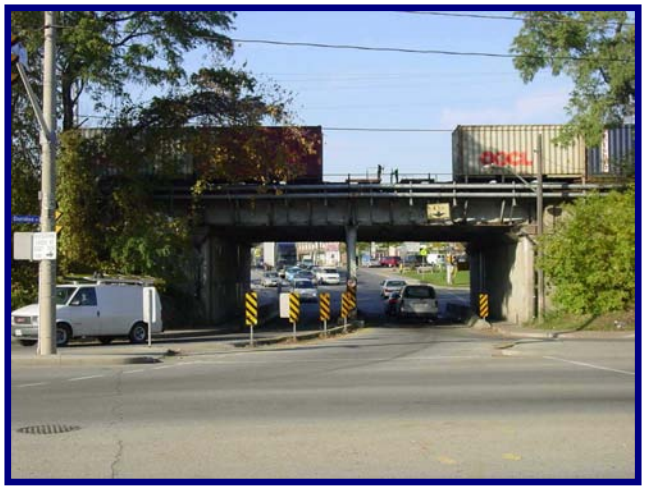
TORONTO

SCARLETT ROAD / CP RAIL BRIDGE

CLASS ENVIRONMENTAL ASSESSMENT

ENVIRONMENTAL STUDY REPORT



August 2007

TSH
engineers
architects
planners

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EXECUTIVE SUMMARY
Exists as a separate file.

1 INTRODUCTION AND BACKGROUND

1.1 PURPOSE OF ENVIRONMENTAL STUDY REPORT

This Environmental Study Report (ESR) documents the planning and preliminary design components of the Scarlett Road/CP Galt Subdivision Bridge Class Environmental Assessment Study. This Study was initiated to examine operational and safety problems associated with the CP Rail Bridge and adjacent intersections.

When the CP Rail Bridge over Scarlett Rd. was built in 1912, Scarlett Rd., Dundas St. and St. Clair Ave. were realigned in the vicinity of the bridge; the configuration of the roads has changed little since. With increasing traffic volumes over the years, the bridge has become a capacity constraint in the area road network and a deterrent to pedestrian circulation.

In November 2001, TSH (Totten Sims Hubicki Associates) completed a Feasibility Study for the City of Toronto that identified the operational and safety problems associated with the CP Rail Bridge and adjacent intersections. The study also identified potential solutions, ranging from minor operational improvements to bridge replacement with major intersection improvements.

This ESR was prepared in accordance with Schedule "C" of the *Municipal Class Environmental Assessment, June 2000* that has been accepted by the Ministry of the Environment (MOE) and approved by the Government of Ontario for projects of this type.

The City of Toronto completed this Study to confirm the findings of the Feasibility Study and identify the preferred design for improvements to the CP Rail Bridge and the intersections of Scarlett Rd. with Dundas St. and St. Clair Ave.

1.2 STUDY LOCATION

The attached map, **Exhibit 1-1**, identifies the Study Area environment intended to differentiate the scope of work for the Study. Different levels of detail for data collection, analysis and evaluation of alternatives are applied within each of the two Study Areas shown on the map, as indicated in the following table, **Table 1-1: Levels of Detail**.

Exhibit 1-1: Study Area

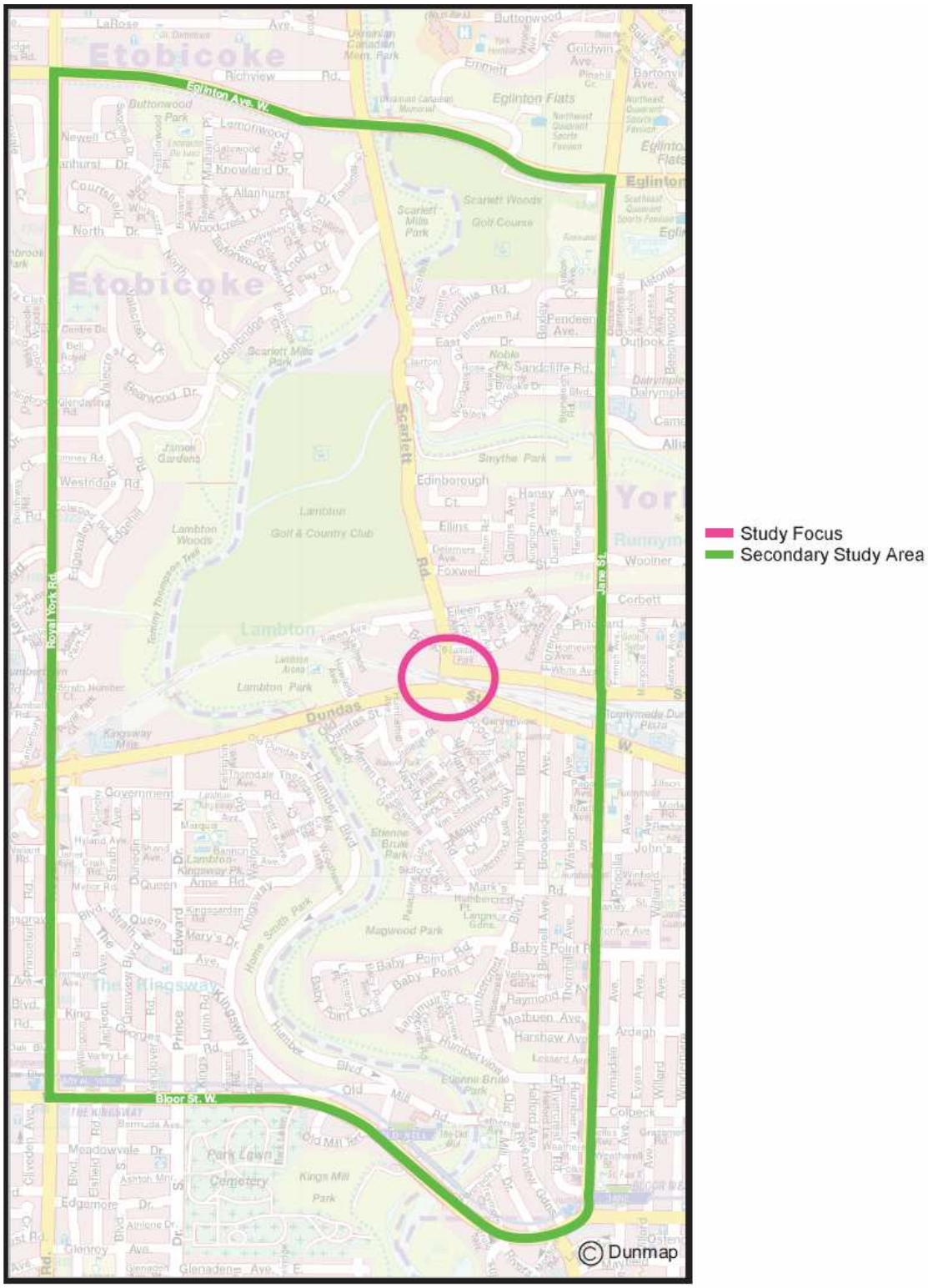


Table 1-1: Levels of Detail

Data/Analysis Scope	Study Focus	Secondary Study Area
Network Link Traffic Volumes		✓
Detailed Traffic Operations Data/Analysis	✓	
Collision History/Safety Review	✓	
Land Use		✓
Natural & Social Environment Impacts	✓	
Transit Operations	✓	✓
Pedestrian and Cyclist Operations	✓	
Rail Operations	✓	
Geometric Design	✓	
Utilities Locations	✓	
Structure Design/Condition Data	✓	

1.3 BACKGROUND

Prior to 1912, Scarlett Road crossed the CP Rail tracks at-grade and intersected with Dundas Street West approximately opposite the present day location of Gooch Avenue. St. Clair Avenue West also crossed the CP Rail tracks at grade and intersected with Dundas Street West, at a shallow angle, east of Scarlett Road.

With the construction of the CP Rail underpass in 1912, Scarlett Road was shifted west to its present alignment, so that the existing roadway and level crossing could remain in operation during construction. St. Clair Avenue West was diverted to its present location, along the north side of the CP Rail tracks and a new intersection with Scarlett Road was constructed. Scarlett Road and St. Clair Avenue West were both re-graded, resulting in 5% slopes down to the underpass. Dundas Street West was diverted to the south of its previous location, and ramps were built along the north side of the street to provide access to the underpass, also at a 5% grade.

The present configuration of the roads in the Study Focus is very similar to what was constructed in 1912. The only major change has been the elimination of the ramps on Dundas Street West. The street has been re-graded across its entire width to provide full access to the underpass; down-grades to the underpass are approximately 4% from the east and 1% from the west. With increasing volumes of automobile traffic, Scarlett Road, St. Clair Avenue West and Dundas Street West have all been widened to four basic lanes, except for Scarlett Road through the underpass. The restricted width through the underpass and the short distance between the Dundas Street West and St. Clair Avenue West intersections on Scarlett Road have required the restriction of movements through the underpass, as described below.

1.4 THE CLASS ENVIRONMENTAL ASSESSMENT PROCESS AND THE SELECTION OF SCHEDULE

The Municipal Class Environmental Assessment process includes five phases, which are:

- Identification of the problem or opportunity;
- Assessment and evaluation of alternative solutions;
- Assessment and evaluation of the alternative design concepts for the preferred solution;
- Documentation in an Environmental Study Report; and
- Project Implementation.

These phases are illustrated in **Exhibit 1-2**, which has been reproduced from the Municipal Class Environmental Assessment document for convenient reference.

The Municipal Class EA defines three types of projects and the process required for each. The selection of the appropriate type for each project is dependent on the anticipated environmental impact. The selection of Schedule C is recommended when major expansion or construction of a new roadway is proposed. The proposed improvements to Scarlett Road fall into this category.

Further information on the class EA process can be obtained from Scott Mitchell at the address shown on page 8.

1.5 DESCRIPTION OF THE ENVIRONMENTAL STUDY REPORT

Based on the documentation recommendations set out in the Class EA document, the ESR includes a discussion of the following:

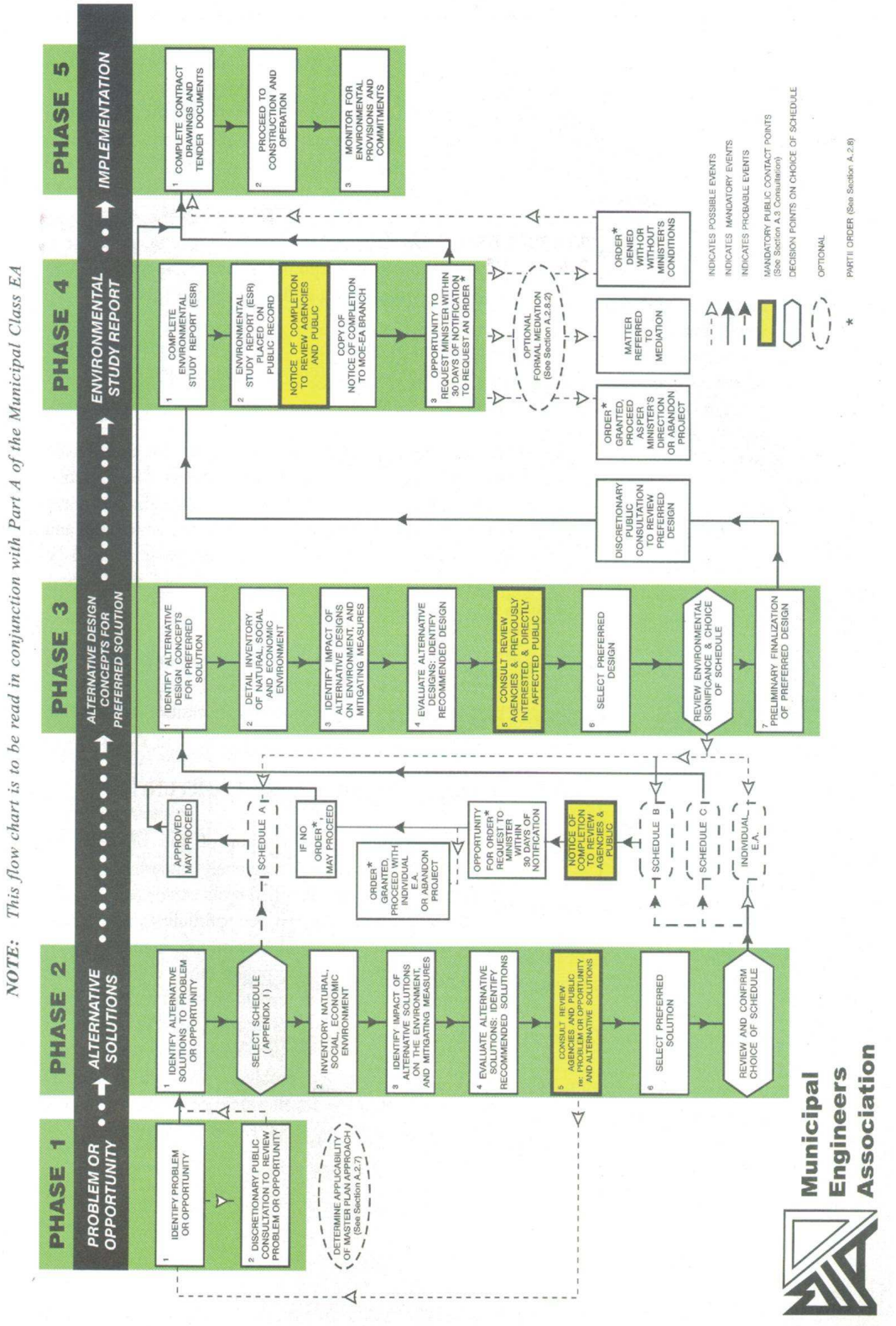
- Background;
- Public and agency consultation process;
- Need and justification to implement physical infrastructure improvements to the Study Focus area;
- Alternative solutions;
- Existing natural and socio-cultural environmental conditions;
- Alternative designs;
- Examination and selection of appropriate impact mitigating measures; and
- Recommended plan.

1.6 PROJECT TEAM AND STUDY TIMEFRAME

The City of Toronto retained TSH (Totten Sims Hubicki Associates) to undertake the class environmental assessment for this Study. The project team was comprised of representatives from the City of Toronto and TSH. General direction was provided by City representatives with Technical Advisory Committee (TAC) meetings held at key points in the process and prior to presenting the study findings to the members of the public.

For the City of Toronto, the Project Manager was Scott Mitchell. For TSH, the Project Manager was Mike Delsey, P.Eng. The roles of other team members and specialists are noted below:

Exhibit 1-2: The Municipal Class EA Planning and Design Process



Environmental:	Colleen Goodchild	Social Environment and Environmental Planning
	Rudi Warmé	Natural Environment
	Scott Shayko	Noise and Air Quality Impact Assessments
Transportation:	Doug Robertson	Traffic Operations Analysis and Safety
	Paul Bumstead	Travel Demand Forecasting and Needs Assessment
Engineering:	Brenda Jamieson	Road Design
	Dru Dron	Drainage Design
Archaeological:	Kim Slocki	Archaeological Assessment

The Class EA work was undertaken between 2003 and 2005.

2 CONSULTATION PROCESS AND STUDY APPROACH

2.1 PURPOSE AND OBJECTIVES OF THE STUDY

The purpose of this Study was to address existing traffic safety and operational concerns and long-term mobility needs to the roads and/or CP Rail Galt Subdivision Bridge at Scarlett Road and Dundas Street West/St. Clair Avenue West on the basis of:

- City policies and technical criteria pertaining to major/minor arterial roads;
- Requirements and policies of Official Plan documents;
- Natural, social and economic environmental constraints and opportunities; and
- Values, sentiments and desires of the local residents, affected agencies and other stakeholders.

The objective of the class environmental assessment was to develop a plan for improvements in the Study Focus Area that would address the identified problems and opportunities.

2.2 PROJECT TASKS

To ensure that the purpose and objectives of this project would be met and that the conclusions and recommendations resulting from the study would be endorsed by the City, local stakeholders, the public and affected agencies, the following tasks were undertaken:

- Examine the need and justification to implement improvements in the Scarlett Road corridor to resolve existing traffic congestion and safety concerns, and efficiently accommodate long term transportation demands for all modes of travel. For the purpose of this study, the 2011 and 2021 planning horizons have been considered;

- Identify significant technical, environmental and public issues, concerns and constraints associated with the provision of additional vehicular capacity within the Study Focus Area;

- Identify a broad range of planning alternatives that address the various modes of travel (e.g. auto, walking, cycling, transit);

- Complete an assessment of alternative solutions and design concepts that incorporates the concerns and values of the public and affected agencies/Ministries, etc.;

- Identify measures needed to mitigate public concerns, environmental and construction related impacts associated with recommended improvements to the CP Rail Bridge and adjacent intersections;

- Prepare a preliminary design for the improvements; and

- Prepare an Environmental Study Report (ESR) that documents all public input and comments and complies with the requirements of the *Municipal Class Environmental Assessment, June 2000*, for Schedule "C" undertakings.

2.3 THE CLASS ENVIRONMENTAL ASSESSMENT PROCESS

As previously mentioned, the Scarlett Road/CP Rail Bridge Class Environmental Assessment was carried out in accordance with the *Municipal Class Environmental Assessment, June 2000*.

The filing of the ESR completes the planning and preliminary design stage of the project. The ESR is filed with the Ministry of the Environment (MOE) in the public record and made available for review by the public for a thirty (30) calendar day review period. A public notice is published at the time of submission to MOE. Copies of the report are available for review and comment during normal business hours at the following locations:

Clerk's Office
Toronto City Hall
12th Floor West
100 Queen Street West
Toronto, ON M5H 2N2
Tel. 416- 392-8016

Toronto Public Library
Jane/Dundas Branch
620 Jane Street
Toronto, ON M6S 4A6

Tel. 416-394-1014

If no outstanding concerns are brought forward during the review period, the City may proceed to the detail design/construction stage (implementation).

The Class EA process contains a provision that allows for changing the status of a project from a Class EA to an Individual Environmental Assessment. This is called a 'Part II Order' (it replaces the previous 'bump-up' provision). Members of the public, interest groups, government agencies and others may request that an Individual Environmental Assessment be prepared for a specific project if they feel their concerns have not been addressed through the Class EA planning process. The Minister of the Environment determines whether or not this is necessary and the decision in this regard is final. If the 'Part II Order' is granted, the project cannot proceed unless an Individual Environmental Assessment is prepared. The Individual Environmental Assessment is subject to a formal government review and approval and may result in a formal public hearing.

Anyone wishing to request a 'Part II Order' of the Scarlett Road/CP Rail Bridge Class Environmental Assessment Study, must submit a written request detailing their comments/concerns within the thirty (30) calendar day review period, to the Minister of the Environment, with a copy to the proponent, at the following addresses:

MOE address:
Minister of the Environment
12th Floor,
135 St. Clair Avenue West
Toronto, ON M4V 1P5

City of Toronto (Proponent) address:
Scott Mitchell
City of Toronto
Transportation Services Division
City Hall, 22nd Floor East
100 Queen Street West
Toronto, ON M5H 2N2

2.4 EXTERNAL INVOLVEMENT

The following external ministries, municipalities, agencies and authorities were contacted at the project initiation stage through correspondence notifying them of the project commencement and requesting their comments. A summary of agency comments and relevant correspondence is included in **Appendix A.**

Federal Agencies:
Environment Canada

Provincial Agencies:
Ministry of the Environment
Ministry of Municipal Affairs and Housing
Ministry of Natural Resources
Ministry of Culture
Ministry of Citizenship, Tourism and Recreation
Ministry of Agriculture and Food
Ministry of Education
GO Transit

Municipal/Regional Agencies and Authorities:
Toronto and Region Conservation Authority

Transportation:
GO Transit
CP Rail
CN Rail
Toronto Transit Commission

Utilities:
Toronto Hydro
Rogers Cable
Bell Canada
Enbridge Gas Distribution Inc.
Enbridge Pipeline Inc.

Others:
Toronto Pedestrian Committee
Toronto District School Board
Toronto Catholic District School Board
Toronto Separate School Board
Toronto Police Service
Toronto Fire Services
Toronto Emergency Medical Services

2.5 PUBLIC INVOLVEMENT

Throughout the Study, the public and various interest groups have had opportunities to make comments, identify issues and provide additional information and data. The comments provided by the public and interest groups have broadened the information base and facilitated enhanced decision making in the completion of this Class EA. A summary of the public correspondence and input received during the course of the Study is provided in **Appendix B**.

By providing individuals and interest groups with the opportunity to identify their concerns and special knowledge, the Project Team was able to respond to specific issues and comments. Two public meetings were held as detailed below. The methods of the formal contacts are identified below. Ratepayer Group meetings were held in the Fall of 2004. Summaries of these meetings are provided in **Appendix C**.

2.5.1 Notice of Study Commencement

Letters were mailed to Provincial Ministries, Agencies and Authorities, special interest groups and interested individuals on October 16, 2003, advising them of the study commencement as well as informing them of the contacts at the City of Toronto. Notices of the Study Commencement were also mailed on October 23, 2003 to those property owners/residents whose within the Study Area. Newspaper notices were placed in the York Guardian and Annex Guardian/Bloor West Villager on October 24 and 31, 2003, respectively.

2.5.2 Public Meeting and Open House 1

Letters were mailed to Provincial Ministries, Agencies and Authorities, special interest groups and interested individuals on May 10, 2004 advising them of the details of the first Public Meeting and Open House. Notices of the first Public Meeting and Open House were also mailed on the week of May 17, 2004 to those property owners/residents whose properties are within the Study Area. Newspaper notices were placed in the York Guardian and Annex Guardian/Bloor West Villager on May 21 and 28, 2004.

The first Public Meeting and Open House was held on the date and location noted below:

Date:	Wednesday, June 2, 2004
Time:	6:00 p.m. – 9:00 p.m. (Presentation at 7:00 p.m.)
Location:	ANAF Legion Hall, 702 Jane Street
Attendance:	approx. 73

The purpose of the meeting was to present information and obtain feedback on the study objectives, data collection, need and justification assessment, alternative solutions and their assessment and next steps in the process. Sign-in sheets, comment sheets, and a summary of Phases 1 and 2 of the Class EA process were available at the meeting.

A summary of the first Public Meeting and Open House is provided in **Appendix B**.

2.5.3 Public Meeting and Open House 2

Letters were mailed to Provincial Ministries, Agencies and Authorities, special interest groups and interested individuals on October 20, 2004, advising them of the details of the second Public Meeting and Open House. Notices of the second Public Meeting and Open House were also mailed on October 20, 2004 to those property owners/residents whose properties are within the Study Area. Newspaper notices were placed in the York Guardian and Annex Guardian/Bloor West Villager on October 29 and November 5, 2004.

The second Public Meeting and Open House was held on the date and location noted below:

Date:	November 9, 2004
Time:	6:00 p.m. – 9:00 p.m. (Presentation at 7:00 p.m.)
Location:	ANAF Legion Hall, 702 Jane Street
Attendance:	approx. 42

The purpose of the meeting was to present the assessment of the alternative design concepts and the technically preferred alternative. Sign-in sheets, comment sheets, and a summary of Phases 1, 2 and 3 of the Class EA process were available at the meeting.

A summary of the second Public Meeting and Open House is provided in **Appendix B**.

2.5.4 Notice of Study Completion/Filing of the ESR

This ESR will be filed in the public record for 30 calendar days and the public notified by means of newspaper advertisements and mailings to agencies, interested individuals and adjacent property owners.

3 IDENTIFICATION OF TRANSPORTATION PROBLEMS AND OPPORTUNITIES

3.1 KEY ISSUES

The following are some significant issues identified during the Feasibility Study that were addressed during the Class EA Study and served as the starting point for the Need and Justification:

Safety – Factors such as short intersection spacing and restricted sight distances, roadway widths and vertical clearances create significant safety concerns (66 collisions in 3 years) for the movement of vehicles, pedestrians, cyclists and trains through the Study Area. A thorough safety review was undertaken to understand the nature and severity of problems at this site in relation to other comparable sites within the City of Toronto and other jurisdictions;

Traffic Operations – The spacing and configuration of the intersections of Scarlett Rd. with St. Clair Ave. and Dundas St. have created multiple traffic operations problems, including capacity deficiencies and movement restrictions. In order to obtain an accurate assessment of the operation of the Scarlett Road intersections with St. Clair Avenue West and Dundas Street West, operational analyses and simulation were carried out using Synchro/SimTraffic Version 6.

Pedestrians and Cyclists – The existing CP Rail underpass is a barrier to pedestrian circulation due to dark, narrow sidewalks and the safety hazards noted above. Scarlett Rd. is identified as a proposed bicycle lane route in the Toronto Bike Plan, but bike lanes cannot be accommodated through the CP Rail underpass. The design of improvements to the bridge and surrounding road network must incorporate features to remove these barriers and safely accommodate pedestrians and cyclists through the Study Area.

Railway Operations – Four tracks cross Scarlett Rd. on the CP Rail bridge, one yard track and three mainline tracks (CP Galt Subdivision, carrying approximately 25 freight trains per day and 12 GO trains per day on GO's Milton line). The high level of mainline traffic and the proximity of a yard, with multiple tracks, switches and signals, severely limit the options for bridge replacement and construction staging. An additional track provides access to the marshalling yard immediately to the east of Scarlett Road and a weigh scale located west of Scarlett Road. Consultation with CP was undertaken to obtain additional data regarding the existing bridge condition, rehabilitation plans and operational constraints that would apply to work at this site.

Traffic Patterns – Improvements to the Scarlett Rd. railway underpass and adjacent intersections could alter established traffic patterns throughout the area. For example, an increase in vertical clearance and/or provision of a southbound left-turn at Dundas St. could attract increased commercial traffic to Scarlett Rd. Potential impacts of such changes on traffic volumes and travel patterns through the surrounding area will require careful consideration.

Transit Operations – Although no TTC bus routes currently pass through the Scarlett Road/CP Rail underpass, four routes operate on adjacent roadway sections. Consultation with the TTC was undertaken to confirm existing and future operations in the area. TTC is currently undertaking a Streetcar right-of-way Environmental Assessment for St. Clair Avenue West east of the Study Area (Gunns Road to Jane Street) defined for this project. TTC has requested that the City of Toronto examine the potential for streetcars to pass through the CP Rail Galt Subdivision Bridge at Scarlett Road.

3.2 ASSESSMENT OF EXISTING CONDITIONS

3.2.1 Design Details and Physical Condition of the Roadways and Bridge

Exhibit 3-1 illustrates the topographic base plan for Scarlett Road at the CP Bridge.

