

TOWN OF OAKVILLE
SIXTH LINE FROM DUNDAS STREET
TO HIGHWAY 407 ETR
CLASS ENVIRONMENTAL ASSESSMENT STUDY
TOWN OF OAKVILLE PROJECT NO. EA-067-11

ENVIRONMENTAL STUDY REPORT

MORRISON HERSHFIELD LIMITED
235 YORKLAND BOULEVARD, SUITE 600
TORONTO, ONTARIO, M2J 1T1
TEL: (416) 499-3110
FAX: (416) 499-9658

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EXECUTIVE SUMMARY

A. Introduction

Purpose of Study

The Town of Oakville has initiated a Class Environmental Assessment study for improvements to Sixth Line between Dundas Street to Highway 407 ETR. The consulting firm of Morrison Hershfield Limited has been retained to undertake the study on behalf of Town of Oakville.

Population and employment forecasts indicate that much growth is still to happen in Town of Oakville over the next twenty to thirty years. This will further increase traffic on the road system. The Town of Oakville has identified Sixth Line between Dundas Street to Highway 407 ETR to investigate existing and future traffic capacity requirements, transportation system considerations, safety and operations, and to review the need and justification for possible improvements to Sixth Line.

This Environmental Study Report reviews the study background, existing and future conditions within the study area and alternative solutions. In addition, the ESR reviews and presents the results from Public Information Centre (PIC) #1 and #2, the final preferred design and recommendations for construction including mitigation.

The major objectives of this study were to:

- Confirm and document the need for the proposed road improvements, including all utilities;
- Address existing and potential safety issues along the corridor;
- Establish the preferred alignment;
- Prepare preliminary roadway designs as the basis for estimating project costs and property requirements and identifying appropriate mitigating measures;
- Liaise with other jurisdictions affected by this undertaking. These will include the Region of Halton and Conservation Halton;
- Preparing travel forecasts representative of the current and forecast development in this area of the Town and to work with the Town transportation model to incorporate updated development assumptions for the horizon years and to develop and apply a sub-area analysis to determine specific requirements in the Sixth Line corridor;
- Consideration of pedestrian and cyclist requirements in terms of on and off-street facilities and timing considerations at intersections;
- Access control requirements, including centre median control, restricted turning movements at intersections to ensure the capacity of the roadway is not compromised now or in the future;
- Prepare Preliminary Design for the preferred alternative; and
- Prepare an Environmental Study Report (ESR). Filing of which will secure the required environmental approval for the project.



Study Area

The study corridor of the project extends from the south of Dundas Street to the Highway 407 ETR. The physical boundaries of the study area are shown in **Figure E-1**.

The study area on Sixth Line is from Dundas Street to Highway 407. Sixth Line is a north-south roadway and within the study area, is generally a flat and straight two-lane rural road with limited development of individual homes. The roadway is narrow with limited shoulder width with a typical right-of-way of 22m. Sixth Line has a posted speed limit of 60 km/h from just north of Dundas Street to just south of Burnhamthorpe Road, where it then changes to 80 km/h to the north.

Currently, Sixth Line intersects at Dundas Street and Burnhamthorpe Road, which operate under the jurisdiction of Halton Region. The intersection at Dundas Street is operating under traffic signal condition. The intersection of Sixth Line and Burnhamthorpe Road is operating under unsignalized traffic control with a flashing all-way stop condition.

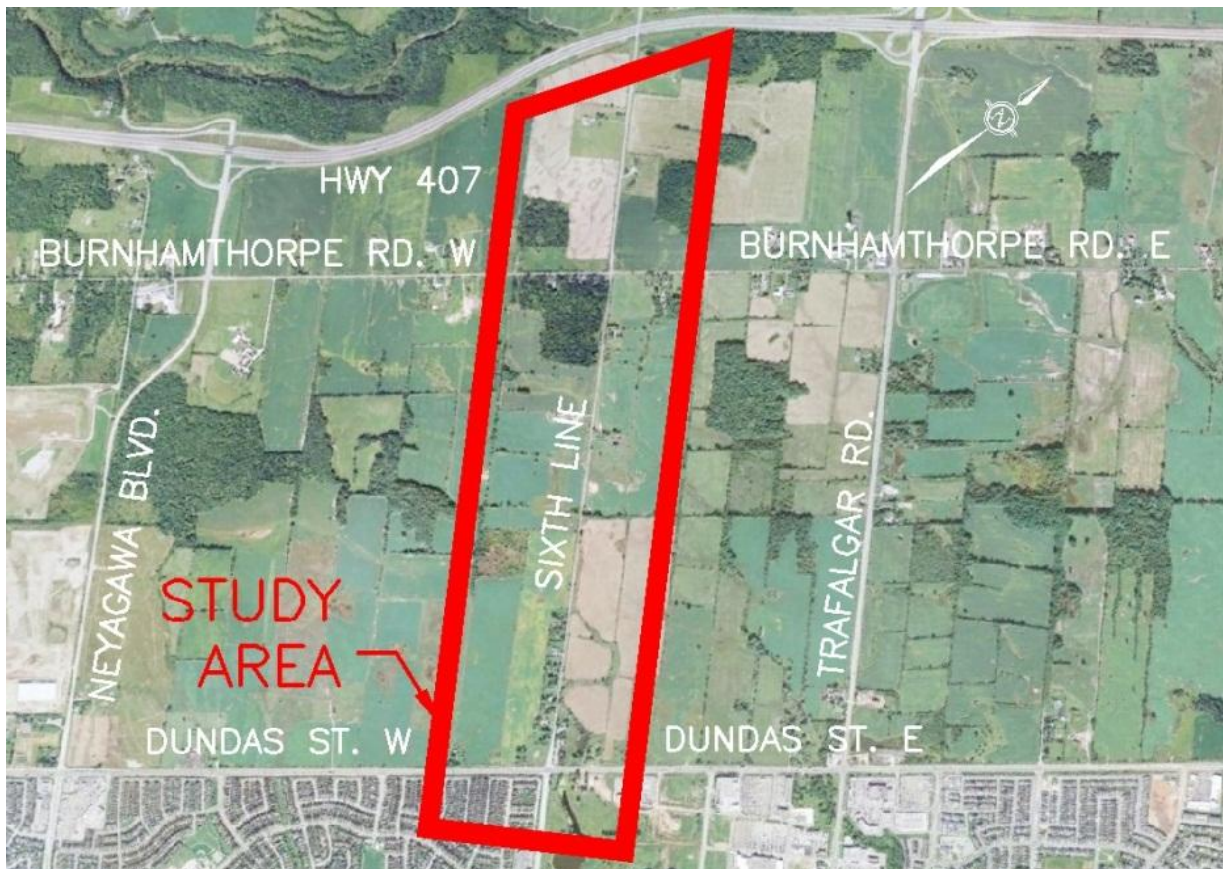


Figure E-1 - Study Area Key Plan



Study Organization

A consultant team led by Morrison Hershfield Limited carried out the Environmental Assessment Study, on behalf of the Town of Oakville.

B. Background Information

Town of Oakville Official Plan - Livable Oakville (2009)

The Town of Oakville's *Livable Oakville Plan*, establishes the goals, objectives and policies to manage and direct physical changes and its effects on the social, economic and natural environment of the Town of Oakville. The plan establishes the long-term desired land use pattern for lands within the Town, coordinates the land use and infrastructure requirements to accommodate the anticipated growth, establishes a framework and policy context for decision making in the planning process and conforms to provincial policy statements and provincial plans.

The Town of Oakville's *Livable Oakville Plan* defined the required minimum right-of-way widths for the designated major networks. Right-of-way of Sixth Line between Dundas Street to Highway 407 ETR is shown as 26m.

Town of Oakville Active Transportation Master Plan (2009)

The Town of Oakville's *Active Transportation Master Plan Study* is to formulate a plan consisting of short, mid and long-term actions and recommendations that will establish and support a desired level of active transportation (cycling and walking) for Town of Oakville residents. The plan recognizes cycling and walking as a viable mode of transportation, and will facilitate their use as a feasible means of commuting as well as for leisure and recreational opportunities.

Sixth Line north of Dundas Street is identified as a primary route which will implement bike lanes (On-road) on Sixth Line and multi-use trails (Off-road – in boulevard) on Dundas Street.

Town of Oakville North Oakville East Secondary Plan (2008)

The purpose of the *North Oakville East Secondary Plan* is to establish a detailed planning framework for the future urban development of the North Oakville East Planning Area which includes the study area. The plan designates the future land uses as well as the road network and transit network improvements.

The recommended improvements for Sixth Line include widening to 4 lanes and designating it as a Secondary Transit Corridor.

C. Public Consultation

As part of the Municipal Class EA process, consultation with stakeholders, including federal departments, provincial ministries, municipalities and agencies, First Nations, utilities, and adjacent landowners, was initiated through the circulation of a Notice of Study Commencement. Each party on the list of stakeholders was contacted for information or comments. The opportunity for these agencies to participate in the project was provided through the distribution



of a study announcement, the creation of a Technical Advisory Committee composed of interested agencies and utilities, the scheduling of 2 formal Public Information Centres (PIC), the placement of this ESR on the Public Record and distribution of a Notice of Study Completion.

Technical Advisory Committee (TAC)

In addition to the distribution of notices, a Technical Advisory Committee (TAC) was formed to provide input and advice to the project team at key stages during the study and included representatives from the Region of Halton, Conservation Halton, Oakville Hydro, Bell Canada, Union Gas and Cogeco Cable. Four meetings were held for the committee members to provide input on the study and to review and comment on the Public Information Centre material. Two meetings were held with Conservation Halton on October 1st 2012 and October 28th 2013. A meeting with the utility companies (Bell Canada, Union Gas and Cogeco Cable) was held on September 16th 2013 and a meeting with Oakville Hydro on September 30th 2013. The meetings were held at the offices of the Town of Oakville's Engineering Department and the Conservation Halton office.

Public Information Centre #1

The first Public Information centre (PIC #1) was held in the Trafalgar Room at the Oakville Town Hall, 1225 Trafalgar Road, Oakville on Tuesday, December 4th, 2012, from 6:00pm to 8:00pm.

The presentation boards for PIC #1 were organized to provide an opportunity for the public to review the problem being addressed, background information, the alternative solutions being considered, evaluation of alternative solutions and identifying a preliminary preferred solution.

In total, 25 members of the public attended the first Public Information Centre for Sixth Line.

Public Information Centre #2

The second Public Information Centre (PIC #2) was held in the Committee Room #1 at the Oakville Town Hall, 1225 Trafalgar Road, Oakville on Wednesday, October 2nd, 2013, from 6:00pm to 8:00pm.

The presentation boards for PIC #2 were organized to provide an opportunity for the public to review the summary of studies completed since the first public information centre, the alternative designs considered, evaluation of alternative designs and identifying a preliminary preferred design and the potential benefits, impacts and mitigation measures associated with the preliminary preferred design.

In total, 12 members of the public had attended the second Public Information Centre for Sixth Line.



D. Natural and Cultural Environment

Fisheries and Aquatic Habitat

Within the study area there are two linear aquatic ecosystems that cross Sixth Line however these are ephemeral watercourses and were dry during the field investigation. Neither crossing provides fish habitat.

Ditches that flow along Sixth Line do not provide fish habitat. The ditches are ephemeral and during the investigation, most of the ditch line was dry. There was little to no vegetation and the water source in the ditches was primarily runoff from the surrounding farm fields.

Two large ponds were identified at the north end of the study area. One of the ponds is within the Highway 407 right-of-way and the other is on a private property on the east side of Sixth Line, just south of Highway 407. The riparian habitat at the Highway 407 pond was limited to grasses and low herbaceous plants. The pond on private property was surrounded by mowed grass with some trees. Both waterbodies likely support bait fish

Terrestrial Ecosystems

The vegetation community within the study area consists of cultural meadow (CUM), deciduous forest (FOD), and agricultural crop land.

Species observed in the CUM within the study area included: Grass sp. (*Poa sp.*), White Clover (*Trifolium repens*), Dandelion (*Taraxacum officinale*), Ox-eye Daisy (*Chsanthemum leucanthemum*), and Canada Goldenrod (*Solidago canadensis*).

The deciduous forest is a mature stand (40 – 50 years) and contains numerous snags. The tree species present included: White Ash (*Fraxinus americana*), Trembling Aspen (*Populus tremuloides*), Sugar Maple (*Acer saccharum*), Ironwood (*Ostrya virginiana*), Red Oak (*Quercus rubra*), Shagbark Hickory (*Carya ovate*), and Horse Chestnut (*Aesculus hippocastanum*). This forest stand is identified in the Oakville Official Plan Natural Features Mapping as Woodland (Town of Oakville, 2006).

A search on the MNR's Natural Heritage Information Centre (NHIC) database shows that no rare plant species have been recorded in this area. The MNR, Aurora office, does not have record of any vegetation Species at Risk (SAR) as being observed near the study area. No rare vegetation was observed during field investigations.

Wildlife and Species at Risk

The Breeding Bird Atlas of Canada lists 90 bird species as being recently observed near the study site. Six of these species are listed as SAR: Barn Swallow (*Hirundo rustica*), Bobolink (*Dolichonyx oryzivorus*), Chimney Swift (*Chaetura pelagica*), Common Nighthawk (*Chordeiles minor*), Eastern Meadowlark (*Sturnella magna*) and Whippoorwill (*Caprimulgus vociferous*).

The MNR's NHIC database has a recorded observation of Milksnake (*Lampropeltis triangulum*) and Jefferson x Blue-spotted Salamander (*Ambystoma hybrid*). Historical records on the NHIC



database include Northern Bobwhite (*Colinus virginianus*) and Redside Dace (*Clinostomus elongatus*) as being observed in this area.

The MNR, Aurora office, has records of five wildlife SAR as being observed near the study area: Bobolink, Canada Warbler (*Wilsonia canadensis*), Eastern Ribbonsnake (*Thamnophis sauritus*), Milksnake, and Snapping Turtle (*Chelydra serpentina*).

Archaeological Assessment

Due to the proximity to water, soils and topography, the Sixth Line corridor has the potential for archaeological remains but extensive and intensive disturbances have removed any archaeological potential from within the current right-of-way. No further work within right-of-way area is required. The archaeological potential factors indicate that approximately 76 percent of lands adjacent to the Sixth Line right-of-way have potential for archaeological remains. Any future design changes to the road that require expansion beyond current right-of-way into these areas mapped this report should be subject to a Stage 2 archaeological assessment by a licensed archaeologist

Cultural Heritage Assessment

Nine (9) built heritage resources and three (3) cultural heritage landscapes of 40 years and older in age and of heritage value or interest were identified within or adjacent to the Sixth Line study corridor from Dundas Street East north to Highway 407.

The intersection of Dundas Street East and Sixth Line was the location of the 19th century historical crossroads settlement of Munn's Corners (Site # 1). Today, only a few buildings and a cemetery associated with this rural hamlet remain as visible reminders of the former community, such as Munn's Corners (Site # 1); Munn's Church (Site # 2); Munn's Cemetery (Site # 3); and, 3060 Sixth Line (Site # 4). All four resources are located close to the existing road right-of-way. Sites # 2 and # 3 are designated municipally under the OHA and are included on the Town of Oakville Register *Appendix A: Register of Designated Heritage Properties Under Part IV of the Ontario Heritage Act* (September 1, 2013). Site # 4 at 3060 Sixth Line, is included on the Town of Oakville Register *Section E: Register of Properties of Cultural Heritage Value or Interest (Not Designated)* of the Town of Oakville's Heritage Register (September 1, 2013).

Consultation with the Town of Oakville heritage planner (2012 and 2013) indicates the house on No. 3369 Sixth Line (Site # 5), which is included on the Town of Oakville Register *Appendix A: Register of Designated Heritage Properties Under Part IV of the Ontario Heritage Act* (September 1, 2013), is currently in storage and will be reconstructed on-site. A Heritage Easement for the property and the building reconstruction dated February 28, 2012 was approved. Heritage Permit 19/10-42.205 is approved for the reconstruction. During the 2012 survey, it was noted that the barn and silo still remained on the site; however, these built heritage resources have since been demolished.

There are no known federally or provincially recognized properties or any known cemeteries located within or adjacent to the Sixth Line study corridor.



E. Transportation Problem and Opportunity

A traffic study was completed to assess traffic conditions and to identify any existing or potential operational deficiencies. Capacity and level of service (LOS) analyses were completed at each intersection during the weekday morning and afternoon peak hour volumes under three scenarios: Existing traffic conditions (2012); interim future traffic conditions for the 2021 horizon year and future traffic conditions for the 2031 horizon year.

Based on the network analysis, the following conclusions can be drawn:

- All roadway segments are currently operating at an LOS of C, a satisfactory level for both AM and PM Peak Hour traffic volumes with average travel speed estimated to be approximately 60 km/h for all segments;
- The intersection of Sixth Line at Dundas Street is currently operating at an acceptable LOS of C during peak AM and PM total existing traffic conditions with the WBTR movement operating with the highest v/c ratio during the PM peak hour. The approach delay for this movement is 33.3 sec/veh;
- The intersection of Sixth Line at Burnhamthorpe Road is currently operating at an overall LOS of E and B during the AM and PM peak hours, respectively. The NB and SB movements fail during the morning peak hour. The movement with the highest approach delay for this intersection is for the NB traffic during the morning peak hour;
- It is anticipated that the New North Oakville Transportation Corridor (NNOTC) will begin construction in 2015. In addition, based on the North Oakville Master Plan, Secondary Plans and other traffic related studies in the area that have been submitted to the Town, it is anticipated that four new east-west connecting roadways will be provided between Dundas Street and Burnhamthorpe Road by 2021, creating four new intersections on Sixth Line. These new roadways will provide a connection for the new proposed development on the east and west side of Sixth Line as well as completing the road network for the North Oakville Master Plan;
- 2021 analysis based on the do-nothing scenario indicates poor LOS and Volume to Capacity ratio that would exceed threshold limit of 0.85 between Burnhamthorpe Road to Dundas Street during the AM peak hour. Whereas, during the PM peak hour, Sixth Line would experience congestion with volume to capacity ratio exceeds 0.85 between Future Street D to Dundas Street. Alternatively, analysis based on widening Sixth Line to four lanes would project all roadway segments to operate at an LOS of C or better. Similarly, analysis based on widening Sixth Line to four lanes would project all roadway segments to operate at an LOS of E or better under the future 2031 traffic conditions; and
- It is anticipated that all four future intersections between Dundas Street and Burnhamthorpe Road will operate under traffic signal controls by 2031. All intersections are forecasted to operate satisfactorily with several movements on the minor streets operating at a low LOS. Although these movements are at capacity, they are still functional.

Based on existing capacity needs along the Sixth Line corridor between Dundas Street and Highway 407, projected increases in traffic volumes will further reduce Levels of Service along



the corridor and at the intersections. Transportation solutions are necessary to enhance the safety and mobility of existing and future users of Sixth Line. The following objectives have been identified:

- Respond to current and anticipated pressures in travel demand through the corridor;
- Investigate how to best improve the corridor and intersection operations and safety along Sixth Line including opportunities to improve deficient roadway geometrics;
- Opportunity to maintain and enhance the character of the existing area through landscaping opportunities;
- Support the movement of people and goods;
- Opportunity to enhance facilities for pedestrians and cyclists; and
- Minimize any adverse impact that the above objectives will have on the natural and social environment.

F. Evaluation of Alternative Solutions

The Class Environmental Assessment process for municipal roads in Ontario requires consideration and evaluation of all reasonable alternative solutions to accommodate for future travel demand. Environmental and technical impacts on each alternative solution are carefully examined and a preliminary preferred solution is selected. The following alternative planning solutions have been assessed from a traffic perspective and been identified as possible alternative solutions:

Alternative 1 – Do Nothing

This transportation planning alternative consists of doing nothing to the existing arterial road network beyond currently planned improvements and normal maintenance.

The Do Nothing alternative represents the “status quo” and is identified as a measure of baseline conditions upon which the other transportation planning solutions can be evaluated and compared. By definition, the Do Nothing alternative does not meet the Town’s commitment to an innovative, pedestrian-friendly and transit-supportive community.

Alternative 2 – Limit Growth and Development

This option involves the implementation of policies that would place additional constraints on where growth may occur and/or how much development may occur.

Alternative 3 – Transportation Demand Management (TDM)

This option involves spreading out peak travel periods by shifting demands to periods outside of critical congestion, and reducing the number of vehicles on the road, by encouraging car-pooling and transit use. In addition, this option provides opportunities for Pedestrians and Cyclists in the study corridor.

Alternative 4 – Transportation System Management (TSM)

This option involves no widening on Sixth Line. It includes the use of other measures to improve the capacity of the road flow through traffic signal synchronization, incident management, and other methods.

Alternative 5 – Provide Additional Traffic Lanes along Sixth Line

This option involves widening Sixth Line from two lanes to four lanes in the study corridor. Also includes geometry adjustments to correct operational, geometric, and structural deficiencies.

Alternative 6 – Intersection Improvements

This option involves implanting traffic signal and improving possible lane configuration to accommodate left and right turn lanes.

Alternative 7 – Upgrade other Arterials Corridors or Build a new Corridor

This option involves no widening or other improvements on Sixth Line. Instead, it involves making all required improvements and widening to nearby roads to accommodate the expected additional traffic demand and address existing capacity and safety issues.

The assessment of each alternative under the different criteria within each evaluation category, namely, Transportation / Technical, Cultural Environment, Natural Environment, Socio-Economic Environment, Aesthetics/Streetscapes and Cost are summarized in **Table 5-2**. The alternatives were ranked from being the most desirable to the least desirable under each criterion in each category and an overall evaluation within each category was established.

Based on the results of the evaluation, alternative planning solution 3(Transportation Demand Management Initiatives), 4 (Transportation System Management), 5 (Provide additional traffic lanes along Sixth Line) and 6 (Intersection improvements) were selected as the preferred alternative solution. The results of the comparative evaluation were presented to the public for review and input as part of the consultation activities undertaken during Phase 2. All input received during Phase 2 was taken into consideration.

