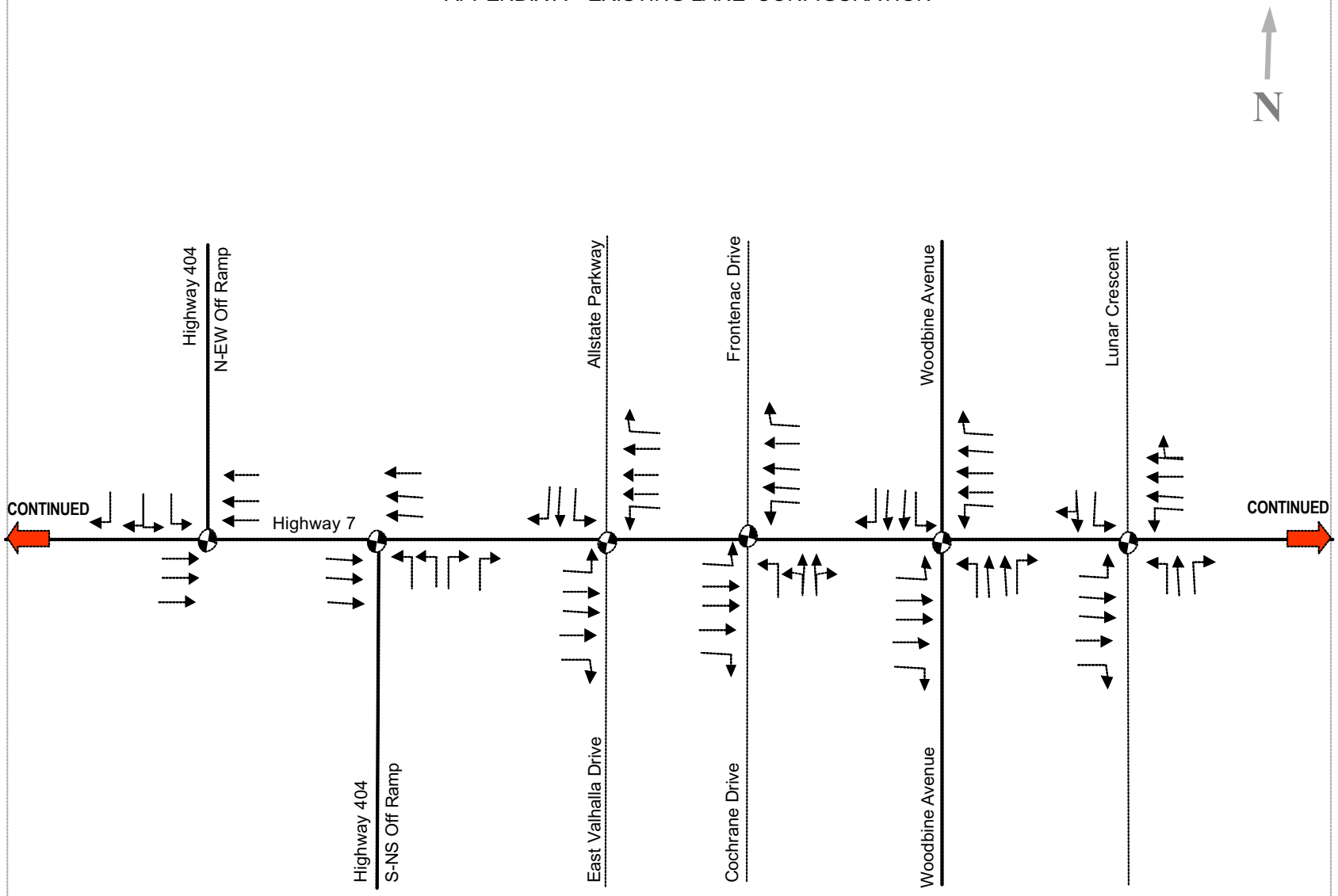

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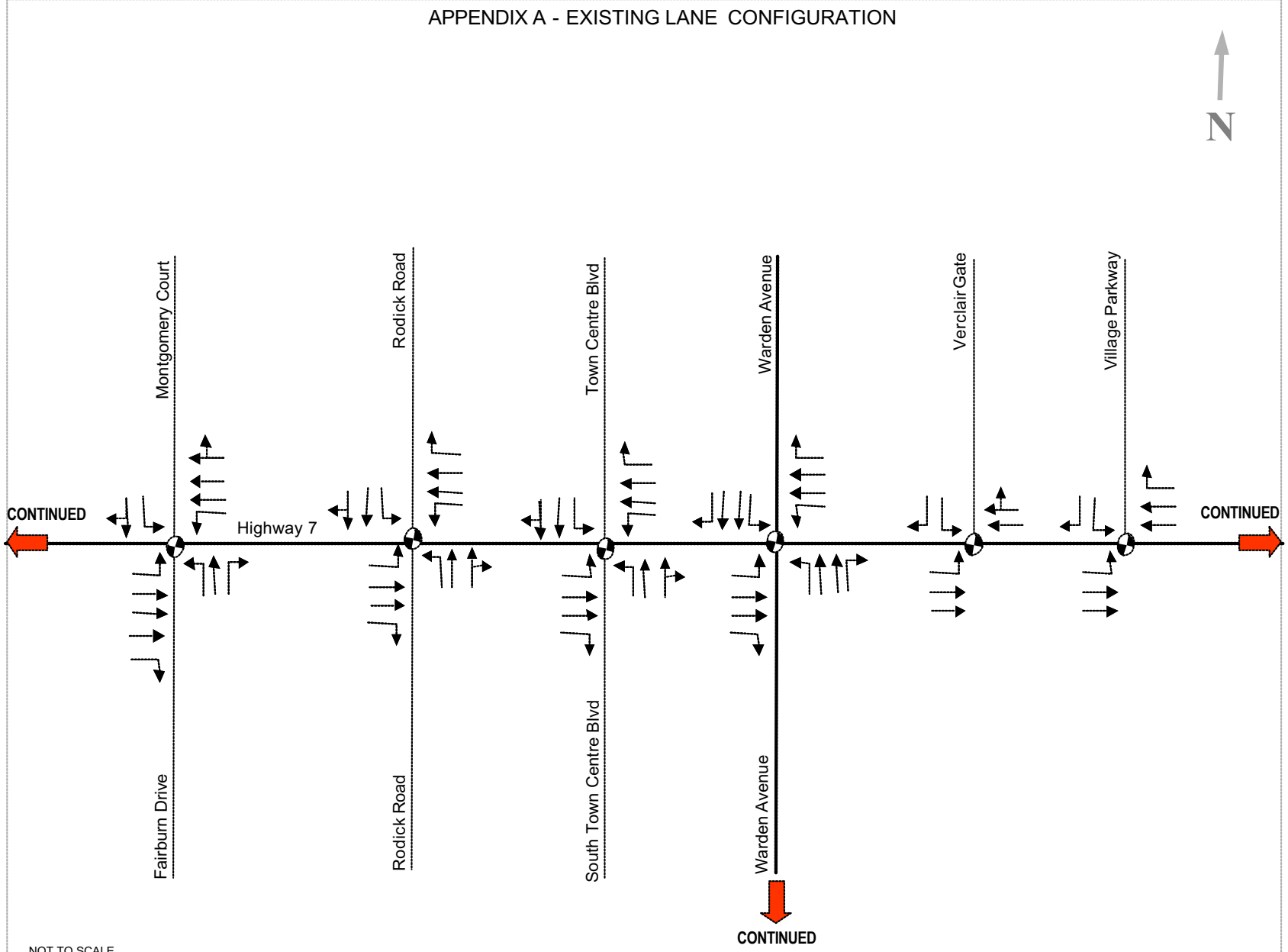