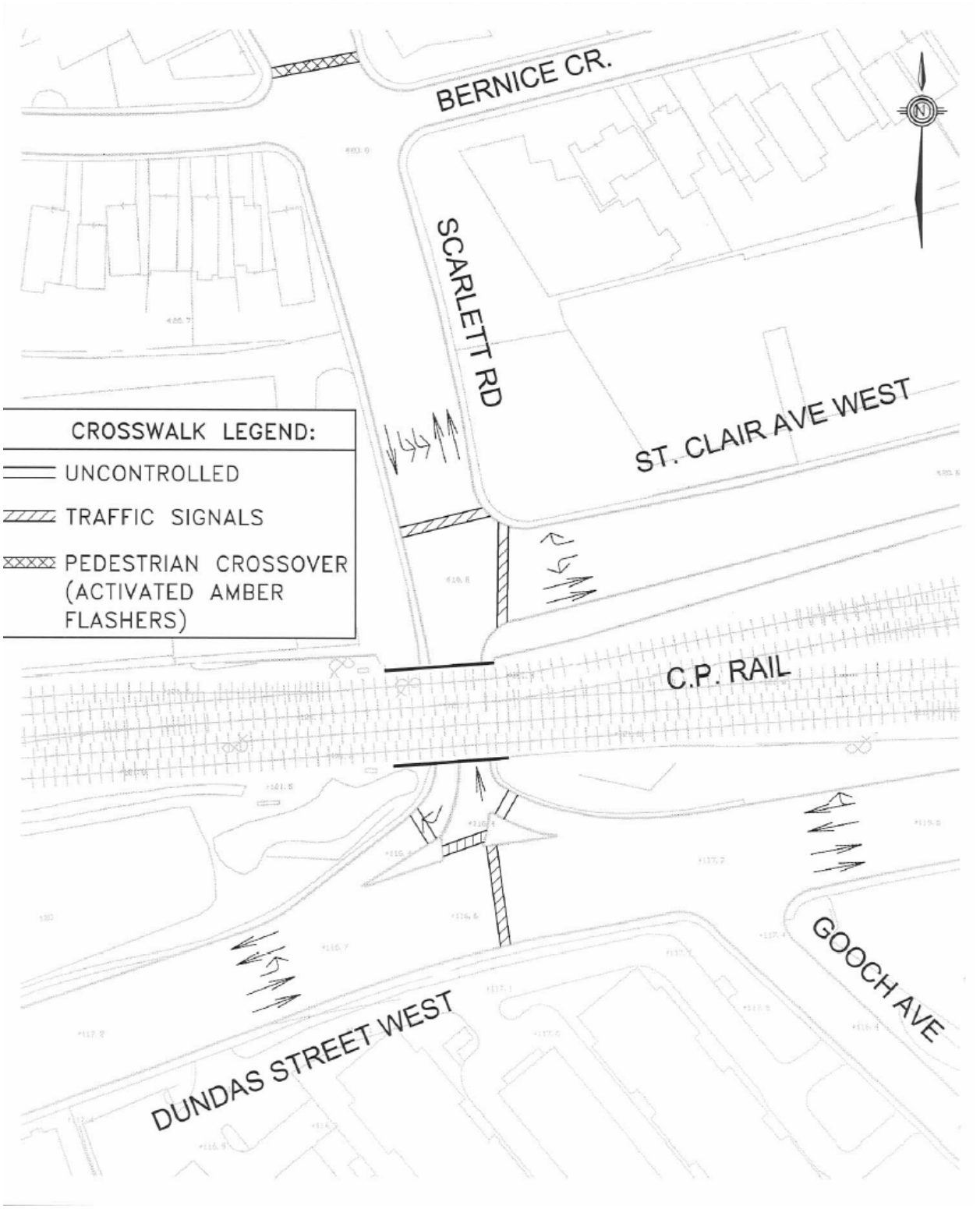
3.2.1.1 CP Rail Structure

The existing Scarlett Road subway structure at Mile 6.8 of the CP Rail Galt Subdivision was constructed in 1912 and consists of two span (6.75 m + 8.0 m) structural steel deck plate girders supported on concrete abutments and a structural steel frame pier. The west span provides a 5.9 m clear opening and accommodates a single lane of southbound vehicular traffic and a pedestrian sidewalk. The east span provides a 7.1 m clear opening and accommodates a single lane of northbound vehicular traffic and a pedestrian sidewalk. Each sidewalk is separated from the adjacent traffic lane by a concrete barrier wall. The structure has substandard vertical clearances of 4.1 m for the southbound lane and 4.0 m for the northbound lane. The 17.7 m± wide concrete deck accommodates four (4) rail tracks; 3 mainline and 1 spur line serving CP Rail's Lambton Yard.

CP Rail's main signal cable is carried across the structure in two (2) conduits supported by brackets on the south side of the deck. There are also telecommunication fibre optic cables buried within the track ballast on the structure.

The structure is owned and maintained by CP Rail. It was most recently rehabilitated in 1997; the work consisting of repairs to the west ballast wall and the underside of the deck. The structure is currently considered by CP Rail to be in fair to good structural condition, with the exception of cracks in the wingwalls, which are to be repaired within 5 to 10 years. There are currently no plans for major rehabilitation/replacement of the structure.

Exhibit 3-1: Existing Topographic Base Plan



3.2.1.2 Scarlett Road

Scarlett Road within the Study Area is a minor arterial road with a basic four lane urban cross section from St. Clair Avenue West northerly to Eglinton Avenue West. South of St. Clair Avenue West, through the CP Rail underpass, Scarlett Road has only one traffic lane and a concrete sidewalk in each direction. Existing structure clearances are illustrated in **Exhibit 3-2**. Both horizontal and vertical clearances are deficient as shown in **Table 3-1**.

Table 3-1: Horizontal/Vertical Clearances

Criteria	Existing	Minimum
Vertical clearance	4.1m	5.0m[1]
Horizontal clearance – outside	0.0m	1.0m[2]
Horizontal clearance – median	0.0m	1.5m[3]
Lane Width	3.5m S/B; 4.7m N/B	3.5m
Sidewalk Width	1.22m	2.0m
Bikelane Width	N/A	1.5 – 2.0m

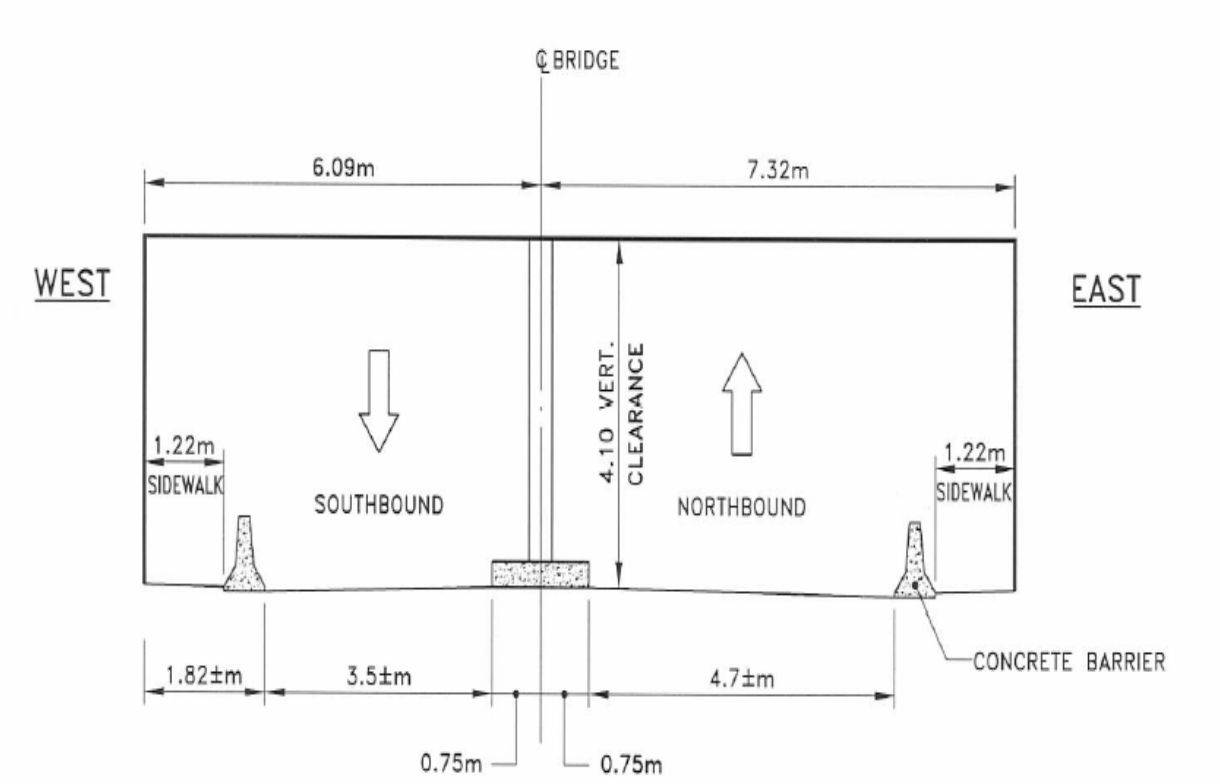
Notes:
[1] Minimum streetcar vertical clearance =4.7m
[2] Minimum streetcar horizontal clearance (outside) = 1.0m
[3] Minimum streetcar horizontal clearance (median) = 0.75m

Approximately 50 m of storage length is available on Scarlett Road between the intersections of Dundas Street West and St. Clair Avenue West. As a result of this restriction and the availability of only a single lane through the underpass, all southbound Scarlett Road traffic must turn right at Dundas Street West; this turn is channelized. At St. Clair Avenue West, one of the two southbound through lanes becomes a left-turn lane. A second left-turn lane is introduced at the intersection to accommodate the heavy southbound left-turn movement onto St. Clair Avenue West.

The single northbound lane through the underpass receives westbound right-turns and eastbound left-turns from Dundas Street West; the westbound right-turn movement is channelized. At the St. Clair Avenue West intersection, the single northbound lane accommodates the through and right-turn movements. A second northbound lane is introduced at the north side of the St. Clair Avenue West intersection.

There is a local road intersection (Bernice Crescent) located approximately 90 m north of St. Clair Avenue West. A pedestrian cross-over, with actuated flashers, crosses the north leg of this intersection. A second local road (Eileen Avenue) crosses Scarlett Road approximately 140 m north of Bernice Crescent. Foxwell Street, a collector road, provides a connection between Scarlett Road and Jane Street and is located approximately 180 m north of Eileen Avenue. Foxwell Street is stop-controlled at Scarlett Road; the Foxwell Street/Jane Street intersection is signalized. Southbound left-turns are prohibited (by signage) on Scarlett Road between the hours of 4:00 p.m. and 6:00 p.m. daily.

Exhibit 3-2: Existing Structure Clearances



There is no information available related to the existing pavement structure of Scarlett Road. The pavement is generally in good condition as reported by pavement condition surveys provided by the City. The pavement condition rating for Scarlett Road (within the Study Area) and year of last resurfacing/reconstruction is detailed on **Table 3-2**.

Table 3-2: Pavement Condition Rating

Scarlett Road Section	Pavement Rating	Year Last Rehabilitated
At Dundas	8.0	1995 – resurfaced
Dundas to St. Clair	8.0	Either 1992 or 1995
At St. Clair	7.2	1992 – resurfaced
Scarlett north of St. Clair	6.5	1983 – reconstructed
Source: City of Toronto Works and Emergency Services Department (Pavement Rating as of 2005)		

3.2.1.3 St. Clair Avenue West

St. Clair Avenue West is a major arterial road that extends east from Scarlett Road. It has a basic four lane cross section through the entire Study Area. At the intersection with Scarlett Road, the two westbound lanes become a right-turn lane and a left-turn lane.

St. Clair Avenue West is parallel to the northern limit of the CP Rail right-of-way between Scarlett Road and Jane Street. East of Jane Street it continues directly east, diverging from the tracks, which extend in a more southeasterly direction. A sidewalk is provided on only the north side of St. Clair Avenue West between Scarlett Road and Jane Street.

3.2.1.4 Dundas Street West

Dundas Street West is a major arterial road with a basic four lane cross section, extending east-west across the southern side of the Study Focus. At the Scarlett Road intersection, there is an eastbound left-turn lane and a westbound channelized right-turn lane. A bus stop is located on the east side channelization island. The island is set back from the westbound through lanes to create a bus bay.

Dundas Street West parallels the southern limit of the CP Rail right-of-way east of Scarlett Road. A local street (Gooch Avenue) intersects with Dundas Street West on the south side, approximately 50 m east of Scarlett Road. Approximately 150 m further east, there is a signalized access to a major grocery store (Loblaws). An additional access is provided to this store via Gooch Avenue.

To the west of Scarlett Road, Dundas Street West extends to the southwest, diverging from the CP Rail tracks. Humberhill Avenue, a residential collector road, extends south from Dundas Street West at a recently signalized intersection approximately 200 m west of Scarlett Road. The primary access to Lambton Park and the Lambton Arena is located on the north side of Dundas Street West approximately 350 m west of Scarlett Road.

Sidewalks are provided on both sides of Dundas Street West west of Scarlett Road. A sidewalk is provided on the south side of Dundas Street West east of Scarlett Road, but the north side sidewalk ends approximately 50 m east of the intersection. Pedestrian crossings are marked across the northbound lane and the southbound and westbound channelized right-turn lanes at the Scarlett Road intersection. A pedestrian crosswalk across Dundas Street West is marked (and provided with signals) only on the east side of the Scarlett Road intersection.

The section of Dundas Street West in the area of Scarlett Road is identified as a location for a proposed bicycle lane in the City of Toronto Cycling Master Plan Study. The bicycle lane is anticipated to have a width of 1.5 to 2.0m. The Dundas Street West bicycle lane is intended to provide connectivity between the proposed Scarlett Road bicycle lane and lanes extending to the south along the Humber Valley to the west and through a residential area to the east.

3.2.2 Traffic Signal Operations

The intersections of Scarlett Road with St. Clair Avenue West and Dundas Street West are controlled by traffic signals. At St. Clair Avenue West, the southbound left-turn movement operates as protected only because of the dual left-turn lanes. The southbound through movement operates concurrently with the southbound protected left-turn phase. The westbound right-turn movement also operates concurrently with the southbound protected left-turn phase, except between 8:00 a.m. and 5:00 p.m. on weekdays; right-turns on red are also prohibited during these hours.

The St. Clair Avenue West signal is interconnected with the signal at Dundas Street West so that the northbound/ southbound green at St. Clair starts five seconds before the eastbound protected left-turn phase at Dundas. This allows northbound traffic queued through the underpass to clear the St. Clair Avenue West intersection before left-turning traffic from Dundas Street West is released, so that this traffic can flow through the underpass without having to stop.

At the intersection of Scarlett Road and Dundas Street West, all southbound traffic is required to turn right. This movement is channelized, so it is not controlled by the traffic signal. The westbound right-turn is also channelized. The traffic signals control only the eastbound and westbound through movements, the eastbound left-turn movement and the north-south pedestrian crossing on the east leg of the intersection. The eastbound left-turn movement is protected only. The protected only phasing allows the eastbound left-turn movement from Dundas Street West to be synchronized with the northbound through movement at St. Clair Avenue West, to reduce the build-up of queues in the underpass.

The eastbound through movement on Dundas Street West receives a green signal at all times except when a pedestrian activates the push button to cross Dundas Street West. When a pedestrian actuation occurs, eastbound and westbound through traffic is stopped, and the north-south pedestrians receive their "Walk" indication at the same time as the eastbound protected left-turn phase.

The traffic signals at the Scarlett Road/Dundas Street West intersection are part of the City's central control system. A common cycle length, currently 80 seconds, is used for signals on this part of Dundas Street West to allow for co-ordination. The Scarlett Road/St. Clair Avenue West signal is not on the central control system, but it must also run on an 80-second cycle to maintain co-ordination with the Dundas Street West signal.

3.2.3 Transit Operations

GO Transit operates its Milton Line on the CP Rail Galt Subdivision, over Scarlett Road. Twelve trains operate throughout the day, Monday to Friday between 0:700 to 23:00. The closest GO Station to the Study Focus area is Kipling GO Station located near the intersection of Dundas Street West, Bloor Street and Kipling Avenue (Six Points Interchange) in Etobicoke.

The need for additional GO Rail Service in this corridor has been identified in the "GO Route Map to the Future" document (August 2000). For planning purposes, GO has identified a need to accommodate up to 54 trains per day, including peak period, midday and evening service.

Four Toronto Transit Commission routes operate in or near the Study Focus Area. They are:

- **30 Lambton** – Operates along Dundas Street West from the Kipling GO Station to the High Park subway station on the Bloor-Danforth line.

- **35 Jane** – Operates along Jane Street from north of York University to the Jane Street subway station on the Bloor-Danforth line.

- **55 Warren Park** – Operates from the Jane Street subway station along Jane Street to Dundas Street West and down Humberhill Avenue.

- **79 Scarlett Rd** – Operates from Jane Street/Lawrence Street West down Scarlett Road. In rush hour it operates down Scarlett Road to St. Clair Avenue West to Runnymede to the Runnymede subway Station on the Bloor-Danforth line. The main route uses Foxwell/Pritchard/Henrietta to access Runnymede.

The Toronto Catholic District School Board operates buses within the area for St. James Catholic School, located at 230 Humbercrest Boulevard. Bus stop locations go as far north as Black Creek, east to Jane and west to Bernice/Eileen (west of Scarlett Road).

The Toronto District School Board transports approximately 30 students to the two local elementary schools, Lambton Park Community School and George Syme Community School. Two buses provide these services. A small number of students are transported mid-day to gifted programs at schools outside the Study Area. These buses do not currently use Scarlett Road through the CP Rail Bridge.

3.2.4 Toronto Bike Plan

The 2001 Toronto Bike Plan "Proposed Bikeway Network" proposes that Scarlett Road from Eglinton Avenue to Dundas Street West have a bike lane. The proposed bike lane would continue along Dundas Street West westerly to Humber River and easterly to connect to a shared roadway route on Humbercrest Boulevard.

Chapter 4 of the Toronto Bike Plan recommends the provision of bicycle friendly features for bridges/underpasses. Bicycle friendly features include provision of bike lanes and improvements to lighting and drainage.

3.2.5 Safety Review

A safety review of the Study Focus Area was carried out, consisting of analysis of the reported collision history at the Scarlett Road/Dundas Street West and Scarlett Road/St. Clair Avenue West intersections, and a site inspection.

The collision analysis was based on the following data, obtained from the City of Toronto Traffic Data Centre:

- Motor vehicle accident reports for the period January 1, 2000 to December 31, 2002;
- A 'Collision Directory Report' from the City of Toronto summarizing collisions for the same period; and
- Safety Performance Function parameters for signalized intersections in the City of Toronto based on the 2002 iTrans Report entitled 'Network Evaluation – Signalization Intersection Study'.

A site inspection was carried out between 11:30 am and 2:00 pm on Monday, October 20th 2003. The purpose of the site inspection was to review any potential hazards identified in the previous site inspection carried out in 2001 and to determine if any new hazards are occurring. A potential hazard may be a deficiency in safety, operations and/or positive guidance at a location that may or may not be contributing to a specific collision concern.

3.2.5.1 Collision History - Scarlett Road/Dundas Street West Intersection

Based on a review of the information provided to the study team, a total of 66 reported collisions occurred at or in the immediate vicinity of the Scarlett Road and Dundas Street West intersection between January 1, 2000 and December 31, 2002. **Table 3-3** provides a summary of the distribution of collisions in this three-year period.

Table 3-3: Collision History - Scarlett Road at Dundas Street West Intersection

Year	Number of Collisions
2000	24
2001	25
2002	17

Exhibit 3-3: Collision Diagram, Dundas Street W. and Scarlett Rd. (2000 – 2002) shows all 66 collisions, and includes collisions occurring immediately upstream and downstream of the intersection, including all collisions occurring on the southbound channelized right-turn lane. No fatal collisions occurred during the study period.

Safety Performance Function (SPF) parameters for the prediction of collisions at signalized intersections were used to estimate the expected number of collisions occurring at the Dundas Street West/Scarlett Road intersection. The SPF parameters used were specific to the City of Toronto and are documented in the May 2002 iTrans report "Network Evaluation – Signalization Intersection Study" for the City of Toronto. The particular parameters used for the estimation are applicable to 3-legged intersections with a Major Arterial intersecting a Minor Arterial (Grouping 4). The parameters were used to calculate the expected number of fatal/injury collisions and property damage only collisions.

The actual collision frequency (sub-grouped for fatal/injury combined and property damage only separately) at the subject intersection was smoothed statistically, to eliminate yearly fluctuations in the number of collisions, and to obtain a more representative, long-term performance estimate.

Based on the results, the smoothed fatal/injury collision frequency for the intersection was found to be slightly higher than the expected collision frequency. The smoothed property damage only collision frequency was found to be substantially higher than the expected collision frequency. These results indicate that the intersection is experiencing a slightly higher frequency of fatal and injury collision occurrence than would otherwise be expected, and a substantially higher frequency of property damage only collision occurrence than would otherwise be expected (**Table 3-4**)

Exhibit 3-3: Collision Diagram, Dundas Street W. and Scarlett Rd. (2000 – 2002)

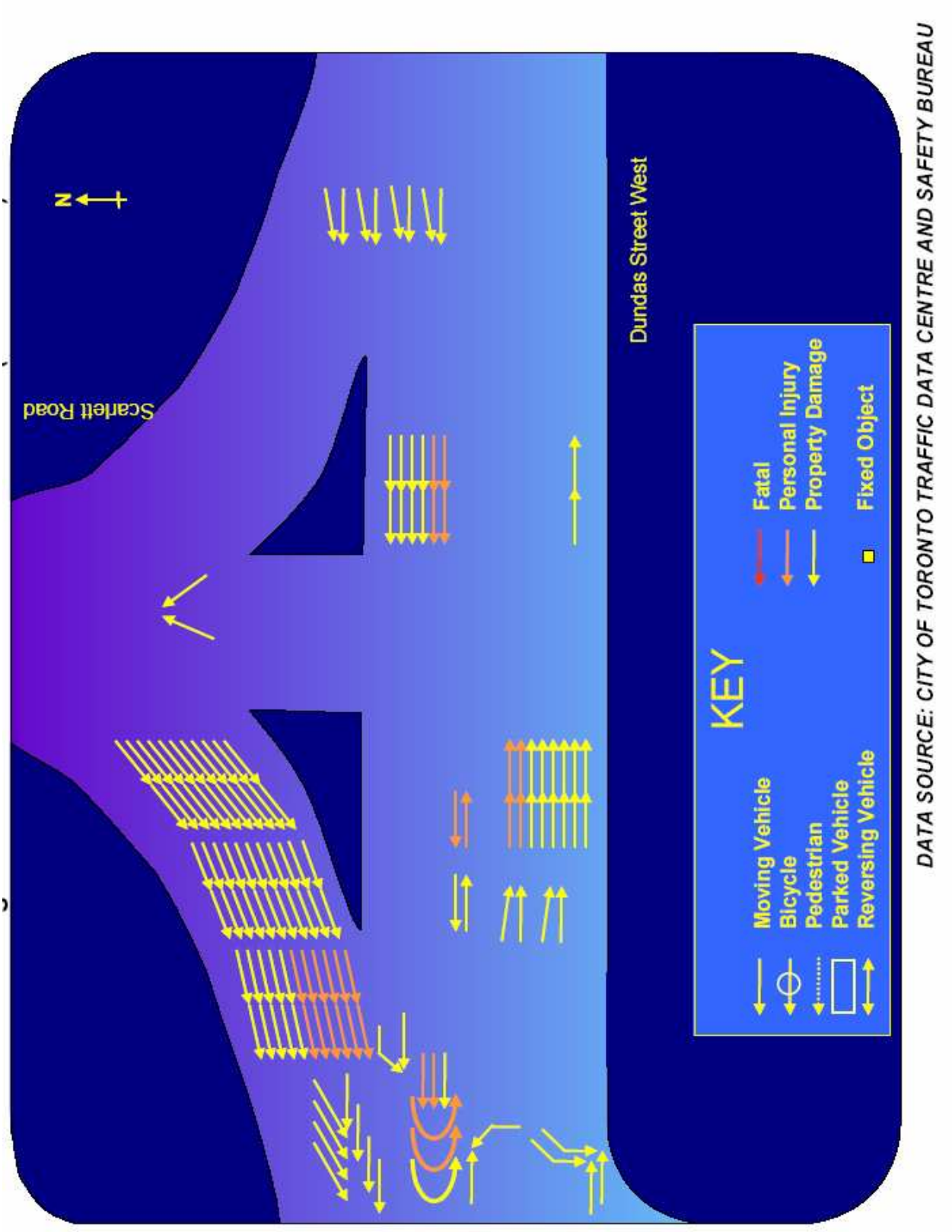


Table 3-4: Dundas Street West and Scarlett Street Comparison of Expected and Smoothed Collisions/Year

Collision Type	Volume	Smoothed Collision Frequency[3]	Expected Collision Frequency[4]	Higher than Expected
Fatal and Injury	Major[1] – 29,167	4.5 collisions/year	3.6 collisions/year	Yes
Property Damage Only	Minor[2] – 6,171	16.3 collisions/year	7.7 collisions/year	Yes

Notes:

1. Estimated volume per day entering intersection on major approach, based on 8 hour count taken in 2002 and an expansion factor.
2. Estimated volume per day entering intersection on minor approach, based on 8 hour count taken in 2002 and an expansion factor.
3. The smoothed collision frequency is calculated as m = [(1-w) * count/n] + w (SPF) where w = k/(k+n(SPF), k = 2.9 (Fatal and Injury)/ 2.7 (PDO) and n = 3 years
4. The expected collision frequency is calculated as $m = a (F1)^{b1} * (F2)^{b2}$ where
   a = 0.000866 (PDO), a = 0.000326 (Fatal and Injury)
   F1 = Major volume, b1 = 0.441 (PDO), b1 = 0.588 (Fatal and Injury)
   F2 = Minor volume, b2 = 0.523 (PDO), b2 = 0.375 (Fatal and Injury)

This poorer performance may be attributable to the geometry of the intersection, operations, or to other environmental and/or situational issues. To assess the potential causal factors of collisions, the characteristics attributable to the collision experience were compared to established norms, to search for over-representations.

3.2.5.1.1 Collision Characteristics

The collision characteristics were tested for over-representation using the Chi-Square test, described in **Appendix D**. A finding of over-representation indicates a collision characteristic exceeds expected norms by a statistically significant margin, and is therefore not the result of random chance. Suitable aggregate data on signalized intersections in the City of Toronto were not available for use in this study. Therefore, aggregate data from signalized intersections in the Region of Durham for a three-year period (2000 – 2002), representing primarily urban areas was used. Comparisons of collision type, season, day of week, time of day, weather, road surface and light conditions were made.

3.2.5.1.2 Collision Type

Collision type was examined to assist in the identification of casual factors. The original motor vehicle collision reports for Scarlett Road/Dundas Street West intersection were referenced to determine the collision type as shown in **Table 3-5**.

Table 3-5: Collision Type at the Scarlett Road/Dundas Street West Intersection

Collision Type	Frequency	Percentage
Rear End	46	69.7%
Sideswipe	10	15.1%
Turning Movement	7	10.6%
Approaching	2	3.0%
Angle	1	1.5%
Total	**66**	**100.0%**

The most predominant types of collisions occurring at the intersection are rear end and sideswipe collisions. Together, these two types account for 85% of the collisions occurring at the study site. The Chi-squared test was used to determine if the proportions of collision types exhibited at the study site were significantly different than typically found at signalized intersections. The tests identified rear end and sideswipe collisions as having a significantly higher than expected occurrence at the Scarlett Road/Dundas Street West intersection. It was noted that the same collision types were over represented in the previous report *Scarlett Road/CP Rail Grade Separation Feasibility Study: Final Report (November 7, 2001).*

The following observations were made with regard to the two over-represented collision types:

- **Rear End Collisions –** A large majority of the rear end collisions (33) at the Scarlett Road and Dundas Street West intersection occurred in the southbound channelized right-turn lane. Six (6) of these collisions resulted in an injury. From the police narrative reports, it was noted that motorists were not expecting vehicles to be stopped in the channelized lane. Some possible causes were determined:

    - Restricted sight distances, due to the presence of the bridge structure and its embankment prevents motorists from seeing stopped vehicles until the last minute;

    - Last minute braking due to uncertainty as to whether it is safe to merge, this braking may surprise the following vehicle;

    - Motorists not expecting vehicles to stop at the yield sign when there is no through traffic on Dundas Street West; and

    - The channelization diverting all southbound traffic from the intersection may contribute to reduced motorist awareness of potential conflicts related to intersection operations.