This preferred alternative planning solution involves widening the roadway to four lanes, providing localized widening at intersections to accommodate turning lanes, and improve the geometry of Sixth Line. The implementation of Transportation Demand Management and Transportation System Management was also carried forward, to encourage active transportation as planned in the Town of Oakville's *Active Transportation Master Plan*.

G. Evaluation of Alternative Designs

Based on the screening of the Alternative Solutions noted in the previous section, methods of implementing the preferred alternative solution were developed for the improvement of Sixth Line between Dundas Street and Highway 407 ETR.

Various alternative designs concepts for the widening of Sixth Line were investigated. All of the alternatives considered pedestrian realm features and active transportation opportunities.



A brief description of the design alternatives is discussed below:

Alternative 1 – Do Nothing – Existing 2 Lane Rural Cross-Section

Continuation of existing conditions and would involve no change to the existing roadway (For comparison purposes only).

Alternative 2 – Widening About Existing Centre Line

Widen Sixth Line on both the west and east sides of the existing centreline to accommodate 4 lanes (2 per direction).

Alternative 3 – Widening About the Centre Line and To The East Along Natural Heritage System

Widen Sixth Line on both the west and east sides of the existing centreline and shifting towards the east along the Natural Heritage System to accommodate 4 lanes (2 per direction).

Alternative 4 – Use of Roundabouts at Intersections

Implement roundabouts at the Sixth Line intersections as part of the intersection improvements solution.

Based on the evaluation of the alternative design concepts and consultations, the Preliminary Preferred Design is widening Sixth Line along the existing centreline and shifting to the east along the Natural Heritage System (Alternative 3) to minimize impacts to properties, cultural heritage resources and natural heritage features including existing vegetation. The design also provides an opportunity to provide enhanced landscaping and streetscaping features to the corridor.

The Preliminary Preferred Design was presented to the agencies, utilities and the public as part of Public Information Centre #2 for review and comment. All input received during Phase 3 was taken into consideration and was used to refine the Preliminary Preferred Design, where appropriate.

H. Project Description

The Preferred Design widens the road about the centerline between Dundas Street and Future Street “D”, minimizing property impacts to the property owners on both sides of the road. Between Future Street “D” and Burnhamthorpe Road, the widening shifts east to mitigate impacts to the Natural Heritage System located to the south-west of the Sixth Line and Burnhamthorpe Road intersection. The alignment then shifts back to the existing centreline between Burnhamthorpe Road to Highway 407 ETR.

The key elements of the Preliminary Preferred Design are as follows:

- Sixth Line widened to four lanes from Dundas Street to Highway 407 (ETR);
- Left turn lanes provided throughout the corridor;
- The signalization of intersections;



- The provision of sidewalks and on-street bicycle lanes and potential for on street parking layby’s in front of Neighbourhood Centre and Park lands;
- The provision of continuous medians to enhance the streetscape and landscaping features; and
- Culvert structure replacements.

Typical Cross-Section

The typical sections have been developed to implement the *North Oakville East Secondary Plan’s* “Avenue/Transit Corridor” classification for Sixth Line, which permits on-street parking outside the Natural Heritage System areas and encourages transit supportive development and the *Active Transportation Master Plan’s* recommended on-road bike lanes.

Three typical cross-sections are proposed for Sixth Line which are comprised of an urban cross-section with no on-street parking, an urban cross-section with on-street parking for use in front Neighbourhood Centre and Neighbourhood Park Areas and an urban cross-section for the shifted alignment at the Natural Heritage System. Common elements to all include a 31.0m right-of-way, 3.35m through lanes, 1.66m on-street bike lanes and a 4.50m landscaped median. At the intersections, a 3.25m left turn lane and 1.25m raised median are provided instead of the landscaped median.

Pavement Structure Design

Considering the traffic requirements and subgrade conditions, the recommended pavement design for Sixth Line is detailed in the following table:

Recommended Pavement Design for Sixth Line

Pavement Structure	Reconstruction and New Construction (mm)
HL3 Asphaltic Concrete	50
HL8 Asphaltic Concrete	100
Granular ‘A’ or 20mm Crusher Run Limestone	150
Granular ‘B’ or 50mm Crusher Run Limestone	450

Pedestrian and Cyclist Facilities

Provisions for cyclists and pedestrians have been included in the preferred design for the widening of Sixth Line through the use of both sidewalks and on-street bike lanes as per the Town of Oakville’s *Active Transportation Master Plan*. The preferred alternative includes a minimum 2.0m wide sidewalk along both sides of Sixth Line throughout the corridor. The sidewalks are generally separated from the travel lanes by means of a minimum 2.15m wide boulevard or 2.20m wide parking layby’s depending on the location. On-street bike lanes are also proposed along both sides of Sixth Line with a minimum width of 1.66m. The on-street bike lanes are currently separated from the travel lanes through the use of a mountable curb and



gutter. This separation of the bike lanes and travel lanes will be further examined during the detailed design stage.

Intersections

The preferred design will maintain all existing intersections along Sixth Line with the following configurations:

- Sixth Line and Dundas Street – Signalized, exclusive left turn lanes on all approaches, eastbound exclusive right turn lane;
- Sixth Line and Kaiting Trail – Exclusive northbound and southbound left turn lanes;
- Sixth Line and Sixteen Mile Drive – Signalized, exclusive left turn lanes on all approaches; and
- Sixth Line and Burnhamthorpe Road - Signalized, exclusive northbound and southbound left turn lanes.

A total of 4 new intersections will be introduced along Sixth Line due to the Region of Halton's New North Oakville Transportation Corridor as well as adjacent development. The new identified intersections will have the following configurations:

- Sixth Line and North Park Drive – Signalized, exclusive left turn lanes on all approaches;
- Sixth Line and Future Street “C” – Signalized, exclusive northbound and southbound left turn lanes;
- Sixth Line and Future Street “D” – Signalized, exclusive northbound and southbound left turn lanes; and
- Sixth Line and New North Oakville Transportation Corridor – Two lane roundabout.

The traffic movements and configurations of the remaining intersections will be reviewed as part of the draft plan approval process during the detailed design stage.

Improvements at Sixth Line and Dundas Street

The Region of Halton, as part of its Dundas Street Rapid Bus Transit Corridor, is completing an Environmental Assessment for Dundas Street from Neyagawa Boulevard to Oak Park Boulevard to widen Dundas Street to six lanes including transit/HOV lanes. The Sixth Line and Dundas Street intersection is located within the project area. Due to the intersection's close proximity to the Munn's United Church and Munn's Cemetery, the widening of Dundas Street in this area will be shifted completely to the north. Coordination was undertaken with the Region of Halton who provided the intersection design which was implemented in the Sixth Line preferred design. The construction of the Sixth Line and Dundas Street intersection by the Region is scheduled to start in late 2016 to early 2017.

Improvements at Sixth Line and the New North Oakville Transportation Corridor

The Region of Halton is completing the detail design of the New North Oakville Transportation Corridor which involves the construction of a new four lane roadway to improve the transportation system capacity in north Oakville. The New North Oakville Transportation



Corridor intersects Sixth Line between Burnhamthorpe Road and Highway 407 ETR. The Sixth Line intersection, as proposed by the Region, will consist of a two lane roundabout. The Region provided the roundabout design which was implemented in the preferred design for Sixth Line. The construction of the Sixth Line intersection by the Region is scheduled to start in late 2015.

Driveway Access / Restrictions

Due to the planned subdivision developments adjacent to the Sixth Line corridor, most existing driveway entrances will be removed and property access will be provided through the future local roads intersecting Sixth Line. The proposed 4.5m centre landscaped medians allows for the possible inclusion of centre turn lanes to access properties fronting Sixth Line. The access to the individual properties will be reviewed during detailed design to determine if full movement entrances can be provided.

Drainage and Stormwater Management

The proposed widening of Sixth Line will require an updated stormwater management strategy that addresses the targets established in NOCSS and incorporates the additional drainage from the increased impervious area.

An urban cross-section will be implemented as part of the Preferred Design. The conveyance of stormwater will be handled by a minor system consisting storm sewer, catchbasin, catchbasin leads and maintenance holes. The preferred alternative for providing quality and quantity treatment is to collaborate with adjacent developers on stormwater pond design.

Traffic Signals and Illumination

There is currently no existing illumination along Sixth Line between Dundas Street and Highway 407 ETR. As part of the urbanization of the Sixth Line corridor along with the adjacent development, new illumination is proposed as part of the preferred design to ensure adequate lighting levels along the roadway are provided. The proposed lighting pole locations will be in the centre landscaped median to illuminate both directions of travel. The need and type of illumination along the Sixth Line corridor will be confirmed at the detail design stage.

All existing signalized intersections along Sixth Line will be maintained as signalized. Temporary traffic control signals will be installed and maintained during the construction phases. Permanent traffic control signals will be installed during the final stages of the project to accommodate the intersection layouts.

Landscaping

The proposed widening of the Sixth Line corridor provides an opportunity to improve both the aesthetics and ecological conditions of the corridor. The proposed design provides a 4.5m centre landscaped median throughout the study area as well as boulevards on both sides of the road in areas where parking laybys are not provided such as near intersections.

Transit

The Preliminary Preferred Design includes a 30m setback from any parking layby's to the intersections which allows sufficient spacing for transit stops including bus pads at both the near-side and far-side of all the intersections. The location of the transit stops will be determined during the detailed design stage in coordination with the transit authorities.

Utilities

Several utilities, both below and above grade, are located along the Sixth Line corridor. These include Oakville Hydro, Bell Canada, Union Gas and Cogeco Cable. It is anticipated that all the utilities located within the proposed right-of-way for Sixth Line may require relocation to implement the proposed widening. Formal definition of utility impacts and relocation strategy will be determined during the detailed design.

Property Requirements

The preliminary design was prepared with the goal of minimizing the need for property along the Sixth Line corridor. A total of 39,052m² of property is required to accommodate the proposed road widening. Most of the property has been or will be dedicated as part of adjacent subdivisions review and approval process.

Construction Staging

Construction staging will likely proceed as follows:

- Relocation of above and underground utilities in conflict with the proposed road widening. This will include relocation of above ground utility pole, and other above and underground utility services and the construction of temporary pavement where necessary;
- Reconstruct/construct one side of the road at a time and provide continuous traffic lanes in both directions on the other side of the roadway;
- Reconstruct the other side of the roadway after the first side is completed. A minimum of one lane in each direction will be provided during the roadway reconstruction;
- Construct the centre medians including landscaping elements;
- Resurface the roadway after reconstruction;
- Construct streetscaping and urban design elements on both sides of the roadway where included in the plan; and
- Property owners and tenants may experience interruption to their property access during construction. To reduce this impact, all property owners should be notified prior to construction and in advance of work related to their access.



Implementation and Timing

The reconstruction of Sixth Line is currently planned to be undertaken in 3 phases:

- Phase 1: Dundas Street to North Park Drive (Construction Start: 2015)
- Phase 2: North Park Drive to Burnhamthorpe Road (Construction Start: 2020)
- Phase 3: Burnhamthorpe Road to Highway 407 (ETR) (Construction Start: 2023)

The schedule will be subject to annual priority review, funding and Council approval. The Region of Halton has planned improvements to the Dundas Street and Sixth Line intersection by 2016/2017 and the construction of the New North Oakville Transportation Corridor and Sixth Line intersection by 2015. Coordination of design, tendering and construction between the Town of Oakville and the Region of Halton will be required.

Permits and Approvals

As part of the detailed design phase of this project, permits will be required from the following agencies:

- MOE - Permit to Take Water, Certificate of Approval for Storm, Sanitary and Watermain construction
- MNR - Permit to Authorize works with potential to affected listed species or Letter of Advice
- MOL - Notice of Project
- Conservation Halton – Permit for Development, Interference with Wetlands & Alterations to Shorelines & Watercourses
- Halton Region – Design Approval, Road Occupancy Permit
- Town of Oakville - Noise Control By-law Exemption

In addition, the Town of Oakville will be required to obtain temporary easements and/or permissions to enter from various property owners throughout the project.

Cost Estimate

The total capital construction cost of the widening of Sixth Line is estimated to be approximately \$17.8 million for all 3 phases. The following are the estimated construction costs for the 3 phases:

- Phase 1 - Dundas Street to North Park Drive - \$5,819,469.50
- Phase 2 - North Park Drive to Burnhamthorpe Road - \$7,776,366.00
- Phase 3 - Burnhamthorpe Road to Highway 407 ETR - \$4,247,925.50

This includes full depth reconstruction, utility relocations, traffic signals and illumination, storm sewer and drainage items as well as engineering and contingency costs. The property acquisition costs are not included in the estimate. These figures are expressed in 2014 dollars and do not carry any escalation allowance for work undertaken in future fiscal periods.

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Appendix “I”	Geotechnical Investigation Report
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Appendix “K”	Preliminary Cost Estimate

1 PROJECT INTRODUCTION

1.1 Introduction

The Town of Oakville has initiated a Class Environmental Assessment study for improvements to Sixth Line between Dundas Street to Highway 407 ETR. The consulting firm of Morrison Hershfield Limited has been retained to undertake the study on behalf of Town of Oakville.

The study will review and confirm the need for improvements to the corridor and assess alternative solutions, including an evaluation of potential environmental impacts. Upon completion of the study, an Environmental Study Report will be filed for public review.

This study is being conducted in accordance with Schedule “C” of *the Municipal Class Environmental Assessment (2007)* approved under the *Ontario Environmental Assessment Act*.

1.1.1 Purpose of the Environmental Study Report

Population and employment forecasts indicate that much growth is still to happen in Town of Oakville over the next twenty to thirty years. This will further increase traffic on the road system. The Town of Oakville has identified Sixth Line between Dundas Street to Highway 407 ETR to investigate existing and future traffic capacity requirements, transportation system considerations, safety and operations, and to review the need and justification for possible improvements to Sixth Line.

A number of key issues/considerations have been identified, as part of the Class Environmental Assessment planning process, which have been examined carefully, including:

- Traffic optimization measures;
- Mitigation requirements from proposed improvements (i.e. noise, land, natural features etc.);
- Develop sustainable transportation system;
- Improve road and streetscape design;
- Potential need for structural improvements at key points within the study area;
- Stormwater management;
- Consideration of the community’s and stakeholders’ vision for Sixth Line;
- Providing a road constructed to Town standards that will be capable of safely serving the existing and future travel needs of the area;
- Enhancing road user safety by improving the geometry and roadside environment in the vicinity of the corridor;
- Improving connectivity to residences and farms;
- Consideration of pedestrian and cyclist needs;
- Land use implications;
- Opportunities for expanding public transit capacity;



- Avoiding/minimizing impacts to any environmentally sensitive areas identified throughout the study; and
- Full compliance with Town of Oakville plans, Conservation Halton policies and requirements and all applicable regulations.

Possible improvements for Sixth Line may include, but are not limited to, the following:

- Do-nothing;
- Limit growth and development;
- Transportation system management;
- Improving public transit service;
- Intersection improvements along Sixth Line between Dundas Street to Highway 407 ETR;
- Widening in support of Transit-HOV Lanes;
- Improvements to other roadways in the vicinity of Sixth Line; and
- Combining the improvements above.

During the agency, stakeholder and public consultation processes, additional concerns may arise which will be considered in the context of this study.

1.2 The Municipal Class Environmental Assessment (Class EA)

The Environmental Assessment Act of Ontario (EA Act) provides for the protection, conservation, and wise management of the environment. The EA Act applies to municipalities and to activities including municipal road projects. Activities with common characteristics and common potential effects may be assessed as part of a “class”, and are therefore approved subject to compliance with the approved Class Environmental Assessment (Class EA) process.

This process provides a rational planning approach to consider the environmental and technical advantages and disadvantages of alternatives and their trade-offs to arrive at a preferred alternative for addressing the problem (or opportunity). The Municipal Class EA is an approved planning document that describes the process that must be followed to meet the requirements of the Ontario EA Act. Providing the Class EA planning process is followed, a proponent does not have to apply for formal approval under the EA Act.

The Class EA process places emphasis on both project assessment and on public and agency involvement and consultation, and encourages stakeholder participation throughout the process to resolve all project related issues and concerns. If concerns are raised that cannot be resolved through discussion with the Region, a “Part II Order” request may be submitted to the Minister of the Environment.

Municipal infrastructure projects are classified in the Class EA in terms of one of the following schedules:

- Schedule ‘A’ Projects that are limited in scale have minimal adverse environmental effects and include the majority of municipal road maintenance, operation, and emergency activities. There projects are pre-approved and therefore, a municipality can proceed without further approval under the EA Act.
- Schedule ‘A+’ As part of the 2007 amendments, Schedule A+ was introduced where Schedule A+ projects are pre-approved; however, the public is to be advised prior to project implementation.
- The purpose of Schedule A+ is to ensure some type of public notification for certain projects that are pre-approved under the municipal class EA, it is appropriate to inform the public of municipal infrastructure project(s) being constructed or implemented in their area.
- Schedule ‘B’ Projects that have the potential for some adverse environmental effects. These projects are approved subject to a screening process, which includes directly contacting affected public and relevant review agencies.
- Schedule ‘C’ Projects that have the potential for significant environmental effects that must proceed under the planning and documentation procedures outlined in the Municipal Class EA document.

The preparation of an Environmental Study Report (ESR) is required for Schedule C projects. At the end of this study, an ESR will be filed for public and agency review.

This project is being completed as a Schedule “C” project. Typically, on similar projects, after the EA process, minor modifications to the recommended undertaking and its impacts on the environment may be identified during detail design; however, these modifications are not anticipated to change the intent of the undertaking.

The Municipal Class EA process is shown in **Figure 1-1** and includes the following basic phases for a Class “C” project. **Figure 1-1** is from the Municipal Class Environmental Assessment manual written by the Municipal Engineers Association in June 2000, as amended in 2007. This study will cover Phases 1 through 4:

- Phase 1: Identify the Problem or Opportunity
- Phase 2: Identify Alternative Solutions
- Phase 3: Examine Alternative Design Concepts for Implementing the Preferred Solution
- Phase 4: Prepare and File Environmental Study Report
- Phase 5: Proceed to Detailed Design, Construction and Operation

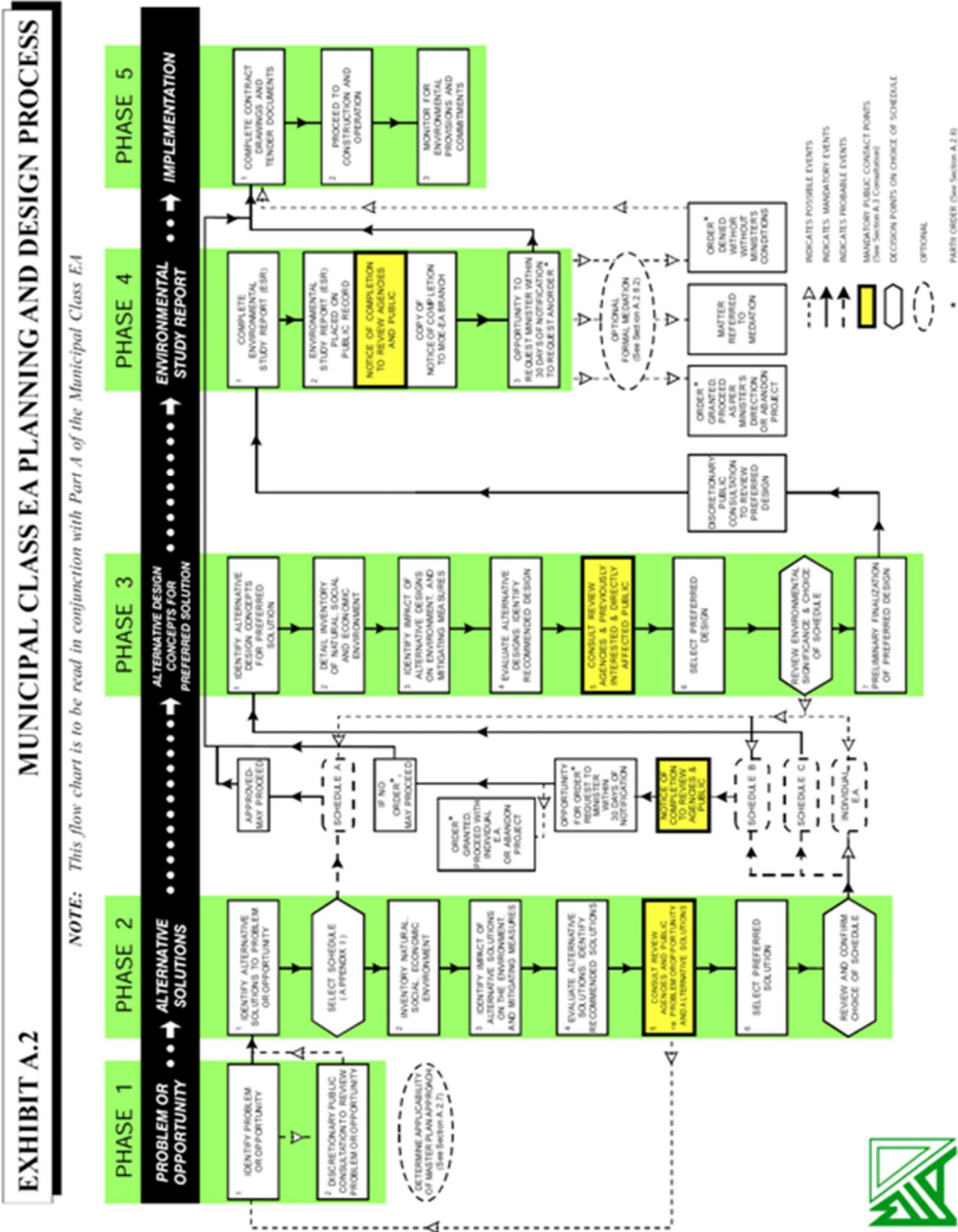


Figure 1-1 - Municipal Class EA Design and Planning Process



1.2.1 The Environmental Study Report

The Sixth Line Class EA study was initiated in July 2012 through the advertised Notice of Study Commencement. The study scope will follow the requirements of the Municipal Class EA process, and the following timetable.