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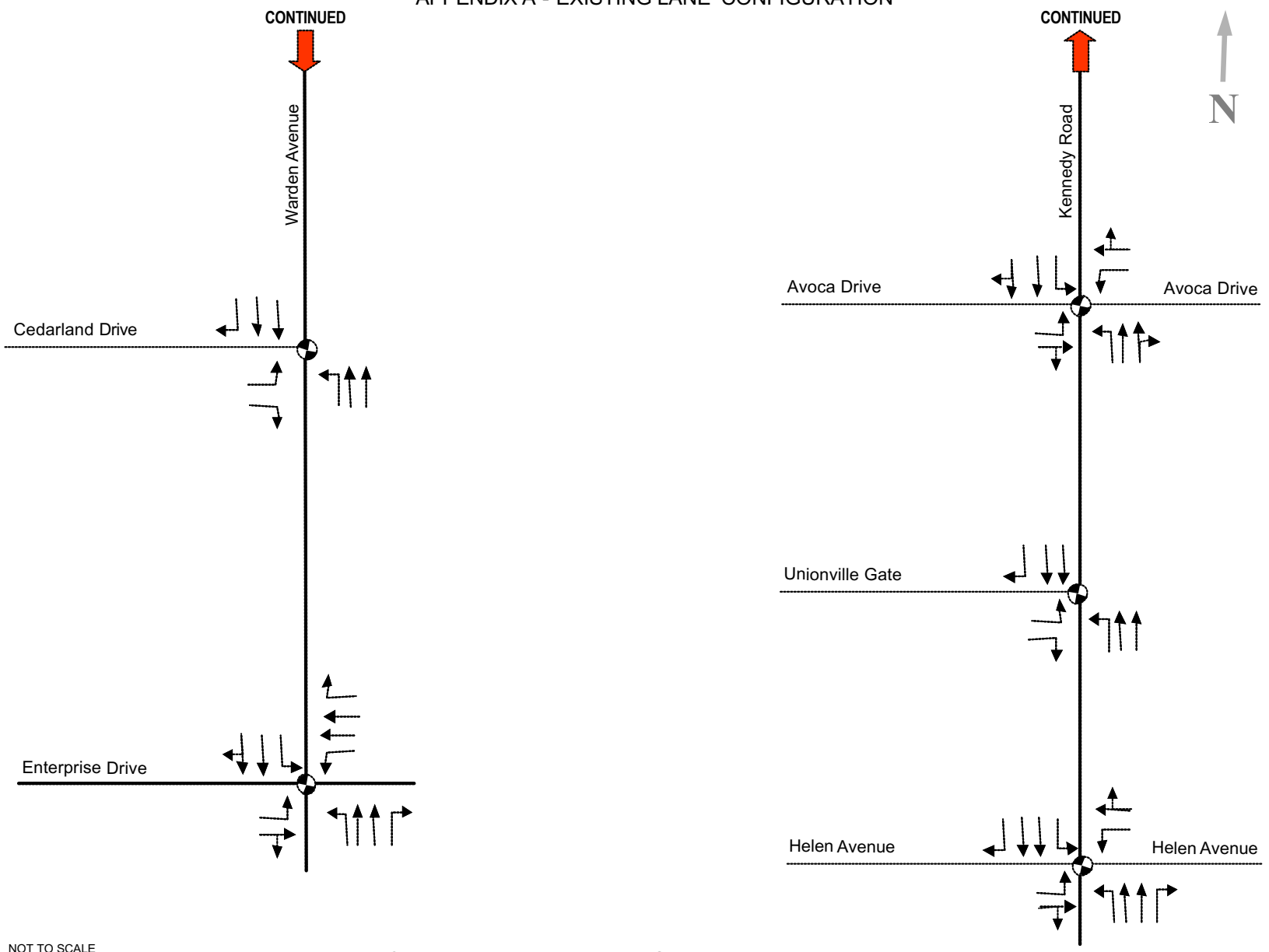

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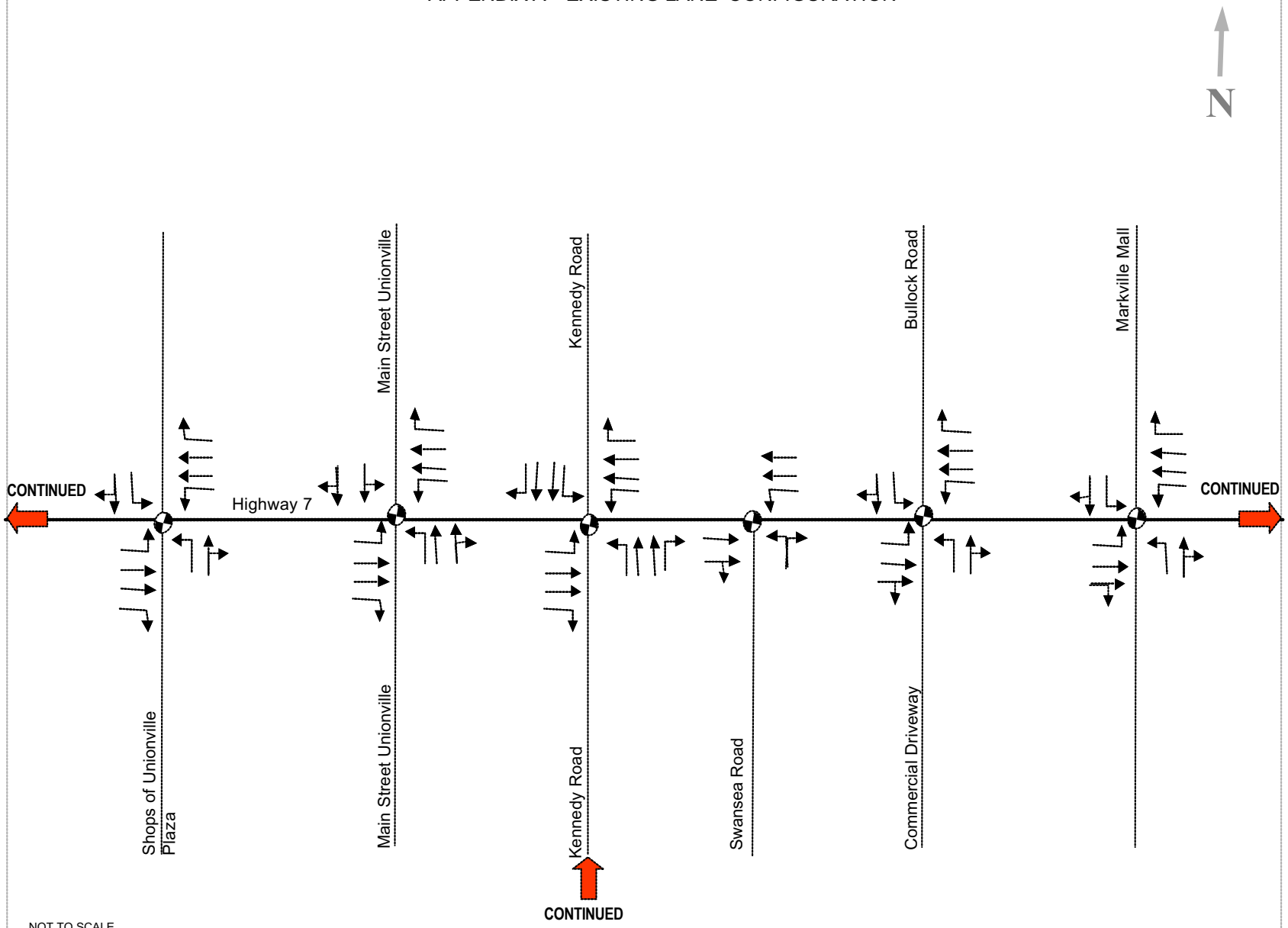

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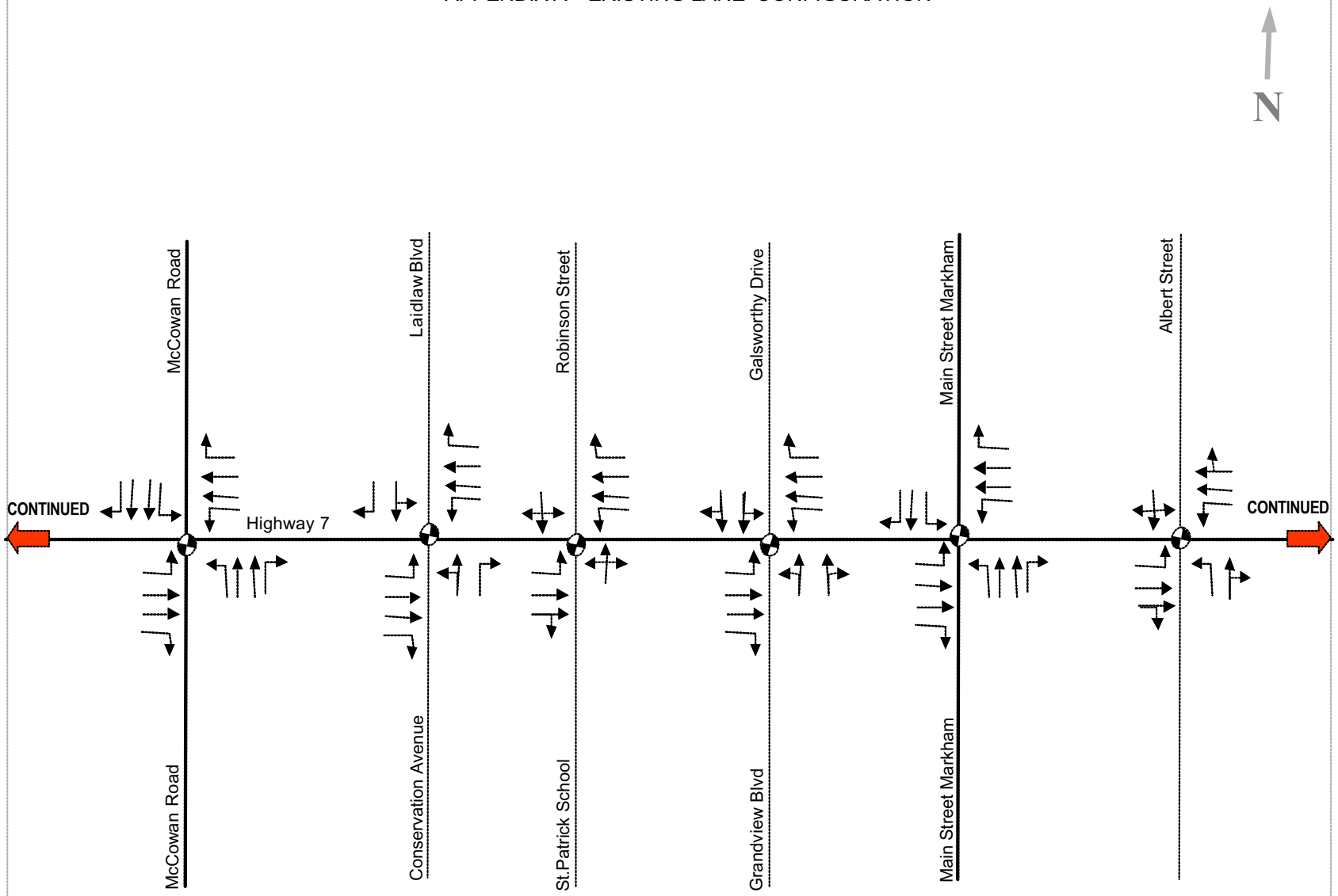