Eight (8) rear end collisions occurred on the eastbound approach and another five (5) rear end collisions occurred on the westbound approach. A scan of the police narrative found no common causal factor. Aggressive lane changing, tailgating, sudden braking due to uncertainty/ inattention and weather/road conditions was noted as contributing factors.

- **Sideswipe Collisions –** An investigation of the sideswipe collision analysis showed no common site specific problem, but the following was observed:

    - Three collisions occurred between a southbound vehicle merging with a westbound vehicle. It is possible that the presence of a bus shelter or a stopped bus could be preventing southbound merging motorists from observing through vehicles travelling westbound. In addition, the pavement markings on the westbound approach of Dundas Street West demarcate a lane for buses in addition to the two through lanes. This 'third' lane does not continue through the intersection, but may when empty give motorists in the southbound channelized right-turn lane the false impression that it is safe to merge

    - Four sideswipe collisions occurred on the westbound approach, these appear to have occurred due to sudden lane changes and failing to signal a lane change.

- Left-turn/U-Turn Collisions – This collision type was not over represented, yet was noted due to the southbound channelization at the intersection, which prevents motorists on Scarlett Road from turning

left onto Dundas Street West. A total of six collisions involved either a left-turn or U-turn movement on westbound Dundas Street West downstream of the intersection. It was noted that there is a left-turn and U-turn prohibition for traffic on westbound Dundas Street West downstream of the intersection. Of the six collisions, two resulted in an injury.

No other collision characteristic was found to be over-represented. No collisions were observed involving pedestrians or cyclists.

3.2.5.1.3 Summary of Collision Analysis at Scarlett Road/Dundas Street West Intersection

Based on the collision analysis summarized above, the following has been established:

- The Scarlett Road/Dundas Street West intersection is currently experiencing a fatal/injury collision frequency that is greater than expected;
- The Scarlett Road/Dundas Street West intersection is currently experiencing a property damage only collision frequency that is substantially greater than expected;
- Two collision types are over-represented, specifically rear end and sideswipe collisions.
- Left-turn and U-turn collisions were noted as occurring on westbound Dundas Street West downstream of the intersection, despite a prohibition on these movements.

3.2.5.1.4 Site Inspection of Scarlett Road/Dundas Street West Intersection

Crosswalk Location

In the previous site visit, it was observed that sight distance is restricted at the existing pedestrian crosswalk that crosses the channelized southbound right-turn lane. Sight distance restrictions may inhibit motorist's ability to perceive a pedestrian crossing the road and to react accordingly. As well, pedestrians have restricted sight distance of approaching vehicles. A sign installed at the crosswalk informs pedestrians to wait for a gap in traffic to cross the street. Pedestrians are waiting for gaps in traffic, however, at least one pedestrian was observed crossing closer to the railway structure so that she could better look out for approaching vehicles. Although no collisions involving pedestrians occurred during the study period, it is believed that the potential for a collision is greater at this site than what would be typically expected at a crosswalk location.

Southbound Channelized Right-Turn Lane

Apart from the large cluster of rear end collisions and casual factors noted earlier in the collision analysis, the southbound channelized right-turn lane was identified as being problematic. All southbound traffic on Scarlett Road at Dundas Street West is currently diverted into the channelized right-turn lane by way of a narrow median and hazard markers. This median may not physically prevent motorists from crossing into Dundas Street West should they fail to negotiate the curve. An illumination pole is located in the median and may be a potential hazard for motorists if they were to lose control while negotiating the curve. No collisions relating to this particular hazard have been identified as occurring during the study period.

Bus Stop Location/Lane Markings

A bus stop is located on the westbound approach of Dundas Street West. When a bus is stopped, it prevents motorists in the southbound channelized right-turn lane from seeing westbound traffic approaching. In addition, the pavement markings on the westbound approach of Dundas Street West demarcate a lane for buses in addition to the two through lanes. This 'third' lane does not continue through the intersection, but may when empty give motorists in the southbound channelized right-turn

lane the false impression that it is safe to merge. Three sideswipe collisions involving through westbound vehicles and merging vehicles from the southbound channelization may be attributable to this condition.

Side Street Conflicts

It was observed that the proximity of Gooch Avenue to the Dundas Street West/Scarlett Road intersection creates vehicle-turning conflicts outside of the confines of the traffic signals, giving rise to increased collision potential. Motorists coming from Gooch Avenue must wait for adequate gaps in traffic to enter or cross Dundas Street West. Sight distance is limited, particularly for motorists on Gooch Avenue looking for westbound traffic. To proceed to Scarlett Road, vehicles have to cross multiple traffic lanes to enter the channelized right-turn lane leading to potential conflicts. No collisions relating to this particular hazard have been identified.

Assignment of Right-of-Way for Northbound Traffic

At times during the site visit, traffic was observed backed up in the northbound approach to the CP Rail Structure. Traffic making the right-turn from westbound Dundas must yield to traffic making the left-turn from eastbound Dundas. This is contrary to motorist expectations. It was observed that motorists making the left-turn were yielding to motorists making the right-turn. A lack of a clear understanding of the assignment of right-of-way for northbound traffic may lead to potential merging conflicts and/or sideswipe collisions. One collision occurred involving left and right-turn movements onto Scarlett Road from Dundas Street West immediately south of the railway structure.

Exhibit 3-4 illustrates some of the issues identified in the site investigation.

Exhibit 3-4: Site Investigation, Scarlett Road and Dundas Street West

Sight Distance Restricted

Picture shows view of southbound channelization from the vantage point of a pedestrian about to cross the channelization.

Assignment of Right-of-Way for Northbound Traffic

Motorists turning left and right off Dundas Street do not appear to be clear on which vehicle has the right-of-way.

Roadside Hazard

Median indicated with arrow may not physically prevent motorists from crossing into Dundas Street. Illumination pole may be a potential hazard for errant vehicles.

Bus Stop Location/Lane Markings

Bus stop shelter and stopped buses block view of traffic on westbound Dundas Street. Lane markings in front of bus stop may mislead motorists into believing there is an acceptable gap for merging with westbound traffic.

3.2.5.2 Collision History - Scarlett Road/St. Clair Avenue West Intersection

Based on a review of the information provided to the study team, a total of 35 reported collisions occurred at or in the immediate vicinity of the Scarlett Road and St. Clair Avenue West intersection between January 1, 2000 and December 31, 2002. **Table 3-6** provides a summary of the distribution of collisions in this three-year period.

Table 3-6: Collision History of Scarlett Road and St. Clair Ave. Intersection

Year	Number of Collisions
2000	13
2001	8
2002	14

Exhibit 3-5 shows all 35 collisions, and includes collisions occurring immediately upstream and downstream of the intersection. No fatal collisions occurred during the study period.

Safety performance function parameters for the prediction of collisions at signalized intersections were used to estimate the expected number of collisions occurring at the St. Clair Avenue West/Scarlett Road intersection. These parameters are documented in the May 2002 iTrans report "Network Evaluation – Signalization Intersection Study" for the City of Toronto. The particular parameters used for the estimation are applicable to 3-legged intersections with a Major Arterial intersecting a Minor Arterial (Grouping 4).

The parameters were used to calculate the expected number of fatal and injury collisions (combined) and property damage only collisions.

The actual collision frequency (subgrouped for fatal and injury combined and property damage only separately) at the subject intersection was smoothed statistically, to eliminate yearly fluctuations in the number of collisions, and to obtain a more representative, long-term performance estimate.

Based on the results, the smoothed fatal and injury collision frequency was found to be slightly lower than the expected collision frequency. The smoothed property damage only collision frequency was found to be slightly higher than the expected collision frequency. These results indicate that the intersection is experiencing a slightly lower frequency of fatal and injury collision occurrence than would otherwise be expected, and a slightly higher frequency of property damage only collision occurrence than would otherwise be expected (**Table 3-7**)

Table 3-7: St. Clair Avenue West and Scarlett Road Comparison of Expected and Smoothed Collisions/Year

Collision Type	Volume	Smoothed Collision Frequency[3]	Expected Collision Frequency[4]	Higher than Expected
Fatal and Injury	Major[1] – 19,160 Minor[2] – 7,604	2.8 collisions/year	3.1 collisions/year	No
Property Damage Only		8.8 collisions/year	7.2 collisions/year	Yes

Notes:

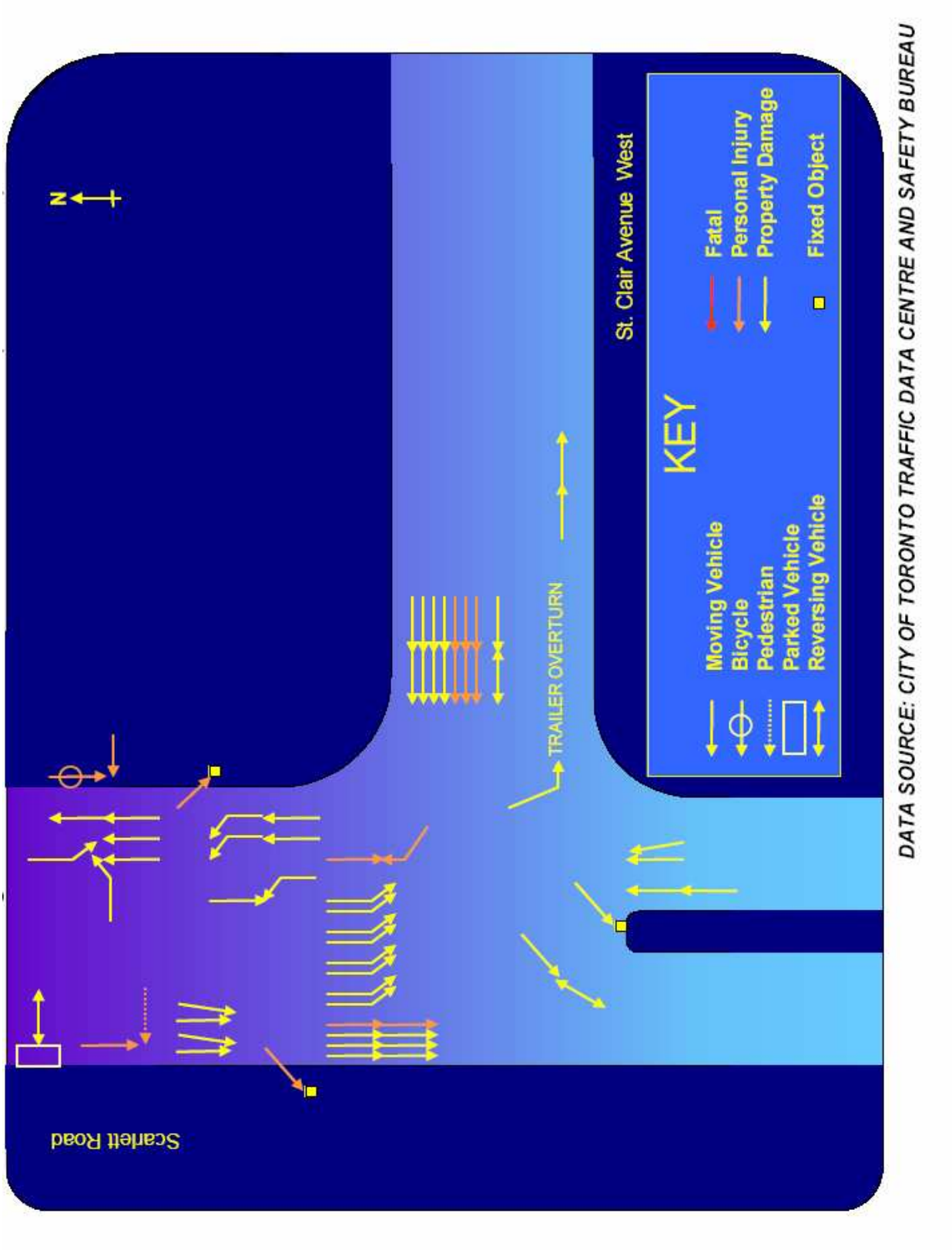
1. Estimated volume per day entering intersection on major approach, based on 8 hour count taken in 2002 and an expansion factor.
2. Estimated volume per day entering intersection on minor approach, based on 8 hour count taken in 2002 and an expansion factor.
3. The smoothed collision frequency is calculated as m = [(1-w) * count/n] + w (SPF) where w = k/(k+n(SPF), k = 2.9 (Fatal and Injury)/ 2.7 (PDO) and n = 3 years
4. The expected collision frequency is calculated as $m = a (F1)^{b1} * (F2)^{b2}$ where
   a = 0.000866 (PDO), a = 0.000326 (Fatal and Injury)
   F1 = Major volume, b1 = 0.441 (PDO), b1 = 0.588 (Fatal and Injury)
   F2 = Minor volume, b2 = 0.523 (PDO), b2 = 0.375 (Fatal and Injury)

The poorer performance for property damage only collisions may be attributable to the geometry of the intersection, operations, or to other environmental and/or situational issues. To assess this, the characteristics attributable to the collision experience were compared to established norms, to search for over-represented characteristics.

3.2.5.2.1 Collision Characteristics

The collision characteristics were tested for over-representation using the Chi-Square test described in **Appendix D**. A finding of over-representation indicates a collision characteristic exceeds expected norms by a statistically significant margin, and is therefore not the result of random chance. Suitable aggregate data on signalized intersections in the City of Toronto were not available for use in this study. Therefore, aggregate data from signalized intersections in the Region of Durham for a three-year period (2000 – 2002), representing primarily urban areas, was used.

Exhibit 3-5: Collision Diagram Scarlett Road and St. Clair Avenue West



3.2.5.2.2 Collision Type

Collision type was examined to assist in the identification of casual factors. The original motor vehicle collision reports for Scarlett Road/St. Clair Avenue West intersection were referenced to determine the collision type as shown in **Table 3-8**.

Table 3-8: Collision Type at the Scarlett Road/St. Clair Avenue West Intersections

Collision Type	Frequency	Percentage
Rear End	15	42.9%
Sideswipe	8	22.9%
Single Motor Vehicle	7	20.0%
Turning Movement	4	11.4%
Other	1	2.9%
Total	**66**	**100.0%**

The most predominant types of collisions occurring at the intersection are rear end, followed by sideswipe and single motor vehicle collisions. Together these three types account for 86% of the collisions occurring at the study site. The Chi-squared test was used to determine if the proportions of collision types exhibited at the study site were significantly different than that typically found at signalized intersections as determined by the data available from the Region of Durham. The tests identified sideswipe collisions and single motor vehicle collisions as having a significantly higher than expected occurrence at the Scarlett Road/St. Clair Avenue West intersection. It was noted that sideswipe collisions were over represented in the previous report *Scarlett Road/CP Rail Grade Separation Feasibility Study: Final Report (November 7, 2001).*

The following observations were made with regard to the two over-represented collision types:

- **Sideswipe Collisions –** Four of the sideswipe collisions involved vehicles turning left in the dual left-turn lanes from Scarlett Road to St. Clair Avenue West. In all instances, one of the vehicles encroached into the lane of the other vehicle. In one instance, a turning bus struck a vehicle in the adjacent lane. In another instance, a turning driver cut another vehicle off in advance of a lane closure downstream on St. Clair Avenue West. It was noted that skip lines are used to demarcate the two left-turn lanes and left-turn arrows are clearly shown on Scarlett Road on the southbound approach;

- Two sideswipe collisions involved southbound vehicles on Scarlett Road, one involving a passenger door being opened by a disembarking passenger getting struck by a passing vehicle;

- One sideswipe collision involved two northbound vehicles emerging from the railway structure;

- One sideswipe collision involved a truck reversing away from the railway structure striking a following vehicle. The truck driver likely failed to observe the height restriction sign posted at the underpass.

- **Single Vehicle Collisions –** A total of seven single vehicle collisions were observed. Three of the collisions resulted in an injury. The circumstances surrounding these collisions are as follows:

    - A motorist backing out of a driveway losing control of their vehicle and striking a parked vehicle on the west side of Scarlett Road;

- A pedestrian crossing between a queue of vehicles waiting on the north approach of Scarlett Road being struck by a vehicle in the southbound curb lane, resulting in an injury;

- A bicyclist riding against traffic on the east sidewalk of Scarlett Road being struck by a vehicle leaving a parking lot, resulting in an injury;

- A vehicle losing control while making a left-turn from St. Clair Avenue West onto Scarlett Road striking the median in the middle of the railway structure;

- A southbound vehicle on Scarlett Road losing control and striking a utility pole, resulting in an injury;

- A southbound vehicle on Scarlett Road losing control and striking a fire hydrant;

- A trailer overturning on a truck attempting a left-turn from Scarlett Road to St. Clair Avenue West.

No common casual factor was observed among the single vehicle collisions occurring at and in the vicinity of the intersection. All but one of the collisions involved dry road surface conditions.

No other collision characteristic was found to be over represented.

3.2.5.2.3 Summary of Collision Analysis at Scarlett Road/St. Clair Avenue West Intersection

Based on the collision analysis summarized above, the following has been established:

- The Scarlett Road/St. Clair Avenue West intersection is experiencing a slightly lower than expected number of fatal/injury collisions;

- The Scarlett Road/St. Clair Avenue West intersection is experiencing a slightly higher than expected number of property damage only collisions;

- Sideswipe and single motor vehicle collisions are over-represented.

3.2.5.2.4 Site Investigation of Scarlett Road/St. Clair Avenue West Intersection

<u>CP Rail Bridge Structure, South of St. Clair</u>
The CP Rail Bridge Structure was noted in the previous site inspection as being a potential hazard. The structure allows one traffic lane in each direction with sidewalks on each side. A center pier of columns separates the two lanes. The narrowness of the lanes reduces the allowable turning radius for vehicles turning left from St. Clair Avenue West. The median structure was inspected again, confirming that the structure has been recently hit and continues to be a potential hazard for motorists. The pier and its columns continue to present a hazard and the bridge columns in the median restrict sight distances.

During the study period, two collisions occurred involving the CP Rail Bridge Structure. In the first collision, a truck was unable to complete its turn underneath the structure and reversed into a following vehicle. In the second collision, a vehicle lost control and struck the middle column of the bridge structure.

In the previous site visit, an existing concrete barrier was identified between the southbound lane of Scarlett Road and the pedestrian walkway as being a hazard. A similar structure is also present dividing the northbound lanes of Scarlett Road and the pedestrian walkway. The end treatment of the barrier on both approaches to the concrete barrier uses a sloped section, which has the potential to "launch" vehicles. A hazard sign had been provided in both directions to delineate the concrete barrier. Both signs have been vandalized, either being bent completely flat or thrown into the bushes on the railway embankment. In a later site visit, it was noted that both signs were repaired. No collisions involving the concrete barrier were observed during the study period.

Southbound Left-turns

Southbound left-turn movements from Scarlett Road to St. Clair Avenue West are made from the dual left-turn lanes. The end of the north-south phase has a lag protective left-turn phase. It was observed that motorists were aggressively using the amber phase and all-red period to turn left. On two occasions, motorists on St. Clair Avenue West had a green phase while southbound left-turn motorists were still turning left.

It was also noted that motorists proceeded through on Scarlett Road from the rightmost left-turn lane. It was not known whether the motorists were merely ignoring the pavement markings and the lane designation signs, or whether they may have misinterpreted the dual through traffic signals as allowing through movements from two lanes rather than one.

Driver Workload

The previous site inspection identified a preponderance of traffic and non-traffic signing devices in the view of the driver, particularly on the southbound approach to the intersection. These remain today. There are information signs for pedestrians, warning signs, advertising signs, lane designation signs and multiple traffic signal heads. These devices all compete for the attention of the drivers. Compounding the situation is the fact that these elements are presented in a constrained location, which increases the demand placed on the drivers to interpret and respond to each. The high demands placed on drivers at this location can impact their ability to make proper choices regarding proper traffic lane selection and interpretation of traffic signs and signals. No specific collision can be attributed directly to driver workload issues.

Grade on southbound and westbound approaches

It was noted in the previous site inspection that the roadway grade declines in the southbound and westbound directions. This may have been contributing to a loss of control collision problem, possibly due to polished pavement surface. There were three loss of control collisions during the study period, two on southbound Scarlett and one involving a left-turn from St. Clair Avenue West to Scarlett Road striking the CP Railway Bridge Structure. In addition, a trailer overturned on the back of a left-turning truck. The grade change from Scarlett Road to St. Clair Avenue West may have been a contributing factor.

Pedestrian Facilities under CP Rail Bridge

Sidewalks located under the CP Rail bridge do not create a safe and attractive environment for pedestrians. The bridge under-structure lacks proper drainage conditions. No illumination is provided under the bridge and improvements would enhance pedestrian service. A screen has been added to the understructure to prevent pigeons from nesting, however the other issues remain. No collisions involving pedestrians were observed in the vicinity of the bridge structure.

Parking Facilities

During the lunch hour, a plaza located on the east side of Scarlett Road, immediately north of the intersection with St. Clair Avenue West generated a significant amount of traffic movements in and out of the parking lot. Motorists were observed waiting in the curb lane for a free parking spot in the plaza or

parking in the curb lane itself. A no stopping sign is clearly posted on the road adjacent to the plaza. Police do not appear to be enforcing the no stopping restriction – a police car was observed leaving the plaza without taking any action against vehicles parking along the curb. The above activity caused last minute merging and delays in the curb lane.

It was noted in the site inspection that parking is permitted upstream of the intersection in the eastbound curb lane of St. Clair Avenue West during off peak hours. A vehicle was parked in the curb lane for a significant part of the site inspection and was causing numerous merging conflicts with vehicles turning left onto St. Clair Avenue West from the dual left-turn lanes. In addition, a delivery truck was observed on southbound Scarlett Road north of the intersection stopped in a no stopping zone in front of a store. Its presence affected traffic approaching the intersection from the north. No collisions relating to the above issue were identified.

Exhibit 3-6: Site Investigation, Scarlett Road and St. Clair Avenue West illustrates some of the issues identified in the site investigation.

Exhibit 3-6: Site Investigation, Scarlett Road and St. Clair Avenue West

3.2.6 Traffic Operations Analysis

The analysis and simulation of the "Do Nothing" alternative (existing geometric conditions) under existing and projected future traffic volumes have been completed. This section summarizes the data used, the methodology and the results.

3.2.6.1 Traffic Volume Data

All traffic volumes were provided by the City of Toronto. The count dates varied by intersection as follows:

- Dundas Street West and Scarlett Road – August 2002;
- Scarlett Road and St. Clair Avenue West – November 2002;
- Scarlett Road and Bernice Crescent – May 2001;
- Dundas Street West and Gooch Avenue – May 2003;
- Dundas Street West and Humberhill Avenue – May 2001; and
- Dundas Street West at Loblaws entrance – February 1999.

2002 was used as the base year for existing conditions analysis. Prior to the analysis, the following adjustments were applied to the count volumes to obtain consistent volumes between intersections:

- Volumes and truck percentages on Scarlett Road between Dundas Street West and St. Clair Avenue West were balanced; and

- Through volumes at the minor intersections (Gooch Avenue, Humberhill Avenue, Bernice Crescent and the Loblaws entrance) were carried through from the adjacent major intersection, while turning movements to and from the side street were taken from the count.

A summary of the balanced 2002 traffic volumes at the Dundas Street West/Scarlett Road and Scarlett Road/St. Clair Avenue West intersections is attached as **Appendix E**.

3.2.6.2 Traffic Growth Rates

Growth rates used to project the balanced 2002 volumes to the 2011 and 2021 horizon years were derived from screenline travel demand forecasts produced by the GTA Travel Demand Forecasting model. The screenline rates were found to be more consistent and reasonable than the link growth rates, reflecting the model's calibration on a screenline basis rather than link by link. **Table 3-9** summarizes the growth rates that were applied to estimate the traffic volumes used in the analysis and simulation of the 2011 and 2021 horizon year scenarios.

Table 3-9: Screenline Traffic Volume Growth Rates*

Horizon Year	North of Dundas		North of St. Clair		South of Dundas		West of Scarlett		East of Scarlett	
	NB	SB	NB	SB	NB	SB	EB	WB	EB	WB
2011	0.99%	1.24%	1.41%	1.04%	1.56%	1.55%	0.44%	1.68%	0.39%	1.91%
2021	0.52%	0.74%	0.91%	0.91%	0.86%	0.80%	0.62%	0.89%	0.64%	1.03%

* Compounded annual % growth, from 2001 model base year to horizon year

A summary of the 2011 and 2021 traffic volume projections at the Dundas Street West/Scarlett Road and Scarlett Road/St. Clair Avenue West intersections is provided in **Appendix E**.

3.2.6.3 Operational Analysis

The traffic operations analysis was carried out using Synchro Version 6. The a.m. and p.m. peak hours were analyzed for the existing condition (2002), 2011 and 2021, using the existing traffic signal timing plans, lane geometry and traffic characteristics. The existing condition Synchro files were calibrated to ensure that existing volumes could be processed (volume to capacity ratio < 1.00 for all movements). Details on the calibration adjustments are provided in **Appendix F**. The calibrated Synchro files were then used for the 2011 and 2021 without further adjustment.

The level of service (LOS) and volume to capacity ratio (v/c) results generated by Synchro are summarized in **Table 3-10** for the Dundas Street West/Scarlett Road intersection and in **Table 3-11** for the Scarlett Road/St. Clair Avenue West intersection.

Table 3-10: LOS* and v/c Results, Dundas Street West and Scarlett Road

Year	Peak Hour	Eastbound		Westbound		Southbound	Overall Intersection
		Left	Through	Through	Right	Right	
2002	a.m.	D	A	B	A	C	B
		0.86	0.33	0.31	0.09	0.83	0.61
	p.m.	F	A	B	B	F	C
		0.99	0.40	0.71	0.14	0.99	0.83
2011	a.m.	E	A	B	B	F	E
		0.94	0.34	0.37	0.12	1.07	0.74
	p.m.	F	A	C	B	F	F
		1.08	0.42	0.84	0.18	1.15	0.97
2021	a.m.	E	A	B	B	F	F
		0.96	0.37	0.38	0.14	1.14	0.72
	p.m.	F	A	C	B	F	F
		1.11	0.45	0.86	0.21	1.21	1.01

* The level of service is defined according to average delay per vehicle (in seconds), using the following criteria from the *Highway Capacity Manual*: A ≤ 10; B >10 – 20; C >20 – 35; D >35 – 55; E > 55 – 80; F >80

The analysis showed that critical movements at the Dundas Street West/Scarlett Road intersection are currently operating at capacity during the p.m. peak hour. The critical movements are:

- Eastbound left-turn; and
- Southbound right-turn.

Demands for these movements approximately equal their calculated capacity during the p.m. peak hour, and are projected to be near or at capacity in the a.m. peak hour by 2011. The capacity constraint on the

eastbound left-turn results from a need to operate it in a fixed-time protected only mode to maintain coordination with the Scarlett Road/St. Clair Avenue West intersection. The capacity of the southbound right-turn is limited by a lack of gaps in westbound through traffic. Due to constraints of the analysis methodology, this turn had to be analyzed as a signalized movement, with right-turns on red permitted and an overlap with the eastbound left-turn phase. Actual operations are better than indicated by the analysis.