Notice of Study Commencement	July 4, 2012
Public Consultation Centre #1	December 4 , 2012
Public Consultation Centre #2	October 2, 2013
File Environmental Study Report (ESR) & submit Notice of Study Completion	Summer 2014
30 Days Review Period Expiries (assuming no objections)	Summer 2014

1.3 Description of the Study Area

The study area on Sixth Line is from Dundas Street to Highway 407. Sixth Line is a north-south roadway and within the study area, is generally a flat and straight two-lane rural road with limited development of individual homes. The roadway is narrow with limited shoulder width. Sixth Line has a posted speed limit of 60 km/h from just north of Dundas Street to just south of Burnhamthorpe Road, where it then changes to 80 km/h to the north.

Currently, Sixth Line intersects at Dundas Street and Burnhamthorpe Road, which operate under the jurisdiction of Halton Region. The intersection at Dundas Street is operating under traffic signal condition. The intersection of Sixth Line and Burnhamthorpe Road is operating under unsignalized traffic control with a flashing all-way stop condition. It is important to note that Sixth Line has been identified as “Minor Arterial – Transit Corridor” in the approved North Oakville East Secondary Plan. The study area is shown on **Figure 1-2**.

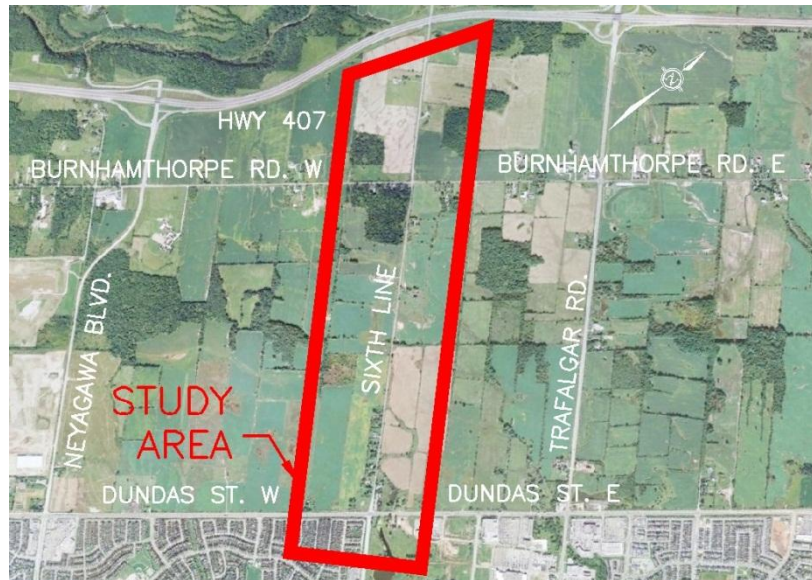


Figure 1-2 - Study Area Key Plan

1.4 Background Reports

The Sixth Line study takes into consideration a number of plans and guidelines. The study will be compatible with the following reports provided by the Town of Oakville:

1.4.1 Town of Oakville Official Plan-Livable Oakville (2009)

The Planning Act of the Province of Ontario requires that an official plan “contain goals, objectives and policies established primarily to manage and direct physical change and the effects on the social, economic and natural environment of the municipality.”

The Livable Oakville Plan:

- Establishes the desired land use pattern for lands within the Town, south of Dundas Street and north of Highway 407, to 2031;
- Coordinates land use and infrastructure requirements to ensure that the anticipated growth can be accommodated;
- Establishes a framework and policy context for decision making that provides certainty for the planning process; and
- Conforms or does not conflict with provincial plans, has regard to matters of provincial interest, and is consistent with provincial policy statements.

The Livable Oakville Guiding Principles:

- Preserving and creating a livable community in order to:
 - Preserve, enhance, and protect the distinct character, cultural heritage, living environment, and sense of community of neighbourhoods;
 - Direct the majority of growth to identified locations where higher density, transit and pedestrian oriented development can be accommodated; and



- Achieve long term economic security within an environment that offers a diverse range of employment opportunities for residents.
- Providing choice throughout the Town in order to:
 - Enable the availability and accessibility of a wide range of housing, jobs and community resources to meet the diverse needs of the community through all stages of life;
 - Provide choices for mobility by linking people and places with a sustainable transportation network consisting of roads, transit, walking and cycling trails; and
 - Foster the Town’s sense of place through excellence in building and community design.
- Achieving sustainability in order to:
 - Minimize the Town’s ecological footprint;
 - Preserve, enhance and protect the Town’s environmental resources, natural features and areas, natural heritage systems and waterfronts; and
 - Achieve sustainable building and community design.

Oakville’s road network consists of municipal roads, regional roads and provincial highways. The role and function of each element of the road system is clearly defined within an effective and road classification system to support the provision of an efficient, safe and accessible road network with adequate capacity for both passengers and goods movement. The road hierarchy is shown in Schedule “C” of Town of Oakville’s Official Plan (see **Figure 1-3**). Sixth Line between Dundas Street to Highway 407 is classified as “Minor Arterial”.

The Town of Oakville’s Official Plan defined the required minimum right-of-way widths for the designated major networks. Right-of-way of Sixth Line between Dundas Street to Highway 407 ETR is shown as 26m.



Figure 1-3 – Town’s Official Plan-Livable Oakville (2009) – Road Hierarchy

1.4.2 Town of Oakville Active Transportation Master Plan (2009)

The Town of Oakville has developed a comprehensive *Active Transportation Master Plan* (ATMP), with a particular focus on walking and cycling. The Town initiated this study in May 2008 and established a study team, led by the Town's Sustainable Transportation Program Coordinator, and consulted with residents and stakeholders over the course of the study. A final report was completed and presented to Council in the spring of 2009.

The Town of Oakville's *Livable Oakville Plan*, which is being updated in 2009, called for the development of a convenient and efficient Town-wide cycling and pedestrian system that links all communities in the Town. In April of 2007 Town Council approved the *Oakville Transportation Master Plan*, which included a recommendation to "initiate and complete an update of the *Town-Wide Trails and Cycleways Master Plan*". In addition, Council approved a Town-wide Environmental Strategic Plan that includes a goal to establish an environmentally friendly transportation system that improves mobility. It includes specific actions including increasing cycling infrastructure and walking path connectivity. Halton Region's *Transportation Master Plan*, approved in 2004, also includes a conceptual regional cycling and pathways network that includes routes in the Town of Oakville, primarily in Regional Road rights-of-way.

The objective of this *Active Transportation Master Plan Study* is to formulate a plan consisting of short, mid and long-term actions and recommendations that will establish and support a desired level of active transportation (cycling and walking) for Town of Oakville residents. The plan recognizes cycling and walking as a viable mode of transportation, and will facilitate their use as a feasible means of commuting as well as for leisure and recreational opportunities.

The Vision for the ATMP is that the Town of Oakville is a pedestrian and cycling supportive community that encourages active transportation for both utilitarian and recreational travel through:

- Ensuring that every street accommodates pedestrians and cyclists;
- Established promotional and educational policies and programs including a coordinated marketing strategy to encourage active transportation year-round;
- A Town-wide visible and connected active transportation network of on-road and off-road facilities designed with safety in mind that are comfortable, convenient, and accommodate the needs of existing and future users; and
- Approved Official Plan policies and associated strategies which recognize that great places require pedestrians and cycling friendly land development and streetscape designs that support the Town of Oakville's vision to become the most livable Town in Canada.

As shown in **Figure 1-4**, the ATMP lists Sixth Line north of Dundas Street as a primary route which recommends that on-road bike lanes be included as part of future development plans.

The *Town of Oakville Active Transportation Master Plan* (2009) identifies:

- Sixth Line as Bike Lane (On-road); and
- Dundas Street as Multi-use Trail (Off-Road – In Boulevard).

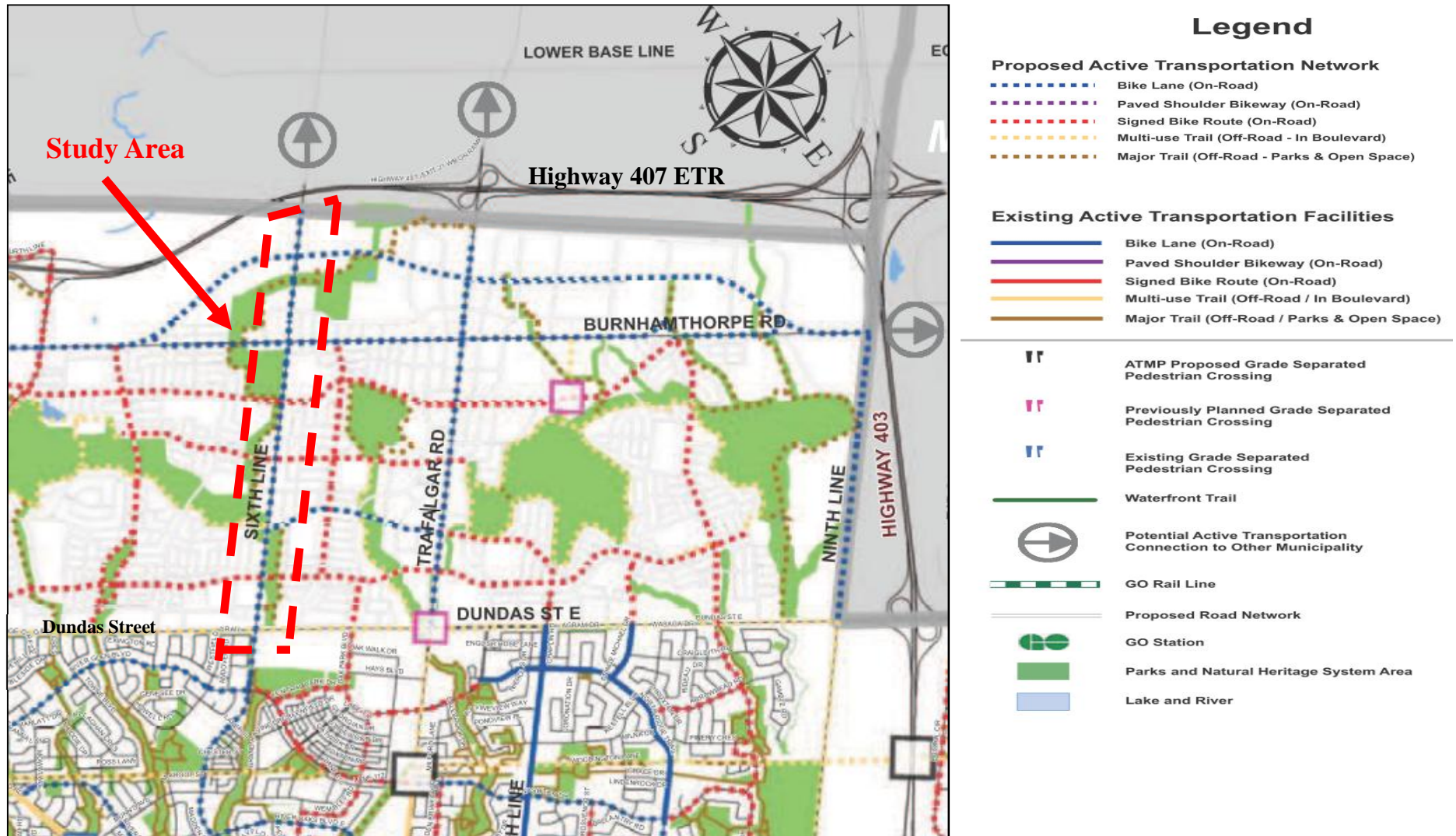


Figure 1-4 – Town of Oakville Active Transportation Master Plan (2009) – Recommended Cycling and Transit Network

1.4.3 Town of Oakville North Oakville East Secondary Plan (2008)

The purpose of the *North Oakville East Secondary Plan* is to establish a detailed planning framework for the future urban development of the North Oakville East Planning Area. The Planning Area is comprised of the Glenorchy and Joshua's Meadows residential communities / employment districts and approximately 53 hectares of the Sixteen Hollow residential community/employment district located as identified on **Figure 1-5**, Community Organization to the Official Plan.

As shown in **Figure 1-6**, the *North Oakville East Secondary Plan* (2008) designates land uses along Sixth Line:

- Between Highway 407 (ETR) and New North Oakville Transportation Corridor as 'Transitway' and 'Employment Area';
- Between New North Oakville Transportation Corridor and Burnhamthorpe Road as 'Employment Area', 'Natural Heritage System Area', 'Stormwater Management Facility', and 'Transitional Area'; and
- Between Burnhamthorpe Road and Dundas Street as 'Sub Urban Area', 'Stormwater Management Facility', 'Neighbourhood Park Area', 'Natural Heritage System Area', 'Neighbourhood Centre Area', and 'Dundas Street Urban Core Area'.

The North Oakville East Secondary Plan recommended road network improvements beyond 2021 are presented in **Figures 1-7**. The North Oakville East Secondary Plan recommends widening Sixth Line between Dundas Street to Highway 407 ETR to 4-lanes by 2021;

The transit network beyond 2021 is presented in **Figures 1-8**. The recommended transit network improvements pertinent to the study area are:

- Sixth Line between Dundas Street to Highway 407 ETR as Secondary Transit Corridor;
- Dundas Street as Primary Transit Corridor by 2021.

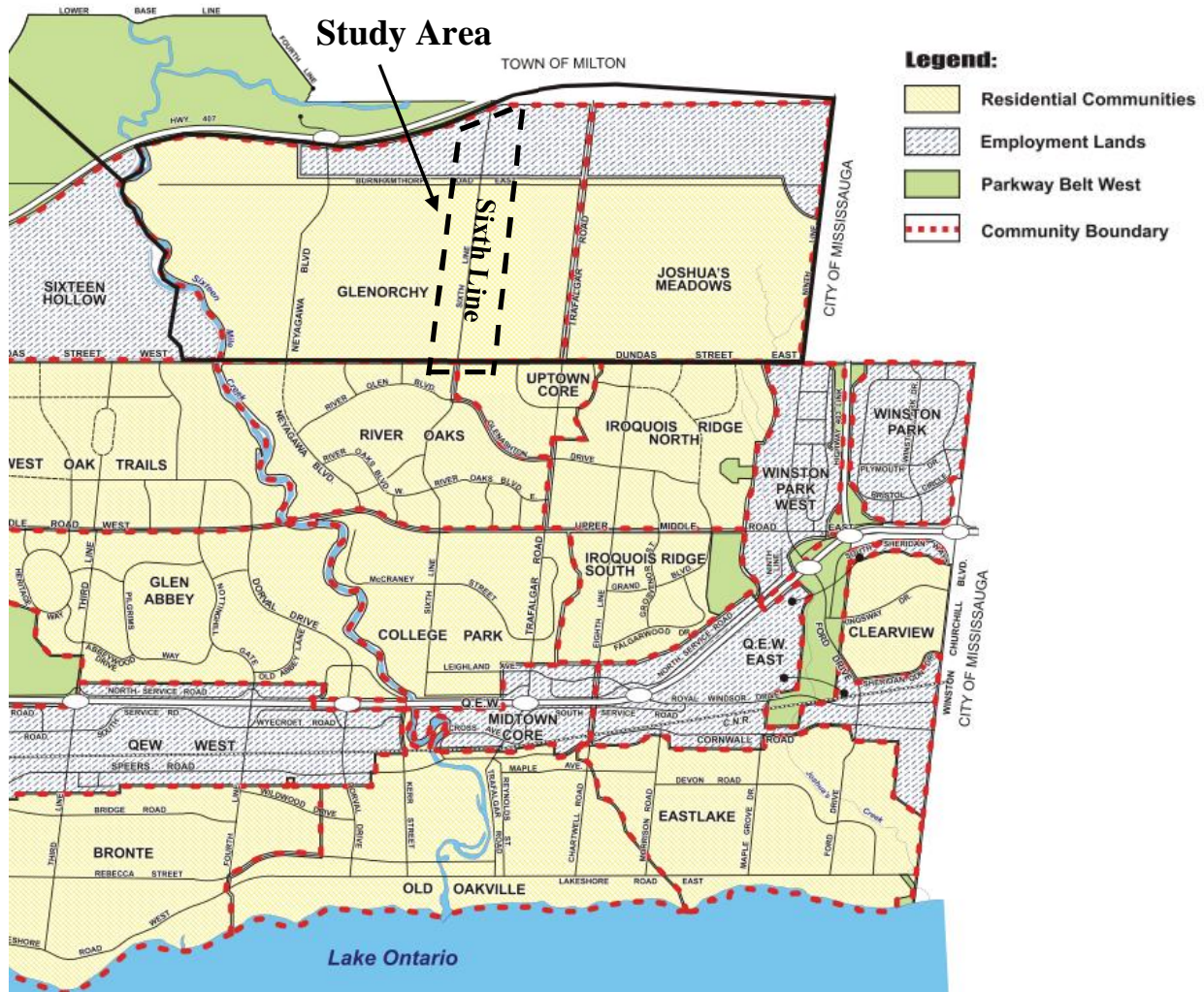
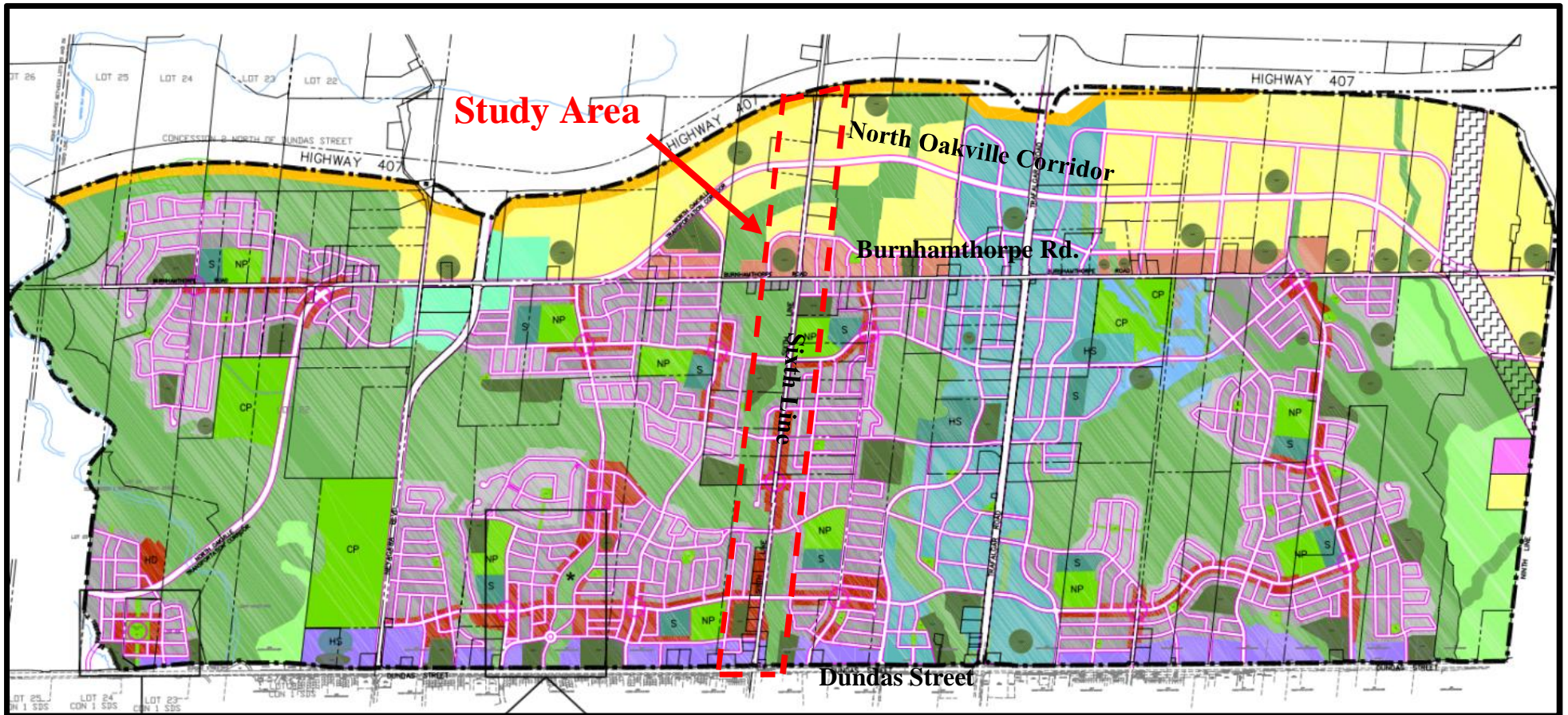


Figure 1-5 – Community Organization, North Oakville East Secondary Plan (2008)



LEGEND

	SECONDARY PLAN AREA BOUNDARY		INSTITUTIONAL AREA		UTILITY CORRIDOR
	OAKVILLE / MILTON MUNICIPAL BOUNDARY		STORMWATER MANAGEMENT FACILITY (final location tbd)		NEIGHBOURHOOD ACTIVITY NODE
	TRANSITWAY		COMMUNITY PARK AREA		CEMETERY AREA
	DUNDAS STREET URBAN CORE AREA		NEIGHBOURHOOD PARK AREA		NEIGHBOURHOOD CENTRE AREA
	NEYAGAWA BLVD. URBAN CORE AREA		VILLAGE SQUARE/URBAN SQUARE		GENERAL URBAN AREA
	TRAFALGAR ROAD URBAN CORE AREA		ELEMENTARY SCHOOL SITE		SUB URBAN AREA
	TRANSITIONAL AREA		SECONDARY SCHOOL SITE		HIGH DENSITY RESIDENTIAL AREA
	EMPLOYMENT AREA		JOSHUA CREEK FLOODPLAIN AREA		POLICY REFERENCE - SEE POLICY SECTION 7.4.7.2
	NATURAL HERITAGE SYSTEM AREA				