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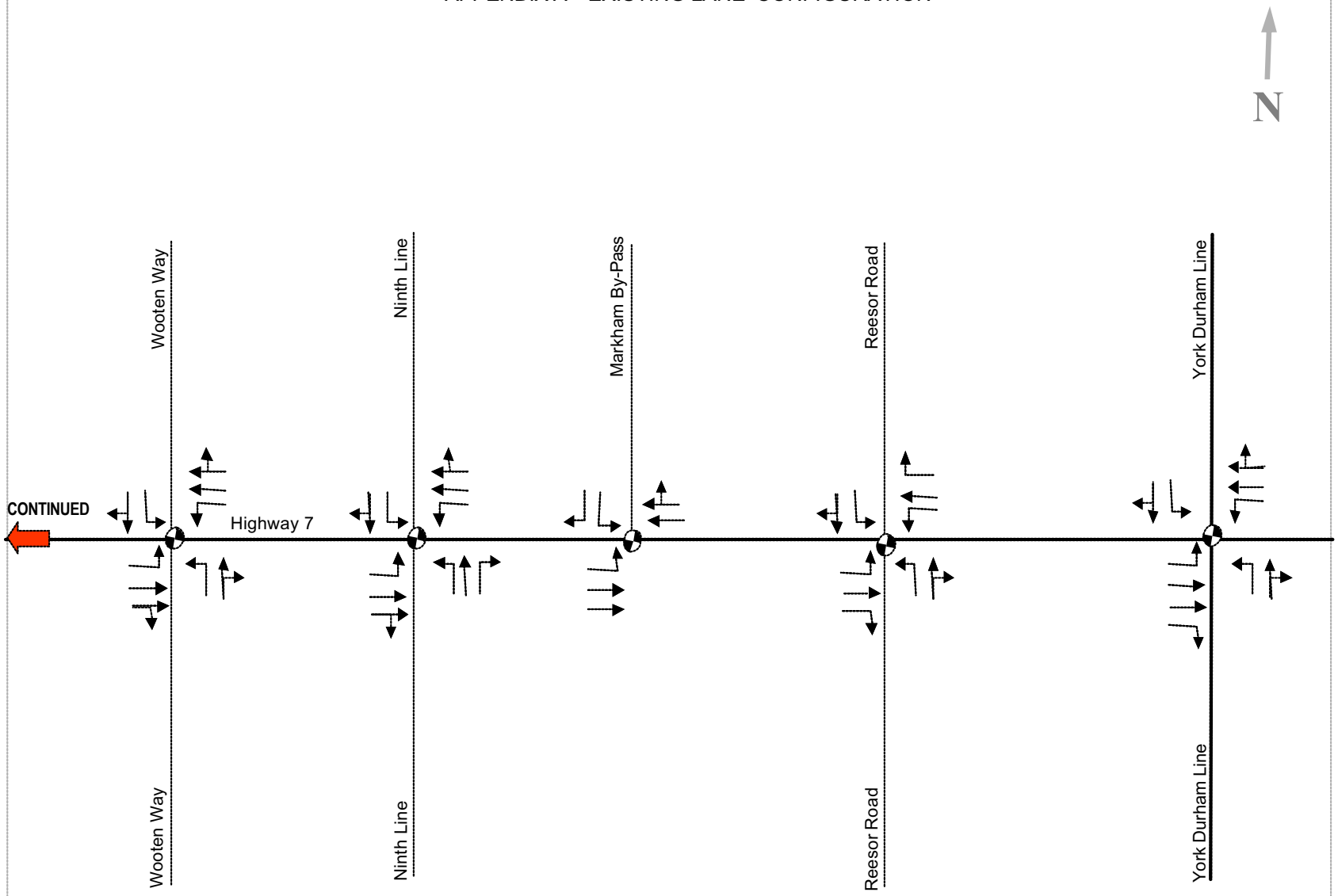

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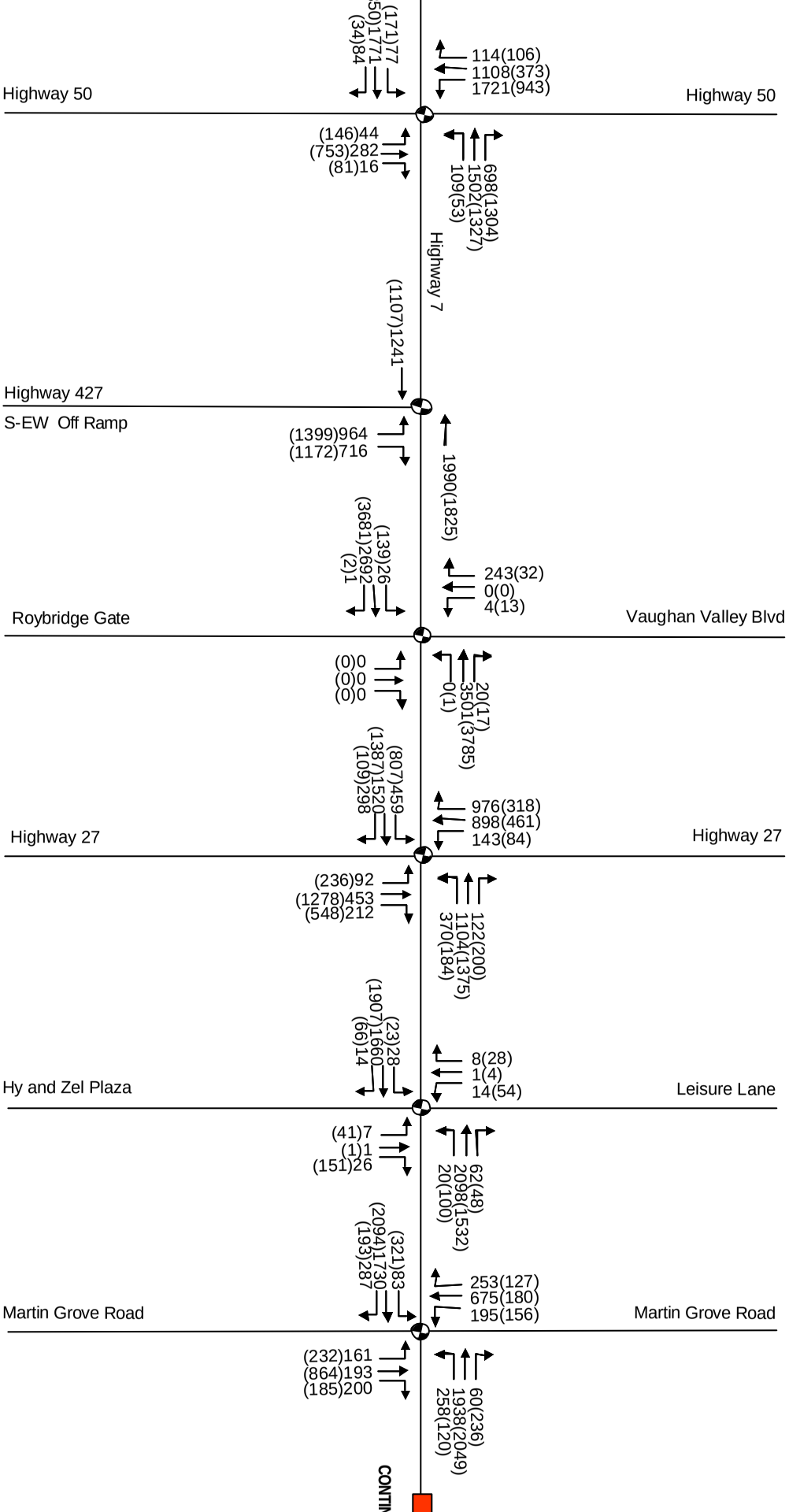
APPENDIX B