Table 3-11: LOS* and v/c Results, Scarlett Road and St. Clair Avenue West

Year	Peak Hour	Westbound		Northbound	Southbound		Overall Intersection
		Left	Right	Through/Right	Left	Through	
2002	a.m.	E	B	B	F	A	D
		0.90	0.50	0.83	0.99	0.25	0.91
	p.m.	D	B	D	C	A	C
		0.72	0.44	0.98	0.59	0.34	0.81
2011	a.m.	F	C	C	F	A	F
		1.07	0.59	0.91	1.09	0.28	1.02
	p.m.	D	B	F	C	A	E
		0.86	0.52	1.08	0.65	0.37	0.91
2021	a.m.	F	C	D	F	A	F
		1.10	0.61	0.96	1.18	0.30	1.07
	p.m.	E	B	F	C	A	F
		0.87	0.54	1.13	0.70	0.40	0.95

* The level of service is defined according to average delay per vehicle (in seconds), using the following criteria from the *Highway Capacity Manual*: A ≤ 10; B >10 – 20; C >20 – 35; D >35 – 55; E > 55 – 80; F >80

At Scarlett Road and St. Clair Avenue West, the analysis showed that the intersection is currently operating near capacity in the a.m. peak hour, and is projected to be near or at capacity in both peak hours by 2011. The analysis found capacity/near capacity operations and excessive delays on the following movements:

- Southbound left-turn;
- Northbound through/right-turn; and
- Westbound left-turn.

The delays to these critical movements result from a combination of heavy, conflicting demands and the capacity constraint imposed by the single lane in each direction through the CP Rail underpass.

Additional analyses of the 2011 and 2021 horizon years were completed using traffic signal timing plans optimized by Synchro, to determine whether traffic signal timing changes could address the identified operational issues. The results showed minor performance improvements, but multiple movements at both intersections were still found to be operating near or at capacity with excessive delays. The

effectiveness of traffic signal timing changes is limited by the need to serve heavy conflicting demands at both intersections, while the total available intersection capacity is limited by intersection geometry.

3.2.6.4 Simulation

Operations of Dundas Street West, Scarlett Road and St. Clair Avenue West in the vicinity of the CP Rail underpass were simulated using SimTraffic Version 6. Operation of the road network was simulated for the entire a.m. peak hour and p.m. peak hour in each horizon year, using the volumes, signal timings, lane geometry and traffic characteristics from the corresponding Synchro file. The results were reviewed on screen to identify operational issues.

The simulations generally confirmed the critical movements indicated by the Synchro analysis, with the exception of the southbound right-turn at Dundas Street West and Scarlett Road. The simulations showed this turn to generally operate with little or no delay, with occasional short duration queuing during the highest demand periods. This result is consistent with actual operations. Other operational issues identified by the simulation include:

- Northbound capacity through the CP Rail underpass is reduced because vehicles making right-turns onto St. Clair Avenue West from the single shared lane on Scarlett Road slow through vehicles. Pedestrians crossing St. Clair Avenue West also block northbound right-turns from time to time, stopping all northbound traffic until they clear the intersection. The lack of a northbound right-turn lane also reduces the number of vehicles that can turn right on red, although this effect is minor.

- Westbound right-turn traffic from Dundas Street West quickly fills the northbound lane on Scarlett Road through the CP Rail underpass during the southbound left-turn and westbound phases at the Scarlett Road/St. Clair Avenue West intersection. During the p.m. peak hour, this queue spills back onto the Dundas Street West westbound through lanes, creating delays for westbound through traffic.

- The constrained capacity on Scarlett Road northbound through the CP Rail underpass reduces the throughput of the eastbound left-turn from Dundas Street West. Throughput is further reduced when queued vehicles under the underpass fail to clear before the start of the eastbound left-turn phase. The simulation indicates that this can result from pedestrians crossing St. Clair Avenue West.

- Heavy through traffic volume demands on Scarlett Road and Dundas Street West often create long delays for drivers entering these streets at the adjacent unsignalized intersections. This problem is exacerbated when queues from the signalized intersections back up through adjacent intersections.

3.3 CONCLUSIONS

A review of existing and projected future conditions within the Study Focus Area and Secondary Study Area identified the following deficiencies:

<u>CP Rail Underpass and Roadway Geometry</u>

- Substandard vertical clearance through the underpass.

- Substandard horizontal clearances through the underpass.

- Substandard sidewalk width through the underpass.

- Scarlett Road restricted to one lane per direction through underpass (two lanes per direction north of underpass).

- No southbound left-turn from Scarlett Road to Dundas Street West.

- Horizontal and vertical clearances will not accommodate streetcar movement through the underpass.

- No space through underpass to accommodate future bicycle lanes.

Safety

- Both the Scarlett Road/Dundas Street West and the Scarlett Road/St. Clair Avenue West intersections are experiencing collision rates higher than typical for signalized T intersections in the City of Toronto.

- The current configuration of the southbound right-turn channelization on Scarlett Road at Dundas Street West leads to a high occurrence of rear end collisions. Contributing factors include a lack of sight distance and no downstream acceleration lane.

- The divider between the southbound right-turn lane and the northbound lane on Scarlett Road at Dundas Street West is inadequate. An illumination pole on the channelization island is a fixed object collision hazard.

- Crosswalks across the right-turn channelization lanes at the Dundas Street West intersection are a potential hazard to pedestrians and cyclists due to restricted sight distances and speed of traffic.

- Entrances and side street intersections in close proximity to the arterial intersections create a risk of rear end and sideswipe collisions.

- The southbound dual left-turn lane configuration at the Scarlett Road/St. Clair Avenue West intersection is contributing to the occurrence of left-turn sideswipe collisions.

- The current configuration of the CP Rail underpass presents a risk of collisions due to the centre support, narrow southbound lane and substandard vertical clearance.

- Pedestrian/cyclist facilities through the underpass are inadequate and unattractive.

- Southbound drivers on Scarlett Road approaching St. Clair Avenue West face a higher than typical workload due to the number and locations of signs and signals in the area.

- Downgrades on the approaches to the Scarlett Road/St. Clair Avenue West intersection may encourage speeds that are higher than appropriate for the conditions.

- The skid resistance of the pavement on downgrade approaches should be reviewed and enhanced, if possible.

Traffic Operations and Capacity

- The analysis results confirm the traffic operations component of the need and justification for improvements previously identified by the Scarlett Road/CP Rail Grade Separation Feasibility Study (TSH Nov. 7, 2001). Further analysis and simulation will be completed to explore the effectiveness of potential improvements in addressing the identified operational issues.

- Insufficient capacity to accommodate demand on the following Scarlett Road intersection turning movements:
  - Eastbound left-turn at Dundas Street West;

  - Westbound left-turn at St. Clair Avenue West in the p.m. peak hour;
  - Northbound through/right-turn at St. Clair Avenue West in the p.m. peak hour; and
  - Southbound left-turn at St. Clair Avenue West in the a.m. peak hour.

- Intersection spacing and configuration restrict signal timing options for improving intersection operations.

- Capacity of the northbound movements at the Scarlett Road/St. Clair Avenue West intersection and the eastbound left-turn and westbound right-turn movements at the Scarlett Road/Dundas Street West intersection is restricted by the availability of only a single lane through the underpass.

The identified safety, capacity and operational deficiencies indicate a need for geometric, safety and operational improvements to the Scarlett Road intersections with Dundas Street West and St. Clair Avenue West, including improvements to the CP Rail underpass.

4 EXISTING ENVIRONMENTAL CONDITIONS

4.1 NATURAL ENVIRONMENT

The following is a summary of the information collected for the Scarlett Road Grade Separation Study in June 2001. Study Area conditions are to be confirmed in May 2004.

Although the land use within the Primary Study Area is dominated by residential, commercial and industrial developments the vegetation cover in this area appears to have been in place for many years, especially along the south side of the CP Rail corridor adjacent to the tracks. This area has an established tree cover of white elm, locust, Manitoba maple, and horse chestnut with some specimens well over 100 years old. The locusts in particular are very large and quite healthy. Other plantings in the railway right of way south of the tracks and east of Scarlett Road include Norway maple, lilac and red pine that may have been planted 20 or 30 years ago. Opposite Scarlett Road, along the south side of Dundas Street West, several tree species have been planted within the past 10-15 years. Some of these have recently died; however a young Norway maple, several red pines and a Russian olive appear to have adapted to the harsh site conditions and established themselves well.

Manitoba maple is a prolific and opportunistic species and a number of mature specimens have established themselves along the north side of the tracks east and west of Scarlett Road. This species, once established, is difficult to eradicate. Its spreading limbs become over-extended, frequently resulting in breakage of branches which can be hazardous to pedestrian traffic. A mature and healthy white elm, which survived the Dutch elm disease onslaught of the 1950's, is located on the north-west quadrant of Scarlett Road and the rail line. Across the road in the small parkette just north of St. Clair Avenue West is a single young red ash, as well as a small grouping of junipers that may have been planted when Scarlett Road was realigned in 1912.

4.1.1 Drainage / Stormwater Management

4.1.1.1 Background Information

All available background information relevant to storm drainage issues within the study area was collected and reviewed as part of this study. Sources of information included the following:

- Site visit and reconnaissance
- Storm and combined sewer schematics
- Drainage area delineation mapping
- Plan and profile drawings
- Soils mapping

City staff provided as much background information as possible to assist TSH staff in familiarizing themselves with the drainage characteristics of the study area. Unfortunately, many of the drawings are quite old, and in some cases outdated or difficult to read or interpret. However, as much useful information as possible was derived from these sources.

4.1.1.2 Existing Drainage Patterns and Infrastructure

Topography within the study area is such that runoff is directed to the local low point of elevation located on Scarlett Road almost directly under the CPR bridge. Existing Scarlett Road slopes downhill from Bernice Court towards this low point, a distance of approximately 100 metres. Similarly, St. Clair Avenue West currently slopes downhill towards Scarlett Road beginning at a point approximately 100 metres east of Scarlett Road. The existing low point at the railway overpass is approximately 0.5 metres below the low point in the Dundas Street West profile, situated in the vicinity of the Scarlett Road/Dundas Street West intersection.

The study area is fully urbanized with curb and gutter provided throughout. Land use in the Study Area is primarily commercial/residential. The drainage area adjacent to the local low point at the railway is largely impervious, with only small grassed or landscaped areas present in the form of small boulevards. These boulevards, for the most part, are graded on relatively steep slopes such as that along the south side of St. Clair Avenue West beside the railway corridor and along the west side of Scarlett Road just north of the railway.

The sewer mapping provided by the City indicates that the study area is serviced by a combination of separate storm sewers as well as some combined sewer. A nine inch to twelve inch storm sewer on St. Clair Avenue West discharges to a 36 inch to 42 inch (potentially combined) sewer on Scarlett Road. This in turn provides an outlet to the existing 42 inch trunk storm sewer on Dundas Street West which flows in a westerly direction to its ultimate outlet at the Humber River. A 33 inch storm sewer on Bernice Crescent east of Scarlett Road provides minor system drainage for the subdivision in that area, outletting to the 42 inch combined sewer located on Scarlett Road between Eileen Avenue and Dundas Street West (36 inch combined between Bernice Crescent and St. Clair Avenue West).

Information provided by City staff indicates that the total drainage area tributary to the Dundas Street West storm trunk sewer from within the study area is approximately 15.3 hectares (City catchment areas 41 and 47).

4.2 SOCIAL ENVIRONMENT

There are a wide variety of land use designations within the Primary Study Area (Draft City of Toronto Official Plan, Map 12 Land Use Plan, May 2002). The land between Dundas Street West and St. Clair Avenue West, east of Scarlett Road is designated Utility Corridor; the CP Rail line and Lambton Yard are located in this area. The land west of Scarlett Road, north of Dundas Street West and south of the rail line is designated Employment Area. The land north of the rail line, and west of Scarlett Road is designated as Employment Area, as is the land north of St. Clair Avenue West and east of Scarlett Road. The land adjacent to Scarlett Road, from just south of Bernice Crescent to just north of Eileen Avenue is designated as Mixed Use area. The land east of this Mixed Use area to Jane Street is designated Neighbourhood Area, as is the land west of the Mixed Use area to Etobicoke Creek Open Space Area.

South of the Scarlett Road/Dundas Street West intersection there is an area designated as Apartment Neighbourhood that is surrounded by Mixed Use Areas to the east and west, bordering on Dundas Street West.

4.2.1 Current Planning Applications

The City of Toronto has identified no active planning applications within the Study Focus Area. There are, however, a number of applications in the vicinity of the Study Focus Area. These are attached as **Appendix G**. None of the applications appear to have a significant impact on future traffic volumes, although some applications may impact vehicular movement in the area.

4.2.2 Additional Considerations and Ongoing Studies

The new City of Toronto Official Plan will replace the official plans that were in place for the seven former municipalities of Metropolitan Toronto. The new OP is applicable to all land in the amalgamated municipality of Toronto. The purpose of the new Official Plan is to provide a strategy for directing development in Toronto over the next 30 years, focusing growth where it can realize the greatest social, environmental and economic benefits.

The Ontario Municipal Board has scheduled the first pre-hearing in April to consider the appeals to the new Official Plan. City Council adopted a number of staff reports that resolve the appeals of a number of appellants. These settlements will be presented to the Ontario Municipal Board at the pre-hearing. To date, seventeen appeals have been withdrawn reducing the number of appeals to be heard to 146.

The Official Plan has received both Council and the Minister of Municipal Affairs approval (in part). The Minister's decision was the subject of 163 appeals….. that were forwarded to the Ontario Municipal Board in April 2003. Approximately 90 of the appeals are 'protective' appeals that relate to properties with applications undergoing development processing. There are also appeals of the Plan in its entirety and therefore no portion of the Plan has come into force.

The City of Toronto recently completed the Etobicoke City Centre Secondary Plan (Kipling/Islington area), located to the west of the study area. The impact of approved, proposed and potential future development associated with the Bloor/Islington Focus and Six Points Focus will increase background traffic growth through the study area, particularly on Dundas Street West and Bloor Street. This is reflected in the travel demand forecasting model used to produce the background traffic growth rates.

An Environmental Assessment for the extension of the 512 St. Clair Avenue West streetcar route in an exclusive right-of-way from Yonge Street to Gunns Road has been completed jointly by the City of Toronto Transportation Services, Planning and TTC staff. The EA is limited to only those sections of the proposed right-of-way which require an EA for expansion. This EA was brought forward after the release of a joint City-TTC report entitled "Feasibility of Reserved Streetcar Right-of-way on St. Clair Avenue West".

4.2.3 Heritage

The Scarlett Road/Dundas Street West area has a large amount of heritage resource potential due to its proximity to the Humber River (designated as a Canadian Heritage River) and the number of mills formerly located along the river. Discussion with members of the York LACAC reveals that there are no designated heritage features within the Study Focus Area. However, Scarlett Road itself is considered to be of historical significance since it is the original road that led north towards a mill.

The following is a description of heritage features within the Secondary Study Area.

- Old Dundas Street West was the original Dundas Street highway. This highway was originally a stagecoach route and a toll highway. The Lambton House, located at 4066 Old Dundas Street West, was built in 1847, includes Sir William Pierce Howland (one of the "Fathers of Confederation") as an owner and was also a stagecoach stop and hotel. The house has been designated as a historic landmark by the York LACAC.

- A plaque commemorating the location of a Toll House which was used for collecting fares from travellers using Dundas Street West is located on the southwest corner of the Loblaws site on Gooch Avenue.

- A street railway was operated on Old Dundas Street; the route ran from Lambton House to Keele Street. It was operated by hydroelectric power generated from the Humber River.

- Sir William Pierce Howland also resided in a home that was torn down when the current Dundas Street West was built. Members of the York LACAC hope that there will eventually be signage indicating the former location of the Howland home.

- The York LACAC is publishing a guidebook describing a "Discovery Walk" in the area - the walk, beginning at Lambton House, is a loop and will follow a trail along the Humber River and part of Humbercrest Boulevard. Humbercrest Boulevard was originally an aboriginal trail.

- The Lambton Golf and Country Club, located west of Scarlett Road was formed in 1903. It was one of the first shared capital golf clubs in the Greater Toronto Area.

- Lambton Park, located north of Dundas Street West, west of Scarlett Road is one of the oldest parks in the Greater Toronto Area. At one time, the park contained a carousel and a dance pavilion. Additionally, boating and skating occurred on the mill pond located in the park.

4.2.4 Archaeological Resources

The Stage 1 archaeological review of Scarlett Road/St. Clair Avenue West and Dundas Street West intersections and the CP Rail bridge over Scarlett Road indicated there are 10 registered archaeological sites within 2,000 metres of the study corridor. The Stage 1 Assessment can be found in **Appendix H**. The study area is within close proximity to the Humber River, signifying high archaeological potential, due to the extremely disturbed condition of the above listed areas, the probability of encountering additional significant sub-surface prehistoric Aboriginal and 19th century Aboriginal and Euro-Canadian sites is low. As such, the following recommendations are presented:

- The study area is cleared of further archaeological concern.

- In the event that deeply buried archaeological remains are encountered during construction activities, the office of the Regulatory & Operations Group, *Ministry of Culture* should be contacted immediately.

- In the event that human remains are encountered during land development, both the *Ministry of Culture* and the Registrar or Deputy Registrar of the Cemeteries Regulation Unit of the *Ministry of Consumer and Business Services* should be contacted immediately.

5 ALTERNATIVE SOLUTIONS

5.1 DESCRIPTION OF ALTERNATIVES

Alternative Solutions, commonly called planning alternatives, for physical and/or operational improvements to the road network and/or the CP Rail structure were generated by the Project Team after identification of the problems and opportunities within the Study Focus and Secondary Study Area. These alternatives were presented to the public at the first public meeting. Comments from the public were incorporated and the following five planning alternatives were carried forward for further assessment.

Do Nothing

The Do Nothing alternative was included as a benchmark for the assessment of the other planning alternatives. As the name suggests, the Do Nothing alternative involves no improvements to the road network or CP Rail Structure within the Study Focus.

Remove Bridge and Close Scarlett Road

This alternative would involve the removal of the CP Rail Structure and closure of Scarlett Road between St. Clair Avenue West and Dundas Street West.

Transportation Demand Management

Transportation Demand Management (TDM) involves the implementation of measures to reduce the number of vehicles on the roadway. Four TDM measures considered suitable to the Study Area and consistent with the study goals were included in this alternative. Potential TDM measures include:

1. Increased transit use;
2. Promoting carpooling;
3. Promoting flexible work hours; and
4. Increased usage of bicycles and walking.

Transportation System Management

Transportation Systems Management (TSM) measures are minor physical and/or operational modifications to improve the safety and capacity of the existing road network. TSM measures are generally short-term improvements to the road network within the Study Area. Potential TSM measures include:

1. Removal of westbound to northbound channelization at Dundas Street West;
2. Removal of southbound to westbound channelization at Dundas Street West;
3. Addition of acceleration lane for southbound to westbound move at Dundas Street West;
4. Relocation of westbound bus stop on Dundas Street West at Scarlett Road;
5. Increased turning radius at northwest corner of Scarlett Road and St. Clair Avenue West;
6. Improved Scarlett Road median barrier south of CP Rail bridge;
7. Addition of medians on Dundas Street West and Scarlett Road;
8. Modifications to signage and pavement markings; and
9. Modifications to signal timings.

Bridge Replacement/Road Improvement

The replacement of the CP Rail Structure/Road Improvement alternative would improve operations and safety at the Bridge and provide added improvements to operations for the Study Area's road network. This alternative would include improvements to sidewalks, lanes, sight distances, lateral/vertical clearances and dedicated bike lanes.

5.2 ASSESSMENT CRITERIA

The above noted alternative solutions were assessed on the basis of four criteria groups – transportation, natural and social environment, economic and cultural environment and engineering. Within each criteria group were a number of sub-factors. Study Team members generated the sub-factors and presented them for comment at the first Public Meeting.

Transportation

The following six sub-factors were used to assess the transportation impacts of the planning alternatives.

- Accessibility – provision for all desired vehicle movements;
- Safety - vehicular, pedestrian and cyclist safety;
- Traffic Operations and Capacity - accommodation of current and future travel demand;
- Railway Operations – capacity, operation, future considerations and construction impacts;
- Transit Operations - affect on current and future transit operations and support for extension of transit service in St. Clair/Scarlett/Dundas corridors; and
- Traffic Patterns - affect on traffic volumes at adjacent major intersections and on neighbourhood streets.

Natural and Social Environment

Six sub-factors were utilized to assess the impact of the alternatives on the natural and social environment within the Primary Study Area. The sub-factors are as follows:

- Property Impacts - direct and indirect effect on buildings, property and access;
- Noise - effect of traffic and construction related noise;
- Water Resources - effect on natural runoff and stormwater;
- Soils - effect on disturbing potential contaminated soils;
- Vegetation - effect on existing vegetation; and
- Air Quality – effect on local air quality.

Economic and Cultural Environment

The following two sub-factors were used to assess the impact of the alternatives on the economic and cultural environment.

- Industrial/Commercial - effect on deliveries, customers and employees; and
- Archaeology/Heritage - effect on known or potential resources.

Engineering

Two sub-factors were utilized to assess the alternatives from an engineering perspective. They are as follows:

- Construction Costs - capital costs; and
- Utilities and Major Services - impact on existing and proposed utilities and services.

5.3 ASSESSMENT OF ALTERNATIVE SOLUTIONS

A matrix documenting the assessment of planning alternatives is included as **Table 5-1**.

Table 5-1: Assessment of Alternative Solutions (Planning Alternatives)

	Do Nothing	**Remove Bridge – Close Scarlett Road**	**Promote Transportation Demand Measures (TDM)**	**Implement Transportation System Management (TSM) Measures**	**Bridge Replacement / Road Improvement**
Description of Alternatives	*No improvements made within the Study Area.*	*Remove bridge and close Scarlett Road between St. Clair Avenue West and Dundas Street West.*	*Measures to reduce the number of vehicles on the roadway.*	*Minor physical and/or operational modifications to improve the safety and capacity of the existing road network.*	*Improvements to the CP Rail underpass and existing road network.*
Criteria/Sub Factors					
Transportation					
Accessibility	• No change in accessibility. • No left-turn from southbound Scarlett Road to eastbound Dundas Street West. • Pedestrian/cyclist movements through underpass spatially restricted and inhospitable. • Substandard vertical and horizontal clearances of the underpass restrict access of large trucks, transit vehicles and emergency services vehicles.	• Eliminates access between Dundas Street West and St. Clair Avenue West via Scarlett Road. • Travellers would be forced to reroute to adjacent road network. • Significant impact to pedestrian/cyclist travel due to out-of-way travel.	• Does not address existing restrictions on accessibility for pedestrians, cyclists, transit, large trucks and emergency services vehicles through underpass.	• Potential minor improvements to intersections for all modes (vehicles, pedestrians and cyclists). • Does not address existing accessibility issues through underpass.	• Improvements to the underpass will improve accessibility for trucks, transit vehicles, emergency services vehicles, pedestrians and cyclists. • Road network improvements, such as the addition of turn and through lanes, will increase accessibility through the study area.

Safety
• Vehicular, Pedestrian and Cyclist Safety
	• Collision rates higher than typical for T-intersections in Toronto at both the Scarlett Road/St Clair Avenue West and Scarlett Road/ Dundas Street West intersections.
	• General safety concerns include:
	  • Sight distance restrictions; and
	  • Potential roadside hazards.
	• Pedestrian/cyclist safety issues include:
	  • Less than desirable sidewalk/road width and lighting through underpass,
	  • Restricted sight distances at Dundas Street West crosswalks;
	  • Channelized right-turn lanes at Scarlett Road/Dundas Street West; and
	  • Traffic queuing through pedestrian crossover at Bernice Crescent.
		• Mitigates most safety concerns related to the Dundas Street West and St. Clair Avenue West intersections with Scarlett Road.
		• Diverted traffic may create or worsen safety issues at other intersections on the area road network.
			• TDM has potential to reduce auto travel but may increase travel by pedestrians, cyclists and transit riders.
			• Existing pedestrian/cyclist safety issues not addressed.
				• TSM has potential to reduce collisions through study area.
				• Some options, such as the removal of right-turn channelizations at Dundas Street West, may improve pedestrian/cyclist safety.
					• Improved structure clearances reduce risk of collisions with structure and improve sight lines.
					• Improved pedestrian/cyclist facilities such as wider sidewalks, cycling lanes and increased sight distances will enhance safety for pedestrians/cyclists.
					• Improvements to capacity of Scarlett Road through underpass and adjacent intersections will reduce congestion/delay and the related collisions.

Traffic Operations and Capacity
• Accommodation of current and future demand
	• Capacity constraints exist for the following critical movements:
	  • Eastbound left-turns at Dundas Street West;
	  • Northbound through-right at St. Clair Avenue West;
	  • Southbound dual left-turns at St. Clair Avenue West; and
	  • Westbound left-turns at St. Clair Avenue West.
		• Eliminates capacity constraints on Scarlett Road and Dundas Street West.
		• Diverted traffic would increase congestion at Jane Street intersections with St. Clair Avenue West and Dundas Street West.
		• Short term disruption to travel through study area during construction.
			• TDM has potential to reduce future travel demand, providing minor improvement to intersection operations.
			• Does not address long-term capacity/operating issues.
				• TSM has potential to improve operation of some critical intersection movements in the short term.
				• Minor disruption to vehicular traffic movement during implementation.
				• CP Rail underpass restricts capacity to accommodate future traffic growth.
				• Does not address long-term capacity/ operating issues.
					• Capacity improvements through the underpass and at the Scarlett Road intersections with St. Clair Avenue West and Dundas Street West could improve operation through the study area.
					• Short term disruption to travel through Study Area during construction.

Railway Operations	• No direct impact on railway operations.	• Potential for short term disruption of railway operations during bridge removal.	• No direct impact on railway operations.	• No direct impact on railway operations.	• Potential for short term disruption of railway operations during construction.

	Do Nothing	Remove Bridge – Close Scarlett Road	Promote Transportation Demand Measures (TDM)	Implement Transportation System Management (TSM) Measures	Bridge Replacement / Road Improvement
Description of Alternatives	*No improvements made within the Study Area.*	*Remove bridge and close Scarlett Road between St. Clair Avenue West and Dundas Street West.*	*Measures to reduce the number of vehicles on the roadway.*	*Minor physical and/or operational modifications to improve the safety and capacity of the existing road network.*	*Improvements to the CP Rail underpass and existing road network.*
Transit Operations Effects on current and future transit operations	• TTC does not operate along Scarlett Road between St. Clair and Dundas. • Buses have difficulty making left-turns from southbound Scarlett Road to eastbound St. Clair Avenue West.	• Diverted traffic would increase congestion on the surrounding road network, which may delay existing transit services.	• With the implementation of TDM measures, transit ridership could potentially increase, thereby reducing congestion through the study area.	• Potential to improve transit service through the study area by improving traffic operations. • Widening eastbound lanes at St. Clair Avenue West/Scarlett Road intersection would improve bus turning from southbound to eastbound • Feasibility of relocating westbound Dundas Street West bus stop uncertain.	• Bridge replacement may accommodate operation of transit vehicles on Scarlett Road between St. Clair Avenue West and Dundas Street West (requires further assessment). • Improvements to traffic operations will improve transit trip times and reliability. • Widening eastbound lanes at St. Clair Avenue West/Scarlett Road intersection would improve bus turning from southbound to eastbound.
• Support for extension of transit service in St. Clair/Scarlett/ Dundas corridors	• Does not support extension of transit service through noted corridors.	• Does not support extension of transit through noted corridors.	• Does not support extension of transit through noted corridors.	• Does not support extension of transit through noted corridors.	• Bridge replacement may accommodate passage of transit vehicles (requires further assessment).
Traffic Patterns • Effect on traffic volumes on neighbourhood streets	• Existing capacity constraints and movement restrictions result in traffic infiltration through residential neighborhoods north of St. Clair Avenue West.	• High potential for increased traffic infiltration through residential area north of St. Clair Avenue West.	• The rate of growth of traffic infiltration on residential streets may decrease marginally with the implementation of TDM measures due to a reduction in automobile use.	• TSM measures could result in short-term reduction in traffic infiltration on residential streets due to intersection operation improvements. • Some options may result in traffic diversion to alternate routes.	• Provision of southbound left-turn at Dundas Street West could improve the Scarlett Road/St. Clair Avenue West intersection operation and potentially reduce traffic infiltration through residential areas to the north. • Improvements to vertical clearance at the underpass could result in increased commercial vehicle traffic on Scarlett Road.
Natural and Social Environment					
Property Impacts • Direct and indirect effect on buildings, property and access.	• No direct impact on buildings, property or access. • Ease of access will decline with increasing levels of congestion.	• No impact on buildings or property. • This option reduces accessibility to properties near the Scarlett Road/Dundas Street West intersection.	• No direct impact on buildings, property or access.	• No impact on buildings. • Minor property acquisition may be required for some options. • Some options may restrict access to properties near intersections.	• No impact on buildings. • Property acquisition required to realign/widen roads and replace rail structure. • Some design options may restrict access to properties near intersections.
Noise • Effect of traffic/ construction related noise	• No appreciable change in noise levels.	• No appreciable change in noise levels. • Short duration construction noise.	• No appreciable change in noise levels.	• No appreciable change in noise levels. • Short duration construction noise.	• No appreciable change in noise levels over the long term • Most significant construction noise impacts due to nature and duration of the work.
Water Resources • Effect on natural runoff and stormwater	• No impact on water resources.	• No impact on water resources.	• No impact on water resources.	• Potential to increase stormwater run-off due to an increase in the amount of paved surfaces.	• Potential to increase stormwater run-off due to an increase in the amount of paved surfaces.
Soils • Effect on disturbing potential contaminated soils	• No impact on soils.	• No impact on soils.	• No impact on soils.	• No impact on soils.	• Potential for disturbance of contaminated soils.