Figure 1-6 - North Oakville East Secondary Plan (2008) – Land Use

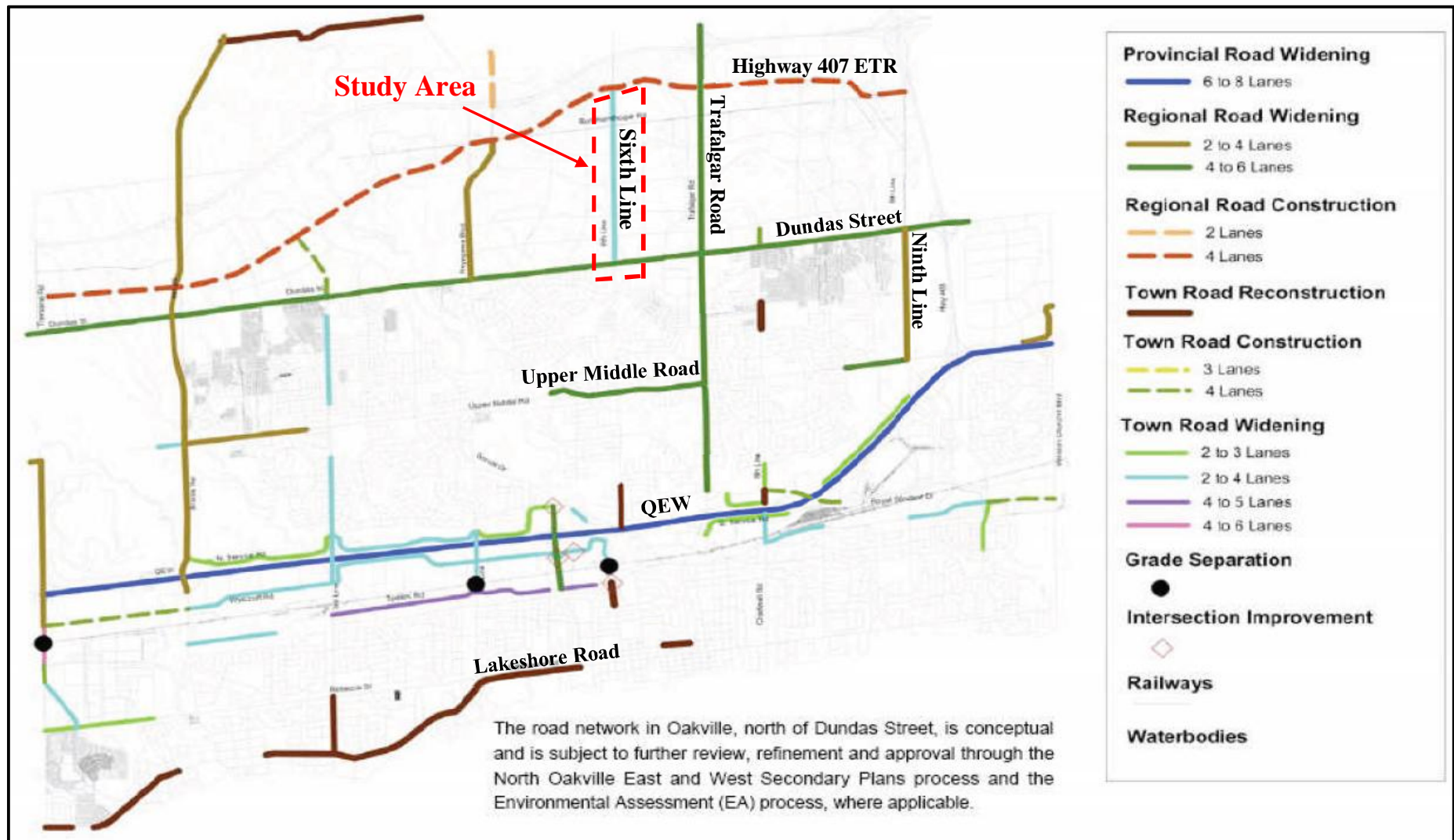


Figure 1-7 – North Oakville East Secondary Plan (2008) – Network Improvements

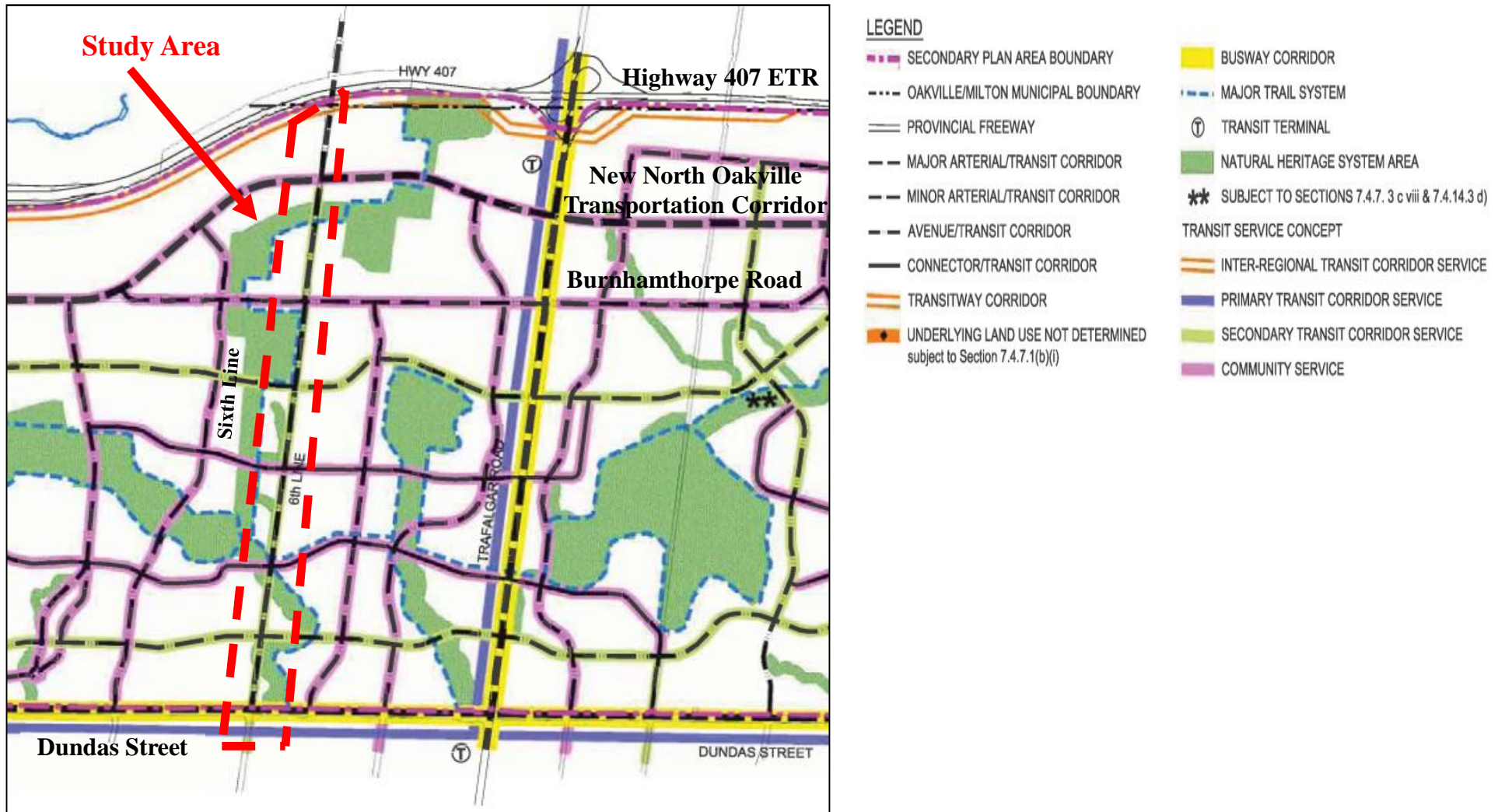


Figure 1-8 – North Oakville East Secondary Plan (2008) – Transit Improvements



1.5 Study Organization

1.5.1 The Project Team

The Town of Oakville Project Team consisted of:

- Dale Lipnicky, Project Leader – Capital Projects
- Paul Allen, Manager of Design & Construction
- Dan Cozzi, Director of Engineering & Construction
- Trisha Collingwood, Planner, Planning Services
- Gabe Charles, Acting Manager, Planning Services
- Rita Julio, Water Resources Engineer, Development Engineering

1.5.2 The Consultant Team

John Grebenc, Morrison Hershfield led the consultant team, consisting of the following members:

Consultants (Morrison Hershfield Limited): **Sub Consultants:**

Nasser Saad, Morrison Hershfield

Andrew Murray, A.M. Archaeological Associates

Ali Mekky, Morrison Hershfield

Victor Wood, VA Wood Associates Ltd.

Paul Draycott, Morrison Hershfield

Richard Unterman, Unterman McPhail Associates Ltd.

Farooq Arshad, Morrison Hershfield

Barbara McPhail, Unterman McPhail Associates Ltd.

Joe Ostrowski, Morrison Hershfield

George Chelvanayagam, Morrison Hershfield

Eagle Kwok, Morrison Hershfield

Martin-Pierre Blouin, Morrison Hershfield

Sara Fadaee, Morrison Hershfield

1.5.3 The Technical Agencies Committee (TAC)

Technical agencies, including federal, provincial and municipal agencies and utilities with a potential interest in the study or whose mandate may be affected, will be contacted early in the study to ascertain whether or not they want to participate in the study. The agencies will be asked to provide comments and concerns regarding the study. The mailing lists and correspondence are provided in **Appendix A**.



2 PUBLIC CONSULTATION

An extensive communication plan and stakeholder sensitivity analysis was developed as part of the Sixth Line improvements study and included consultation with the general public, government agencies and various interest groups and Aboriginal communities.

Further details on the Communications Plan and the Stakeholder Sensitivity Analysis are available in **Appendix A**.

2.1 External Agencies/Stakeholders

A list of stakeholders, including federal departments, provincial ministries, municipalities and agencies, First Nations, utilities, and adjacent landowners, was prepared at the project initiation. Each party on the list of stakeholders was contacted for information or comments. The opportunity for these agencies to participate in the project was provided through the distribution of a study announcement, and through announcements for formal Public Information Centres (PIC). The following agencies were invited to be involved in the study.

- **Federal Agencies**
 - Canadian Environmental Assessment Agency
 - Canadian Transportation Agency
 - Environment Canada
 - Environment Canada Halton/Peel
 - Fisheries and Oceans Canada
 - Transport Canada
 - NAV CANADA
 - Canadian National Railway (CNR)
 - Aboriginal Affairs and Northern Development Canada

- **Provincial Agencies**
 - Ministry of Agriculture, Food and Rural Affairs
 - Ministry of Attorney General
 - Ministry of Culture
 - Ministry of Economic Development and Trade
 - Ministry of Health
 - Ministry of Municipal Affairs and Housing
 - Ministry of Natural Resources
 - Ministry of the Environment
 - Ministry of Transportation
 - Ministry of Energy and Infrastructure
 - Ontario Provincial Police
 - Constituency Office
 - GO Transit/Metrolinx
 - Ontario Realty Corporation
 - 407 ETR Concession Company
 - Conservation Halton
 - Ontario Ministry of Aboriginal Affairs

- **Municipal Government and Agencies**
 - Regional Municipality of Peel
 - City of Mississauga
 - Halton Regional Police Service
 - Halton Region Ambulance Services
 - Halton Region Emergency Medical Services
 - Halton Ecological and Environmental Advisory Committee (EEAC)
 - Halton Agricultural Advisory Committee (HAAC)
 - Halton Regional Cycling Advisory Committee
 - Town of Oakville Fire Department
 - Town of Oakville Public Works
 - Town of Oakville Engineering and Construction
 - Town of Oakville Planning Services
 - Town of Oakville Parks and Open Spaces
 - Town of Oakville Transit Services
 - Oakville Transit
 - Oakville Chamber of Commerce
 - Halton District School Board
 - Halton Catholic District School Board

- **Utilities**
 - Bell Canada
 - Cogeco Cable
 - Inter Provincial Pipeline
 - Microcell
 - Blink Communications
 - Oakville Hydro Corporation
 - Enbridge Gas
 - Rogers Cable TV
 - Rogers Cable Communications
 - Telus Networks
 - TransCanada Pipelines

- **First Nations**
 - Union of Ontario Indians
 - Association of Iroquois & Allied Indians
 - Metis Nations of Ontario
 - Founding First Nation Circle
 - Mississauga of the New Credit First Nation
 - Six Nations of the Grand River Territory
 - Mississauga of Scugog Island First Nation
 - Alderville First Nation
 - Mohawks of Akwesasne
 - Oneida Nation of the Thames

- Six Nations Haudenosaunee Confederacy Council
- Mohawks of the Bay of Quinte
- Wahta Mohawks
- Hiawatha First Nation
- Curve Lake First Nation
- Beausoleil First Nation
- Chippewas of Mnjikaning First Nation (Rama)
- Moose Deer Point First Nation

- **Interest Groups**
 - In2ition Marketing Insights
 - Read Voorhees and Associates
 - Trinison Management Corporation
 - Urbantech Consulting

The correspondences with external agencies/stakeholders are included in **Appendix A**.

2.2 Summary of Consultation Process

Consultation with agencies, stakeholders and the general public was a key component of this study and several opportunities were made available to learn about and become involved in the project. The consultation program included the consultation methods summarized in **Table 2-1** and described below.

Table 2-1 – Consultation Methods

	Agencies & Other Stakeholders	First Nations	Businesses & Resident (Project Mailing List)	General Public
Advertisements				
Notices of Study Commencement	Published in the local community newspapers			
Notices of Public Information Centers				
Notices of Study Completion				
Letters				
Notices of Study Commencement	Mail	Mail	Mail	Newspaper Advertisements & Town of Oakville Website
Notices of Public Information Centers	Mail	Mail	Mail	Newspaper Advertisements & Town of Oakville Website
Notices of Study Completion	Mail	Mail	Mail	Newspaper Advertisements & Town of Oakville Website



	Agencies & Other Stakeholders	First Nations	Businesses & Resident (Project Mailing List)	General Public
Questionnaires				
PIC #1	PIC Venues			
PIC #2	PIC Venues			
Technical Advisory Committee	Technical agencies invited to attend the TAC meeting			
Public Information Centres	All groups are welcome to attend			

2.2.1 Notice of Study Commencement

The Notice of Study Commencement outlines the study and study area, discusses the Class EA process and provides information on how the public may participate in the project. A Notice of Study Commencement was advertised on April 27, 2012 on the Town of Oakville’s website, on July 4, 2012 and July 11, 2012 in the local newspapers (Oakville Beaver), on July 5, 2012 in the local newspapers (North Oakville Today), and via direct mail. A copy of the Notice of Study Commencement is included in **Appendix A**.

2.2.2 Project Mailing List

The Project Mailing List consisted of agencies, First Nations and all property owners adjacent to the Sixth Line corridor within the vicinity of the corridor, in addition to others who wrote, telephoned, emailed, or filled in comment sheets during the study. Those on the mailing list were sent letters and notices at the Study Commencement, prior to the Public Information Centres, and at the Study Completion. Opportunities for public input were provided throughout the study process and gathered through public meetings, telephone inquiries, letters, email and faxes. A copy of the agency mailing list is included in **Appendix A**.

2.2.3 Newspaper Advertisement

Advertisements for Study Commencement Notice, Public Information Centres, and Study Completion were published in local newspapers as outlined in **Table 2-4**. All advertisements were published in two issues. Copies of the newspaper advertisements were also sent with the formal letters notifying recipients of the Study Commencement. Copies of the newspaper advertisements are provided in **Appendix A**.

2.2.4 Technical Advisory Committee (TAC)

In addition to the distribution of notices, a Technical Advisory Committee (TAC) was formed to provide input and advice to the project team at key stages during the study and included representatives from the Region of Halton, Conservation Halton, Oakville Hydro, Bell Canada, Union Gas and Cogeco Cable. Four meetings were held for the committee members to provide input on the study and to review and comment on the Public Information Centre material. Two meetings were held with Conservation Halton on October 1st 2012 and October 28th 2013. A

meeting with the utility companies (Bell Canada, Union Gas and Cogeco Cable) was held on September 16th 2013 and a meeting with Oakville Hydro on September 30th 2013. The meetings were held at the offices of the Town of Oakville’s Engineering Department and the Conservation Halton office. Refer to **Appendix A** for meeting minutes and details.

2.2.5 Public Information Centres

2.2.5.1 Public Information Centre #1

The first Public Information centre (PIC #1) was held in the Trafalgar Room at the Oakville Town Hall, 1225 Trafalgar Road, Oakville on Tuesday, December 4th, 2012, from 6:00pm to 8:00pm.

The public was notified of the PIC #1 for Sixth Line from Dundas Street to Highway 407 by:

- Advertisements that were published in the local newspaper;
- Notices were sent by mail by prior to the PIC to all stakeholders and agencies according to the project mailing list; and
- Online via the Town of Oakville website at www.oakville.ca.

Notices were sent to relevant agencies on the initial agency list. Contacts from the Municipal, Provincial and Federal government agencies as well as First Nations were also notified about the Study and PICs.

The presentation boards for PIC #1 were organized to provide an opportunity for the public to review the problem being addressed, background information, the alternative solutions being considered, evaluation of alternative solutions and identifying a preliminary preferred solution. Comment sheets were provided to members of the public who attended to write comments on display boards.

The event followed a standard “open house” format with display boards set up around the room with members of the project team, including representatives from the Town of Oakville and Morrison Hershfield.

In total, 25 members of the public attended the Public Information Centre for Sixth Line. The public who attended the PIC were asked to fill the sign-in sheet and to provide comments through the comment sheets.

Feedback was solicited at the PIC from the participants either in-person or by providing a comment sheet. Participants at the PIC had the choice of submitting their comment sheet via a “comment box” or by mailing the comment sheet to the consultant.

In total, 6 comment sheets were collected by drop-in, and email by the deadline date of December 18th, 2012. A summary of the received comments and responses is shown in **Table 2-2**.

After the completion of PIC #1, the following actions were undertaken:

- Reviewed all comments and suggestions received from the public and agencies;
- Responded to written questions and comments, if response was requested;
- Based on input received from public agencies and other stakeholders, preferred solution was finalized;
- Alternative designs to implement the preferred solutions were created and evaluated; and
- The preliminary preferred design was presented at PIC #2.

Table 2-2 – Summary of PIC #1 Comments and Responses

Item #	Comments	Responses
1	<p>1. Please ensure on-road bike lanes are installed along the whole length of Sixth Line included in the project.</p> <p>2. Please liaise with the Town of Milton to ensure that they also widen Sixth Line and install bike lanes north of 407 up to Steeles.</p> <p>3. Please install traffic circles/roundabouts at all junctions along Sixth Line not additional traffic lights. Traffic circles do not need to be large in diameter – can only be a few feet in diameter (see UK practice). Traffic circles smooth out the traffic flow, save on gas wasted idling at lights and save on driver frustration.</p>	<p>Transportation Demand Initiatives including the provision of 1.5m on-street bike lanes will be carried forward as part of the preferred solution. Pavement layout section will be presented in PIC#2, which is currently scheduled to take place in Spring 2013.</p> <p>The study area boundary is located to the south of Highway 407 ETR. Improvements to the north of Highway 407 ETR are outside the scope of this environmental assessment.</p> <p>Further topographic and legal survey work is currently being undertaken by the Town of Oakville to confirm the available right-of-way within the vicinity of the intersections. If the roundabouts could be installed within the existing right-way or with minimum impacts to the adjacent properties while addressing all traffic problems for the future conditions, then the roundabout option may be considered as an alternative. The completed evaluation will be presented in PIC#2 which is currently scheduled for spring 2013. The alternative design concepts will be evaluated based on the design criteria established for this EA study.</p>
2	<p>I think the Town of Oakville should digitally document the last of the Region’s agricultural/rural area’s transition to pure suburb. I’m picturing something like Google Streetview except that you would be able to click forward and backwards through time as well as space. If you traced the same route down Sixth Line with a camera two or three times a year for ten to fifteen years, a digital archive could be compiled for citizens (present and future) to see a time lapse of a suburb’s creation for rural lands.</p>	<p>Comment Noted. This undertaking falls outside of the scope of the Environmental Assessment for improvements to Sixth Line from Dundas Street to Highway 407 ETR.</p>

Item #	Comments	Responses
3	We are owners of 3043 Sixth Line and are concerned about the road widening of Sixth Line. We understand that it will be widened and that's fine; just concerned of how much land will be taken off our property.	Your particular concerns will be taken into consideration while developing the alternative design concepts. The alternative solutions and the preferred design concepts for the preferred solution will be developed and presented in PIC#2. The PIC#2 is currently scheduled to take place in the spring of 2013. All efforts will be made to minimize loss of property.
4	1. 6th line is a very well used north-westerly route by cyclists. It is one of only 3 "safe" north-westerly routes out of urban Oakville. Therefore how this section of roadway is improved will be of prime interest to many people.	Comment Noted.
	2. For the record the Oakville Cycling Club has more than 200 members in 2012, many of which use 6th line.	Comment Noted.
	3. Present experiences while cycling on the section of 6th line between Dundas and Burnhamthorpe is with motor vehicles travelling at or above the present 80 km/h speed limit, particularly southbound. The paved portion is narrow making it difficult for vehicles to overtake a cyclist (providing a 1 metre clearance) when an oncoming vehicle is approaching.	Transportation Demand Initiatives including the provision of 1.5m on-street bike lanes has been carried forward as part of the study. Additionally, the existing rural section will be converted to urban section which will also include 1.5m sidewalks. The proposed roadway typical section will be presented in the PIC#2. PIC#2 is currently scheduled to take place in spring 2013.