EXISTING AM(PM) PEAK HOUR VOLUMES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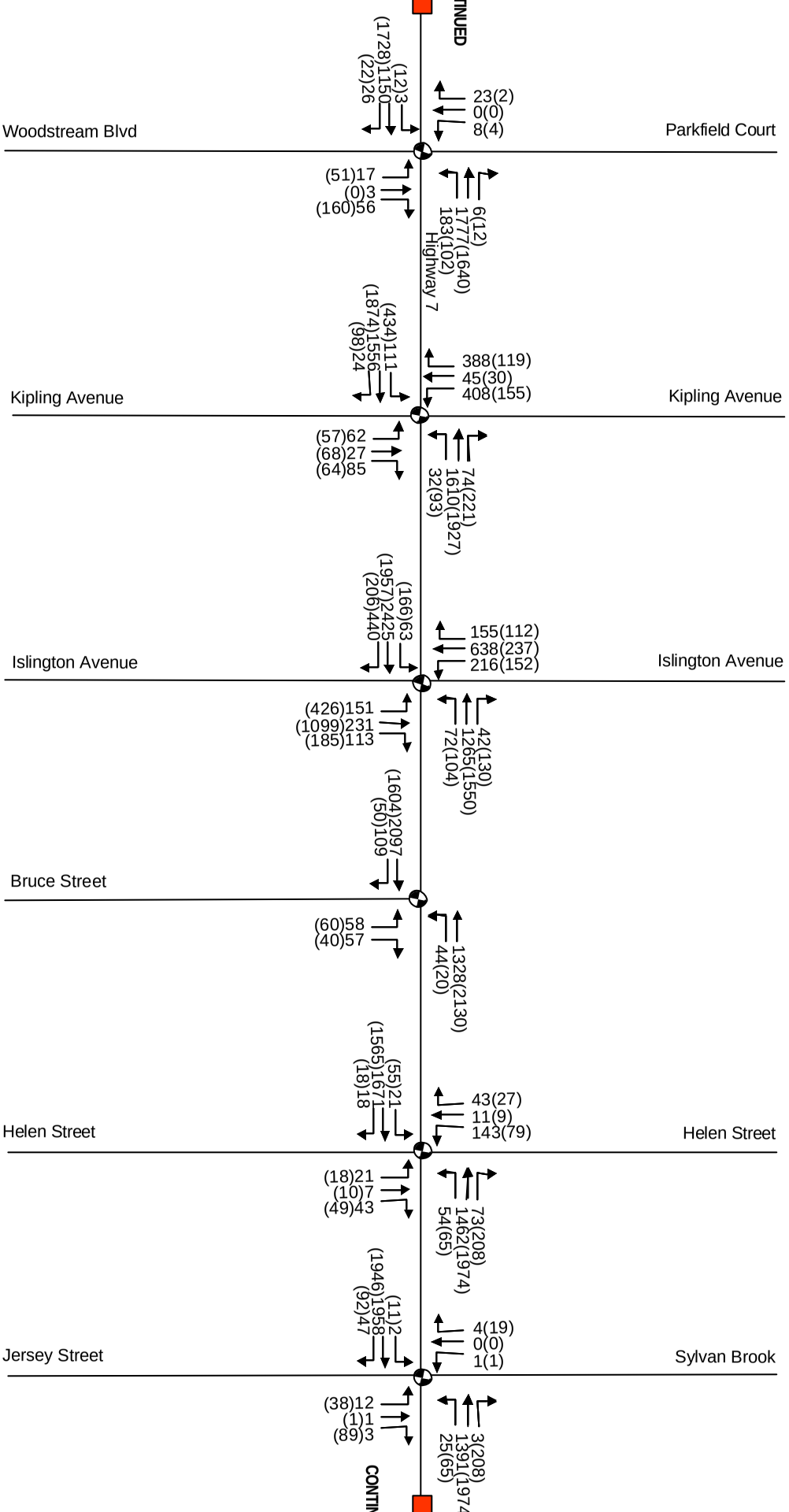
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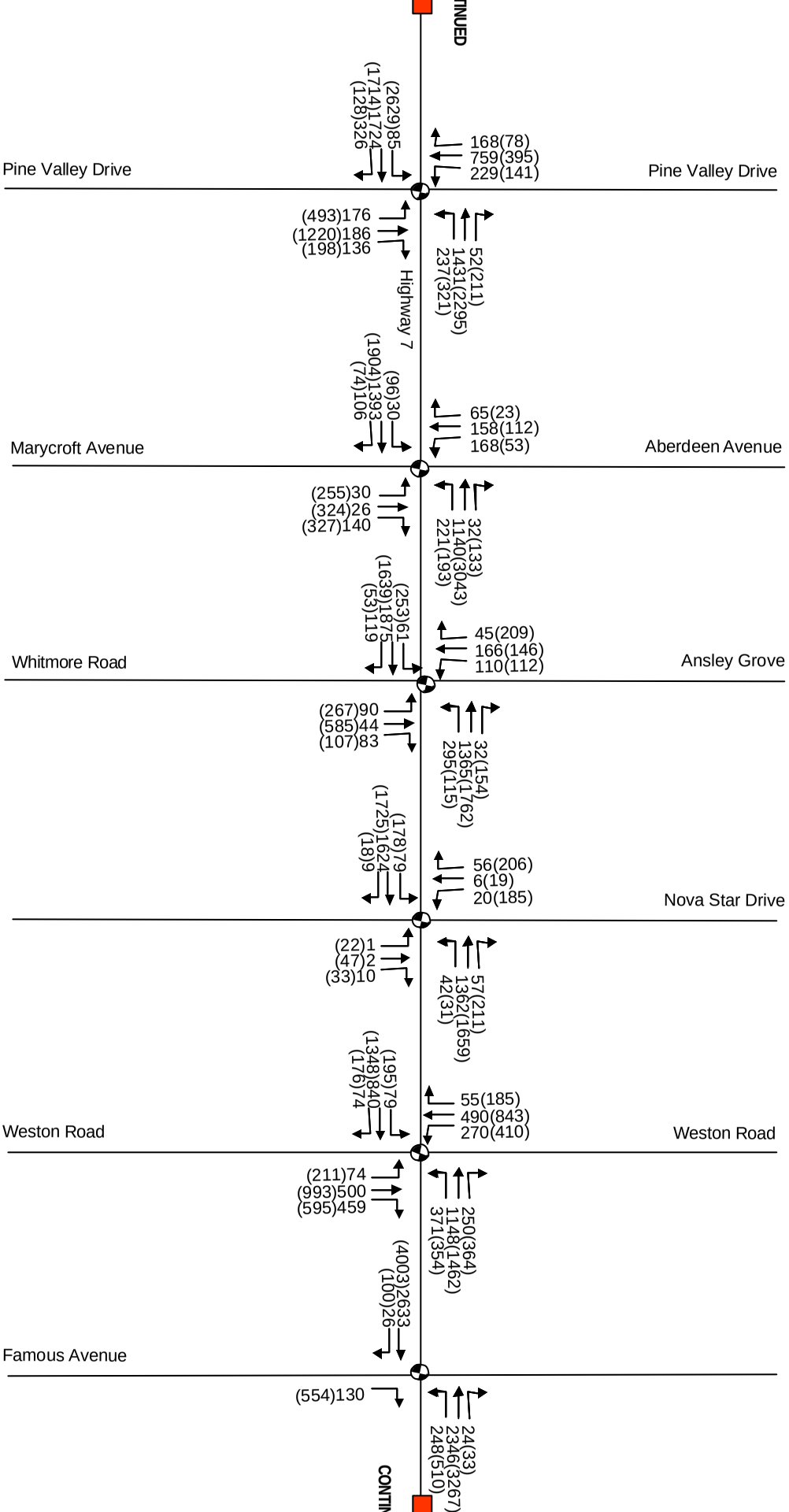
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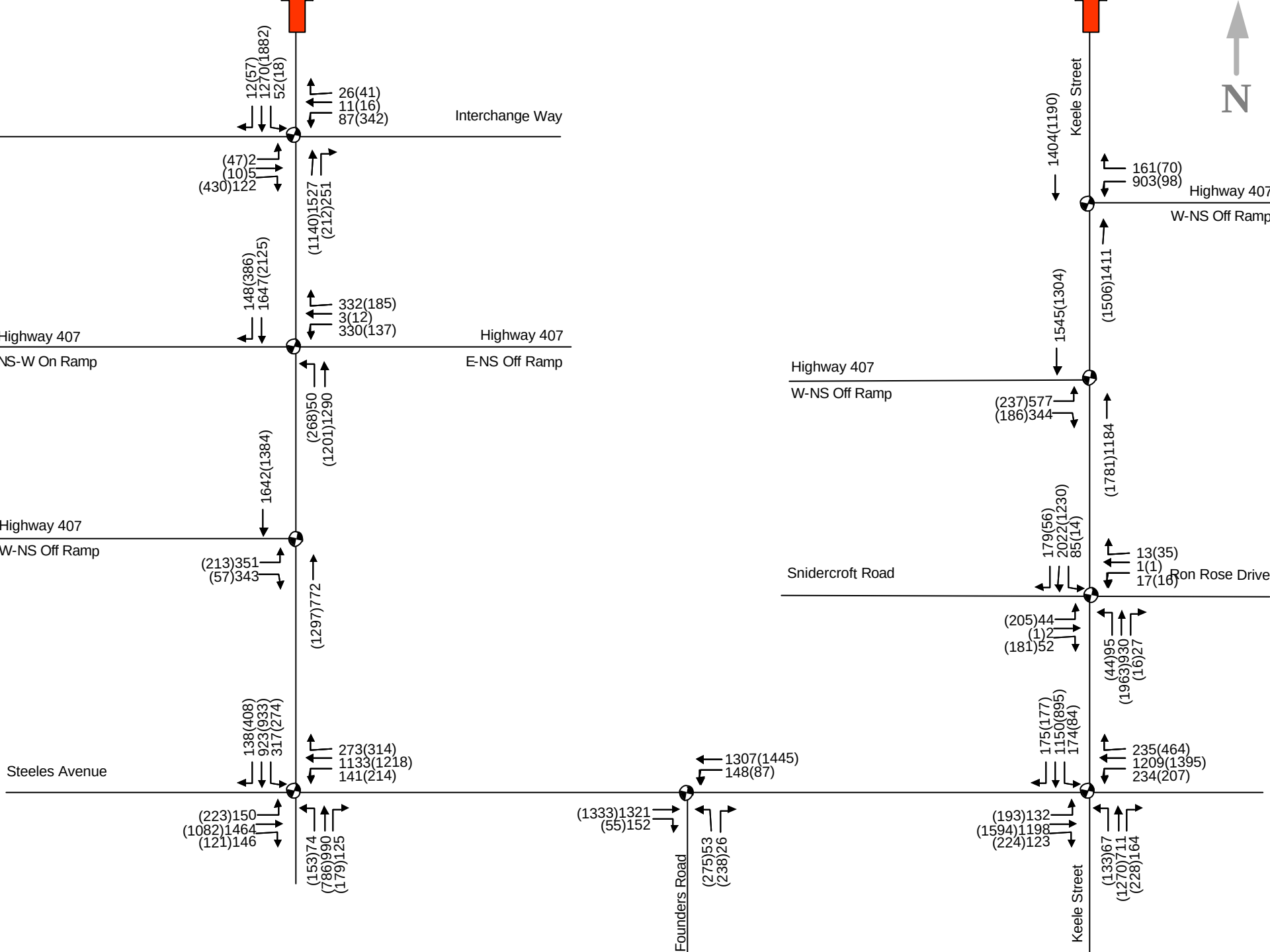
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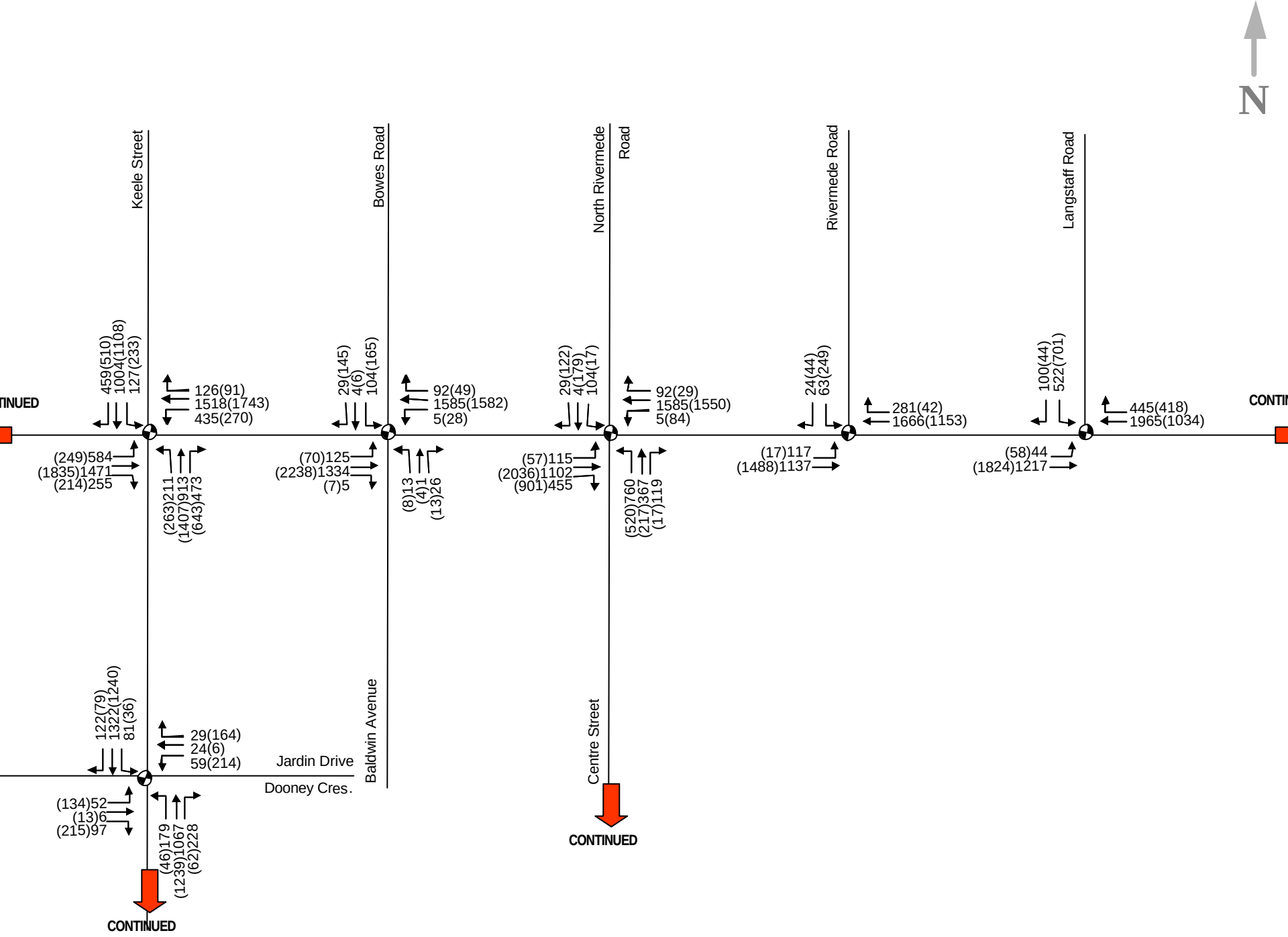