	Do Nothing	Remove Bridge – Close Scarlett Road	Promote Transportation Demand Measures (TDM)	Implement Transportation System Management (TSM) Measures	Bridge Replacement / Road Improvement
Description of Alternatives	*No improvements made within the Study Area.*	*Remove bridge and close Scarlett Road between St. Clair Avenue West and Dundas Street West.*	*Measures to reduce the number of vehicles on the roadway.*	*Minor physical and/or operational modifications to improve the safety and capacity of the existing road network.*	*Improvements to the CP Rail underpass and existing road network.*
Vegetation • Effect on existing vegetation	• No impact on existing vegetation.	• Potential for minor impacts to existing vegetation in the vicinity of the underpass.	• No impact on existing vegetation.	• Potential for minor impacts to existing vegetation.	• Potential impacts to existing vegetation. • No rare or endangered species in Study Area. Mature tree species are located on the north and south side of the rail line, with specimen species over 100 years old south of the rail line.
Air Quality	• Traffic congestion has a negative impact on air quality.	• Marginal improvement in air quality in Study Focus Area, but diversion of traffic could have a negative impact on air quality in other areas.	• TDM could result in a marginal improvement in air quality over the "do nothing" alternative by reducing congestion.	• TSM could result in a marginal improvement in air quality over the "do nothing" alternative in the short-term by reducing congestion.	• Bridge replacement / road network improvements could result in a marginal improvement in air quality over the "do nothing" alternative by reducing congestion.
Economic and Cultural Environment					
Industrial/ Commercial • Effect on deliveries, customers and employees	• Increasing traffic congestion will increase delays for customers, employees and deliveries	• Diverted traffic would increase congestion in adjacent areas, delaying customers, employees and deliveries. • Reduced accessibility to local businesses could impact for customers, employees and deliveries.	• TDM may provide minor improvements for customers, employees and deliveries by reducing congestion.	• Some TSM measures may restrict access to local businesses.	• Replacement of underpass and intersection improvements provides the potential for improvements for customers, employees and deliveries by reducing congestion and increasing accessibility.
Archaeology/ Heritage • Effect on known or potential resources	• No heritage resources designated within the Study Focus Area. • No impact on archaeological resources.	• No heritage resources designated within the Study Focus Area. • No impact on archaeological resources.	• No heritage resources designated within the Study Focus Area. • No impact on archaeological resources.	• No heritage resources designated within the Study Focus Area. • Low potential to impact archaeological resources as Study Focus Area has previously been disturbed.	• No heritage resources designated within the Study Focus Area. • Low potential to impact archaeological resources as Study Focus Area has previously been disturbed.
Engineering					
Construction Costs • Capital Cost	• No construction costs.	• Moderate construction costs would be associated with bridge removal and closing Scarlett Road.	• No construction costs.	• Minor construction costs would be associated with the implementation of TSM measures.	• Major construction costs associated with bridge replacement and intersection improvements.
Utilities and Major Services • Impact on existing and proposed utilities and services	• No impacts on utilities or services	• Potential minor impacts on utilities and services.	• No impact on utilities or services.	• Potential minor impacts on utilities and services.	• Potential major impacts on utilities and services associated with bridge replacement and intersection improvements.
Recommendation	**Carry forward only for comparison in assessment of bridge replacement/road improvement alternatives.**	**Do not carry forward.**	**Carry forward for consideration in combination with TSM and bridge replacement / road improvement alternatives.**	**Carry forward for consideration in combination with TDM and bridge replacement / road improvement alternatives.**	**Carry forward as preliminary preferred solution.**

5.4 ASSESSMENT RESULTS

The assessment process resulted in the following recommendations:

- The Do Nothing alternative should be carried forward only for comparison with bridge replacement/road improvement alternatives during the next phase of the Study;
- The removal of the CP Rail Structure and closure of Scarlett Road was not recommended for further consideration as it would cause increased congestion and traffic infiltration on the road network in the Primary and Secondary Study Areas;
- The promotion of TDM measures should be carried forward for consideration in combination with TSM and bridge replacement/road improvement alternatives. TDM measures on their own would only marginally address the amount of traffic infiltration on residential streets and would have no significant effect on safety;
- The implementation of TSM measures should be carried forward for consideration as a short term improvement. Although some TSM measures may reduce accessibility, most options will improve vehicular, pedestrian and cyclist safety, improve operation of some critical intersection movements and potentially reduce traffic infiltration on residential streets; and
- The bridge replacement/road improvement alternative should be carried forward for consideration as a long-term improvement. This alternative has the potential to improve accessibility and safety and potentially reduce traffic infiltration through residential areas.

6 DESIGN ALTERNATIVES

Alternative designs were developed and assessed to address the following three aspects of the proposed replacement of the CP Rail Bridge and improvement of adjacent intersections on Scarlett Road:

- The configuration of the intersections of Scarlett Road with Dundas Street West and St. Clair Avenue West, including the number of lanes required through the bridge;
- Type of structure to be used to replace the existing CP Rail bridge; and
- Accommodation of turning movements to and from Gooch Avenue.

Design alternatives, assessments and recommendations for each of these aspects are described in the following three sections.

6.1 INTERSECTION LANE CONFIGURATION ALTERNATIVES

6.1.1 Description of Alternatives

Three alternatives were considered for the reconfiguration of the Scarlett Road intersections with St. Clair Avenue West and Dundas Street West, in conjunction with the replacement of the CP Rail bridge. Each alternative adds incremental traffic movement and/or capacity improvements to the preferred solution, and all alternatives include improvements to pedestrian facilities and the addition of bicycle lanes. The intersection configuration alternatives are:

1. Add one northbound lane through the bridge to alleviate the northbound capacity restriction at the St. Clair Avenue West intersection;
2. Add one northbound lane and one southbound lane through the bridge, introducing the southbound left-turn movement at Dundas Street West; and
3. Add one northbound and one southbound lane through the bridge and construct an eastbound dual left-turn lane on Dundas Street West to increase the capacity of the critical eastbound to northbound movement.

The addition of an acceleration lane on Dundas Street West for the southbound to westbound channelized right-turn was considered as an option for improving traffic operations in conjunction with each of the above alternatives. With all alternatives, the westbound to northbound channelization at the Dundas Street West intersection is removed, and the southbound dual left-turn lane at the St. Clair Avenue West intersection is maintained.

6.1.2 Traffic Operations

Capacity analysis of the Scarlett Road intersections with St.Clair Avenue and Dundas Street West was carried out in the Feasibility Study for each of the roadway configuration alternatives. Projected traffic volumes for 2001, 2011 and 2021, and signal timings optimized using Synchro, were used.

The capacity analysis provides a level of service at each intersection in isolation, and allows for comparison with the levels of service achievable with the "do nothing" alternative. Alternative 1 provides a significant operational improvement over the do nothing alternative. While Alternatives 2 and 3 do not perform as well as Alternative 1, due to the addition of the southbound left-turn at the Scarlett Road/Dundas Street West intersection, they do perform better than the do nothing alternative. Alternative 3 consistently out-performs Alternative 2 through the additional capacity provided by the eastbound dual left-turn lane on Dundas Street West.

A more complete picture of the overall traffic operations within the Study Focus Area was provided by Synchro/Sim Traffic analysis. Results showed that Alternatives 2 and 3 produce less queuing through the

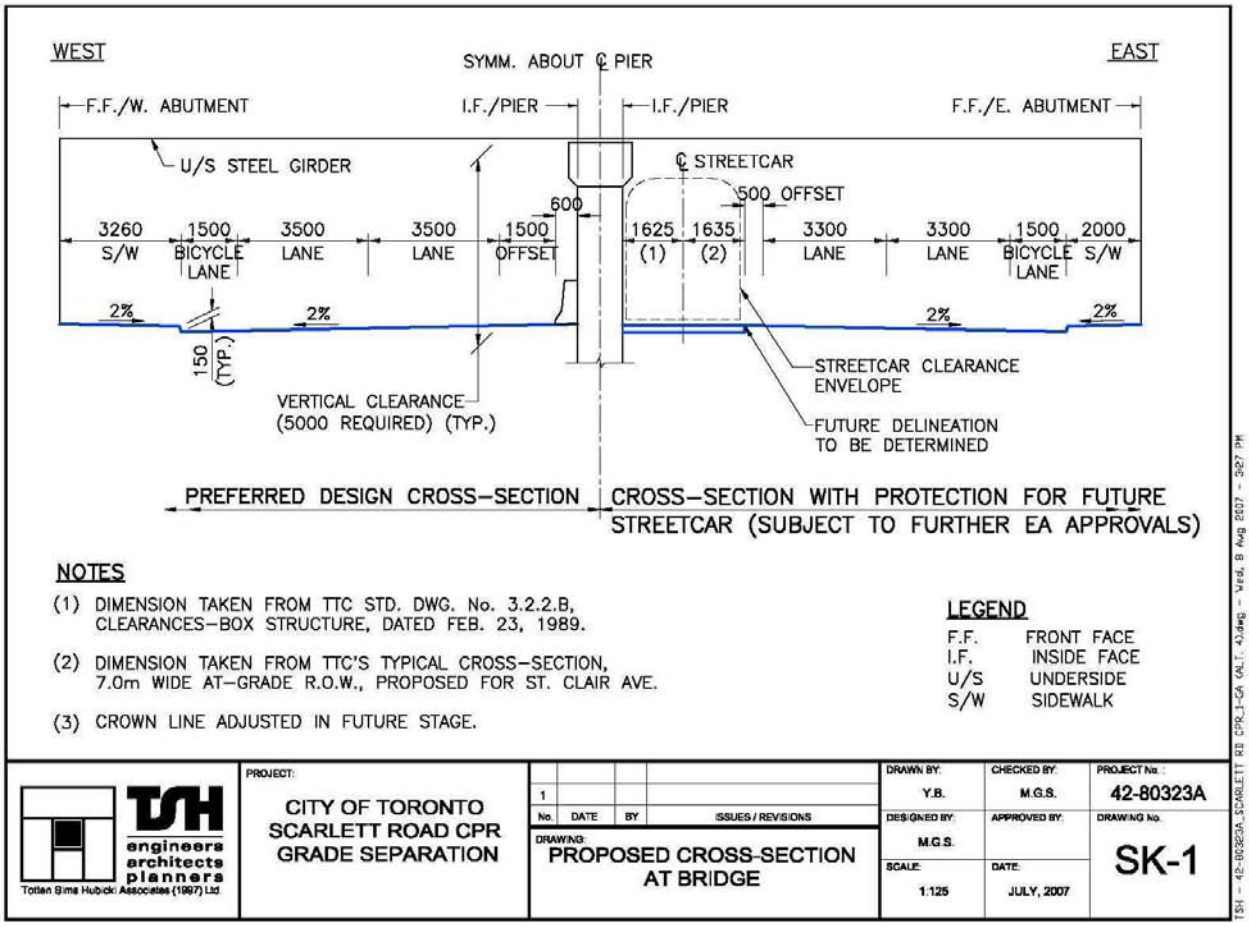
Bernice Crescent PXO than Alternative 1 due to the diversion of some southbound left-turns from St. Clair Avenue West to Dundas Street West. The results also confirm that Alternative 3 provides significantly improved delay reduction over Alternative 2.

6.1.3 Assessment of Alternatives

The detailed assessment of the lane configuration options undertaken in the Feasibility Study and confirmed in this Class EA, demonstrate Alternative 3 to be the preferred option for network accessibility, route selection, transit and alleviating southbound queuing, while reducing congestion and improving future operations relative to the do nothing alternative. On the basis of these factors, Alternative 3 was carried forward as the preferred intersection lane configuration alternative.

Error! Reference source not found. illustrates the proposed Scarlett Road cross section through the railway underpass.

Exhibit 6-1: Preferred Design Cross Section



6.2 STRUCTURE TYPE ALTERNATIVES

6.2.1 Description of Alternatives

Structural alternatives are influenced by a number of factors, including usage (rail traffic), span requirements (number and width of lanes, bike lanes and sidewalks), number and spacing of tracks, vertical clearance requirements, constraints relating to limitations on the magnitude of grade changes for both rail and road, and construction staging constraints relating to maintenance of road and rail traffic and availability of work areas adjacent to the site.

The November 2001 Scarlett Road/CP Rail Grade Separation Feasibility Study established the minimum vertical clearance as 4.65m, in accordance with the Ontario Highway Bridge Design Code (OHBDC). In June 2002, the OHBDC was superseded by the Canadian Highway Bridge Design Code (CHBDC). The CHBDC does not provide specific geometric criteria for bridge clearances, but directs users to the TAC Manual or to local standards. The TAC Manual recommends a minimum vertical clearance of 5.0m for rail bridges over roadways while the Geometric Standards for Road Design in Ontario, designated by the Ministry of Transportation in August 2003 as the standard for use in Ontario, specifies 4.8m vertical clearance. As such, a minimum vertical clearance of 4.8m was initially adopted for this study.

In November 2004, Canadian Pacific Railway amended their design guidelines to require 5.8m vertical clearance, although the guidelines included a clause permitting relaxation of the 5.8m requirement to the minimum required by TAC (5.0m), subject to the Railway's approval. In January, 2005 the Railway advised that a minimum vertical clearance of 5.0m would be acceptable, in consideration of the significant impacts to road grades, utilities and property which would be associated with the provision of further increased clearance.

The required clearance can be obtained through any combination of raising the rail profile, lowering the road profile or constructing a thinner bridge superstructure.

The extensive track system, with switches and crossovers at CP Rail's Lambton Yard, immediately east of the bridge, make the option of track grade raises prohibitively expensive. Similarly, only minor lowering of the road grades is considered practical, given the existing road grades, roadside development, underground utilities and drainage requirements. The bridge superstructure depth is a function of bridge type and span. Cast-in-place concrete, steel deck plate girder and steel through plate girder are the only three superstructure types acceptable to CP Rail for this site. The span is largely dictated by the cross sectional elements of the roadway, although a two span configuration with a pier separating northbound and southbound lanes significantly reduces the span of the superstructure and therefore is preferred. Bridge type is therefore the principal governing factor in the strategy to obtain the prescribed vertical clearance.

6.2.2 Assessment of Alternatives

The steel through-plate girder alternative provides the least construction depth of the three bridge types mentioned above, and for the Scarlett Road site, it is the only option that enables the required minimum clearance to be obtained. It was therefore carried forward as the preferred structure type.

6.3 ALTERNATIVES FOR ACCESS TO GOOCH AVENUE

6.3.1 Description of Alternatives

Gooch Avenue is a local street located on the south side of Dundas Street West, immediately east of Scarlett Road. It is one of two connections between Dundas Street West and the residential neighbourhood located to the south, in the Humber River valley. Three alternatives were identified for

providing access to Gooch Avenue, given the preferred intersection configuration and bridge type identified above:

- Alternative 1, taken from the 2001 Feasibility Study, restricts access to Gooch Avenue to right-in/right-out by median barrier on Dundas Street West. Alternative 1 is depicted on **Exhibit 6-2**.

- Alternative 2 retains the same Scarlett Road alignment as Alternative 1, but provides full access at Gooch Avenue. Alternative 2 is depicted on **Exhibit 6-3**.

- Alternative 3 is a realignment of Scarlett Road to intersect directly with Gooch Avenue, providing full access at Gooch Avenue. Alternative 3 is depicted on **Exhibit 6-4**.

6.3.2 Traffic Volume Projections

As an initial step in the assessment of the Gooch Avenue access alternatives, projected 2021 a.m. and p.m. peak hour traffic volumes at the intersections of Scarlett Road with Dundas Street West/Gooch Avenue and St. Clair Avenue West were estimated for each of the alternatives.

The volume for the new southbound left-turn movement at Dundas Street West was estimated on the basis of the results from the origin-destination survey completed as part of the 2001 Feasibility Study. This study found that approximately 25% of the a.m. peak hour southbound left-turn traffic at St. Clair Avenue West would likely turn left at Dundas Street West if that movement was made available. Approximately 20% of the southbound left-turns at St. Clair Avenue West would divert to Dundas Street West in the p.m. peak hour.

For Alternatives 2 and 3, additional traffic was assumed to be attracted to Gooch Avenue due to the availability of a protected Scarlett Road-Gooch Avenue through movement. This through traffic was estimated as 50% of the total turning movement volumes at Gooch Avenue with the existing configuration. The traffic volumes used in the analysis of Alternative 1 are summarized in **Exhibit 6-5**; the volumes for Alternatives 2 and 3 are summarized in **Exhibit 6-6**.

Exhibit 6-1: Access to Gooch Avenue Design Alternative 1

Exhibit 6-2: Access to Gooch Avenue Design Alternative 2

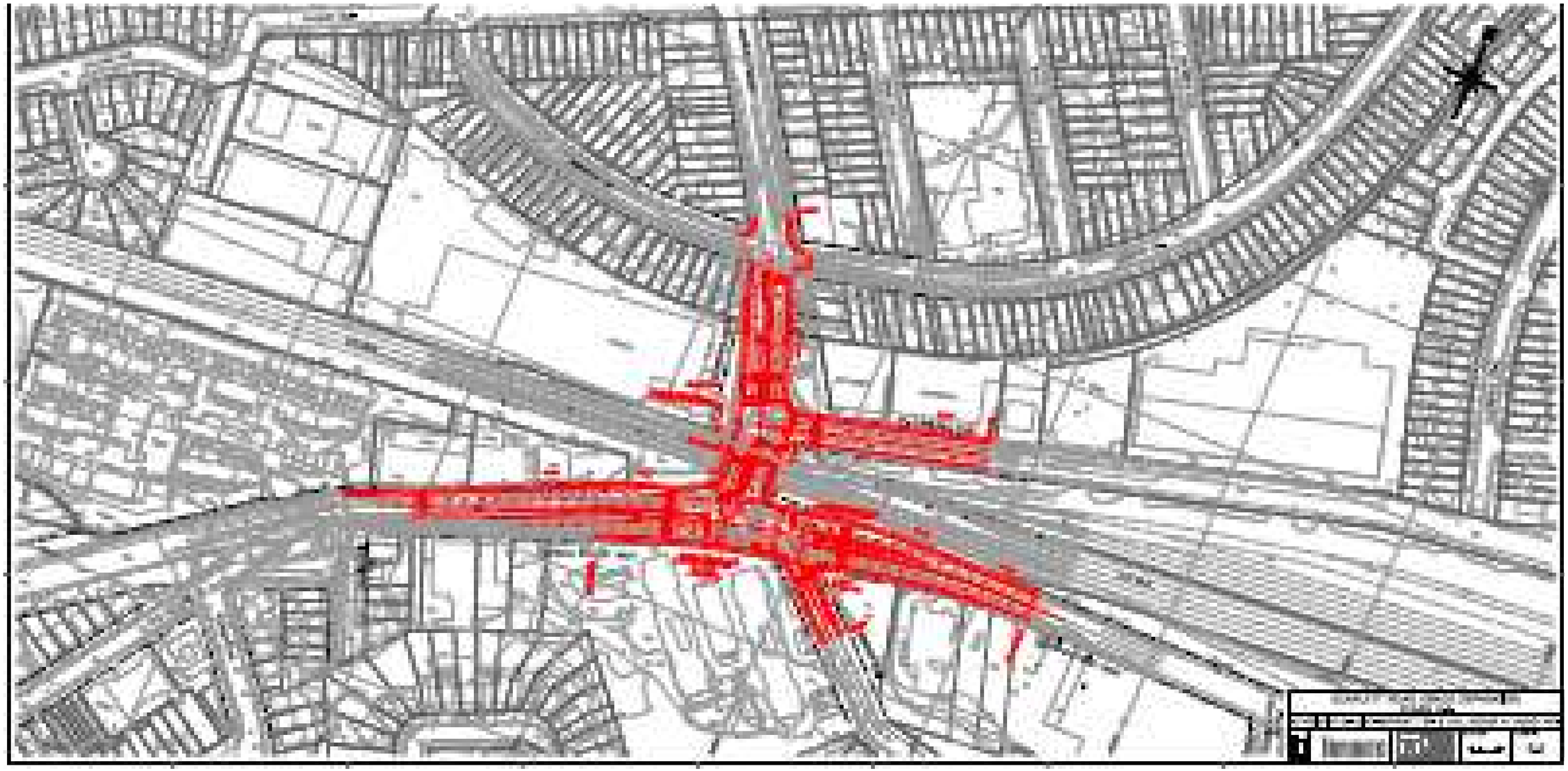


Exhibit 6-4: Access to Gooch Avenue Design Alternative 3

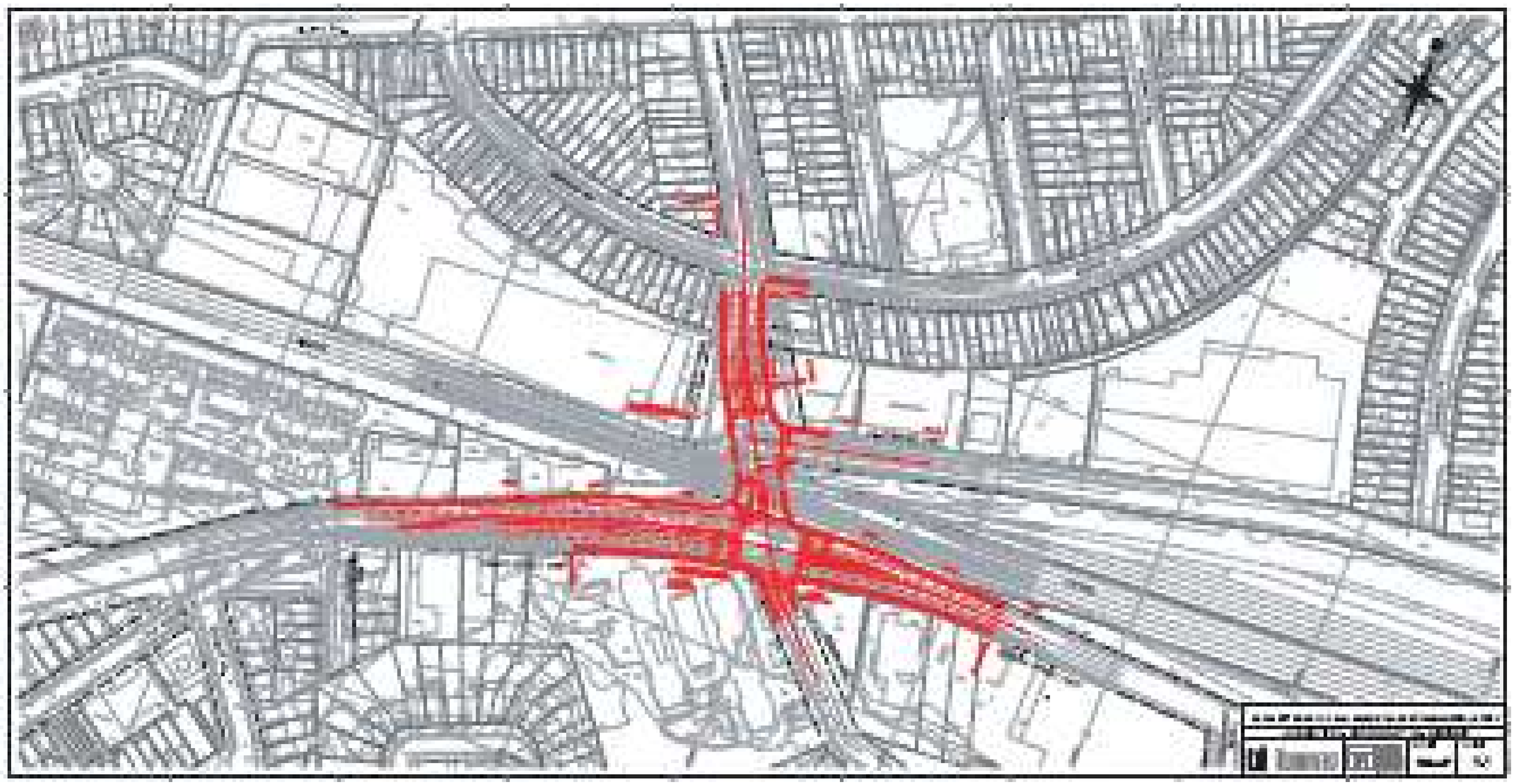


Exhibit 6-5: 2021 Traffic Volume Estimates for Design Alternative 1

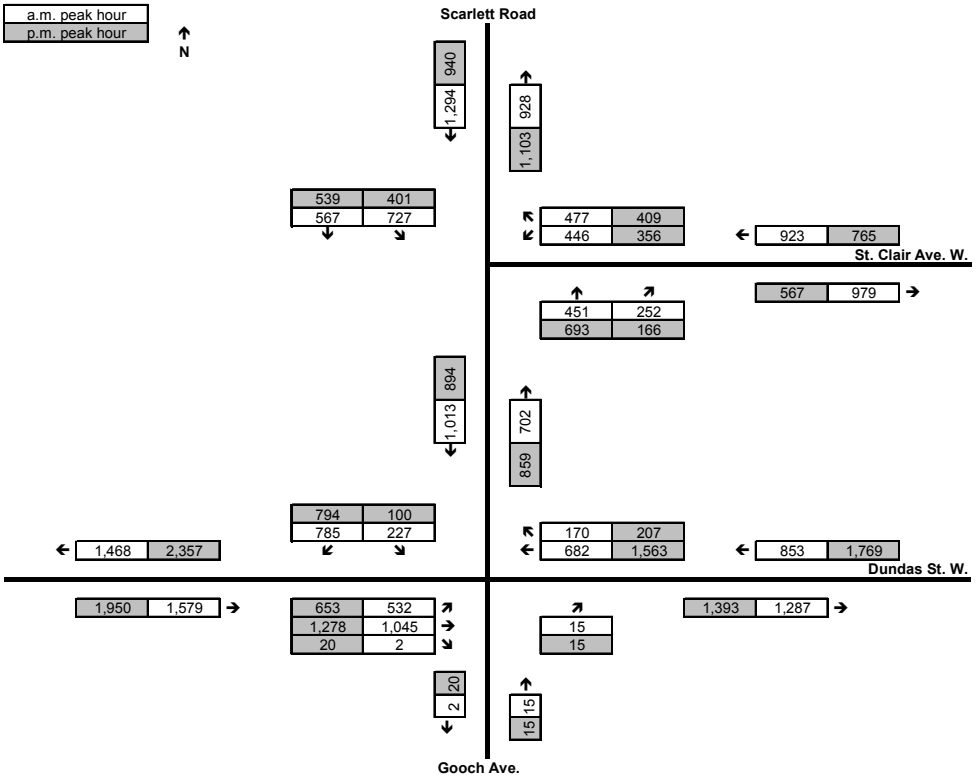
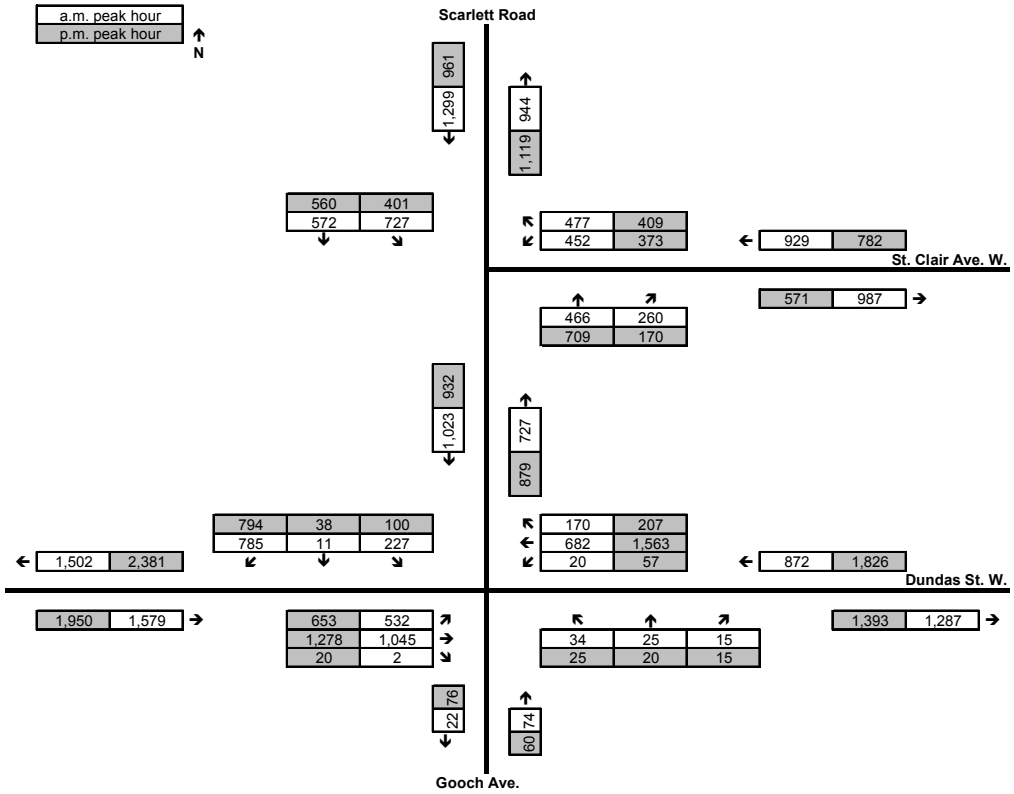


Exhibit 6-6: 2021 Traffic Volume Estimates for Design Alternatives 2 & 3



6.3.2.1 Analysis

The traffic operations analysis was completed using Synchro, Version 6, the volume estimates summarized above and the same parameters used in the calibrated analysis of existing conditions. Traffic signal timings were adjusted as required to reflect changes in intersection geometry and volumes. Synchro was used to optimize the signal timings. The timing objective was to achieve a volume to capacity ratio (v/c) of 1.00 or less for all movements, with a maximum cycle length of 120 seconds. The Dundas Street West and St. Clair Avenue West intersections must use the same cycle length in order to maintain coordination.