Item #	Comments	Responses
	<p>4. Traffic calming measures are required, either 'rumble Strips' or 'round-about' at intersections. Traffic lights also work but too many in short sections of roadway can cause frustrations to vehicle operators.</p>	<p>Intersection improvements have been carried forward as part of phase 1 of the Class EA. Further topographic and legal survey work is currently being undertaken by the Town of Oakville to confirm available right-of-way within the vicinity of the intersections. If the roundabouts could be installed within the existing right-way while addressing all traffic problems for the future conditions, then further evaluation of roundabout option may be considered for traffic calming. The alternative design concepts will be evaluated based on the design criteria established for this EA study.</p>
	<p>5. With reference to the North Oakville East Secondary Plan (2008) - Land Use figure that was reproduced and displayed at the Open House on Dec 4, 2012, my comments are:-</p>	<p>See response to comment #4.</p>
	<p>5a) It is noted that there could be up to 5 intermediate intersections between Dundas and the present Burnhamthorpe Road and additional 2 more between Burnhamthorpe and the 407.</p>	
	<p>5b) One of the displays indicates that in the future (2031) these intersections would be controlled via traffic lights and verbally I recall that they would be co-ordinated to work together. A major concern when any road has many traffic signals placed close together (co-ordinated or not) they tend to promote speeding in order that the vehicle operator does not get caught at the next</p>	

Item #	Comments	Responses
	<p>light. I would ask that traffic calming measures be employed as identified in 4 above at some of these intersections.</p>	
5c)	<p>It is recognized that 'round-about' are new to this area but work well in Britain and Continental Europe. The one recently built on Tremaine Road, Milton is well designed and appears to work well.</p>	
6.	<p>If active transportation is to be taken into consideration for the renovation of 6th Line, then the minimum expectation would be a 1.5 meter wide identified section with a continuous painted line on both sides of the road. It has been proved in other parts of Ontario that where such delineation has been made the life expectancy of the vehicle travelled section last longer due to the edges not breaking away.</p>	<p>Transportation Demand Initiatives including the provision of 1.5m on-street bike lanes has been carried forward as part of the study. Additionally, the existing rural section will be converted to urban section which will also include 1.5m sidewalks. The proposed roadway typical section will be presented in the PIC#2. PIC#2 is currently scheduled to take place in spring 2013.</p>
7.	<p>Any drainage should be via slots in the vertical part of the curb into catch-basins thus eliminating cast drain covers which tend to sink with time. A good example is to be found on McCraney Street west of Trafalgar Road.</p>	<p>Preliminary storm water management (SWM) will be conducted during the next phases of the study. The SWM study will be completed in accordance with the applicable standards and will satisfy the requirements of the Town of Oakville and Conservation Halton. The selection of drainage structure type will be determined during the detailed design phase.</p>

Item #	Comments	Responses
5	<p>1. The effect of noise and vibration from the increased and closer traffic patterns is of particular concern. Anything that can be done to minimize or ameliorate the noise and vibration will be welcome.</p>	<p>A noise assessment study will be undertaken as part of Class EA to evaluate existing and future noise levels within the proposed corridor. If the noise level after the improvements is not within the acceptable range, noise mitigation measures alternatives will be developed in accordance with the current applicable standards and guidelines. Further discussion will take place with the Church's representative prior implementation of the preferred solution.</p>
	<p>2. We are also concerned about the potential loss of property along Sixth Line. Loss of any parking spots because of actions by the Region or Town would be a major problem as we cannot expand the parking areas to the east because of environmental constraints due to the creek and related setback requirements.</p>	<p>The Town of Oakville currently working on completing the topographic and legal survey for the project, upon review of the survey, we will re-evaluate the proposed roadway section and its impact on the right-of-way. The roadway section presented in the PIC#1 was developed to address future traffic conditions. All efforts will be made to minimize loss of property.</p>
	<p>3. Safety has been a key consideration in our discussions with the Region because of the use of our facilities seven days by week. Particularly we have concerns about the lack of a traffic lane from Dundas onto Sixth Line and subsequently access into Munn's Church. The proposed plans may also impact signage for the church. For your information the Region has already developed draft plans for the entranceways into Munn's. Your study should probably review these draft plans.</p>	<p>As per response#2, during the next phases of the study, we will further evaluate the intersection layout which will include the length and the width of the right and left turn lanes. The lanes arrangement at the subject intersection will be finalized based on the completed traffic study for the future conditions. Regarding the existing signs within the Church right-of-way, based on selected preferred solution, the signs locations will be evaluated. If the existing signs are located within the clear zone (the offset necessary to address Roadside Safety guidelines), then new locations for the signs will be proposed and reviewed with the Church's representations. However, the exact locations will be determined during the detailed design phase.</p>

Item #	Comments	Responses
	<p>4. We certainly hope that the Region and Town are coordinating their plans for the intersection of Dundas and Sixth Line, especially as they relate to the daylighting triangle on the northeast corner, and for general safety matters.</p>	<p>The improvements to the Dundas Street/Sixth Line intersection will be coordinated with Halton Region, Approval Agencies and other Stakeholders.</p>
	<p>5. The cumulative and continuing effect of construction in the surrounding vicinity is also a concern. In the last two years there have been a number of construction and utility projects – sewer and water along Dundas, hydro and gas along Sixth Line, and subdivision construction across Sixth Line and south of Dundas east of sixth Line. All of these projects have had negative effects on our operations and fundraising events.</p>	<p>Preliminary construction staging will be evaluated during the next phases of the Class EA. However, final staging plans development and coordination with utility companies will be undertaken during the detail and construction phases of the project.</p>
6	<p>Please note that we have particular concern for the remains of our ancestors. Should excavation unearth bones, remains or other such evidence of a native burial site or any Archaeological findings, we must be notified without delay. In the case of a burial site, Council reminds you of your obligations under the Cemeteries Act to notify the nearest First Nation Government or other community of Aboriginal people which is willing to act as a representative and whose members have a close cultural affinity to the interred person. As I am sure you are aware, the regulations further state that the representative us needed before the remains and associated artifacts can be removed. Should such a find occur, we request that you contact our First Nation immediately.</p>	<p>A stage 1 archaeological assessment study will be undertaken as part of the Class EA to evaluate areas of archaeological potentials within the proposed corridor. Mitigation measures alternatives will be developed in accordance with the current applicable standards and guidelines to minimize archaeological impacts. The project team is committed to consult with all interested parties, including First Nations and to ensure that First Nations interests and concerns are adequately addressed throughout the Class EA process.</p>



2.2.5.2 Public Information Centre #2

The second Public Information Centre (PIC #2) was held in the Committee Room #1 at the Oakville Town Hall, 1225 Trafalgar Road, Oakville on Wednesday, October 2nd, 2013, from 6:00pm to 8:00pm.

The public was notified of the PIC #2 for Sixth Line from Dundas Street to Highway 407 by:

- Advertisements that were published in the local newspaper;
- Notices were sent by mail by prior to the PIC to all stakeholders and agencies according to the project mailing list; and
- Online via the Town of Oakville website at www.oakville.ca.

The purpose of this Public Information Centre (PIC#2) was to:

- Provide a summary of studies completed since the first public information centre;
- Present alternative designs considered for improving Sixth Line;
- Present preliminary preferred design;
- Present potential benefits, impacts and mitigation measures associated with the preliminary preferred design;
- Obtain public comments; and
- Present the next steps of the projects.

The event followed a standard “open house” format with display boards set up around the room with members of the project team, including representatives from the Town of Oakville, Region of Halton and Morrison Hershfield. Participants at the PIC had the choice of submitting their comment sheet via a “comment box” or by mailing the comment sheet to the consultant. In total, 12 members of the public had attended the Public Information Centre for Sixth Line. The public who attended the PIC were asked to fill the sign-in sheet and to provide comments through the comment sheets. In total, 1 comment sheet was collected by drop-in, and email by the deadline date of October 11th, 2013. The comments received are presented in **Table 2-3**.

Table 2-3 – Key Study Interest Comments

Key Study Interest	Comment
Preliminary Preferred Design	One member of the public commented on the compatibility of the design with adjacent draft plans of subdivision.

After the completion of PIC #2, the following actions were undertaken:

- Reviewed all comments and suggestions received from the public and agencies;
- Responded to written questions and comments, if response was requested;
- Based on input received from public agencies and other stakeholders, the preliminary design of the preferred alternative was finalized;



- Prepared the Environmental Study Report (ESR);
- Filed the ESR and make it available for public review and comments for a minimum 30-day public review period.

2.2.6 Summary of Consultation Activities

All the consultation activities undertaken during the study are presented in **Table 2-4**.

Table 2-4 – Summary of Consultation Activities

Period	Date	Key Points of Contact
Study Commencement	April 27 th 2012	Notice of Study Commencement advertisement on Town of Oakville website
	July 4 th , 5 th & July 11 th 2012	Notice of Study Commencement advertisements in local community newspapers. <ul style="list-style-type: none"> • Oakville Beaver – July 4th & July 11th 2012 • North Oakville Today – July 5th 2012
Technical Advisory Committee Meetings	October 1 st 2012	Meeting with Conservation Halton held at the Oakville Town Hall, 1225 Trafalgar Road from 1:00 pm to 3:00 pm
	September 16 th 2013	Meeting with Bell Canada, Union Gas and Cogeco Cable held at the Oakville Town Hall, 1225 Trafalgar Road from 2:00 pm to 4:00 pm
	September 30 th 2013	Meeting with Oakville Hydro held at the Oakville Town Hall, 1225 Trafalgar Road from 3:00 pm to 4:30 pm
	October 28 th 2013	Meeting with Conservation Halton held at the Conservation Halton Office, 2596 Britannia Road West from 9:30 am to 11:30 am
Public Information Center (PIC#1)	November 28 th 2012	Notice of PIC #1 advertisement on Town of Oakville website
	December 4 th 2012	PIC #1 held at the Oakville Town Hall, 1225 Trafalgar Road, Oakville from 6:00pm to 8:00pm.
Public Information Center (PIC#2)	September 16 th 2013	Notice of PIC #2 advertisement on Town of Oakville website
	October 2 nd 2013	PIC #2 held at the Oakville Town Hall, 1225 Trafalgar Road, Oakville from 6:00pm to 8:00pm.
Notice of Study Completion	Summer 2014	Notice of Study Completion Advertisements in local community newspapers. <ul style="list-style-type: none"> • Summer 2014



2.3 Summary of Comments

2.3.1 Agencies/Stakeholders

2.3.1.1 Conservation Halton

Conservation Halton was consulted throughout the study. As a member of the Technical Advisory Committee (TAC), Conservation Halton was invited to all TAC meetings and requested the opportunity to provide input to the study.

Conservation Halton provided preliminary comments about the study area in a letter dated January 22nd 2013. Conservation Halton noted that the proposed works have the potential to impact the existing watercourse crossings. Any works that affect the watercourse will require a permit from the CH. Mitigation measures will be required to offset any potential impacts to ecological/aquatic habitat including the need for erosion and sediment control plans.

Conservation Halton also offered comments regarding natural heritage, fish habitat impacts, stormwater management and miscellaneous issues.

As a result, the proposed alignment for Sixth Line was shifted east in front of the Natural Heritage System to avoid impacting Core #7 of the North Oakville-Milton East Provincially Significant Wetland Complex.

See **Appendix A** for a copy of the correspondence.

2.3.1.2 NAV CANADA

A letter from NAV CANADA dated December 4th 2012 confirms that the proposed study has been evaluated and that NAV CANADA has no objection to the project as submitted. See **Appendix A** for a copy of the correspondence.

2.3.1.3 Transport Canada

Correspondence with Transport Canada dated December 6th 2012 states that if any of the related project undertakings cross or affect a potentially navigable waterway, the proponent should prepare and submit an application in accordance with the requirements of the *Navigable Waters Protection Act* (NWPA). It was concluded that there are no navigable waters in the study area. See **Appendix A** for a copy of the correspondence.

2.3.1.4 Sixth Line Landowners

Further to comments received during the 2 PICs, letters from landowners adjacent to Sixth Line were received to offer comments on the proposed design. The letters were received from David Faye and Associates Inc. (Dated December 2nd 2013), Matson, McConnell Ltd. (Dated December 9th 2013), Urbantech West (Dated January 27th 2014) and North Oakville Community Builders Inc. (Dated March 27th 2014). The main concerns were regarding the property impacts to the lands fronting Sixth Line to undertake the proposed widening. See **Appendix A** for a copy of the letters and the Town of Oakville responses.

2.3.2 First Nations

First Nations who may have an interest in the study area were contacted, along with other agencies/stakeholders, in the early stages of the study as noted in **Section 2.1 and 2.2**. The opportunity for the First Nations to participate in the project was provided throughout the Class



EA via notice for the study commencement, notice and invitation to participate in the Public Information Centre (PIC), and the notice of study completion.

The following summarizes key issues from the First Nations correspondence and identifies how each issue was addressed.

2.3.2.1 Aboriginal Affairs and Northern Development Canada

Aboriginal Affairs and Northern Development Canada (AANDC) – Consultation and Accommodation Unit acknowledged receipt of the Notice of Public Information Centre by correspondence dated December 18th 2013. The AANDC offered resources about inquiries regarding aboriginal and treaty rights and asked to be removed from the project mailing list. The AANDC was removed from the mailing list. Through the use of the Aboriginal and Treaty Rights Information System (ATRIS), it was determined that the study area was not within any modern treaty areas. See **Appendix A** for a copy of the correspondence.

2.3.2.2 Ministry of Aboriginal Affairs

A letter from the Ministry of Aboriginal Affairs (MAA) dated January 15th 2013 included contact information for First Nations located near the study area to assist the project team. The MAA was removed from the mailing list at its own request. See **Appendix A** for a copy of the correspondence.

2.3.2.3 Curve Lake First Nation

In a response letter dated December 10th 2012, the Curve Lake First Nation acknowledged receipt of the Notice of Public Information #1. It was indicated that the project area is located within the Williams Treaty Territory and that they are not aware of any issues with the proposed undertaking. It was also requested that they be notified of any archaeological findings related to First Nations. The draft Stage 1 Archaeological Assessment was sent to the Curve Lake First Nation. See **Appendix A** for a copy of the correspondence.

2.3.2.4 Chippewas of Rama First Nation

In a response letter dated December 18th 2012, the Chippewas of Rama First Nation acknowledged receipt of the Notice of Public Information Centre #1 and indicated a copy of our letter had been forwarded to the Williams Treaty First Nations for further review and response. No further communications from the Chippewas of Rama First Nations or the Williams Treaty First Nations were received. See **Appendix A** for a copy of the correspondence.



3 Existing and Future Conditions

3.1 Transportation

3.1.1 Existing and Future Road Networks

The Town of Oakville existing road network consists of a series of roadways that provide connectivity within the Town, Region of Halton and the Greater Toronto Area. The study area of Sixth Line between Dundas Street to Highway 407 ETR is a two-lane road with limited shoulder width. The existing posted speed limit along Sixth Line between Dundas Street to Highway 407 ETR is 60km/h.

The *North Oakville East Secondary Plan (2008)* sets out the long-term transportation vision and integrated road and transit network plan, to support population growth of the town to the year 2021. It also integrates transportation and land use planning and it is compatible with the goals set out in the *Livable Oakville Plan (2009)*.

Recommended road network beyond 2021 by the *North Oakville East Secondary Plan (2008)* is presented in **Figure 1-7** and the proposed design classification of Sixth Line is Minor Arterial.

Recommended road network improvement pertinent to the study area is widening Sixth Line between Dundas Street to Highway 407 ETR to 4-lanes by 2021.

3.1.2 Existing and Future Traffic

The existing (2012) link traffic flows along Sixth Line between Dundas Street to Burnhamthorpe Road are 837 vehicles and 733 vehicles in the AM and PM peak hours, respectively. While, between Burnhamthorpe Road to Highway 407 ETR, the traffic flows are 815 vehicles and 637 vehicles in AM and PM peak hours, respectively.

Existing link analysis confirms that the existing Volume to Capacity (V/C) ratio in study area does not exceed the threshold limit of 0.85. The existing (2012) traffic flow and link analysis are presented in **Figures 4-2** and **4-3 (Section 4.2)**, respectively.

The future (2021 and 2031) link traffic flows are presented in **Figures 4-4** and **4-7**, respectively.

The link analysis with future (2021) traffic shows that 'Do Nothing' Volume to Capacity ratio in AM peak hour would exceed threshold limit of 0.85 between Burnhamthorpe Road to Dundas Street. Whereas, during the PM peak hour, Sixth Line would experience congestion with volume to capacity ratio exceeds 0.85 between Future Street D to Dundas Street (see **Figure 4-5**).

Link analysis with future (2031) traffic shows that Sixth Line corridor from Dundas Street to Burnhamthorpe Road would fail operating during the AM and PM peak hours (see **Figure 4-8**).

3.1.3 Existing and Future Road Transit

Currently, there is no local transit service operating in the Study Area.

The transit beyond 2021 (refer Exhibit 2-9) by the *North Oakville East Secondary Plan (2008)* is presented in **Figures 1-8**. Recommended transit network improvements pertinent to the study area are:

- Sixth Line between Dundas Street to Highway 407 ETR as Secondary Transit Corridor;
- Dundas Street as Primary Transit Corridor by 2021.



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3.2 Engineering

3.2.1 Existing Road Geometrics

The existing cross-section, horizontal alignment and vertical alignment of Sixth Line between Dundas Street to Highway 407 ETR were reviewed based on the topographic survey information provided by the Town of Oakville. The horizontal and vertical alignments were reviewed and compared to the Town of Oakville Design Standards for a design speed of 70 km/h (60 km/hr posted speed).

Specific horizontal elements reviewed include angle of intersection, radii and deflection points. The existing vertical elements reviewed include grades and “K” values for both crest and sag curves. All vertical sag curves were assessed based on the minimum “ K_{sag} ” value for headlight control (non-illuminated condition). The headlight control (non-illuminated condition) was used because there is no lighting present along Sixth Line. If illumination is provided, “K” values can be reduced for sag curves.

3.2.1.1 Existing Cross-section

The segment of Sixth Line between Dundas Street to Highway 407 ETR is currently a 2-lane rural cross-section with partially paved and gravel shoulders and ditches on both sides with a typical right-of-way of 22m.

3.2.1.2 Existing Horizontal Alignment

The existing horizontal alignment of Sixth Line is generally tangent throughout the study area. Through the Burnhamthorpe Road intersection there is large horizontal radius ($R=800m$). Where possible, it is desirable to have the two intersecting roadway alignments on tangent through the intersection area according to the Town of Oakville design standards.

3.2.1.3 Existing Vertical Alignment

The existing profile along Sixth Line between Dundas Street to Highway 407 ETR undulates along the corridor and dips near the five culvert crossings located within the study area. Town of Oakville design standards and Transportation Association of Canada (TAC) – *Geometric Design Guidelines for Canadian Roads (Updated December 2007)* were used to evaluate the existing grades and vertical curves within the study area.

The existing grades within the study area vary from 0.2 % to 4.6 %. This falls outside Town of Oakville design standards of minimum desirable grades of 0.5% to maximum desirable grades of 6%. Some deficiencies exist with respect to the vertical curve (sag and crest) geometrics and approach to the intersection.

TAC Guidelines

The vertical crest curves along Sixth Line have a minimum K_{crest} value of 35, which are acceptable according to the TAC minimum crest vertical curve value guidelines (minimum $K_{crest} = 16-23$, for 70 km/h design speed).



The vertical sag curves along Sixth Line have a minimum Ksag value of 15, which are deficient according to the “headlight control” (un-illuminated roadways, Ksag = 20-25, for 70 km/h design speed) but not “comfort control” (illuminated roadways, Ksag = 10-12 for 70 km/h design speed) for minimum (Ksag) values.

3.2.2 Intersections

Currently, Sixth Line intersects at Dundas Street and Burnhamthorpe Road, which operate under the jurisdiction of Halton Region. The intersection at Dundas Street is operating under traffic signal condition. The intersection of Sixth Line and Burnhamthorpe Road is operating under unsignalized traffic control with a flashing all-way stop condition.

Adjacent development to the north-west of the Sixth Line/Dundas Street intersection is currently under construction including two new intersections: Kaiting Trail and Sixteen Mile Drive.

According to the latest geometric design standards, intersecting roadway alignments on tangent through the intersection area is considered desirable. Intersection angles less than 70 degrees or greater than 110 degrees are considered undesirable. All existing intersection angles are within the desirable limits.

3.2.3 Geotechnical Features and Pavement Conditions

A geotechnical investigation was undertaken as part of the environmental assessment to determine the existing pavement and sub-surface conditions. The full geotechnical investigation report can be found in **Appendix I**.

3.2.3.1 Existing Pavement

The thickness of the existing asphalt surfacing varies from 75mm to 175mm (generally 100 to 150mm) and the granular base varies from 150mm to 450mm thick (generally 250mm to 300mm). The composition of the pavement and immediate subgrade soil at the borehole locations is summarized in **Table 3-1**.