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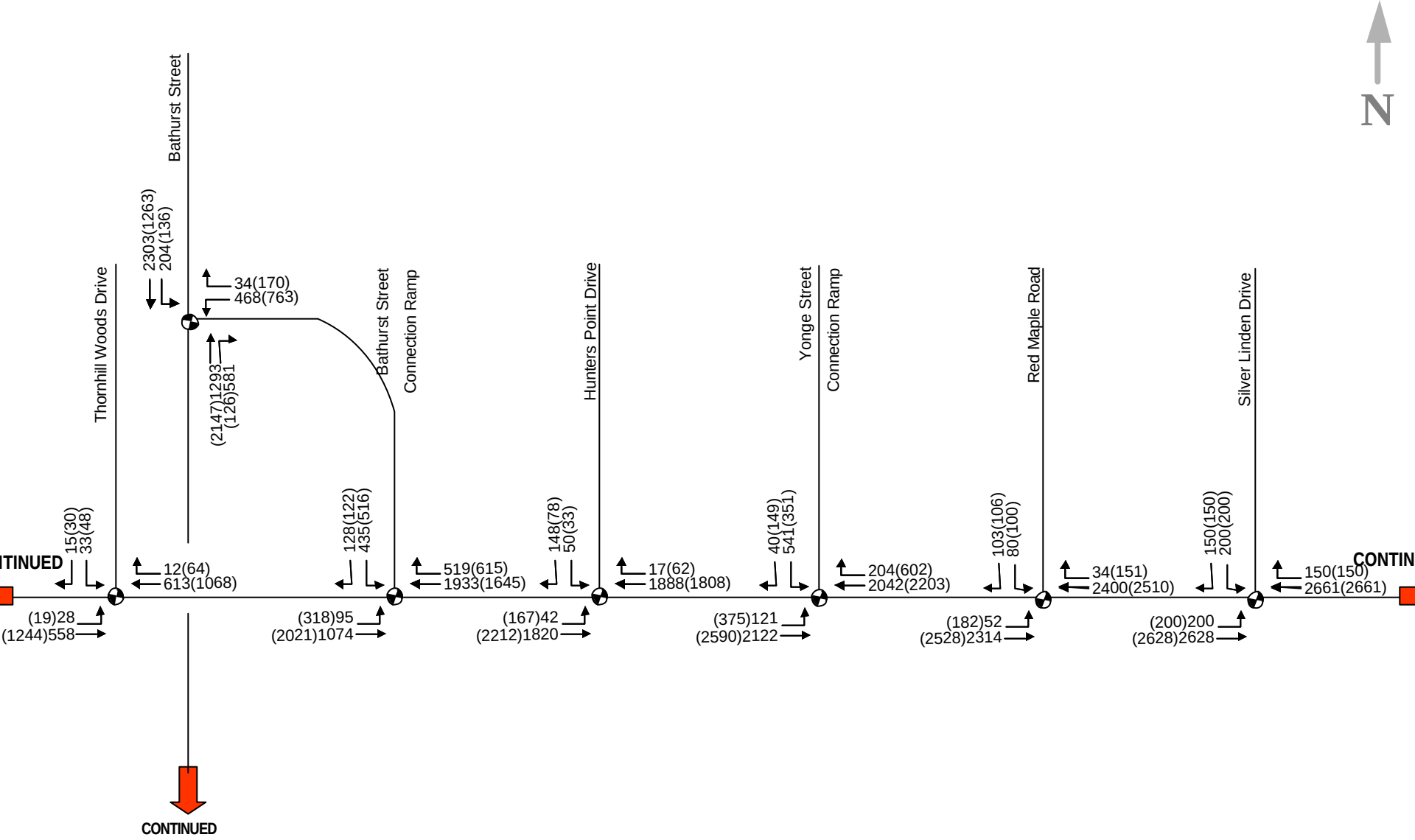
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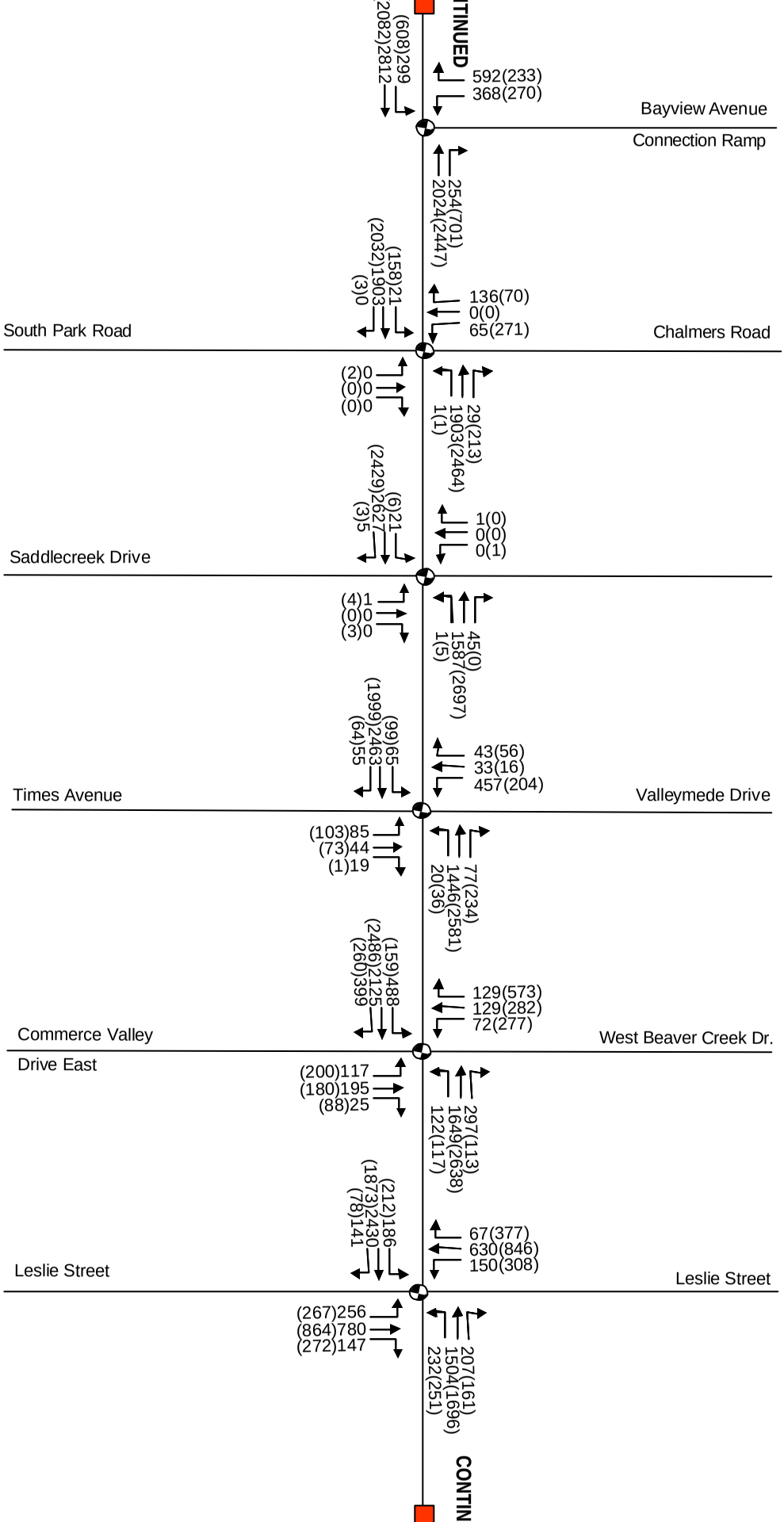
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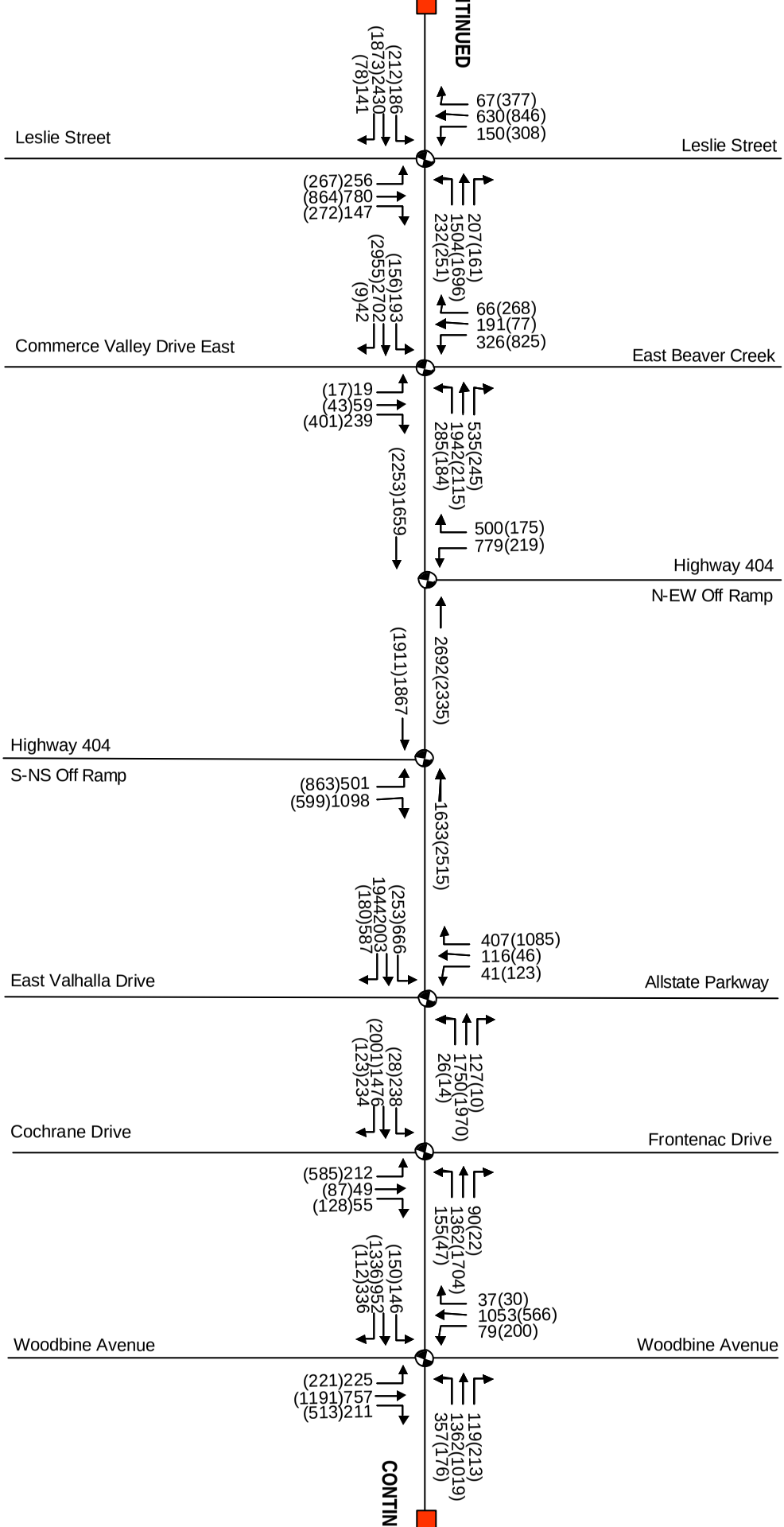
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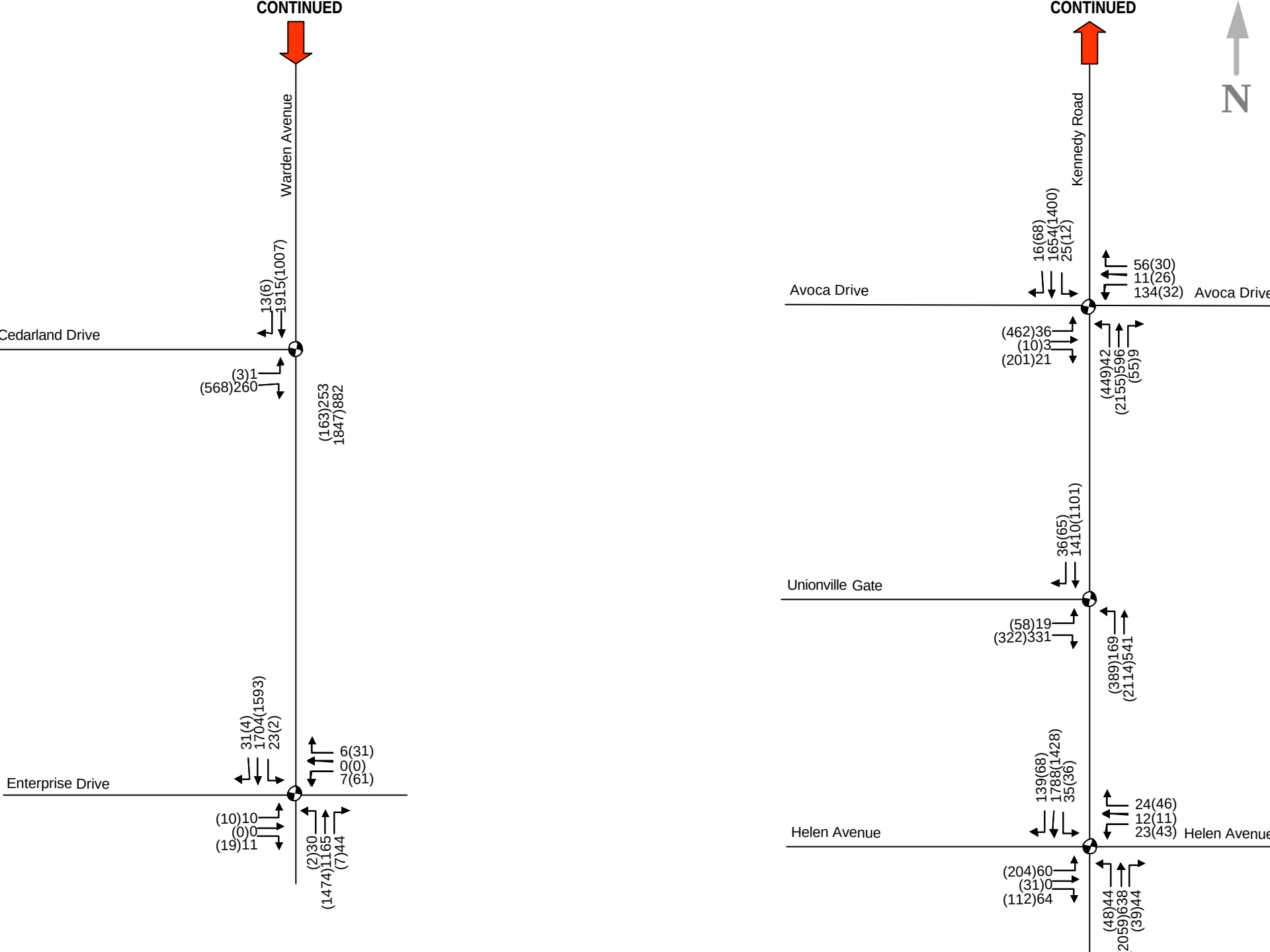