The Synchro Analysis results are summarized in **Table 6-1** for the Scarlett Road/Dundas Street West/ Gooch Avenue intersection and in **Table 6-2** for the Scarlett Road/St. Clair Avenue West intersection. The results are stated in terms of a level of service (LOS) and volume to capacity ratio (v/c) for each movement and for the intersection as a whole. Analysis results for the "Do Nothing" alternative are included in the tables for comparison with the three design alternatives.

Table 6-1: Synchro Analysis Results, Scarlett Road and Dundas Street West/Gooch Avenue, 2021

Alt.	Peak Hour	Cycle (sec.)	Eastbound		Westbound		Northbound		Southbound		Overall
			L [1]	TR [1]	L [1]	TR [1]	L [1]	R [1]	LT [1]	R [1]	
Do Nothing	a.m.	80	E	A	A [2]	B	E [2]	-	-	F	C
			0.97	0.38	0.04 [2]	0.39	0.36 [2]	-	-	1.12	0.74
	p.m.	80	F	A	A [2]	B	F [2]	-	-	F	F
			1.72	0.36	0.14 [2]	0.85	0.84 [2]	-	-	1.36	1.20
1	a.m.	80	E	B	-	C	-	B [2]	B	A	C
			0.95	0.56	-	0.80	-	0.03 [2]	0.43	0.51	0.70
	p.m.	120	F	A	-	F	-	B [2]	C	A	F
			1.07	0.54	-	1.07	-	0.03 [2]	0.27	0.51	0.92
2	a.m.	105	E	B	D	E	E [3]	D	C	A	D
			0.92	0.60	0.23	0.95	0.58 [3]	0.01	0.63	0.51	0.71
	p.m.	120	F	B	D	F	E [3]	D	C	A	F
			1.31	0.65	0.45	1.31	0.48 [3]	0.01	0.41	0.50	0.95
3	a.m.	80	E	B	C	C	B	B [3]	C	A	C
			0.95	0.56	0.19	0.80	0.11	0.05 [3]	0.58	0.46	0.74
	p.m.	120	F	A	C	F	D	D [3]	D	A	F
			1.08	0.54	0.43	1.11	0.11	0.06 [3]	0.49	0.48	0.93

Notes:
1. L = left; TR = through/right shared lane(s); R = right; LT = left/through shared lane(s)
2. Unsignalized movement; not included in overall intersection statistics
3. Includes northbound through movement (to Scarlett Road northbound)

Table 6-2: Synchro Analysis Results, Scarlett Road and St. Clair Avenue West, 2021

Alt.	Peak Hour	Cycle[2] (sec.)	Westbound		Northbound	Southbound		Overall
			L [1]	R [1]	TR [1]	L [1]	T [1]	
Do Nothing	a.m.	80	F	B	C	F	A	E
			1.07	0.55	0.94	1.19	0.31	1.06
	p.m.	80	D	B	F	C	A	F
			0.85	0.54	1.53	0.66	0.42	1.11
1	a.m.	80	D	B	A	D	B	C
			0.82	0.54	0.68	0.87	0.53	0.79
	p.m.	120	D	C	B	D	B	C
			0.64	0.51	0.74	0.55	0.50	0.66
2	a.m.	105	D	B	B	D	B	C
			0.77	0.52	0.75	0.82	0.53	0.78
	p.m.	120	D	C	B	D	B	C
			0.69	0.52	0.72	0.63	0.49	0.69
3	a.m.	80	D	B	A	D	B	C
			0.83	0.54	0.71	0.87	0.54	0.80
	p.m.	120	D	C	B	D	B	C
			0.68	0.48	0.74	0.64	0.54	0.69

Notes:
1. L = left; R = right; TR = through/right shared lane(s); T = through lane
2. Cycle length is the same as at Scarlett Road/Dundas Street West, to maintain coordination between the intersections.

These analysis results show that:

- All three design alternatives provide better overall performance than the existing configurations at both intersections;

- All three design alternatives provide acceptable levels of service for all movements at the St. Clair Avenue West intersection due to the addition of a northbound through lane and diversion of traffic from the southbound left-turn movement to Dundas Street West;

- At the Scarlett Road/Dundas Street West/Gooch Avenue intersection, the demand for the eastbound left-turn and westbound through/right movements exceeds the capacity available under all three design alternatives, resulting in excessive delays (LOS F); and

- Alternative 1 provides the best performance at the Scarlett Road/Dundas Street West/Gooch Avenue intersection, and Alternative 3 provides the worst performance. Alternative 2 is marginally worse than Alternative 1. The worse performance of Alternative 3 relative to Alternative 2 is due to the width of the intersection, which requires long all-red intervals to allow traffic to clear the intersection

before conflicting movements receive a green signal. The increase in all-red times reduces the overall amount of green time available in each signal cycle.

6.3.2.2 Simulations

Traffic operations under each of the design alternatives were simulated for the 2021 a.m. and p.m. peak hours using SimTraffic (Version 6). The simulations used the same parameters as the calibrated simulations of existing conditions, except with signal timings modified as noted above. The simulation results confirm the analysis results produced by Synchro, and also show that:

- Good coordination of signal timings between the Scarlett Road/Dundas Street West and Scarlett Road/St. Clair Avenue West intersections is critical to limit the occurrence of queue spill-back from traffic stopped under the bridge;

- Even with good signal coordination, the southbound left-turn movement at Dundas Street West will often queue back into the Scarlett Road/St. Clair Avenue West intersection due to the very short storage space available for this movement;

- Queuing in the northbound through/right lane under the bridge also sometimes spills back into the Dundas Street West westbound through/right lane, due primarily to the build-up of traffic turning right on red from Dundas Street West westbound;

- All of the Design Alternatives reduce the frequency of queue spill-back through the pedestrian cross-over at Bernice Crescent from the southbound left-turn movement on Scarlett Road at St. Clair Avenue West, relative to the do nothing alternative;

- Maintaining the southbound to westbound channelization at Dundas Street West, and providing a downstream acceleration lane significantly improves the operation of this movement; and

- Extensive queuing is associated with the over-capacity movements noted above.

6.3.3 Assessment

Table 6-3 summarizes the assessment and evaluation of the alternatives for providing access to Gooch Avenue. Italics are used to indicate criteria where there is no significant difference between alternatives.

Table 6-3: Assessment of Gooch Avenue Access Alternatives

FACTOR/CRITERIA	ALTERNATIVE 1 *Right-In/Right-Out Only*	ALTERNATIVE 2 *Full Access, Offset Intersection*	ALTERNATIVE 3 *Full Access, Scarlett Road Realigned*
TRANSPORTATION			
Safety	*All alternatives improve: restricted sight distances under bridge; substandard median and roadside barriers under bridge; substandard lane widths, clearances, turn radii; issues related to westbound right-turn channelization at Dundas Street West.* *All alternatives retain southbound right-turn channelization at Dundas Street West, but safety improved due to better sight distance and downstream acceleration lane.*		
	Fewest potential conflict points in Dundas Street West intersection due to restricted access at Gooch Avenue Potential for illegal manoeuvres to and from Gooch Avenue	Highest potential conflict points in Dundas Street West intersection due to offset between Gooch Avenue and Scarlett Road; requires split phasing. northbound/southbound to reduce collision risk.	Higher number of potential conflict points in Dundas Street West intersection than Alternative 1 due to movements to/from Gooch Avenue.
Traffic Operations (2021 horizon year)	*Northbound operations through bridge, eastbound left-turn at Dundas Street West and southbound left-turn at St. Clair Avenue West improved.* *Adding southbound left-turn at Dundas Street West creates significant potential for southbound queuing through bridge, into St. Clair Avenue West intersection; queuing limited, but not eliminated by signal coordination.*		
	Best overall operations.	Dedicated phase for Gooch Avenue increases delays for major movements and complicates signal coordination.	Gooch Avenue traffic causes minor increases in delay and queuing relative to Alternative 1.
Transit Operations	*All alternatives accommodate transit access through bridge.* *Consider near side bus stop for westbound Dundas Street West at Scarlett Road.*		
Pedestrian and Cyclist Accommodation/Safety	*All alternatives accommodate pedestrian and cyclist movements through bridge, including space for bicycle lanes.* *Safety of pedestrians and cyclists is improved by providing more suitable lighting and drainage under structure as well as increased widths and sight distances.*		
Roadway Access	Restricted access (right-in, right-out) at Gooch Avenue.	*Full access is provided at all intersections.*	
Traffic Management	*Existing vehicular and pedestrian traffic operations on Scarlett Road maintained through Stage 1 construction. One northbound lane (of two existing lanes) on Scarlett Road will be closed for duration of Stage 2 construction.*		Existing vehicular and pedestrian traffic operations on Scarlett Road can be maintained through entire duration of construction.
ENGINEERING			
Construction Staging	*Bridge will be constructed in 2 stages in order to maintain vehicular traffic on Scarlett Road (see Traffic Management) due to overlap of the footprints of the new and existing bridges. Bridge abutments and pier constructed using construction under rail traffic methodology* *CPR requires that all 4 tracks (3 mainline tracks and 1 yard track for Lambton Yard) be maintained in operation, with the exception of short term (48 hour maximum) track closures. Two of three mainline tracks must be maintained during any track closure. On this basis, it maybe necessary to install the Through Plate Girder span for each track during separate 48 hour track closures. Assume 4 separate 48 hour weekend track closures are required per construction stage (8 weekend closures in total).*		Bridge will be constructed in a single stage using construction under rail traffic methodology, as new bridge is located east and clear of existing. CPR requires that all four tracks (3 mainline and 1 yard track) be maintained in operation, with exception of short-term closures. 2 of 3 tracks must be maintained during any track closure. Therefore it may be necessary to install the TPG spans for each track during separate 48 hour weekend track closures (4 in total).
Utility Relocation Requirements	*All alternatives require utility relocations.* *Extent of requirements to be determined in detailed design.*		
Constructability	*While "construction under rail traffic" is complex, techniques are familiar to Ontario construction industry. Square structure geometry facilitates temporary shoring and trestles.*		"Construction under rail traffic" necessitates rearrangement of CP Rail track alignments for Lambton Yard ladders. Skew alignment of bridge structure will complicate "construction under rail traffic" by extending span length of trestles and geometry of temporary shoring/trenches.
Construction Duration	*8 to 10 months (1 construction season)*		10 to 12 months (1.5 construction seasons) unless track work is completed in an Advance Contract.
Construction Costs Note: Cost differences from feasibility study are attributed to increases in construction costs (2001-2004) and greater understanding of project requirements.			
Road: Bridge & Retaining Wall: Track: Engineering & Contingency (25%): ***Total:***	$2.35 M $4.00 M $0.50 M $1.86 M **$8.71 M**	$2.45 M $4.60 M $0.50 M $1.90 M **$9.45 M**	$ 3.10 M $ 5.15 M $ 4.00 M $ 3.23 M **$15.48 M**

FACTOR/CRITERIA	ALTERNATIVE 1 *Right-In/Right-Out Only*	ALTERNATIVE 2 *Full Access, Offset Intersection*	ALTERNATIVE 3 *Full Access, Scarlett Road Realigned*
Other Engineering Considerations: **Adherence to Railway Standards**	*Square spans and uniform through plate girder widths meet CP Rail design guidelines.*		Skew abutments and piers contravene CP Rail design guidelines. Varying width of through plate girder for north mainline and yard tracks is non-standard. Track realignment to maintain uniform through plate girder widths may not be acceptable to CP Rail Operations Dept.
Grade Adjustments to roadways	*Road grade adjustments are required to provide sufficient height under the bridge.*		Scarlett Road profile must be lowered additional 0.4m compared to Alternatives 1 and 2.
ENVIRONMENTAL IMPACTS			
Vegetation Impacts	*Minor impacts to vegetation in parkette on north side of St. Clair Avenue West, east of Scarlett Road. Species include a small red/green ash, a stand of junipers and a crab apple tree.*		Significant impacts to parkette vegetation. Re-alignment of Scarlett Road could affect mature English oak, elm, honey locust and Manitoba maple, which are rooted in the railway corridor.
Community Impacts (traffic access/infiltration)	*All alternatives should reduce traffic infiltration on local neighbourhood roads north of St. Clair Avenue West.*		
	Limits accessibility to/from Warren Park neighbourhood.	*Full access to Gooch Avenue may promote added traffic through neighbourhood.*	
Drainage Impacts	*All alternatives result in drainage impacts to due to lowering grade of roadway.* *Alternative 3 impacts would be the most significant.*		
Property Impacts (Properties Displaced/Properties Affected)	*Minor property requirements from CP Rail; and from apartment building and Loblaws on the south side of Dundas Street West.*		Minor property requirements from CP Rail and from the apartment building and Loblaws on the south side of Dundas Street West. High probability for acquisition of commercial properties on Scarlett Road (#17-23) and St. Clair Avenue West (#2710) due to grading requirements and related severe access/parking impacts.
Property Access Impacts	*All alternatives retain accessibility to existing entrance, except immediately upstream of major intersections. Access may be restricted with raised medians in the future if operational and/or safety problems develop.* *All alternatives require significant re-grading of driveways/parking for commercial properties along Scarlett Road south of Beatrice Crescent and along St. Clair Avenue West east of Scarlett Road. Operation of loading bays of #10 Scarlett Road and #2710 St. Clair Avenue West may be affecting by regarding. Details to be finalized in detail design in consultation with affected property owners.*		
Parking Impacts **On-Street Parking**	*All alternatives could consider additional parking restrictions, e.g. on St. Clair Avenue West east of Scarlett Road.*		
On-Property Parking	*Parking spaces displaced at the #17-19 Scarlett Road plaza due to road re-grading requirements.* *Re-grading of parking areas required to plaza and commercial buildings on St. Clair Avenue West east of Scarlett Road. Some parking spaces may also be lost at the St. Clair Avenue West buildings due to the need to provide additional steps for access to the buildings.*		Severe impacts to on-site parking at Scarlett Road plaza and commercial buildings along St. Clair Avenue West east of Scarlett Road due to road realignment and grading requirements.
Economic Impacts (Impacts to nearby businesses)	*Potential positive economic impact to businesses east of Scarlett Road on Dundas Street West due to provision of southbound left-turn lane from Scarlett Road.*		
	Potential negative economic impact on businesses with access and parking impacts.		Most significant potential negative economic impact to businesses on Scarlett Road and St. Clair Avenue West east of Scarlett Road due to severe impacts of re-grading requirements on parking supply and access.
RECOMMENDATION	**Not recommended**	**Recommended**	**Not recommended**
	Although this alternative addresses safety and operational issues and future travel demand, it restricts access to/from Gooch Avenue.	Addresses future travel demand and maintains road access to Gooch Avenue at similar cost to Alternative 1. Carry forward as the technically preferred alternative.	Although this alternative addresses safety and operational issues and future travel demand, it has significant additional impacts to road grades, property, entrances, parking, businesses and railway operations. Significant additional cost and impacts for only minor operational benefit over Alternative 2.

6.4 ALTERNATIVES FOR STREETCAR PROVISIONS

6.4.1 Description of Alternatives

The Toronto Transit Commission (TTC) requested that the Project Team examine the feasibility of the CP Rail Bridge allowing for streetcars to pass through the new bridge over Scarlett Road. The TTC made this request in anticipation of a potential future need to extend the St. Clair Avenue West streetcar service from its existing terminus at Gunns Road westerly to Scarlett Road or beyond. A full environmental assessment study would be required prior to implementation of any such extension.

Two alternatives for accommodating streetcars through the Scarlett Road/CP Rail bridge were considered:

1. A shared right-of-way would include:
   - Building the bridge to accommodate future streetcar tracks in two centre traffic lanes;
   - Accommodation within a two span bridge; and
   - Use of transit priority signals to facilitate safe streetcar movements between St. Clair Avenue West and Dundas Street;

2. An exclusive right-of-way would include:
   - Building the bridge with a separate centre span to accommodate potential future streetcar service in exclusive lanes;
   - Three-span bridge to limit structure depth and maintain vertical clearance; and
   - Dedicated transit signals to accommodate safe streetcar movements between St. Clair Avenue West and Dundas Street West.

6.4.2 Assessment

- **Table 6-4** documents the assessment undertaken to assess the alternatives for streetcar provisions through the bridge.

Table 6-4: Assessment of Alternatives for Streetcar Provisions

Factor/Criteria	Shared Right-of-Way	Exclusive Right-of-Way
Transportation		
Safety	• Potential for conflicts between streetcars and public traffic in shared lanes • Transit priority signals increase driver workload and create potential for confusion	• Lower potential for conflicts between streetcars and public traffic • Unusual road and traffic signal configurations increase driver workload and create potential for confusion • Additional bridge piers increase obstacles in roadway
Traffic Operations	• Signal pre-emption by transit vehicles disrupts signal coordination, increasing delays to other traffic	• Operation of dedicated transit signal phases takes time from other signal phases and disrupts coordination, increasing delays to other traffic • Wider intersections require longer clearance intervals and pedestrian walk times, decreasing the overall efficiency of intersection operations and increasing congestion • Reduced queue storage length under bridge if St. Clair is widened to the south and/or Dundas Street West widened to the north to accommodate streetcar right-of-way without removing traffic lanes
Transit Operations	• Streetcars can be delayed by other vehicles blocking tracks (possible to mitigate with transit priority signals and queue-jump lanes or other transit priority measures on approaches)	• Streetcar operations not affected by other traffic
Pedestrian and Cyclist Accommodation/Safety	• Crossing streetcar tracks is a potential hazard to cyclists	• Crossing streetcar tracks is a potential hazard to cyclists • Wider intersections increase pedestrian crossing times • Increased intersection complexity/driver workload increases chances of motorists not noticing pedestrians and cyclists
Roadway Access	• Full access can be provided at all intersections	• Full access can be provided at all intersections
Traffic Management	• Existing vehicular and pedestrian traffic operations on Scarlett Road maintained through Stage 1 construction. One northbound lane (of two existing lanes) on Scarlett Road will be closed for the duration of Stage 2 construction.	• Feasible to retain existing vehicular operations on Scarlett Road throughout construction due to addition
Engineering		
Construction Staging	• Two-stage construction under rail traffic, as for recommended bridge design.	• Two-stage construction under rail traffic, but requires additional trestles to support tracks during construction of additional span; may require additional track closure for installation
Utility Relocation Requirements	• Same as for recommended bridge design.	• Additional relocations probably required due to additional road and structure width.
Constructability	• Same as for recommended bridge design.	• Temporary shoring and trestles similar in complexity to recommended bridge design, but additional quantities. • Relocation of Lambton Yard west ladder tracks (with turnouts and signals) would be required to maintain parallel tracks over structure. Alternative would be an asymmetrical structure to accommodate the existing track alignment. Either option requires approval of CP Rail.
Construction Duration	• 8 months (1 construction season)	• 10-12 months (1.5 construction seasons) unless railway track work is completed in an advance contract

Factor/Criteria	Shared Right-of-Way	Exclusive Right-of-Way
Construction Costs **Road:** **Bridge:** **Track:** **Engineering & Contingency:** **Total:**	• No added cost; recommended bridge design can accommodate streetcars without modification $2.4 M $3.7 M $0.5 M $1.8 M $8.4 M	• Cost increment of approximately $5.9 M due to larger structure and roads, increased impacts on properties and railway. $3.2 M $4.5 M (assumes parallel tracks) $3.5 M (assumes yard track relocation) $2.9 M $14.1 M
Other Engineering Considerations: **Adherence to Railway Standards**	• Square spans and through plate girder width meet CP Rail design guidelines.	• Relocation of Lambton Yard west ladder tracks may be required to avoid varying width of through plate girder for north mainline track and yard track. Acceptability to CP Rail Operations Department is not known. Asymmetrical structure to accommodate existing track alignments may be possible, but would be non-standard.
Grade Adjustments to Roadways	• As for recommended bridge design.	• Longer sections of approach roads require lowering to maintain vertical clearance with extension of bridge to the west. • Asymmetrical structure option could require additional road lowering to maintain vertical clearance under the bridge.
Environmental Impacts		
Vegetation Impacts	• Impacts same as recommended bridge design.	• Requires removal of significantly more vegetation from parkette and railway corridor, including mature trees.
Community Impacts (traffic access/infiltration)	• Impacts same as recommended bridge design.	• Impacts same as recommended bridge design.
Drainage Impacts	• Impacts same as recommended bridge design.	• Stormwater runoff increased due to increase in paved area.
Property Impacts (Properties Displaced/Properties Affected)	• Impacts same as recommended bridge design.	• Significant additional property required from CP Rail and from the Parkette and plaza parking lot north of St. Clair Avenue West (City owned). • Road widening to accommodate a separate streetcar ROW could require property along Dundas Street West and St. Clair Avenue West.
Property Access Impacts	• Impacts same as recommended bridge design.	• Left-turns to/from businesses north of St. Clair Avenue West on Scarlett Road restricted by median island (required to "shadow" streetcar ROW under bridge). • Left-turns to/from properties along St. Clair Avenue West and Dundas Street West could be restricted by the streetcar ROW.
Parking Impacts	• Impacts same as recommended bridge design.	• Removes additional spaces from the parking lot of the plaza on the east side of Scarlett Road north of St. Clair Avenue West.
Economic Impacts (Impacts to nearby businesses)	• Impacts same as recommended bridge design.	• Potential negative impact on businesses in Scarlett Road plaza due to additional loss of parking stalls.
Recommendation	**Recommended**	**Not Recommended**
	• Any new bridge should be designed to accommodate future streetcar service in shared lanes. • Should exclusive right-of-way be implemented in the future on the Dundas Street West and St. Clair Avenue West approaches, access through the bridge can be enhanced through use of transit priority signals.	• Significant negative impacts on safety, operations and social environment, significant additional construction cost and uncertainty about approval from CP Rail, with little incremental benefit over shared lanes option with transit priority signals. • Timing and feasibility of streetcar line extension to Scarlett Road are uncertain.

Following the assessment of the Streetcar alternatives, Toronto City Council requested that the Project Team re-examine the feasibility of the CP Rail Bridge allowing for streetcars to pass through the new bridge at Scarlett Road on an exclusive Right-of Way (ROW) with only minor modifications to the technically preferred design, and lesser impacts than that of alternative C2 for transit. As a result of this request, the investigation of bridge options was revisited in conjunction with a review of potential resultant affects to the railway and roadway corridors. The review established the preference for making provision for an exclusive street car ROW through the following design modifications:

1. Increase in the clear span openings from 12.6m to 13.9m as shown in **Exhibit 6-7**. In order to limit the impacts of increased opening widths on the Scarlett Road ROW requirements, a reduction of lane widths from 3.5m to 3.3m would be required to accommodate the exclusive street car lanes. No compromises were made to bike lane or sidewalk dimensions. The additional span length resulted in only minimal change to the bridge depth and therefore no change is expected to the Scarlett Road profile.
2. While the span increases associated with the provision of exclusive streetcar lanes at the subway structure are small (1.3m +/-), the Project Team determined that it would be prudent to review the impacts of the proposed bridge construction on the railway corridor in greater detail. The results of the review, which included additional consultations with CP Rail, are summarized as:
    - The spacing and alignment of the 3 existing mainline trucks cannot be altered. This constraint will necessitate that the bridge superstructure consist of a "common girder" through-plate girder (TPG) configuration, instead of a more standard configuration consisting of a separate TPG span for each track.
    - The alignment of the existing ladder track which connects the North Mainline Track (NML) with the Lambton Yard cannot be altered. As the connection point between ladder and mainline tracks is located within the footprint of the proposed bridge, a special widened TPG superstructure will be required for the existing NML-ladder track layout.
    - Because of the requirement for a widened superstructure for the existing NML-ladder track, the existing North Lead Track, which connects the mainline tracks to the west ladder tracks of CPR's Lambton Yard, must be shifted 2.5 m +/- to the north. An existing siding track on the north side of the main tracks, west of Scarlett Road, must be removed to accommodate the alignment shift of the North Lead Track. Through preliminary discussions, CP Rail has indicated that the siding track is currently not used, and can be removed. The track was formerly used as a scale track, and the Railway may require a replacement scale track at another location, as compensation.
    - The realignment of the North Lead Track will also necessitate replacement of the Railway's signal bridge located immediately west of Scarlett Road. The north support for the signal bridge must be moved 2.5 m +/- to the north, and a longer span provided. Approximately 570m^2 of property will be required from CP rail to accommodate the improvement plan.
    - The Railway has numerous buried signal, track and switch cables adjacent to the existing tracks and suspended on the sides of the existing bridge. In addition, Rogers and Level 3 have fibre optic cables on the north and south sides of the Railway's Right-of-Way (ROW) respectively. This existing infrastructure must be maintained in service during construction, necessitating a detailed relocation and restoration plan for each cable.