Table 3-1 – Existing Pavement Composition

Borehole Number	Approximate Station	Asphalt Thickness	Granular Base Thickness	Subgrade Soil
1	0+850	175 mm	300 mm	Dense Gravelly Sand Fill
2	0+700	175 mm	250 mm	Hard Clayey Silt Till
3	1+150	150 mm	150 mm	Dense Gravelly Sand Fill
4	1+200	100 mm	300 mm	Very Stiff Clayey Silt Till
5	1+335	125 mm	375 mm	Compact Organic Stained Clayey to Sandy Silt Fill
6	1+470	125 mm	250 mm	Dense Gravelly Sand Fill
7	1+595	125 mm	250 mm	Very Stiff Clayey Silt Till



Borehole Number	Approximate Station	Asphalt Thickness	Granular Base Thickness	Subgrade Soil
8	1+680	100 mm	250 mm	Compact Silty Clay Fill, Organic Stained
9	1+775	100 mm	250 mm	Compact Silty Clay Fill, Organic Stained
10	1+890	100 mm	250 mm	Compact Silty Clay Fill, Organic Stained
11	2+000	125 mm	275 mm	Compact Gravelly Sand Fill
12	2+115	125 mm	300 mm	Compact Gravelly Sand Fill
13	2+215	75 mm	250 mm	Compact Gravelly Sand Fill
14	2+325	125 mm	275 mm	Loose Silty Clay Fill, Trace Organics
15	2+435	125 mm	300 mm	Loose Organic Silty Clay Fill
16	2+550	100 mm	275 mm	Stiff Clayey Silt Till
17	2+665	125 mm	250 mm	Compact Silty Clay Fill, Organic Stained
18	2+775	125 mm	250 mm	Compact Silty Clay Fill, Organic Stained, Some Wood Fragments
19	2+925	125 mm	250 mm	Compact Mixed Topsoil and Organic Stained Silty Clay Fill
20	3+050	150 mm	250 mm	Very Stiff Clayey Silt Till
21	3+165	100 mm	250 mm	Loose Organic Silty Clay Fill
22	3+275	150 mm	325 mm	Very Stiff Clayey Silt Till
23	3+375	150 mm	325 mm	Very Stiff Clayey Silt Till
24	3+475	150 mm	200 mm	Very Stiff Clayey Silt Till
25	3+575	150 mm	250 mm	Very Stiff Clayey Silt Till
26	3+675	125 mm	200 mm	Very Stiff Clayey Silt Till
27	3+775	150 mm	175 mm	Very Stiff Clayey Silt Till
28	3+875	125 mm	400 mm	Compact Sandy Silt Fill
29	3+975	125 mm	400 mm	Compact Sandy Silt Fill, Organic Stained
30	4+075	125 mm	450 mm	Very Dense Gravelly Sand Fill



Grain size analyses were carried out on representative samples of the granular base. The grading of the samples are just outside (fine side) of the grading envelope for granular 'A' but are well within the envelope for granular 'B'. It is possible that the granular base is comprised of an upper granular 'A' base and a lower granular 'B' sub-base. However, due to the sampling method (by auger), the sample obtained is an aggregate mixture of the entire granular base.

3.2.3.2 Fill

The pavement was underlain by fill in most of the boreholes over the southern two-thirds of the alignment and north of the future New North Oakville Transportation Corridor. The fill extended to a depth of between 0.6m and 1.3m and varied in composition from loose to compact silty to compact gravelly sand. The silty clay fill is generally organic stained and contained traces of gravel, topsoil and organics in places. Wood fragments and decayed organics were encountered within the fill in Boreholes 18 and 21. The gravelly sand fill contained some asphalt fragments in some of the boreholes. Stone (20mm) and a fragment of PVC pipe was encountered at the bottom of Borehole 3.

3.2.3.3 Clayey Silt Till

The fill was underlain by native clayey silt till. Where there is no backfill, the pavement was immediately underlain by native clayey silt till (except in Boreholes 13, 18, 19, 29, 29 and 30). This glacial deposit extended to a depth of between 0.9m and 2.4m below grade and is comprised of a clayey silt matrix which contained some fine to medium gravel. Based on the Standard Penetration Test results and a visual and tactile examination of the samples, the clayey silt till is considered to have a very stiff to hard consistency.

3.2.3.4 Sandy Silt Till

The pavement in Boreholes 13, 18, 19, 28, 29, 30 and the clayey silt till in the remaining boreholes (except Boreholes 5, 6, 8, 9 and 10) were underlain by a deposit of sandy silt till which extended to a depth of between 2.8m and more than 3.5m below grade (maximum depth investigated). This glacial deposit is comprised of a sandy silt matrix which contained some fine to medium gravel. Based on the Standard Penetration Test results, the sandy silt till is considered to have a compact to very dense relative density.

3.2.3.5 Weathered Shale

The clayey silt till in Boreholes 5, 6, 8, 9, 10 and the sandy silt till in Boreholes 11, 12 and 13 were underlain by weathered shale, which extended to a depth of more than 3.5m below grade (maximum depth investigated). The shale is highly weathered and is generally damp and brick red in colour.

3.2.3.6 Groundwater Conditions

No free water was encountered in the boreholes which were all open and dry to the full depth upon completion of the field work. It is noted that the water level measurements were carried out immediately after completion of drilling each borehole and it is likely that the groundwater had not yet stabilized in the borehole.



An examination of the soil samples revealed that the native soil samples were generally moist and had a brown to reddish brown to brick red colour for the full depth of the boreholes.

Based on the foregoing, the permanent groundwater table is considered to be located below the depths investigated (at least 2.5m to 3.5m below grade) along most of the alignment. However, perched water conditions may occur within the fill and on top of the relatively impervious native till and weathered shale.

3.2.4 Utilities

The Sixth Line corridor is used by several utility services as described below:

3.2.4.1 Oakville Hydro

Hydro lines are located on both sides of Sixth Line. The utility pole lines appear to have been upgraded recently and the new poles have been installed on the west side of Sixth Line at the southern end but then they cross to the east side approximately 100 m from Dundas Street but switch back to the west approximately 700 m from the Dundas Street. North of Burnhamthorpe Road, there are new poles on both sides of Sixth Line. For the majority of the stretch between Dundas Street and Burnhamthorpe Road, the old poles have been left in place.

3.2.4.2 Bell Canada

Bell Canada owns underground ducts and aerial lines running along both sides of Sixth Line north of Dundas Street. The east side of the road is primarily aerial. Fibre-optic cables are also located on both sides of Sixth Line. The Bell ducts and aerial lines will be impacted by the proposed road widening and will need to be further studied during detail design as they may require relocation.

3.2.4.3 Union Gas

Union Gas owns a 150mm gas main that runs on the east side of the road from south of Dundas Street to slightly north of the property for #3043 Sixth Line. A 100mm gas main along the north side of Kaitting Trail crosses Sixth Line to connect to the main line. The gas main will be covered by the proposed road widening and will need to be further studied during detail design as it may require relocation.

3.2.4.4 Cogeco Cable

Cogeco Cable owns underground fibre-optic ducts along the west side of Sixth Line from Dundas Street to Sixteen Mile Drive. The Cogeco ducts may be impacted by the proposed road widening and will need to be further studied during detail design as they may require relocation.

3.2.4.5 Existing Watermain

The Region of Halton owns a 750mm watermain that runs on the east side of Sixth Line from the south of Dundas Street to the RJ Moore Reservoir, located on the east side of the road, north of Burnhamthorpe Road. The fire hydrants will be impacted by the proposed road widening and will need to be relocated.



3.2.4.6 Existing Storm Sewer

Sixth Line from Dundas Street to 150m north is urbanized with concrete curb and gutter. In this section, catchbasins on the east and west side of Sixth Line collect drainage and convey it into an existing 975 mm concrete storm sewer. This storm sewer runs south under Sixth Line until it reaches Dundas Street where it crosses below the intersection. The sewer outlet is at the south-east corner of Sixth Line and Dundas Street. At this point, flow enters West Morrison Creek. The catchbasins will be impacted by the proposed road widening and will need to be relocated.

3.3 Drainage and Stormwater Management

A Drainage Conditions Report was prepared to examine existing drainage conditions, evaluate the impact of the various alternatives on stormwater quality, quantity and flooding and to recommend measures to mitigate any impacts associated with the preferred road design alternative. The complete Drainage Conditions Report is presented in **Appendix H**.

Under existing conditions Sixth Line is a straight two lane rural road with limited development on either side. Drainage is conveyed via vegetated ditches on the east and west side of the roadway. The existing right-of-way is 20.0 m, and approximately 52.5% of the existing cross-section is made up of impermeable surface material (lanes, shoulders). The remaining 47.5% is permeable material (ditches, grass cover).

3.3.1 Stream Systems

According to the North Oakville Creeks Subwatershed Study (NOCSS), there are four subwatersheds that overlap the Sixth Line study area. These subwatersheds include Munn's Creek, Sixteen Mile Creek, East Morrison Creek and West Morrison Creek. The subwatersheds are described in the following sections and shown in **Figures 3-1** and **3-2**.

3.3.1.1 Munn's Creek

Within the NOCSS study area, Munn's Creek flows from north to south. Munn's Creek originates from a poorly defined swale running through agricultural land. There are two tributaries of Munn's Creek in the study area. Both of the tributaries originate in cattail marshes to the immediate north of Dundas Street. In total, 3 reaches of this creek were surveyed in NOCSS.

A small portion of Sixth Line north of Dundas Street drains into the Munn's Creek system. This includes approximately 155 m in length at the south end of the study area. There is an existing high point on Sixth Line at Kaitting Trail. This is the divide between the Munn's Creek subwatershed and the West Morrison Creek subwatershed.

3.3.1.2 Sixteen Mile Creek

Sixteen Mile Creek generally flows from south-east to north-west within the NOCSS study area. In the portion of the Sixteen Mile Creek subwatershed that overlaps the study area, no reaches were surveyed. There is one culvert crossing of Sixth Line within this subwatershed.



3.3.1.3 East Morrison Creek

East Morrison Creek flows generally from north-west to south-east. East Morrison Creek is made up of two tributaries that join just north of Dundas Street. The western tributary is ploughed through with crops. There is no riparian vegetation or canopy cover in this reach. The eastern tributary of East Morrison Creek originates just south of Burnhamthorpe Road where it flows south through ploughed fields.

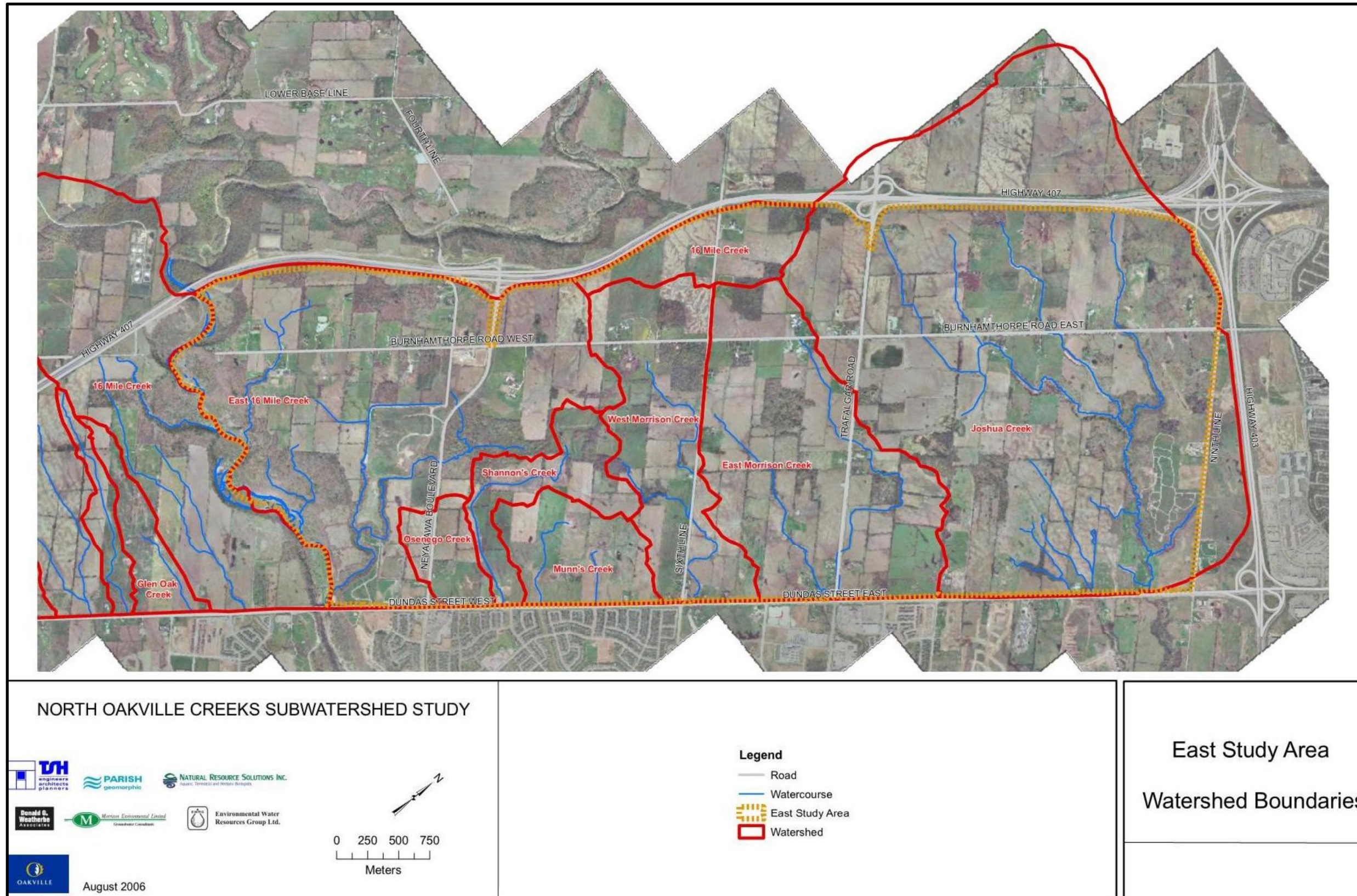
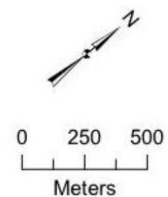


Figure 3-1 Sixth Line Watershed Boundaries



NORTH OAKVILLE CREEKS SUBWATERSHED STUDY



OAKVILLE August 2006

- Legend**
-  East Study Area
 -  Road
 -  Watercourse
 -  Reach Break
 -  Detailed Field Sites

East Study Area
 Reach Delineation
 and Field Sites

Figure 3-2 Sixth Line Reach Delineation



East Morrison Creek, north of Dundas Street, includes reaches MOC-5, MOC-5A and MOC- 4. MOC-5 is considered a low constraint stream corridor, MOC-5A is considered a medium constraint stream corridor and MOC-4 is considered a high constraint stream corridor.

East Morrison Creek does not cross Sixth Line and therefore, any potential realignment or modifications to the three reaches described above will not be discussed.

3.3.1.4 West Morrison Creek

West Morrison Creek flows generally from north-west to south-east. West Morrison Creek crosses Sixth Line and then runs south parallel to it. This section of stream is ploughed through with crops. Tilling has eliminated most riparian cover for the creek. To the north, west Morrison Creek originates from swales in agricultural fields before flowing into the Sixth Line roadside ditch. At the downstream end, there is more tree canopy cover of the creek. Just north of Dundas, there is a small cattail marsh.

West Morrison Creek, north of Dundas Street, includes reaches MOC-W5, MOC-W3, MOCW2 and MOC-W1. All four of these reaches are considered medium constraint stream corridors.

As identified in the Timsin/Arrassa EIR/FSS, realignment of reach MOC-W3 is discussed. The turns found in the channel are not representative of natural planform adjustments; therefore they are considered to be artificial.

The Lower West Morrison Creek (reach MOC-W1) has been identified for realignment in the Sixth Line Corporation's EIR/FSS. In both cases, the objectives of realigning the channel are to safely convey the 100-year and Regional flood flows, promote fish and amphibian habitat, to maintain or increase floodplain storage, and to maintain the low flow length of the channel.

In relation to the Sixth Line widening, the only place the realignment of the West Morrison Creek impacts Sixth Line is at Culvert MW-S2. The outlet of Culvert MW-S2 is at MOC-W1.

A fluvial geomorphologic analysis and channel design was carried out by Geomorphic Solutions for MOC-W1. The recommended channel design is a riffle-pool channel that will naturally adjust to the annual range of flows conveyed. Conceptual channel design drawings were prepared as part of the EIR/FSS. These drawings show that the design intent is to maintain the existing culvert alignment. The culvert will be extended due Sixth Line widening. The outlet of the culvert will be approximately 21 m east of the existing outlet. At this point, the realigned MOC W1 will begin.

An analysis of the proposed channel was completed in the Sixth Line Corporation EIR/FSS by Urbantech. This analysis did not take into account Culvert MW-S2. Culvert MW-S2 has been considered in the hydraulic analysis in NOCSS.

3.3.2 Topographic Depressions/ Hydrologic Features A and B

There are two hydrologic features located adjacent to the study area. Both of these features are wetlands located on the west side of Sixth Line within the West Morrison Creek subcatchment. Wetland MAM2-2 is approximately 0.25 ha in size and called Reed-canary Grass Mineral Meadow Marsh. Wetland MAM2 is approximately 0.24 ha in size and is not named.



Neither wetlands MAM2-2 or MAM2 are located online or in the West Morrison Creek watercourse. Wetland MAM2 is considered a hydrologic feature B. The hydrologic function of this wetland should be maintained. This can be achieved by restricting development of the Sixth Line R.O.W. into this area.

Wetland MAM2-2 is located within NOCSS Core #7 and therefore is given special consideration. NOCSS has established a “Core Area” approach where by natural features area treated as a cluster of habitats.

Core #7 is located immediately adjacent to the Sixth Line R.O.W. on the east side of Sixth Line, just south of Burnhamthorpe Road. Core #7 includes some small forest interior habitat (<1 ha). It includes wetland MAM2-2. The existing woodlot and wetland in Core #7 has been recommended for retention in NOCSS. The hydrologic function of this Core Area should be maintained. This was achieved by shifting the development of the ROW into the area.

3.3.3 Infiltration

The overall goal for groundwater in NOCSS is to maintain infiltration as close to current levels as possible. Wetlands, woodlots and stream corridors are important areas for groundwater recharge.

Core #7 is located immediately adjacent to the Sixth Line ROW on the east side of Sixth Line, just south of Burnhamthorpe Road. Core #7 includes some small forest interior habitat (<1 ha). It includes wetland MAM2-2, a PSW. The existing woodlot and wetland in Core #7 has been recommended for retention in NOCSS. The hydrologic function of this Core Area should be maintained. This can be achieved by restricting development of the ROW into this area.

3.3.4 Culverts

There are five culvert crossings in the study area. The location of the culverts is shown on **Figure 3-4** and information about each is provided in **Table 3-2** below.

Table 3-2 – Existing Culverts on Sixth Line

Culvert Number	Location	Size	Material
1	300m North of Dundas St. E	800mm	CSP
2	700m North of Dundas St. E	2160mm x 900mm	Concrete Box Culvert
3	1.3km North of Dundas St. E	600mm	CSP
4	1.9km North of Dundas St. E	600mm	CSP
5	3km North of Dundas St. E	600mm	CSP

Existing culverts 1, 3, and 4 are not able to discharge the 100 year existing flow without overtopping during this event. All five culverts are not able to discharge the existing Regional flow without overtopping the roadway. Relief would occur at roadway low point for Culvert 5. At Culverts 3 and 4, it is expected that drainage that is backed up at the culvert inlet would bypass the culvert and continue south via existing ditches.



3.3.5 Drainage Areas

Sixth Line between Highway 407 and Dundas Street East has been divided into six drainage areas. Drainage areas were selected based on the existing road profile and future drainage boundaries. Future drainage boundaries are based on proposed SWM pond locations, culvert crossings, future intersections and sub watershed boundaries. Drainage is divided between four subwatersheds including Munn's Creek, East Sixteen Mile Creek, West Morrison Creek and East Morrison Creek. The drainage areas are shown in **Figure 3-3** and detailed in the following sections.

3.3.5.1 D1: Highway 407 to 470m north of Burnhamthorpe Road

This section of Sixth Line is approximately 520m in length and drains north towards Highway 407. Under existing conditions, at the low point in the road profile there is a 600 mm CSP culvert crossing Sixth Line. At this point, drainage from D1 travels west across an open field to two SWM ponds on the south side of Highway 407.

3.3.5.2 D2: 470m north of Burnhamthorpe Road to Burnhamthorpe Road

This section of Sixth Line is approximately 470 m in length and drains south towards Burnhamthorpe Road. Flow crosses Burnhamthorpe Road via an existing 600 mm CSP culvert. Drainage in D2 is part of the Upper West Morrison Creek subcatchment.

3.3.5.3 D3: Burnhamthorpe Road to 425m South of Burnhamthorpe Road

This section of Sixth Line is approximately 425m in length and drains to roadside ditches on Sixth Line towards the south. Drainage crosses Sixth Line at an existing 600 mm CSP culvert crossing and continues south-east. Drainage in D3 is part of the Upper West Morrison Creek subcatchment.

3.3.5.4 D4: 425m South of Burnhamthorpe Road to 675m North of Dundas Street

This section of Sixth Line is approximately 1025 m in length and drains towards the south via road side ditches. Flow from the west ditch crosses Sixth Line at the existing 2160 mm x 900 mm concrete box culvert and continues south-east. Drainage in D4 is part of the Lower West Morrison Creek subcatchment.