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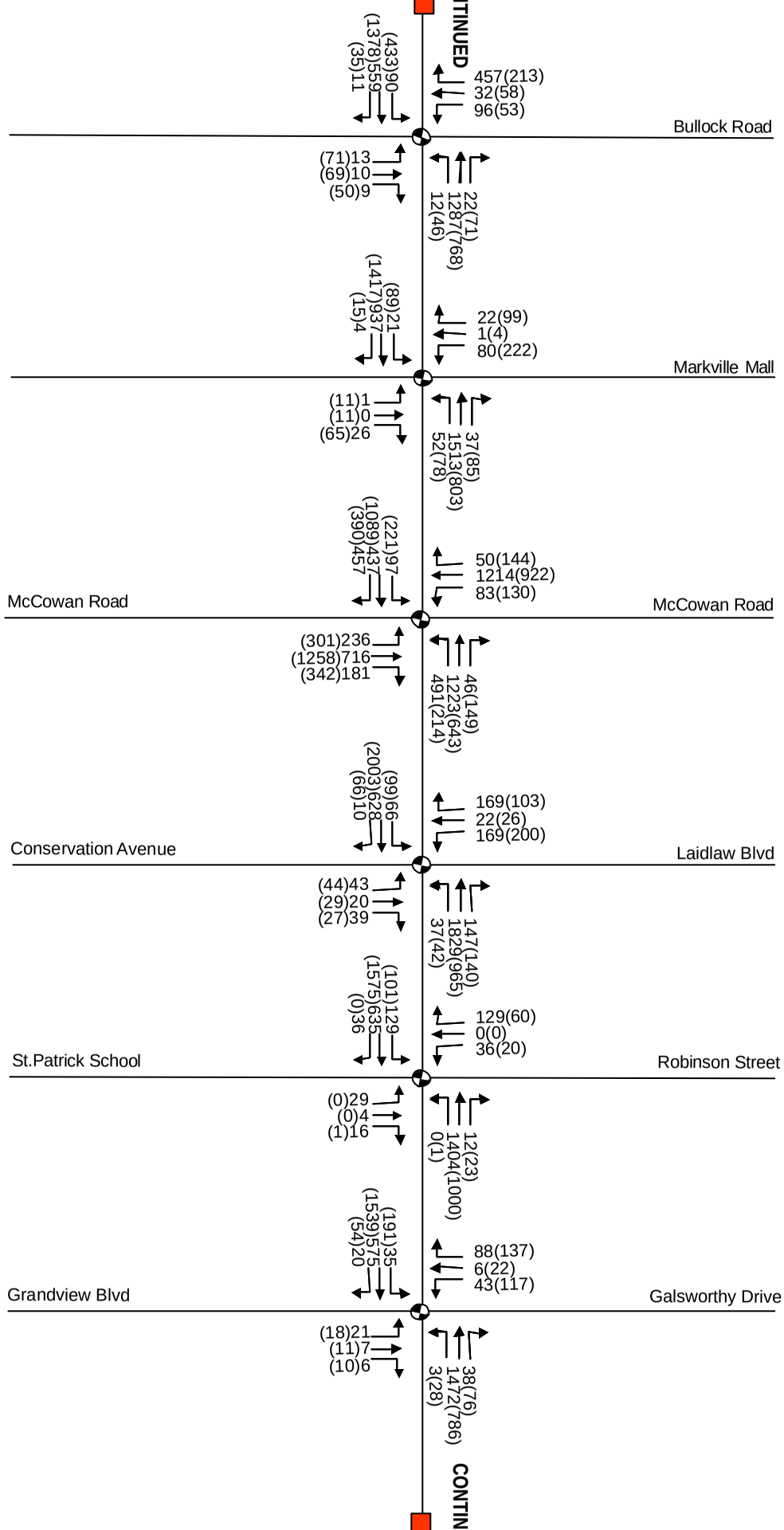
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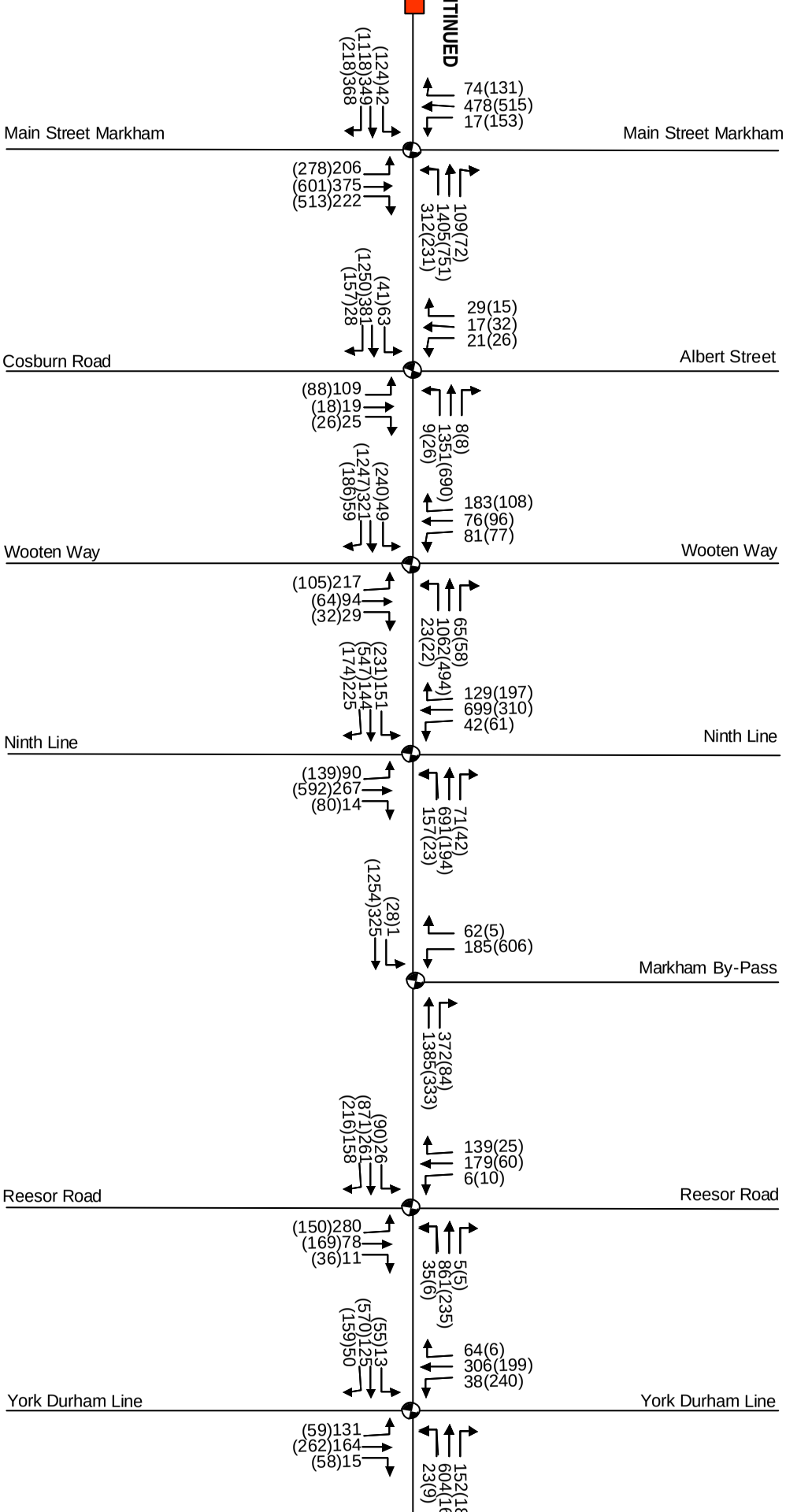
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(1247)321
(186)59
(240)49
183(108)
76(96)
81(77)
Wooten Way
Wooten Way
(105)217
(64)94
(32)29
1062(494)
23(22)
65(58)
(231)151
(547)144
(174)225
129(197)
699(310)
42(61)
Ninth Line
Ninth Line
(139)90
(592)267
(80)14
691(194)
157(23)
71(42)
(1254)325
(28)1
62(5)
185(606)
Markham By-Pass
372(84)
1385(333)
(87)261
(216)158
(90)26
139(25)
179(60)
6(10)
Reesor Road
Reesor Road
(150)280
(169)78
(36)11
861(235)
35(6)
5(5)
(570)125
(159)50
(55)13
64(6)
306(199)
38(240)
York Durham Line
York Durham Line
(59)131
(262)164
(58)15
604(18
23(9)
152(18
N