By modifying the technically preferred two-span bridge alternative, the Project Team was able to accommodate the provision of a dedicated streetcar lane while avoiding most negative impacts of the three-span bridge alternative as discussed in Table 6-4.

6.5 TECHNICALLY PREFERRED DESIGN ALTERNATIVE

The technically preferred design alternative was taken forward to agencies and the public for comments. Based on input received (and described as refinements to the Preferred Design Alternative in Section 6.5), the Preferred Alternative includes the following features, as shown in plan view in **Exhibit 7-1**:

- New two-span, through plate girder bridge, with minimum vertical clearance of 5.0 m above Scarlett Road;
- Two northbound and two southbound lanes under the bridge, as well as a bicycle lane and sidewalk on each side;
- Horizontal and vertical clearances designed to accommodate potential future streetcar service in exclusive lanes;
- Full signal protected access to and from Gooch Avenue at Dundas Street West through an offset intersection with Scarlett Road;
- Eastbound dual left-turn lanes on Dundas Street West eastbound at Scarlett Road; and
- Acceleration lane for the southbound to westbound channelized right-turn from Scarlett Road to Dundas Street West.

This design alternative was refined in preliminary design based on comments received.

6.6 REFINEMENT OF PREFERRED DESIGN ALTERNATIVE

Based on input received from City staff, CP Rail, the Toronto Fire Department, Toronto City Council and the general public during and after the November 9, 2005 Public Information Centre (PIC), refinements were made to the preferred alternative as follows, and based on the request of Toronto City Council on April 25, 26 and 27, 2006.:

- ***CP Rail:*** On November 1, 2004, CP Rail announced a new policy that imposed more restrictive clearance standards for road/rail grade separations. The preferred design presented at the PIC had a vertical clearance of 4.8m, while the new CP Rail standard requires 5.8m desirable or 5.0m minimum. This is further explained in Section 6.2.1. Consultation with CP Rail through November 2004 to January 2005 resulted in a written confirmation from CP rail accepting the 5.0m clearance for the proposed Scarlett Road/CP Rail Bridge. In order to achieve the revised vertical clearance, adjustments to the road profiles of Scarlett Road and St. Clair Avenue West was necessary. The new profiles resulted in increased impacts to properties along Scarlett Road and St. Clair Avenue West, particularly for access and parking. Significant re-grading of driveways/parking areas would be required for the commercial properties along Scarlett Road south of Bernice Crescent and along St. Clair Avenue West immediately east of Scarlett Road. Parking spaces would be displaced at the Scarlett Road plaza, and parking spaces may also be displaced at the St. Clair Avenue West buildings due to the provision of additional steps for access to the buildings. City of Toronto staff subsequently met with each of the affected property owners to convey this newly discovered information and discuss potential mitigating measures that would be further explored in detail design.

- ***Toronto Fire Department:*** A representative of the Toronto Fire Department identified an issue with the design of the channelized right-turn for the department's largest ladder truck. As a result, the channelized right-turn and associated island were redesigned to provide for the TAC design vehicle turning radius WB – 19, as this best reflects the turning characteristics for the large ladder truck.

- ***Public Input:*** Concerns were expressed regarding accessibility to commercial properties on the south side of Dundas Street West west of Scarlett Road, due to the proposed introduction of a double left-turn lane at the Dundas Street West/Scarlett Road intersection. Concerns specifically related to the difficulty that might arise to west bound traffic attempting to turn left across the double left-turn lanes, plus the east bound lanes of Dundas Street West. To address these concerns, the plan was modified to reduce the length of the double left-turn lane storage. A traffic operations analysis on the revised design demonstrated that by 2021 the reduction would result in a less then desired storage for 2021 demand volumes, but would operate adequately in 2011. Queue spill back from the left-turning traffic would occur about half of the time during the AM peak hour and through out the PM peak period (as would also occur with the original plan). The roadway footprint has been designed to allow a reversion to the original double left-turn design through line painting only, should operational or safety reasons warrant the change.

- ***City of Toronto Council:*** Council requested that the Project Team examine the feasibility of the CP Rail Bridge allowing for streetcars to pass through the new bridge at Scarlett Road on an exclusive Right-of Way (ROW), with only minor modifications to the technically preferred design, and lesser impacts than that of Alternative C2 for transit. Toronto Council made this request in anticipation of a potential future need to extend the St. Clair Avenue West streetcar service from its existing terminus at Gunns Road westerly to Scarlett Road or beyond. A separate transit service environmental assessment study would be required prior to implementation of any such extension. As a result of this request, the investigation of bridge options was revisited in conjunction with a review of potential resultant affects to the railway and roadway corridors as shown in **Exhibit 6-7.**

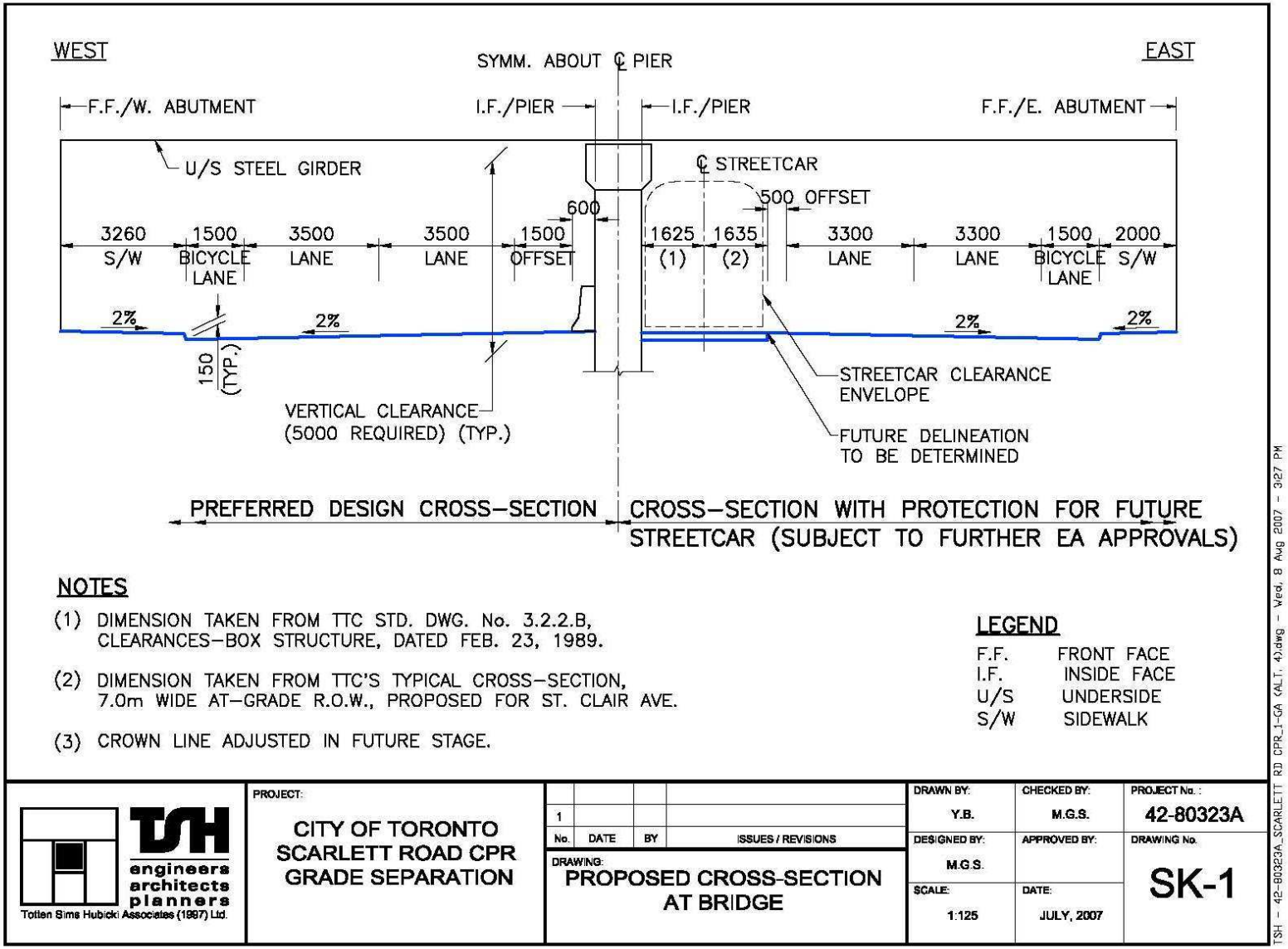


Exhibit 6.7: Cross Section of Preferred Design at CP Rail Bridge

6.7 ANTICIPATED IMPACTS AND PROPOSED MITIGATION MEASURES

The anticipated impacts to the social and natural environment and the proposed mitigation measures are as follows:

6.7.1 Social Environment

- ***Property affected*** (Effect on the buildings and properties adjacent to road) – The recommended improvements impact a number of properties as identified on the plan. Property acquisition can occur following the completion of this Environmental Assessment. Other properties in addition to those noted above, may require a "Permit to Enter" for the construction of the improvements.

  The replacement of the bridge and the new vertical clearance standard imposed by CP Rail require lowering the profile of Scarlett Road and St. Clair Avenue West as shown on the profile drawings (**Exhibit 7-2**). Impacts to parking and access to buildings on Scarlett Road and St Clair Avenue West are noted on **Exhibit 7-1**. All affected property owners have been contacted by City Staff to discuss the impacts and potential solutions.

  The City has not established a program year for the planned improvements. Changes to land use may occur in the intervening period that could alter the impacts or range of potential selection. Further discussions with affected land owners would be necessary during detail design (prior to implementation) to determine the preferred approach to resolving identified impacts.

  In addition, impacts to parking and access resulting from the planned improvements have been identified and a range of alternative mitigating treatments have been developed and costed for planning and funding allocation purposes.

  Resolution of the preferred mitigation approach should be deferred until an implementation program has been established and detail design has commenced in order to ensure that the most appropriate solution is made for the land areas that exist at that time.

- ***Aesthetics*** (Proximity and visual effects to adjacent landowners) - Areas requiring landscape treatment for aesthetic and other considerations will be identified through the development of a Streetscape Plan during detail design

- ***Noise*** (Effect on traffic-related noise in residential areas) - While the improvements to Scarlett Road through the CP Rail Bridge, Dundas Street West and St. Clair Avenue West will increase the footprint of the roadways and the bridge, an increase in sound levels is not expected. As a result, no specific measures are contemplated at this time.

  As part of this Class EA, an analysis was undertaken of sound levels at noise sensitive land uses adjacent to the Study Area. The noise assessment was performed in accordance with the MTO Quality and Standards Directive A-1, Noise Policy and Acoustical Standards for Freeways (Directive A-1), MTO/MOE Noise Protocol and the Ministry of Transportation's Environmental Office Manual Technical Areas – Noise. The improvements are expected to be completed in 2013. The Ministry of Environment requires an analysis of noise impacts 10 years post-construction to account for growth in traffic volumes resulting from improvements. Year 2021 traffic levels from the City's travel demand forecasting model were used to perform the analysis. The resulting noise levels are considered to be conservative, relative to the MOE requirements. This noise impact assessment used measured sound exposure and Stamson software, which are

accepted by MOE for analysis of this type. The Environmental Noise Impact Assessment can be found in **Appendix I**.

A Noise Sensitive Area (NSA) is defined as a building that has an outdoor recreational/living area associated with a residential unit. In accordance with MOE practices, the selected NSAs include outdoor living areas of residences, communal living areas of apartments, schools and other noise sensitive land uses. Apartment balconies were not considered to be noise sensitive. The Scarlett Road study area includes mostly urban and residential development.

Four (4) at-grade NSA's (1.5 m above ground level), were included in the impact assessment. These 4 receiver sites in the Study Area are expected to be the most adversely affected by the noise associated with the roadway improvements, and were modelled to predict the future 2021 sound levels (with and without improvements in the Study Area). A description of the receiver locations is presented in Table 6-2**.**.

The receiver site sound levels and changes in sound level relative to the 'Do Nothing' Alternative are presented in Table 6-3. The noise levels are shown to an accuracy of decimal place for comparison only.

Table 6-5: Modelled Noise Sensitive Areas

Receiver Number(s) (NSA)	Side	Location
R1	West	Along Bernice Crescent, West of Scarlett Road
R2	East	Along Bernice Crescent, East of Scarlett Road
R3	West	Along Dundas Street West, West of Scarlett Road
R4	East	Along Dundas Street West,

Table 6-6: Future Sound Levels at Receiver Sites

Receiver Number(s) (NSA)	24 Hour Leq (dBA) in 2021		Difference in Sound Level (dBA) (Proposed minus Existing)
	Existing 'Do Nothing'	Proposed Improvements	
R1	67	67	0
R2	63	63	0
R3	68	68	0
R4	68	68	0

No increase greater than 5 dB in sound level is expected between the existing and future "build" scenarios. As required by the Ministry's Quality and Standards Directive A-1, the criteria for assessing noise impacts of the this project was based on the following recommendations:

- If the change in noise level is 5 dBA or below, no mitigation effort is required;
- If the change in noise level is over 5 dBA the following procedure is recommended:
  - Investigate the feasibility of noise control measures on the road right-of-way;
  - Implement feasible noise control measures, where a minimum of 5 dBA attenuation, averaged over the first row of receivers is achieved; and/or
  - Mitigate to ambient noise level, as economically and technically feasible.

- ***Noise (Effect of constructed-related noise in residential areas):*** Noise levels at the four NSAs identified above were predicted by modelling. The noise propagation model took into account event duration and distance attenuation. Soundlevels were predicted using reference sound data for: bulldozers, moving dump trucks, front-en loaders, graders and rollers. The worst-case construction noise levels were predicted to be at R3 and R4 at 84 and 79 dBA respectively. It is recommended that construction near these residences be restricted to daytime hours (7:00 a.m. – 7:00 p.m.), whenever possible. Construction should be limited to the time periods allowed by local by-laws. For more information regarding Construction Noise, please see the Assessment documentation provided in **Appendix I**.

- ***Roadway and Railway Vibration Assessment:*** The proposed roadway improvements will not involve any changes to the rail line. Therefore, the current vibration levels from trains are expected to be the same with the proposed roadway improvements in place. Existing noise vibration levels were gathered for along Scarlett Road and Dundas Street West. The existing vibration levels are well below the International Organization for Standardization curve of interest for vibration for residential areas at night. The vibration levels for the future "build" scenario are expected to be below the criteria and no mitigation is required. For more information regarding the Vibration Assessment, please see the documentation provided in **Appendix I**.

6.7.2 Natural Environment

- ***Vegetation*** (effect on existing vegetation) - Trees will be preserved where possible. Existing trees that are to remain will be protected during construction in accordance with standard practice. Where existing trees are slated for removal as a result of the improvements, any new plantings will be undertaken in accordance with the Streetscape Plan, to be developed during detail design. Should replacement plantings be considered for infilling, indigenous tree stock is recommended including native red oak, white elm and honey locust. Manitoba maple is considered an invasive "weed" species and replanting of this tree type is discouraged. To ensure the survival of replacement trees, the selected tree species must be suitable for the urban conditions, and a maintenance program should be planned. Snow fencing will be utilized to protect existing vegetation and delineate areas not to be disturbed by construction activities. Impacts to existing vegetation and mitigation treatments will be determined in the detail design.

  North of the railway corridor Scarlett Road will be realigned in an easterly direction resulting in impacts to the small parkette on the north east corner of Scarlett Road and St. Clair Avenue West. It is expected that the road realignment will result in the loss of a 0.2 m diameter red/green ash, three 0.15 m diameter junipers and a 0.5 m diameter crab apple within this green space. Replacement planting along the south edge of the parkette should be considered.

  South of the railway corridor Dundas Street West will be widened at the intersection with Scarlett Road to accommodate turning lanes. As a result, existing vegetation along the south facing rail embankment along Dundas Street West will be impacted with the possible loss of several tree specimens. West of Scarlett Road much of the existing vegetation cover has been removed and only a small fringe of trees including elm and Manitoba maple are located near the southwest corner of the intersection. Approximately thirteen mature honey locust specimens (DBH 0.4-0.7 m) are located near the top of the rail embankment extending west. The proposed improvements will require removal of a portion of the embankment with the loss of the scrub elms and Manitoba maples and possible disturbance to root systems of the up-slope locusts. Establishment of low retaining walls behind the curbs at the embankment cut should be considered to maintain as much embankment soil as possible and enhance the survival prospects

for these large tree specimens. Along the railway embankment east of Scarlett Road, a similar situation exists where ten large honey locusts are perched near the top of the embankment. Some scrub Manitoba maples clustered near the bridge opening will be lost. Further to the east is a grouping of English oaks and Siberian elm that will not be impacted. Consideration in the design of a similar low retaining wall structure would be beneficial in protecting the locusts east of the bridge.

- ***Water resources (effect on existing water resources, including natural runoff and stormwater)*** - Mitigation measures including construction best management practices should be undertaken to prevent the escape of harmful substances (such as sediments, equipment spills) into stormsewers during and after construction. Best management practices will be confirmed during detail design with reference to TRCA and MNR sediment control guidelines and other applicable references. Erosion control fencing should be placed around all activity areas as well as at adjacent locations where supplies or excavated materials and imported fills may be temporarily stored. These fences should be checked routinely for effectiveness and regularly cleared of silt accumulation to ensure the integrity of erosion prevention measures.

7 PROJECT DESCRIPTION

The recommended design for replacing the Scarlett Road/CP Rail Bridge and associated roadway improvements includes the following features. The recommended design and profile are illustrated on **Exhibit 7-1** and **Exhibit 7-2** respectively:

- New two-span, through plate girder bridge over Scarlett Road, with a minimum vertical clearance of 5.0 m;
- Two northbound and two southbound lanes under the bridge, as well as a bicycle lane and sidewalk on each side;
- Horizontal and vertical clearances designed to accommodate potential future streetcar service in exclusive lanes;
- Full, signal protected access to and from Gooch Avenue at Dundas Street West, through an offset intersection with Scarlett Road;
- Eastbound dual left-turn lanes on Dundas Street West at Scarlett Road; and
- Acceleration lane for the southbound to westbound channelized right-turn from Scarlett Road to Dundas Street West.

Exhibit 7-3 provides an illustration of the proposed improvements.

The design criteria for Scarlett Road, St. Clair Avenue West and Dundas Street West within the study area are summarized in
Table 7-1, **Table 7-2** and **Table 7-3**.

Table 7-1: Recommended Design, Scarlett Road

Criteria	Reference/Notes	Existing Conditions	Design Standards	Proposed Standards - Interim Condition	Proposed Standards With Streetcar
Classification	TAC Pg. 1.3.2.2 Table 1.3.2.1	UAU60	UAU60	UAU60	UAU60
Design Speed		60 km/h	60 km/h	60 km/h	60 km/h
Posted Speed		50 km/h	50 km/h	50 km/h	50 km/h
Minimum Radius	TAC Pg. 2.1.2.13 Table 2.1.2.6	N/A	130	150	150
Minimum Stopping Sight Distance	TAC Pg. 1.2.5.4 Table 1.2.5.3	~ 80 m	75 m – 85 m	80 m	80 m
Minimum K Value[1]	TAC Pg. 2.1.3.6 Table 2.1.3.2/ Table 2.1.3.4	Crest ~ 8 Sag – 2 deflections	Crest – 10 to 13 Sag – 8 to 9	Crest – 8 Sag – 5	Crest – 8 Sag – 5
Maximum Grades	TAC Pg. 2.1.3.2 Table 2.1.3.1	5.2%	6.0%	5.2%	5.2%
Design Vehicle		WB-15	WB-15	WB-15	WB-15
Lane Width	TAC Pg. 2.2.2.2 Table 2.2.2.3	~ 3.1 m	3.5 m – 3.7 m	3.5 m	3.3 m
Street Car Lanes	TTC	N/A	3.8 m (0.5 m offset to traffic	N/A	3.75 m

Criteria	Reference/Notes	Existing Conditions	Design Standards	Proposed Standards - Interim Condition	Proposed Standards With Streetcar
			lane)		
Offset to Centre Pier	TAC / Council	N/A	1.5 m	1.5 m	0.0 m
Boulevard Width		Varies	Varies	Varies	Varies
Sidewalk Width	TAC Pg. 2.2.6.5	1.5 m	1.5 m (min)	2.0 m	2.0 m

Note: 1. K Values comparable to existing conditions retained to minimize impacts on adjacent properties.

Exhibit 7-1 Recommended Design Plan

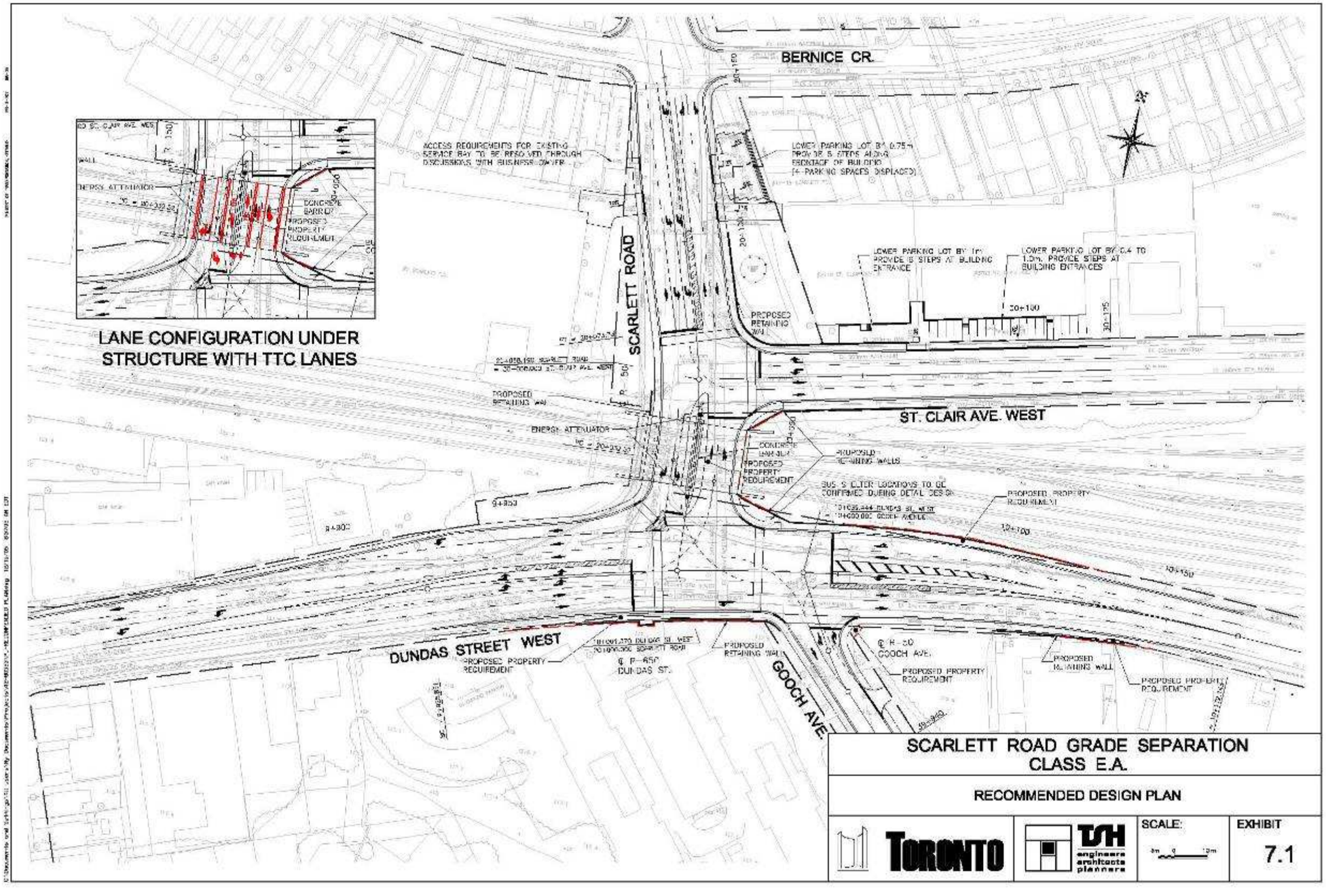


Exhibit 7-2 Recommended Design Profiles

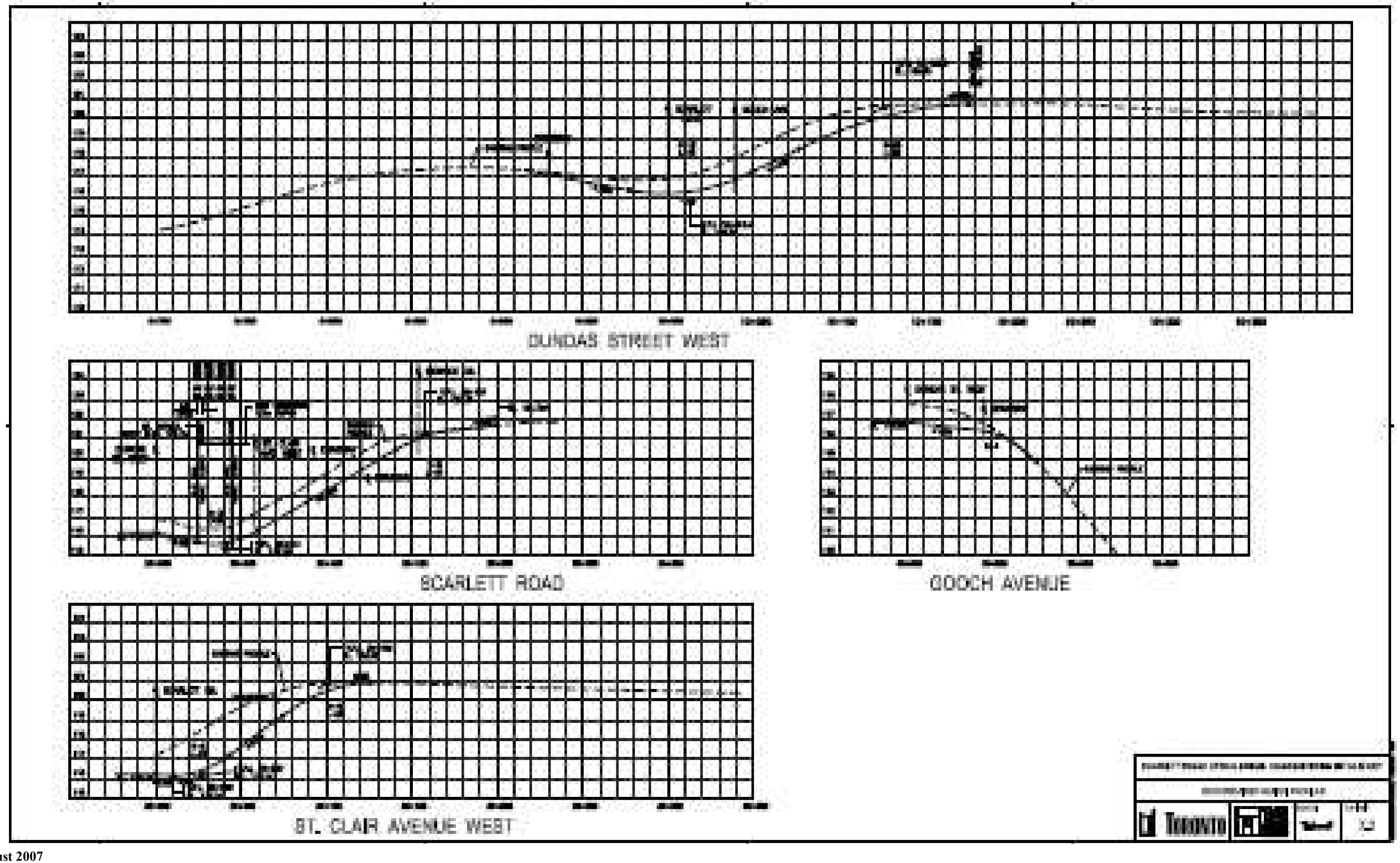


Exhibit 7-3: Visualization of Proposed Improvements

Scarlett Road looking south

Before

After

View of bridge looking northwest from Dundas Street West

Before

After

Table 7-2: Recommended Design, St. Clair Avenue West

Criteria	Reference/Notes	Existing Conditions	Design Standards	Proposed Standards
Classification	TAC Pg. 1.3.2.2 Table 1.3.2.1	UAU60	UAU60	UAU60
Design Speed		60 km/h	60 km/h	60 km/h
Posted Speed		50 km/h	50 km/h	50 km/h
Minimum Radius	TAC Pg. 2.1.2.13 Table 2.1.2.6	N/A	130	N/A
Minimum Stopping Sight Distance	TAC Pg. 1.2.5.4 Table 1.2.5.3	~ 80 m	75 m – 85 m	80 m
Minimum K Value[1]	TAC Pg. 2.1.3.6 Table 2.1.3.2/ Table 2.1.3.4	Crest ~ 10 Sag – N/A	Crest – 10 to 13 Sag – 8 to 9	Crest – 8 Sag – 5
Maximum Grades[2]	TAC Pg. 2.1.3.2 Table 2.1.3.1	6.0%	6.0%	6.5%
Design Vehicle		WB-15	WB-15	WB-15
Lane Width	TAC Pg. 2.2.2.2 Table 2.2.2.3	~ 3.1 m	3.5 m – 3.7 m	4 lanes @ 3.5 m
Boulevard Width		Varies	Varies	Varies
Sidewalk Width	TAC Pg. 2.2.6.5	1.5 m	1.5 m (min)	2.0 m

Note: 1. K Values comparable to existing conditions retained to minimize impacts on adjacent properties.
2. Grade slightly greater than design standard proposed to minimize impacts on adjacent properties.