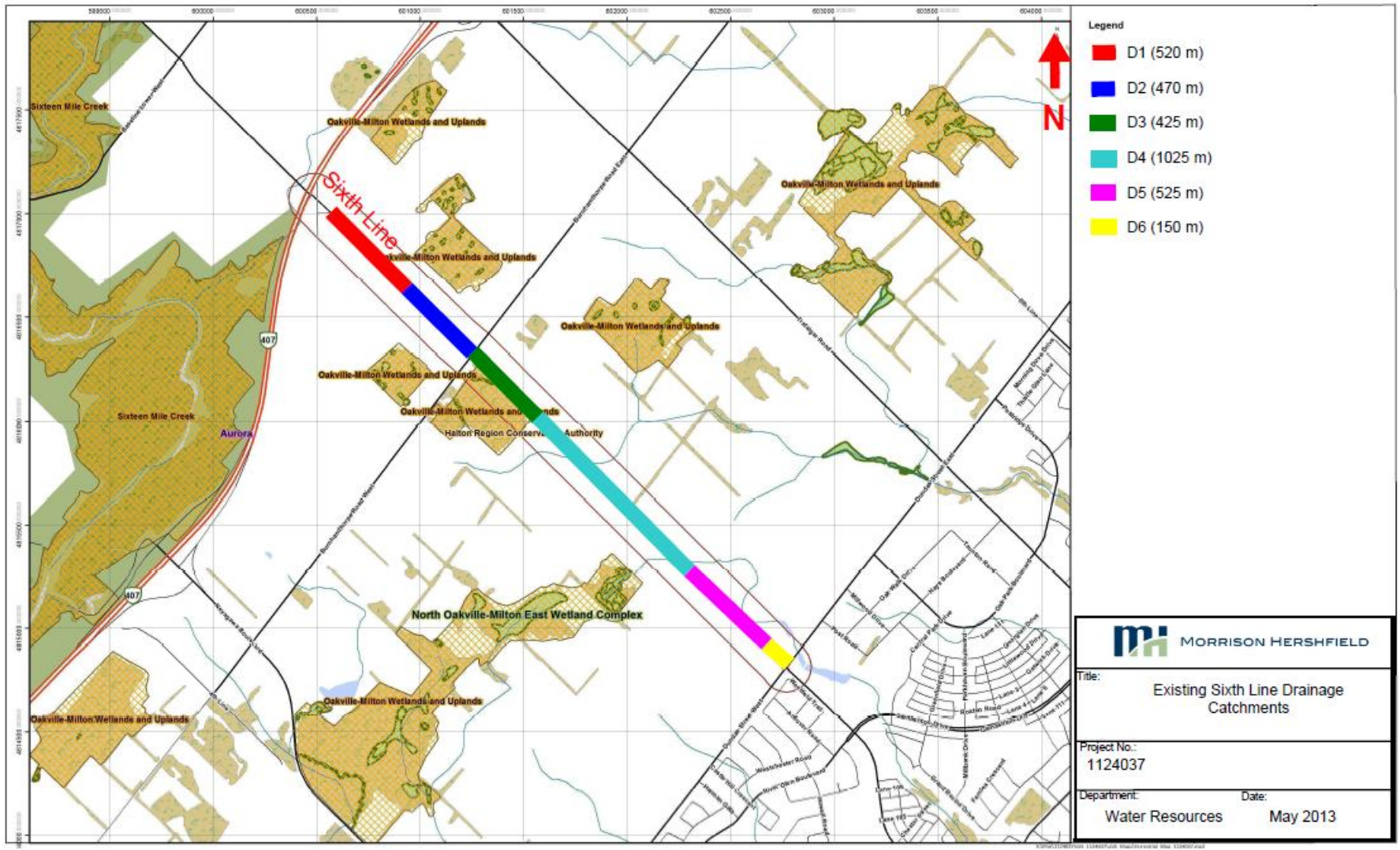


Figure 3-3 Existing Sixth Line Drainage Catchment Areas

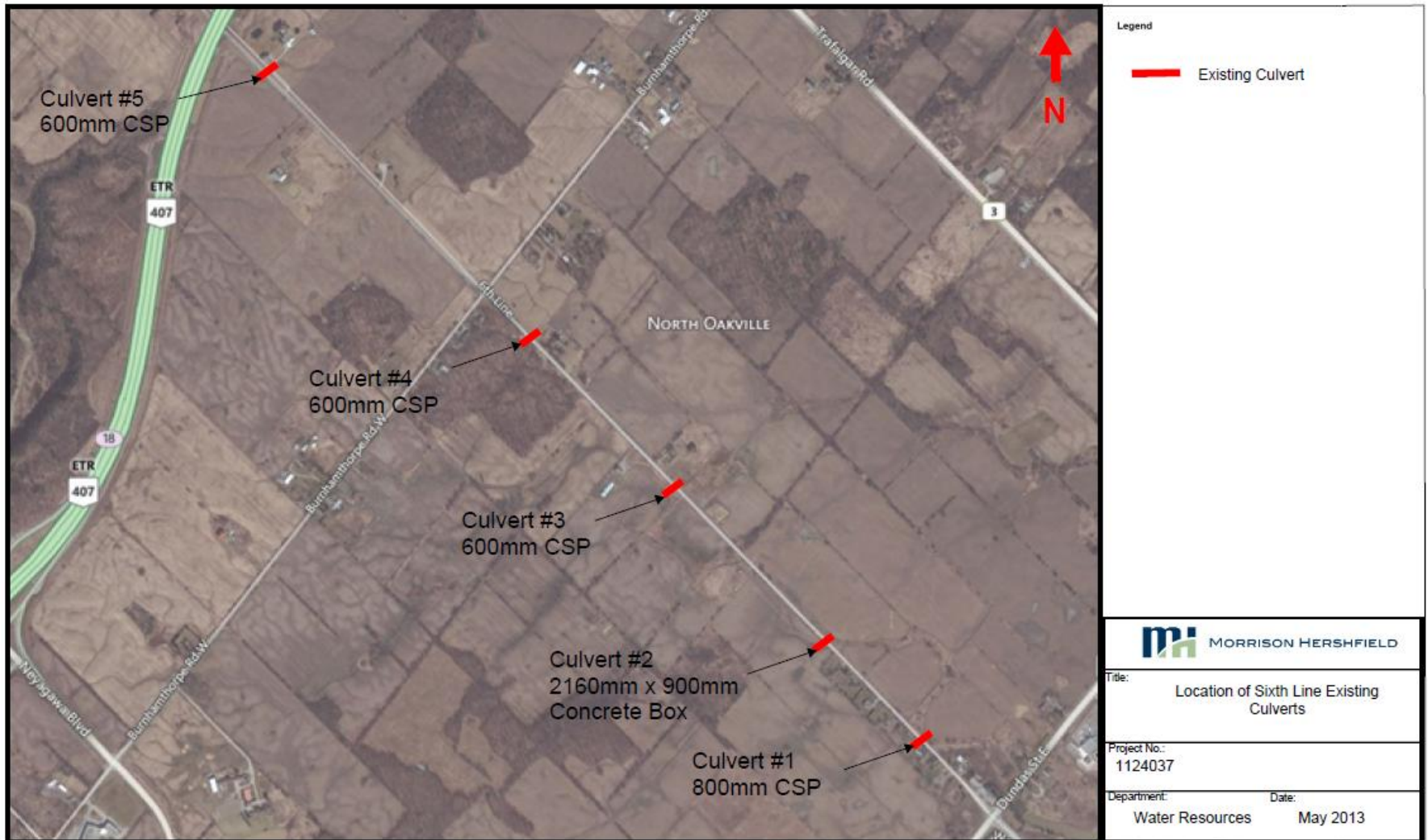


Figure 3-4 Sixth Line Existing Culvert Locations



3.3.5.5 D5: 675m North of Dundas Street to 150m north of Dundas Street

This section of Sixth Line is approximately 525 m in length and drains towards the south via Sixth Line road side ditches. Flow crosses Sixth Line at the existing 800 mm CSP culvert crossing and continues south-east. Drainage in D5 is part of the Lower West Morrison Creek subcatchment.

3.3.5.6 D6: 150m north of Dundas Street to Dundas Street

This section of Sixth Line is approximately 150 m in length and drains towards the south. Catchment D6's northern boundary is at Kaitting Trail where there is an existing high point on Sixth Line. This high point is the dividing line between Munn's Creek subwatershed and West Morrison Creek subwatershed.

Concrete curb and gutter begins 150 m north of Dundas Street. From this point, catch basins on the east and west side of Sixth Line collect drainage and convey it into an existing 450 mm concrete storm sewer. This storm sewer runs south under Sixth Line until it reaches the west quadrant of Dundas Street/ Sixth Line intersection. From this point, the sewer connects to a 700 mm CSP that outlet to an existing ditch.

3.4 Natural environment

An Environmental Impact Study was prepared to document existing aquatic, terrestrial and land use resources throughout the environmental study area and to assess potential impacts on these resources in relation to the project works. The complete environmental existing conditions report can be found in **Appendix C** and the summary of the findings of the environmental assessment study are presented below.

3.4.1 Fisheries and Aquatic Habitat

Within the study area there are two linear aquatic ecosystems that cross Sixth Line however these are ephemeral watercourses and were dry during the field investigation. Neither crossing provides fish habitat (see **Figures 3-5 to 3-7**).

Ditches that flow along Sixth Line do not provide fish habitat. The ditches are ephemeral and during the investigation, most of the ditch line was dry. There was little to no vegetation and the water source in the ditches was primarily runoff from the surrounding farm fields.

Two large ponds were identified at the north end of the study area. One of the ponds is within the Highway 407 right-of-way and the other is on a private property on the east side of Sixth Line, just south of Highway 407. The riparian habitat at the Highway 407 pond was limited to grasses and low herbaceous plants. The pond on private property was surrounded by mowed grass with some trees. Both waterbodies likely support bait fish (see **Figures 3-4 and 3-5**).



Figure 3-5 Concrete culvert northwest of Dundas Street and the current housing development on the southwest side of 6th Line. Looking northwest.



Figure 3-6 Concrete culvert northwest of Dundas Street and the current housing development on the southwest side of 6th Line. Looking east.

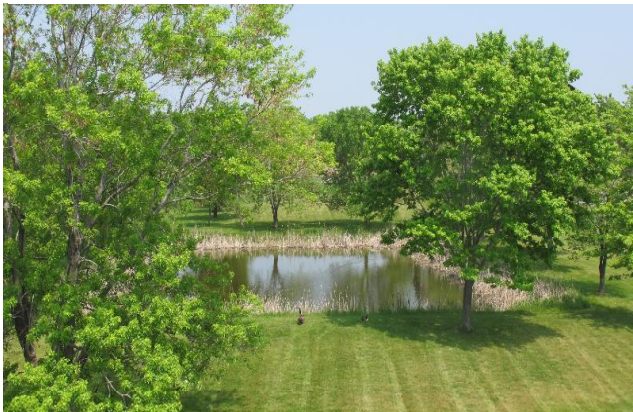


Figure 3-7 Pond on private property on the northeast side of Sixth Line at the north end of the study area.



Figure 3-8 Ponds within the Highway 407 right-of-way



Figure 3-9 Concrete culvert northwest of Dundas Street and the current housing development on the southwest side of 6th Line. Looking southwest.



3.4.2 Terrestrial Ecosystems

The vegetation community within the study area consists of cultural meadow (CUM), deciduous forest (FOD), and agricultural crop land. The terrestrial map is shown in **Figure 3-10** and the vegetation communities within the study area are shown in **Figures 3-11** and **3-12**. **Figures 3-13** and **Figures 3-14** illustrate the photos of the communities.

Cultural meadow (CUM) communities are meadow communities that result from, or are maintained by, cultural or anthropogenic-based disturbances. They have less than (or equal to) 25% tree cover and less than (or equal to) 25% shrub cover. These communities often contain a large proportion of non-native plant species. Species observed in the CUM within the study area included: Grass sp. (*Poa sp.*), White Clover (*Trifolium repens*), Dandelion (*Taraxacum officinale*), Ox-eye Daisy (*Chsanthemum leucanthemum*), and Canada Goldenrod (*Solidago canadensis*).

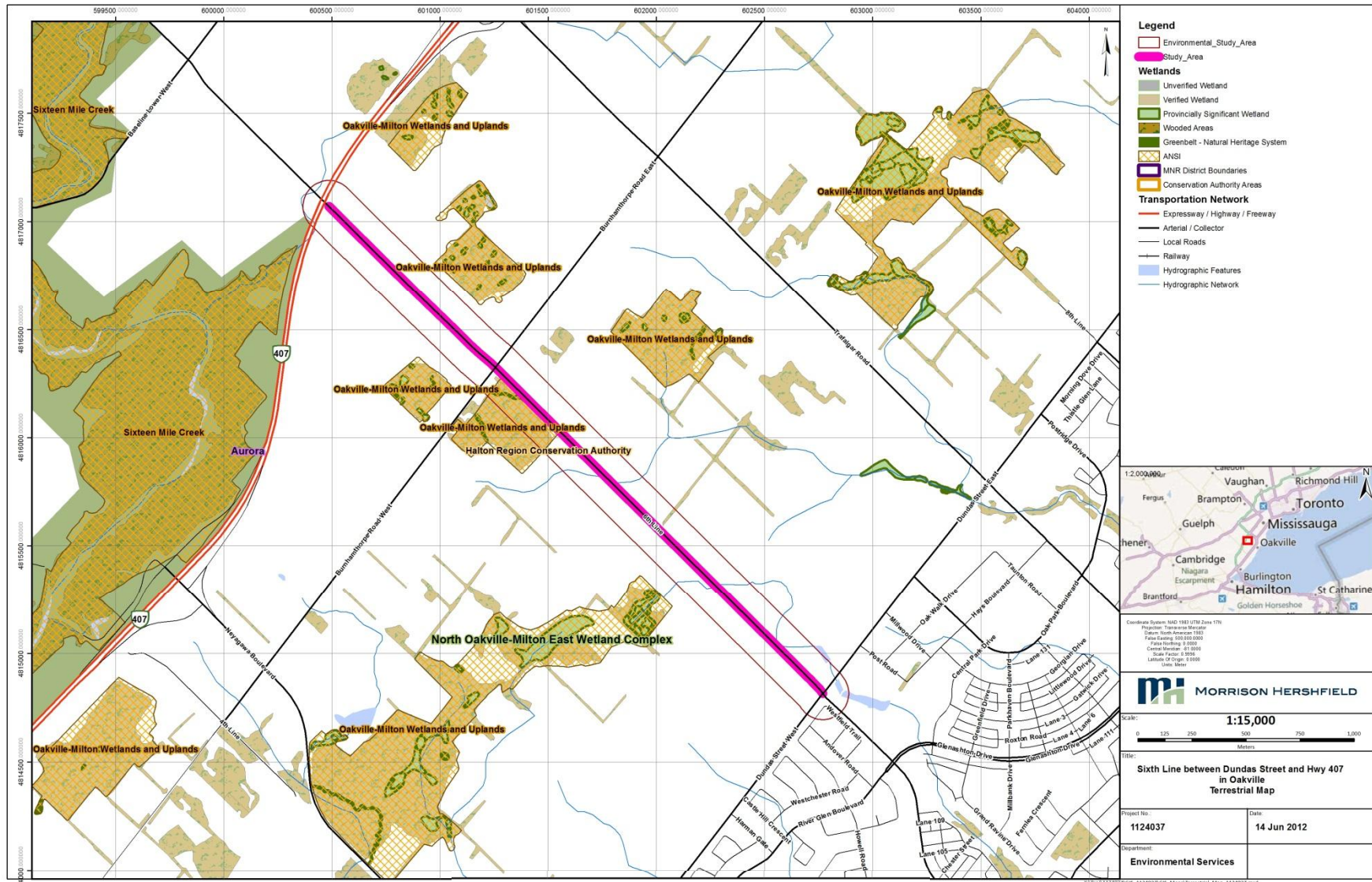


Figure 3-10 Terrestrial Map



Figure 3-11 Vegetation Communities North of Dundas Street



Figure 3-12 Vegetation Communities South of Highway 407



Figure 3-13 Cultural Meadow southwest side of Sixth Line, looking southwest.



Figure 3-14 Deciduous Forest community in the southwest corner at the intersection of Sixth Line and Burnhamthorpe Road

Deciduous forest communities are composed of greater than (or equal to) 75% deciduous tree species and have canopy cover greater than 60%. The forest is a mature stand (40 – 50 years) and contains numerous snags. The tree species present included: White Ash (*Fraxinus americana*), Trembling Aspen (*Populus tremuloides*), Sugar Maple (*Acer saccharum*), Ironwood (*Ostrya virginiana*), Red Oak (*Quercus rubra*), Shagbark Hickory (*Carya ovate*), and Horse Chestnut (*Aesculus hippocastanum*). This forest stand is identified in the Oakville Official Plan Natural Features Mapping as Woodland (Town of Oakville, 2006).

A search on the MNR’s Natural Heritage Information Centre (NHIC) database shows that no rare plant species have been recorded in this area. The MNR, Aurora office, does not have record of any vegetation Species at Risk (SAR) as being observed near the study area. No rare vegetation was observed during field investigations.

3.4.3 Wildlife and Species at Risk

The Breeding Bird Atlas of Canada lists 90 bird species as being recently observed near the study site. Six of these species are listed as SAR: Barn Swallow (*Hirundo rustica*), Bobolink (*Dolichonyx oryzivorus*), Chimney Swift (*Chaetura pelagica*), Common Nighthawk (*Chordeiles minor*), Eastern Meadowlark (*Sturnella magna*) and Whippoorwill (*Caprimulgus vociferous*).

The MNR’s NHIC database has a recorded observation of Milksnake (*Lampropeltis triangulum*) and Jefferson x Blue-spotted Salamander (*Ambystoma hybrid*). Historical records on the NHIC database include Northern Bobwhite (*Colinus virginianus*) and Redside Dace (*Clinostomus elongatus*) as being observed in this area.

The MNR, Aurora office, has records of five wildlife SAR as being observed near the study area: Bobolink, Canada Warbler (*Wilsonia canadensis*), Eastern Ribbonsnake (*Thamnophis sauritus*), Milksnake, and Snapping Turtle (*Chelydra serpentina*).



The following provides a description of the habitat requirements and if there is potential habitat within the study area for each SAR noted from the background research. **Table 3-2** provides a summary of the SAR with the study area.

Barn Swallow

Barn swallow nesting sites include natural features such as caves, holes, crevices, and ledges associated with rocky cliff faces and a variety of artificial structures that provide either a horizontal nesting surface (e.g., a ledge) or a vertical face, often with some sort of overhang that provides shelter. Nests are most commonly located in and around open barns, garages, sheds, boat houses, bridges, road culverts, verandahs and wharfs, and are situated on such things as beams and posts, light fixtures, and ledges over windows and doors. Barn Swallows typically select nesting and foraging sites close to open habitats such as farmlands of various description, wetlands, road rights-of-way, large forest clearings, cottage areas, islands, sand dunes, and subarctic tundra. As Barn Swallow nests are constructed of mud pellets, they require wet sites with a nearby source of mud (Environment Canada, 2011).

While no nests were observed during field investigations, the culverts within the project study area provide suitable habitat for Barn Swallows.

Bobolink

The Bobolink nests primarily in forage crops (e.g., hayfields and pastures), wet prairie, graminoid peatlands and abandoned fields. The Bobolink is sensitive to habitat size and requires large sites of at least 10 hectares (Environment Canada, 2011).

Given these conditions, the project study area is not suitable habitat for Bobolink.

Canada Warbler

The Canada Warbler prefers wet forest types with a well-developed, dense shrub understory. They are also found in dense riparian areas in ravines or on slopes that have dense shrub growth (Environment Canada, 2011).

The deciduous forest within the study area provides potential habitat for the Canada Warbler.

Chimney Swift

The Chimney Swift spends the major part of the day in flight feeding on insects. Flocks can often be seen near bodies of water due to the abundance of insects. The species is mainly associated with urban and rural areas where the birds can find chimneys to use as nesting and resting sites. However, it is likely that a small portion of the population continues to use hollow trees (Environment Canada, 2011).

Given these conditions, the project study area is not suitable habitat for the Chimney Swift.

Common Nighthawk

The Common Nighthawk nests in open, vegetation-free habitat areas such as sand dunes, rocky outcrops, recently burned and logged areas, grasslands, lakeshores and river banks. Mixed and coniferous forests also provide habitat (Environment Canada, 2011). Given these conditions, the project study area is not suitable habitat for the Common Nighthawk.



Eastern Meadowlark

The Eastern Meadowlark is most common in native grasslands, pastures and savannahs. It also uses a wide variety of other anthropogenic grassland habitats, including hayfields, weedy meadows, young orchards, golf courses, restored surface mines, grassy roadside verges, young oak plantations, grain fields, herbaceous fencerows, and grassy airfields. The minimum area required is estimated at 5 hectares (Environment Canada, 2011).

The Cultural Meadow communities within the study area provide potential habitat for Eastern Meadowlark.

Eastern Ribbonsnake

The Eastern Ribbonsnake is frequently found along edges of shallow aquatic features bordered with dense vegetation. Areas that can be used for sunning and upland areas for nesting are also an important component of their habitat (Environment Canada, 2011).

The study area does not provide suitable habitat for the Eastern Ribbonsnake.

Jefferson x Blue-spotted Salamander

Jefferson Salamander habitat includes mature Carolinian deciduous forests with permanent or ephemeral wet breeding areas such as sinkhole ponds, kettle ponds or other natural basins (Environment Canada, 2011).

The deciduous forest community provides potential Jefferson Salamander habitat within the study area.

Milksnake

The Milksnake is best known for occurring in rural areas, where it is most frequently reported in and around buildings, especially old structures. However, it is found in a wide variety of habitats, from prairies, pastures, and hayfields, to rocky hillsides and a variety of forest types. Two other important features of good Milksnake habitat are proximity to water, and suitable locations for basking and egg-laying (Environment Canada, 2011).

The deciduous forest community provides potential Milksnake habitat within the study area.

Northern Bobwhite

The Northern Bobwhite prefers open habitats with a mixture of grasslands, croplands, and brush. In Ontario, this species is more commonly found in agricultural croplands than grasslands (Environment Canada, 2011).

The study area does not provide suitable habitat for Northern Bobwhite.

Redside Dace

Redside Dace are found in slow-moving headwaters with riffle-pool morphology where there is abundant overhanging riparian vegetation (COSEWIC, 2007).

Given the watercourse characteristic required for Redside Dace habitat, there is no suitable habitat within the study area.



Snapping Turtle

The preferred habitat of Snapping Turtles is characterized by slow-moving water with a soft mud bottom and dense aquatic vegetation. Snapping Turtles overwinter underwater, buried beneath logs, sticks or overhanging banks in small streams that flow continuously throughout the winter. They can also hibernate buried in deep mud in marshy areas or beneath floating mats of vegetation (Environment Canada, 2011).

There is no potential habitat for the Snapping Turtle in the study area.

Whip-poor-will

Breeding habitat for Whip-poor-will is greatly dependent on the forest structure: semi-open forests with clearings such as barrens or forests that are regenerating. Feeding areas include shrubby pastures and wetlands with perches (Environment Canada, 2011).

The deciduous forest community provides potential habitat for Whip-poor-will.