APPENDIX C

IMMEDIATE IMPACTS ANALYSIS SUMMARIES

APPENDIX D

2021 ANALYSIS SUMMARIES

APPENDIX E

STORAGE LENGTHS

A key consideration in the roadway/RT design is to ensure that proper eastbound and westbound left turn storage lengths are provided. In the assessment of left turn lane storage requirements, the following have been considered:

- Existing left turn requirements;
- Redistributed traffic volumes resulting from RT operations; and
- Future growth associated with demand to/from side street roadways and north-south arterials

In mature areas where the adjacent land uses are well established, the turning movements from the side streets are well established. In these cases, left turn lane storage requirements were based on existing turning movement demands plus any reassignment from the RT.

In other cases, such as major north-south arterials with growth potential or arterial/collector side streets with future development potential, turning movements' to/from these streets will grow over time. In these cases, the left turn storage needs to be reviewed to ensure that future demands are being met.

The following table summarizes the results of the recommended storage lengths based on projected traffic volumes and the potential of the area to further develop. These storage lengths are based on preliminary analysis and should be investigated in further detail under the detail design phase. Several intersections on Highway 7 are restricted in terms of the amount of storage available. In these cases, it is recommended that the storage length be maximized to accommodate the future volumes in the space available.

Location	Turn Lane	Existing Storage Provided (metres)	Future Storage Provided (metres)	Recommended Storage (metres)
Highway 50	Westbound left	135	180	130
Vaughan Valley Drive	Eastbound left	60	140	80
	Westbound left			Maximize
Highway 27	Eastbound dual left	185 x 2	150 x 2	150 x 2
	Westbound left	185	120	120
Kipling Avenue	Westbound left			Maximize
Islington Avenue	Eastbound left	60	40	60
	Westbound left	55	100	60
Pine Valley Drive	Eastbound left	55	140	90
	Westbound left	55	120	110
Weston Road	Eastbound left	160	140	100
	Westbound dual left	100 x 2	100 x 2	140 x 2
Famous Avenue	Westbound dual left			Maximize
Edgeley Boulevard / Interchange Way	Eastbound left	55	200	200
	Westbound left	75	120	70
Jane Street	Eastbound left	55	60	80
	Westbound left	110	120	80

Creditstone Road	Eastbound left	60	90	60
Keele Street	Eastbound dual left	160 x 2	160 x 2	110 x 2
	Westbound left	60	120	130
Millway Avenue	Eastbound left	Maximize		
	Westbound left			
Centre Street	Northbound left	55	55	55
	Westbound dual left	55 x 2	190 x 2	120 x 2
Centre Street / Dufferin Street	Eastbound left	60	120	60
	Westbound left	80	80	100
Centre Street / New Westminster Drive	Eastbound left	110	150	110
	Westbound left	60	90	70
Centre Street / Bathurst Street	Eastbound left	120	120	120
	Southbound left	80	120	80
Bathurst Street / New Westminster Drive	Northbound left	100	140	100
Red Maple Road	Eastbound left	120	180	180
Silver Linden Drive	Eastbound left	60	160	100
Bayview Avenue	Eastbound left	130	230	230
Chalmers Road / South Park Drive	Eastbound left	Maximize		
	Westbound left	Maximize		
Saddlecreek Drive	Eastbound left	Maximize		
	Westbound left	Maximize		
Valleymede Drive / Times Avenue	Eastbound left	Maximize		
	Westbound left	Maximize		
Commerce Valley Drive West	Eastbound left	120	180	100
	Westbound left	120	110	70
Leslie Street	Eastbound left	100	140	180
	Westbound left	100	130	110
East Beaver Creek	Eastbound left	80	120	80
	Westbound left	200	200	160
Woodbine Avenue	Eastbound left	120	200	100
	Westbound left	120	200	120
Rodick Road	Eastbound left	80	180	90
	Westbound left	100	110	70
Town Centre Boulevard	Westbound left	120	100	80
	Northbound left	60	130	60

Town Centre Boulevard / Clegg Road	Northbound left Southbound left	Maximize		
Town Centre Boulevard / IBM	Northbound left Southbound left	Maximize		
Helen Avenue / Kennedy Road	Eastbound left Northbound left	15 70	140 130	70 130
Kennedy Road / Avoca Drive	Southbound left Northbound left	15 30	130 170	40 130
Kennedy Road / Highway 7	Northbound left Westbound left	60 60	110 160	50 130
McCowan Road	Eastbound left Westbound left	50 55	140 150	100 140
Ninth Line	Eastbound left Westbound left	100 100	130 150	110 100
Markham By-Pass	Eastbound left	80	80	80
Reesor Road	Eastbound left Westbound left	80 80	90 130	80 80
York-Durham Line	Eastbound left Westbound left	55 30	60 60	60 60

Note: The above storage lengths have been approximated from aerial photography and proposed plans.