Table 7-3: Recommended Design, Dundas Street West

Criteria	Reference/Notes	Existing Conditions	Design Standards	Proposed Standards
Classification	TAC Pg. 1.3.2.2 Table 1.3.2.1	UAU70	UAU70	UAU70
Design Speed		70 km/h	70 km/h	70 km/h
Posted Speed		60 km/h	60 km/h	60 km/h
Minimum Radius	TAC Pg. 2.1.2.13 Table 2.1.2.6	~ 600 m	190	650 m
Minimum Stopping Sight Distance	TAC Pg. 1.2.5.4 Table 1.2.5.3	~ 95 m	95 m	95 m
Minimum K Value	TAC Pg. 2.1.3.6 Table 2.1.3.2/ Table 2.1.3.4	Crest ~ 20 Sag ~ 10	Crest – 20 Sag – 12	Crest – 25 Sag – 12
Maximum Grades	TAC Pg. 2.1.3.2 Table 2.1.3.1	4.0%	5.0%	4.3%
Design Vehicle		WB-15	WB-15	WB-15
Lane Width	TAC Pg. 2.2.2.2 Table 2.2.2.3	~ 3.5 m	3.5 m – 3.7 m	2 lanes @ 4.75 m 2 lanes @ 3.5 m
Boulevard Width		Varies	Varies	Varies
Sidewalk Width	TAC Pg. 2.2.6.5	1.5 m	1.5 m (min)	2.0 m

Note: 1.WB-19 proposed at channelized right-turn to accommodate the largest ladder truck operated by the Toronto Fire Department.

7.2 CP RAIL BRIDGE / RETAINING WALLS

As described in the November 2001 Scarlett Road / CP Rail Grade Separation Feasibility Study Report and Section 6.2 of this report, the development and selection of the recommended replacement structure alternative was influenced by several design and operational constraints including:

- The requirement to maintain vehicular and rail traffic in operation during construction;
- The requirement to increase the vertical clearance under the structure to 5.0m (from 4.0m existing);
- The requirement to increase span lengths to accommodate additional traffic lanes in each direction as well as provide for potential future exclusive lanes for street cars, sidewalk widths and horizontal clearances meeting current geometric standards;
- The close proximity of the bridge to roadway intersections at Dundas Street West and St. Clair Avenue West; and
- The close proximity of the bridge to CP's Lambton Yard to the east and to the Humber River Bridge to the west.

The recommended structure consists of a two span structural steel through plate girder superstructure supported on cast-in-place concrete abutments and piers. The bridge will accommodate four CPR tracks; three mainline tracks and one yard track. Each 13.9m clear opening span can accommodate two through lanes in each direction, bike lanes and sidewalks. The bridge openings have been sized to accommodate potential future exclusive streetcar lanes through reduction in lane widths and clearances (as detailed in **Exhibit 6.7.**), resulting in the following dimensions: a 3.26m dedicated streetcar lane; a 0.5m offset / side clearance; two 3.3m wide traffic lanes; 1.5m right hand clearance (which also provides for a bicycle lane); and a 2.0m raised pedestrian sidewalk.

The steel through plate girder substructure configuration was selected because it minimizes construction depth, thus mitigating part of the impact of the increased vertical clearance requirement, and is also best suited to the foregoing construction staging plan because the entire superstructure can be prefabricated off-site and lifted into place utilizing conventional lifting equipment.

In addition to the new railway bridge, the lowering of the roadway profiles of Scarlett Road, Dundas Street West and St. Clair Avenue West and the reconfiguration of the Scarlett Road/Dundas Street West and Scarlett Road/St. Clair Avenue West intersections will necessitate the construction of six retaining walls as described below.

- A wall in the southeast quadrant of the bridge site, paralleling the north curbline of Dundas Street West, extending 110m +/- east of the new east abutment with an average height of 2 m +/-. The wall is required to retain the existing railway embankment from the widened Dundas Street West cross-section;
- A wall in the northeast quadrant of the bridge site, paralleling the south curbline of St. Clair Avenue West, extending 60 m +/- east of the new east abutment with an average height of 2m +/-. The wall is required to accommodate grading requirements within the existing St. Clair Avenue West right-of-way;
- A wall in the northwest quadrant of the bridge site, paralleling Scarlett Road. The wall length will be approximately 9m with an average height of 1m +/-. The wall is required to accommodate grading requirements within the existing Scarlett Road right-of-way;
- Two walls on the south side of Dundas Street West, one west of Gooch Avenue and one east of Gooch Avenue. The wall in the southwest quadrant of the Gooch Avenue intersection will be approximately 65m in length with an average height of 1m +/- while the wall east of Gooch Avenue

will be approximately 40m in length with an average height of 1m +/-. Both walls are required to minimize grading impacts on the adjacent properties; and

- A wall in the northeast quadrant of the Scarlett Road/St. Clair Avenue West intersection. The wall will be approximately 85m in length, varying in height from approximately 2m in the vicinity of the Scarlett Road/St. Clair Avenue West intersection to 1m+/- at its easterly and northerly terminus. This wall is required to minimize the grading impacts on the adjacent properties.

Due to the proximity of several retaining walls to the CPR's mainline tracks, and the railway's requirements regarding maintenance of rail operations, it is anticipated that conventional retaining wall construction methodology may not be feasible for several of the retaining walls due to restrictions on the extent of excavation. Non conventional types of retaining walls, such as a concrete caisson wall, sheet pile wall, or a soldier pile and lagging wall with concrete facing, will be considered for these applications. In other locations, conventional cast-in-place concrete walls will be considered.

7.3 CONSTRUCTION STAGING

Construction will be completed in two main stages, maintaining one lane of vehicular traffic in each direction and all four CPR tracks in service with the exception of short duration work blocks / stoppages necessary to accommodate such operations as installation of temporary piling, temporary trestles and the permanent bridge spans.

In Stage 1, vehicular traffic will be maintained through the existing bridge spans while the new pier and east abutment are constructed immediately to the east of the existing bridge utilizing "construction under rail traffic" methodology. Construction under rail traffic precludes the requirement for a multi-track rail diversion which was deemed unfeasible for this site, and involves the construction of the bridge substructure within shored work trenches and under temporary trestle spans carrying the rail tracks over the work area (s). The installation of the temporary piling for the work trenches and the temporary trestle spans must be accomplished within short duration (<5 hours) work blocks coordinated with the Railway's operations. Complicating the coordination of the work blocks with the train schedules, CPR have indicated that two of the three mainline tracks must be operational during any scheduled track closure in order to minimize the potential for an unplanned interruption to service. Once the Stage 1 substructure is complete the four east TPG spans will be erected. It is estimated that a 10 hour weekend work block / track closure will be required to complete the erection of a TPG span and subsequent re-commissioning of the track. Due to the Railway's aforementioned requirement to maintain 2 of 3 mainline tracks operational, three separate 10 hour weekend work blocks will be required to erect the TPG spans for the three mainline tracks. Alternatively, all three Mainline TPG spans could be installed over a 3 day summer holiday weekend, in a sequence of closely spaced track closures. The requirement that the North Lead Track be shifted to the north will necessitate that the east TPG span for the yard track be installed during a separate track closure, and that the existing bridge superstructure supporting the yard track be removed and replaced with temporary trestle spans supported on a northerly extension of the existing bridge substructure at the same time. It will be necessary to close Scarlett Road to through traffic for a 36 hour period to facilitate the installation of the east TPG span and the temporary trestles for the North Lead Track. Lane closures / restrictions will also be necessary to accommodate construction of the temporary substructure widening. The North Lead Track will be shifted to it's permanent alignment east and west of the bridge, and the signal bridge replaced with a longer span, during a track closure scheduled concurrent with the installation of the east TPG span.

In Stage 2, Scarlett Road traffic will be rerouted to the new east span while construction of the new west abutment is conducted using "construction under rail traffic" methodology and erection of the four west TPG spans. Because the existing bridge superstructure "shares" its steel girders between adjacent tracks, in a type of common girder configuration, it will be necessary to close two mainline tracks concurrently

during the erection of each new west TPG span. The Railway's stated requirement that 2 mainline tracks be maintained in operation at all times can be satisfied by sequencing the erection of the west TPG spans such that the span for the North Lead Track is installed first, and the Lead Track utilized as a temporary mainline track during subsequent track closures / span installations. In addition, it is anticipated that it will be necessary to complete the installation of the 4 west TPG spans during 3 separate 2 track closures, scheduled to run consecutively over a 36 hour period on a 3 day summer holiday weekend, in order to mitigate the duration of individual mainline track closures to 24 hours maximum. This stage would require closure of the westbound lanes of Dundas Street to through traffic for a 48 hour period to facilitate the installation of the west TPG spans. Two way traffic could be maintained with one lane operating in each direction for this closure. Connections between Dundas Street and Scarlett Road/Gouch Avenue may not be feasible during this period. Traffic staging requirements would need to be more fully explored in detail design to mitigate potential affects of closures.

The protection, relocation and restoration of the existing telecommunication, signal, track and switch cables within the Railway's ROW will be coordinated with the foregoing sequence of construction for the bridge and road improvements.

7.4 DRAINAGE

7.4.1 Drainage Issues

No drainage related comments have been received from TRCA or the general public. However, the following drainage related issues have been identified by TSH staff as part of this report. Due to very limited information regarding downstream storm sewer capacity and detailed drainage area mapping, it is recommended that quantitative issues be addressed in greater detail at the detailed design stage.

1. A review of the topography in the study area, including site reconnaissance, indicates potential for surface flooding at the low point under the railway bridge. Only two conventional single catchbasins appear to be in the immediate vicinity of the low point. Furthermore, the proposed profiles deepen the low point relative to Dundas Street West by approximately 1.5 m. City staff have indicated that based on their experience and knowledge of the area, there is no known history of a significant flooding problem at this location.
2. The only existing minor system outlet from the vicinity of the Scarlett Road/St. Clair Avenue West intersection is via a 1,050mm (42 inch) Dundas Street West trunk storm sewer flowing westward and ultimately discharging to the Humber River. The downstream capacity of this storm sewer has not been confirmed in detail. Design sheets and detailed drainage area plans associated with the design/sizing of this storm sewer are not presently available in spite of City staff's best efforts to locate such information.
3. The proposed reconfiguration of Scarlett Road from just north of St. Clair Avenue West to Dundas Street West will result in only a minimal increase in imperviousness relative to the total drainage area for all considered options. The greatest impact is on Dundas Street West as a result of additional turning lanes on the north side and east and west of Scarlett Road. The proposed realignment of Scarlett Road increases the amount of pavement on the east side, but leaves space for a larger boulevard or grassed area on the west side. The net impact is minimized by the combination of increased imperviousness on the east side and increased perviousness on the west side. A simplified analysis using Visual Otthymo has confirmed a less than 2.0% increase in peak flow based on a 1,000 m^2 (assumed, actual value to be confirmed as part of detailed design) increase in imperviousness within the 15.29 ha drainage area identified as City catchment areas 41 and 47. Therefore, quantity control is not considered to be a significant concern.

4. Consideration should be given to investigating the relative merits of providing increased local inlet capacity at the low point under or immediately adjacent to the railway bridge to reduce the potential for significant ponding that may occur at this location under severe runoff conditions.
5. As a result of the existing highly urbanized and fully developed nature of the study area, stormwater quality control opportunities are very limited. However, only a very minimal increase in imperviousness is anticipated as a result of the proposed bridge and road improvements. Therefore, there should be little, if any, additional impact on runoff quality as a result of the proposed undertaking. There is also no space available to accommodate traditional surface measures such as ponds, infiltration trenches, enhanced swales or grassed ditches. Subsurface measures such as oil-grit separators could be retrofitted as part of storm sewer reconstruction at appropriate locations such as the downstream end of St. Clair Avenue West.

7.4.2 Proposed Drainage Measures

The following potential stormwater management (SWM) measures have been identified as desirable by the Toronto Wet Weather Flow Management Study (TWWFMS). During detailed design, their relative merit and feasibility should be investigated more fully. The topography and surface characteristics within the study area provide almost no opportunity for surface treatment or control of storm runoff, such as SWM ponds or vegetative treatment due to the highly urbanized nature of the area and lack of landscaped/vegetated surfaces.

1. St. Clair Avenue West will require some modification to its profile where it intersects with Scarlett Road. As a result, an opportunity exists to reconstruct a portion of the storm sewer on St. Clair Avenue West just upstream of the intersection in order to retrofit an oil-grit separator at the downstream end of St. Clair Avenue West.
2. A leaky pipe system, as per TWWFMS, may not be a suitable treatment on this project as this system should have pretreatment of runoff over a grassed area before discharging into the pipe network.
3. Use of permeable pavement should be encouraged when opportunities for repaving driveways or parking lots arise within the watershed in order to encourage infiltration and filtration of runoff.

7.5 RIGHT-OF-WAY REQUIREMENTS

The existing right-of-way for Scarlett Road and Dundas Street West is shown on **Exhibit 7-1**. The width varies throughout the project limits. The right-of-way width for St. Clair Avenue West is 20 m.

Property acquisition is required to accommodate the proposed widening/realignment of Scarlett Road and Dundas Street West within the study area. The property requirements are identified on the recommended design plan. The replacement of the bridge and the new vertical clearance standard imposed by CP Rail require lowering the profile of Scarlett Road and St. Clair Avenue West as shown on the profile drawings (Exhibit 7-2). Impacts to parking and access to buildings on Scarlett Road and St Clair Avenue West are noted on Exhibit 7.1. All affected property owners have been contacted by City Staff to discuss the impacts and potential solutions.

The property requirements identified as necessary for the preferred plan are:

1. 80.7m^2 of the south west corner of Dundas Street West and Scarlett Road at 3725 and 3735 Dundas Street West.

This property is required for the sidewalk and bus shelter to be located immediately south of the Scarlett Road, Dundas Street West intersection.

2. 19.6m^2 of the south side of Dundas Street West, east of Gooch Avenue in 3671 Dundas Street West.
   This property is required for the relocated sidewalk.

3. 8.5m^2 of the south east corner of the Dundas Street West and Gooch Avenue intersection at 3671 Dundas Street West.
   This property is required for relocated sidewalk at the intersection.

4. 123.0m^2 of the north side of Dundas Street West, east of Scarlett Road.
   This property is required for widening of Dundas Street West and is currently CP property.

5. 570 m^2 of the east side of Scarlett Road under the existing structure.
   This property is required for the widening of Scarlett Road and is currently CP property.

The City has tentatively identified 2011 as the starting year for implementation of the planned improvements. Changes to land use may occur in the intervening period that could alter the impacts or range of potential selection. Further discussions with affected land owners would be necessary during detail design (prior to implementation) to determine the preferred approach to resolving identified impacts.

In addition, impacts to parking and access resulting from the planned improvements have been identified and a range of alternative mitigating treatments have been developed and costed for planning and funding allocation purposes.

Resolution of the preferred mitigation approach should be deferred until an implementation program has been established and detail design has commenced in order to ensure that the most appropriate solution is made for the land areas that exist at that time.

The City has initiated discussions with the affected land owners to inform them of the improvements and identified impacts and to answer property owners that the City would take responsible action to suitably mitigate the impacts.

7.6 PRELIMINARY COST ESTIMATE

The preliminary construction cost associated with the proposed improvements is estimated at $13.90 Million, excluding property acquisition and private utility relocation costs. A breakdown of the cost is provided in **Table 7-4**.

Table 7-4: Preliminary Cost Estimate

Component of Work	Estimated Cost
Roadworks (includes roadway, municipal service relocation/reconstruction, illumination, traffic signal and construction staging costs)	$2.45 M
CP Rail Bridge / Retaining Walls[1]	$7.00 M
Track work, including flagging	$0.55 M

Relocation / restoration of Railway Signals and Fibre	$1.10 M
Engineering/Contingency (25% ±)	$2.80 M
Total	$13.90 M
Note: [1]Refinement of design includes identification of additional retaining walls at a cost of $600,000	

7.7 GEOTECHNICAL/FOUNDATION REQUIREMENTS

During detail design, geotechnical and foundation investigations will be undertaken for the recommended design to confirm the pavement design and the foundation requirements for the CP Rail Bridge and the retaining walls.

7.8 UTILITIES AND MUNICIPAL SERVICES

Existing utilities that are located within the project corridor (illustrated in **Exhibit 7-1**) include storm and sanitary sewers, watermain, bell telephone, hydro, gas and cable. The majority of the existing utilities and municipal services will be impacted by the recommended design and will require relocation.

During detail design, plans will be forwarded to the utility companies to confirm the impact and relocation requirements of the underground and overhead services within the construction limits.

7.9 PEDESTRIAN/CYCLIST FACILITIES

The sidewalks along Scarlett Road, St. Clair Avenue West and Dundas Street West will be maintained or reconstructed to suit the revised roadway geometrics and grades. Bike lanes will be protected for on Scarlett Road through the provision of a 4.67 m and 4.75 m wide curb lanes.

7.10 CONSTRUCTION IMPLEMENTATION

Subject to approval of this Environmental Study Report, the City can proceed to construct the improvements subject to property acquisition and approval for funding by Toronto City Council.

8 MONITORING DURING AND AFTER CONSTRUCTION

Many of the environmental concerns related to the project have been mitigated through the process by which the recommended design was selected, as described in this ESR.

The City will work with all approval authorities prior to the start of construction, to ensure that the proposed works are acceptable and to obtain required permits.

Short-term, potential environmental impacts related to construction activities, along with recommended mitigation measures, are tabled in **Table 8-1**. Mitigation measures that are specific and cost-effective have been selected to address potential impacts. It is recommended that environmental commitments become part of the contract package so that contractors are aware of the requirements prior to tendering. Monitoring of construction activities must ensure that all environmental standards and commitments for construction are met.

Anticipated long term environmental issues are described in **Table 8-2**, along with proposed measures to minimize the negative impacts and enhance the positive impacts of the recommended design of Scarlett Road on the environment.

Table 8-1: Potential Short Term Construction-Related Environmental Impacts and Proposed Mitigation Measures

FACTOR AFFECTED	ENVIRONMENTAL IMPACT	MITIGATION MEASURES
NATURAL ENVIRONMENT		
Fisheries	Impact on fish habitat/ watercourse during construction.	• Careful installation of controls between construction zone and watercourses to minimize disruption. Details to be developed at detail design stage.
Water Quality	Chemical contamination of creeks from construction operations.	• *General contamination*: Prohibit the placement of construction debris or empty fuel or pesticide containers within 30 m of watercourses/run-off. • *Fuel contamination*: Control equipment re-fuelling and maintenance and storage of fuel containers. • *Storage of materials*: Prohibit storage of waste, surplus organic material and topsoil on areas adjacent to creeks. • *Watering from dewatering*: Discharge water either into settling basin or vegetated buffer area where dewatering required. • *Spills:* Adequate measures will be taken to prevent or capture and contain any debris and spills resulting from construction activities.
Erosion and Sedimentation	Sediment transport in stormwater run-off. Slope erosion and stability. Exposed Soils Removal of Soils	• Minimize extent and period of surface exposure, particularly for slopes and if applicable, drainage ditches. • Incorporate erosion and sedimentation control measures in accordance with MNR and TRCA's current guidelines. • Sediment and erosion control measures (including sediment fencing and erosion control fencing) installed and maintained until completion of construction and stabilization of disturbed soils. Include restoration of disturbed areas as a contract requirement. • Exposed soils immediately stabilized with straw mulch, erosion blanket, sod or hydroseed, depending on the specific circumstances. • If contaminated soils are found, the soils will be tested for contaminants resulting from previous land uses or dumping. Contaminated soils will be disposed of according to City guidelines, which will be consistent with the MOE's guidelines for Use at Contaminated Sites in Ontario.
Vegetation	Loss of vegetation to accommodate road improvements and pedestrian facilities. Damage to trees in close proximity of working area.	• Limits of work to be delineated in field prior to construction commencement to minimize environmental impacts. • Vegetation that is subject to significant environmental damage should be fertilized and pruned to accelerate recovery. • Clearing of vegetation in the vicinity of the culverts must be kept to the minimum required to safely and efficiently undertake the work. • Erect snow fence leading around dripline of trees in close proximity to work area; do not allow working/equipment around dripline. • Consider local modifications in grading to reduce impact on vegetation in close proximity to work area.
Air Quality	Reduced air quality due to dust.	• Apply water and calcium during construction. The use of non-chloride based compounds will be used to protect water quality.
SOCIAL ENVIRONMENT		
Maintenance of traffic	Delays to traffic due to construction.	• Maintain traffic movements to local residences and businesses whenever possible. Stage construction appropriately to minimize delays. Use flag persons to facilitate traffic movements.
Traffic Safety	Roadway safety issues associated with construction activities.	• Carry out standard construction safety practices. • Require contractor to conform to the construction requirements of the City and the Ontario Traffic Manual.
Noise	Increased noise levels	• Adhere to local municipal bylaws for hours of construction operation. Ensure proper maintenance of construction equipment.

Table 8-2: Potential Long Term Environmental Impacts and Proposed Mitigation Measures

FACTOR AFFECTED	ENVIRONMENTAL IMPACT	MITIGATION MEASURES
NATURAL ENVIRONMENT		
Vegetation	Loss of vegetation to accommodate selected design.	• Design recommended plan to minimize removal of vegetation. • Restore disturbed soils, plant forest edge and replace riparian vegetation using trees and shrubs as documented in an approved vegetation restoration plan developed during detail design. • Re-vegetate with native plants and shrubs in strategic locations to ameliorate the negative environmental impact of vegetation loss. • Maintain specimen trees where possible.
Water Quality	Reduced water quality due to contaminants contained in road run-off.	• Employ stormwater best management practices to reduce discharge of contaminants to receiving watercourse and wetlands. • Develop monitoring and maintenance program for stormwater management facilities as per MOE and TRCA guidelines.
Fisheries	Loss of fisheries habitat due to construction of road improvements.	• Fisheries Compensation package to be developed in detail during design of the crossings as required. • Provide detail design and Fisheries Compensation package to TRCA (MNR and DFO) for comment.
Wildlife	Loss of trees and shrubs and wildlife passage	• Maintain wildlife passage with any proposed modifications to the watercourse crossing structures.
SOCIAL ENVIRONMENT		
Aesthetics	Reduced visual quality of roadway.	• Development of streetscaping plan to mitigate reduced visual quality..
Noise	Increased noise levels.	• No significant increase in sound levels with improvements when compared to levels without improvements. Mitigation not required.
Access	Impacts to driveways adjacent to road.	• Reconstruct all private entrances physically affected by the widening as part of the construction.

9 COMMITMENTS TO FOLLOW-UP ACTIVITIES

9.1 AGREEMENTS

An agreement will be required between the City of Toronto and CP Rail for property acquisition, construction of the replacement bridge and retaining walls, cost sharing of the construction and ongoing responsibility for maintenance.

Agreements will be required between the City of Toronto and other private land owners for the acquisition of property to implement the recommended plan. The required property is identified on the recommended design plate provided as **Exhibit 7.1**

The recommended plan identifies the location of additional property and the approximate area. It also identifies impacts that affect the use of specific adjacent properties in terms of adjustments to driveway elevations or grades, removal of parking, adjustments to entrance stairs, and so on. The City of Toronto Property Office will have to negotiate compensation for these impacts when negotiating the acquisition of right-of-way for proposed improvements. City staff has met with all directly affected property owners to apprise them of the impacts and to discuss potential mitigation. The acquisition process can commence once the Environmental Study Report has received environmental clearance.

Agreements will also be required with the affected utility companies for the relocation of existing plant in conflict with the recommended plan.

9.2 COST SHARING ARRANGEMENTS

Cost sharing arrangements will be required between the City and CP Rail for construction of the replacement bridge and ongoing maintenance responsibilities.

Cost sharing arrangements may be required with the affected utility companies for the relocation of existing plant in conflict with the Recommended Plan.

9.3 ENGINEERING INVESTIGATIONS

This section identifies activities that must be undertaken prior to or in conjunction with the detail design for the proposed improvements.

- A pre-engineering survey and new mapping should be undertaken prior to detail design.

- A geotechnical investigation will be required during detail design to develop pavement design recommendations for the proposed pavement replacement, rehabilitation and widening. The geotechnical program should include a soils investigation, asphalt pavement coring and laboratory testing.

- A title search and legal surveys will be required to identify precise property requirements for the proposed improvements.

- A composite utility plan is required to identify the location of existing plant within the study area and potential conflicts. Utilities identified during the Class EA are shown on the plans. Relocation requirements will be resolved during detail design, including any relocations repairs or upgrades to municipal services (i.e. water and sanitary services). Once the grading

requirements for proposed improvements have been finalized, the utility relocation requirements for the project will need to be finalized in conjunction with the utility owners, and cost sharing arrangements determined.

- Environmental Site Assessments may be required for potentially contaminated property in the vicinity of the proposed bridge replacement.

- An arborist report and a landscape plan should be developed to mitigate the removal of trees.

- A detailed stormwater management plan must be developed.