Table 3-3 – Summary of the Species at Risk with potential habitat within the study area

Common Name	Scientific Name	MNR Species at Risk Status (SARO Status)	COSEWIC Species at Risk Status	Protection*
Barn Swallow	<i>Hirundo rustica</i>	Threatened	Threatened	ESA, SARA, MBCA
Canada Warbler	<i>Wilsonia canadensis</i>	Threatened	Threatened	ESA, SARA, MBCA
Eastern Meadowlark	<i>Sturnella magna</i>	Threatened	Threatened	ESA, SARA, MBCA
Jefferson x Blue-spotted Salamander	<i>Ambystoma hybrid</i>	Endangered	Threatened	ESA, SARA, FWCA
Milksnake	<i>Lampropeltis triangulum</i>	Special Concern	Special Concern	SARA, FWCA
Whip-poor-will	<i>Caprimulgus vociferous</i>	Threatened	Threatened	ESA, SARA, MBCA

*ESA- Endangered Species Act, SARA- Species at Risk Act, MBCA- Migratory Birds Convention Act, FWCA- Fish and Wildlife Conservation Act



OAKVILLE

3.5 Socio-Economic Environment

3.5.1 Existing Land Use

As shown in **Figure 1-6**, the *North Oakville East Secondary Plan (2008)* designates land uses along Sixth Line:

- Between Highway 407 (ETR) and New North Oakville Transportation Corridor as ‘Transitway’ and ‘Employment Area’;
- Between New North Oakville Transportation Corridor and Burnhamthorpe Road as ‘Employment Area’, ‘Natural Heritage System Area’, ‘Stormwater Management Facility’, and ‘Transitional Area’; and
- Between Burnhamthorpe Road and Dundas Street as ‘Sub Urban Area’, ‘Stormwater Management Facility’, ‘Neighbourhood Park Area’, ‘Natural Heritage System Area’, ‘Neighbourhood Centre Area’, and ‘Dundas Street Urban Core Area’.

3.6 Cultural Environment

3.6.1 Archaeological Resources

A Stage 1 archaeological assessment was carried out within the study area. This work involved background research to identify registered archaeological sites and an assessment of archaeological potential. Due to the proximity to water, soils and topography, the Sixth Line corridor has the potential for archaeological remains but extensive and intensive disturbances have removed any archaeological potential from within the current right-of-way. No further work within right-of-way area is required. The archaeological potential factors indicate that approximately 76 percent of lands adjacent to the Sixth Line right-of-way have potential for archaeological remains. Any future design changes to the road that require expansion beyond current right-of-way into these areas mapped this report should be subject to a Stage 2 archaeological assessment by a licensed archaeologist.

Prior to any land-disturbing activities in the vicinity of the Munn’s Cemetery, a Stage 3 investigation will be required to confirm the presence or absence of unmarked graves, involving either the monitoring of the area by a licensed archaeologist during construction, or the removal of the topsoil with a Gradall followed by the shovel shining of the exposed surfaces and inspection for grave shafts. Zones of Archeological Potential are shown in **Figure 3-15**. The Stage 1 Archaeological Assessment Report is included in **Appendix D**.

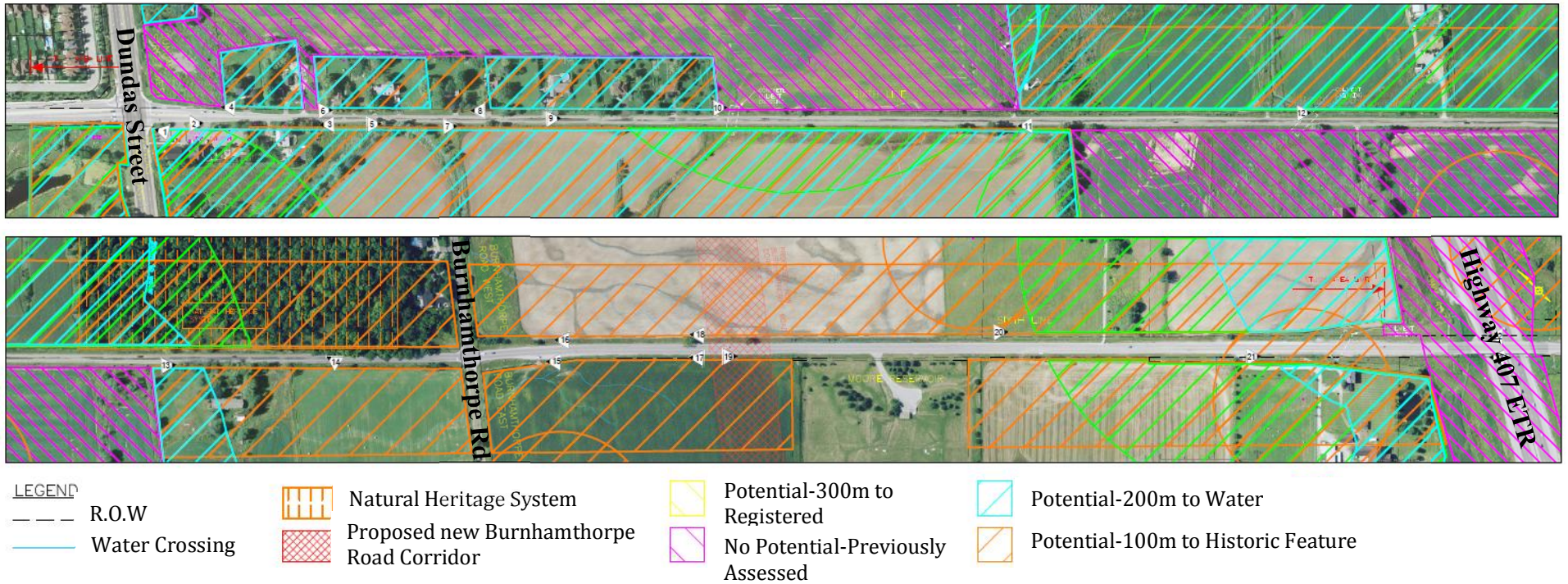


Figure 3-15 Archeological Potential along Sixth Line



3.6.2 Built Heritage and Cultural Landscape Features

A Cultural Heritage Assessment Report was undertaken as part of the study to identify built heritage resources and cultural heritage landscapes of 40 years of age or older within and/or adjacent to the study corridor and potential impacts to the heritage resources. The complete Cultural Heritage Assessment Report is included in **Appendix E**.

The study corridor is located in the physiographic region known as the South Slope. The South Slope is the southern slope of the interlobate moraine (Oak Ridges Moraine) that includes the strip south of the Peel Plain and it rises to the line of contact with the moraine at 800 to 1,000 feet above sea level. It extends from the Niagara escarpment to the Trent River and contains a variety of soils, some of which have proved to be excellent through more than a century of agricultural use.

The South Slope was settled largely of British immigrants after the close of the Napoleonic wars. The mixed, subsistence agriculture developed by the early settlers evolved into grain exports from the lake ports and grew into a principal agricultural pursuit by mid-19th century. When wheat growing declined, it was replaced by commercial mixed farming in which beef cattle, hogs and dairy butter were the chief sources of income. Dairy herds replaced beef cattle towards the end of the century and into the 20th century.

A few buildings that once formed part of the historical crossroads settlement known as Munn's Corners remain at the intersection of Dundas Street and Sixth Line. They include Munn's United Church, and Munn's Pioneer Cemetery and 3060 Sixth Line.

The land on either side of Sixth Line to the north of Dundas Street was once intensively cultivated. Former and active farmland with a few farm complexes is still visible along its length within the study corridor.

3.6.2.1 Description of Identified Cultural Heritage Resources

The project team undertook a windshield survey of the Sixth Line study corridor in June 2012 to identify cultural heritage resources older than 40 years of age. Nine (9) built heritage resources and three (3) cultural heritage landscapes of 40 years and older in age and of heritage value or interest were identified within or adjacent to the Sixth Line study corridor from Dundas Street East north to Highway 407.

The intersection of Dundas Street East and Sixth Line was the location of the 19th century historical crossroads settlement of Munn's Corners (Site # 1). Today, only a few buildings and a cemetery associated with this rural hamlet remain as visible reminders of the former community, such as Munn's Corners (Site # 1); Munn's Church (Site # 2); Munn's Cemetery (Site # 3); and, 3060 Sixth Line (Site # 4). All four resources are located close to the existing road right-of-way. Sites # 2 and # 3 are designated municipally under the OHA and are included on the Town of Oakville Register *Appendix A: Register of Designated Heritage Properties Under Part IV of the Ontario Heritage Act* (September 1, 2013). Site # 4 at 3060 Sixth Line, is included on the Town of Oakville Register *Section E: Register of Properties of Cultural Heritage Value or Interest (Not Designated)* of the Town of Oakville's Heritage Register (September 1, 2013).



Consultation with the Town of Oakville heritage planner (2012 and 2013) indicates the house on No. 3369 Sixth Line (Site # 5), which is included on the Town of Oakville Register *Appendix A: Register of Designated Heritage Properties Under Part IV of the Ontario Heritage Act* (September 1, 2013), is currently in storage and will be reconstructed on-site. A Heritage Easement for the property and the building reconstruction dated February 28, 2012 was approved. Heritage Permit 19/10-42.205 is approved for the reconstruction. During the 2012 survey, it was noted that the barn and silo still remained on the site; however, these built heritage resources have since been demolished.

There are no known federally or provincially recognized properties or any known cemeteries located within or adjacent to the Sixth Line study corridor.

The identified cultural heritage landscapes (CHL) and built heritage resources (BHR) are listed in the **Table 3-4** and mapped in **Figures 3-16**.

3.7 Property Impact and Access

One of the goals of the design improvements for Sixth Line is minimizing the need for property acquisition along the corridor. Due to the limited existing right-of-way, there will be significant property impact associated with this project.

Table 3-4 – Identified Cultural Heritage Landscapes (CHL) and Built Heritage Resources (BHR)

Site #	Resource Category	Resource Type	Location	Description of Resource	Heritage Recognition
1	CHL	Historical Crossroad Settlement	Munn’s Corners (Lots 15 16, Con. 1 NDS and Con. 1 SDS, Geographic township of Trafalgar), Town of Oakville	Munn’s Corners Former crossroads settlement of Munn’s Corners located on the southeast corner of the Sixth Line and Dundas Street East. Local farmer Daniel Munn established Munn’s Pioneer Cemetery c1820 and also operated a successful tavern and stage house on the northwest corner of his property. The crossroads hamlet that grew around the intersection became known as Munn’s Corners. A small log school, which doubled as a church, was built on Munn’s land. The hamlet is now represented by Munn’s Church, Munn’s Pioneer Cemetery and a few residences on west side of Sixth Line north side of Dundas Street. West.	40 years of age and older, not included on the Town of Oakville Register.
2	CHL	Funerary	Dundas Street East (Lot 15, Con. 1 SDS, Geographic township of Trafalgar), Town of Oakville	Munn’s Pioneer Cemetery Located on the southeast corner of the Sixth Line and Dundas Street East, this cemetery was established c1820 by Daniel Munn. It is believed Daniel Munn was the first person to have been interred in the cemetery in 1822.	Included on the Town of Oakville <i>Section A: Register of Designated Heritage Properties Under Part IV of the Ontario Heritage Act</i> (September 1, 2013), By-Law 1993-021.

Site #	Resource Category	Resource Type	Location	Description of Resource	Heritage Recognition
3	CHL	Religious	No. 5 Dundas Street East (Lot 15, Con. 1 NDS, geographic township of Trafalgar), Town of Oakville	Munn's Church Jordan Munn granted property to the Church Trustees in 1842. Built in 1898, as the second church building on the site, this 2.5 storey, vernacular Gothic Revival style church has a gable roof, pointed windows with decorated pointed surrounds and drip molds, a Palladian styled window above the main entrance door, brick buttresses located on three facades, and stone window sills. The building was moved on the site in the late 20th century when Dundas Street was widened. The site is associated with the 19th century agricultural development of Trafalgar Township, the historical crossroads settlement of Munn's Corners and Munn's Pioneer Cemetery (Site #1).	Included on the Town of Oakville <i>Section A: Register of Designated Heritage Properties Under Part IV of the Ontario Heritage Act</i> (September 1, 2013), By-Law 1989-124.
4	BHR	Residential	No. 3060 Sixth Line, west side (Lot 16, Con. 1 NDS, geographic township of Trafalgar), Town of Oakville	Residence This mid-19th century, 1.5 storey building with a side gable roof is much altered. The Trafalgar Township map in the Illustrated Historical Atlas (1877) depicts a residence, probably the existing residence at No. 3060 Sixth Line on the west side of Sixth Avenue north of Dundas Street. The residence is associated with the historical settlement of Munn's Corners. The Town considers this property to have cultural heritage value for its vernacular frame construction and its historical associations with Munn's Corners.	Included on the Town of Oakville <i>Section E: Register of Properties of Cultural Heritage Value or Interest (NOT Designated)</i> (September 1, 2013).

Site #	Resource Category	Resource Type	Location	Description of Resource	Heritage Recognition
5	CHL	Roadscape	Burnham-thorpe Road (Between Con. 1 and 2 NDS, geographic township of Trafalgar), Town of Oakville	Burnhamthorpe Road This east to west road is narrow and undulating and characterized by tree lines, fencerows, hedgerows and generally grassy ditches with narrow gravel shoulders at the Sixth Line. It is an open road on Tremaine's Map (1859) and the Illustrated Historical Atlas (1877).	40 years and older in age, no known heritage recognition.
6	CHL	Roadscape	Sixth Line above Burnham-thorpe Road (Lots 15 and 16, Con. 1 and 2 NDS, geographic township of Trafalgar), Town of Oakville	Sixth Line This two lane paved rural road has generally grassy ditches, narrow gravel shoulders, tree lines, fencing and hedgerows. It was surveyed as a north to south sideline in the original township survey and was opened in the early 19 th century. It is shown an open road on Tremaine's Map (1859) and the Illustrated Historical Atlas (1877).	40 years and older in age, no known heritage recognition.
7	BHR	Residential	No. 3369 Sixth Line (Lot 15, Con. 1 NDS, geographic township of Trafalgar), Town of Oakville	William Bowbeer Residence Built c1853, this brick house has been dismantled and will be reconstructed on site in the future. Driveway with brick gateposts, tree line, barn and silo visible. The barn and silo are now demolished.	Included on the Town of Oakville Appendix A: Register of Designated Heritage Properties Under Part IV of the Ontario Heritage Act, (September 1, 2013), By-Law 2011-033. A Heritage Easement agreement dated February 28, 2012 is registered on title.



Site #	Resource Category	Resource Type	Location	Description of Resource	Heritage Recognition
8	CHL	Agriculture Farm Complex	No. 4243 Sixth Line (Lot 15, Con. 2 NDS, geographic township of Trafalgar), Town of Oakville	Farm Complex This property comprises a 2 storey, hip roof, brick farmhouse built in 1898 (date stone), a large gambrel barn, and outbuildings. It is associated with the 19 th century agricultural development of Trafalgar Township. Michael J. Bigger is noted as the property owner on Tremaine’s Map (1858) and the Illustrated Historical Atlas (1877). The Town considers this property to have potential cultural heritage value for its historic farmstead, including the Victorian brick farmhouse, barn and outbuildings.	Included on the Town of Oakville <i>Appendix E: Register of Properties of Cultural Heritage Value or Interest (NOT Designated)</i> (September 1, 2013).
9	CHL	Agriculture	Adjacent to Sixth Line from Dundas Street north to Highway 407 (Lots 15 and 16, Con. 1 NDS and 2 NDS, geographic township of Trafalgar Township)Town of Oakville	Existing and former agricultural land with characteristic rural field patterns, tree lines, hedgerows and fencing.	40 years and older in age, no known heritage recognition

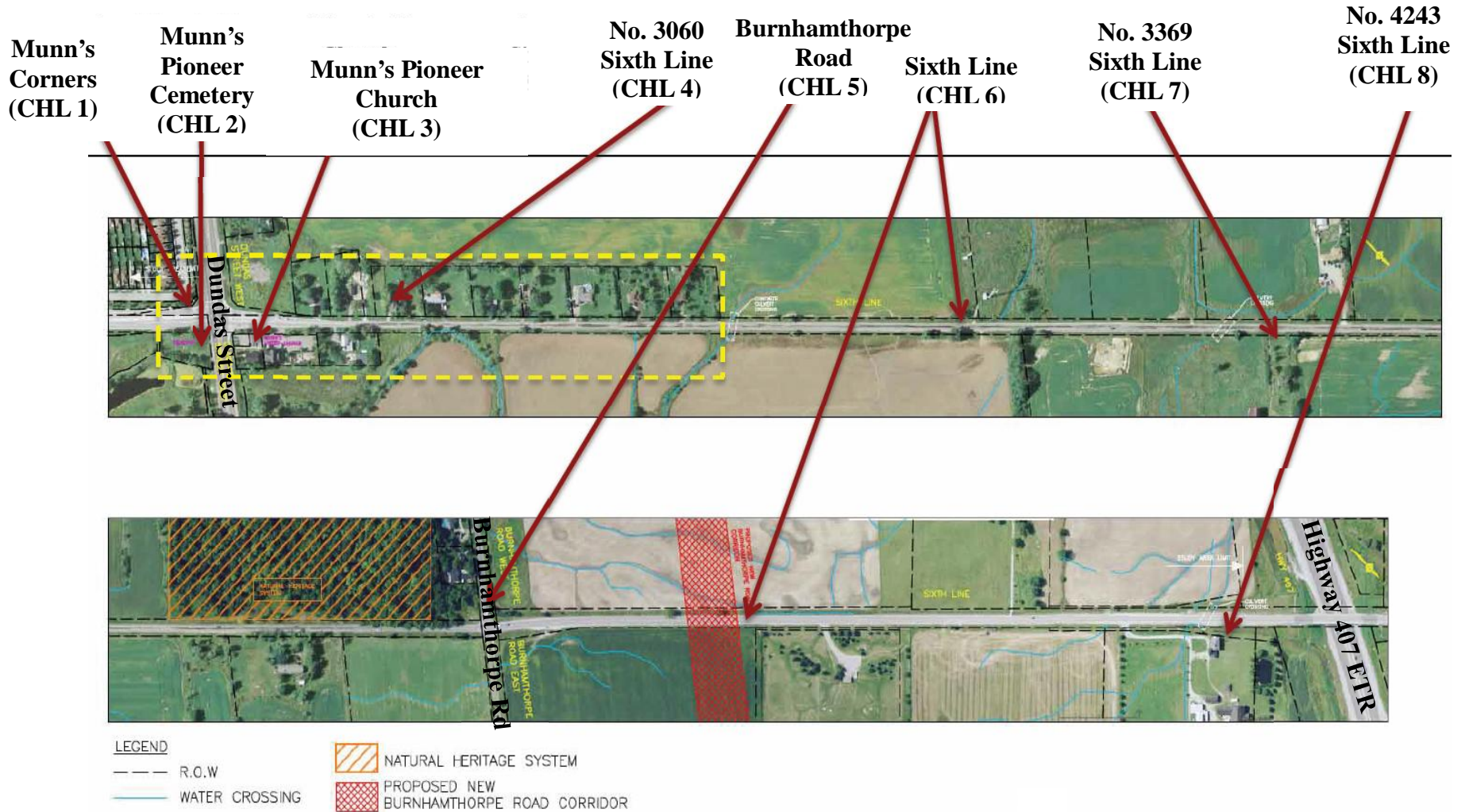


Figure 3-16 Existing Cultural Heritage Resources along Sixth Line

4 TRANSPORTATION NETWORK ANALYSIS

The following section documents current and future traffic conditions, operational deficiencies and constraints experienced by the traveling public along Sixth Line. The operational deficiencies and constraints identified at this stage will provide input into the problem statement and are fundamental to the process of defining alternative solutions.

4.1 Methodology

Intersection turning movement counts were provided by the Halton Region. Automated Traffic Recorder (ATR) counts for the mainline on Sixth Line were provided by the Town of Oakville. All counts were conducted in 2011. One discrepancy was found for the morning peak hour at Sixth Line and Dundas Street intersection. The eastbound through movement was found to be low, possibly due to construction in the vicinity of the intersection. Through conversations with Halton Region, it was determined that 1,700 vehicles would be more appropriate for analysis purposes.

To evaluate the ability of the intersection to handle anticipated traffic growth, it was necessary to project future traffic volumes. The estimation of future traffic volume growth was determined Halton Region. A two percent annual growth rate was applied to the existing background traffic to reflect future conditions.

To assess the quality of flow, traffic operations were evaluated by performing peak hour intersection Level of Service (LOS) analysis. Level of service analyses for both signalized and unsignalized intersections and roadway segments were based on the methodologies and procedures of the Highway Capacity Manual (HCM), as published by the US Transportation Research Board (TRB 2000). This methodology is embedded in analytical software used, including Synchro/Sim Traffic and HCS 2000. Measures of effectiveness (MOE's) provided by these software includes:

- Intersection capacity on an overall basis and for individual movements;
- Volume-to-capacity (v/c) ratio for individual movements, each approach and the overall intersection; and
- Level of service (LOS) for the movements at the intersection, including the movements experiencing the greatest delay (critical movements).

Generally, for two-lane rural highway intersections, on an overall intersection basis, an LOS of C or better is deemed to be a good LOS. Operation of an LOS of D, while still satisfactory, exhibits delays that are noticed by drivers. Individual turning movements are generally acceptable at an LOS of E (at capacity).

Level of service and volume-to-capacity ratio are essentially measuring the same thing; driver delay.

LOS for both signalized and unsignalized intersections is related to the intersection delay and is a quantitative measure of the ability of the intersection (or movement) to be accommodated. LOS definitions used in the HCM analysis are summarized in **Table 4-1**.

Table 4-1 – Level of Service Definitions

Level of Service (LOS)	Signalized Intersection Control Delay per Vehicle (s/veh)	Unsignalized Intersection Control Delay per Vehicle (s/veh)
A (FREE FLOW)	≤ 10	≤ 10
B	> 10 and ≤ 20	> 10 and ≤ 15
C	> 20 and ≤ 35	> 15 and ≤ 25
D	> 35 and ≤ 55	> 25 and ≤ 35
E (CAPACITY)	> 55 and ≤ 80	> 35 and ≤ 50
F (FORCED FLOW)	> 80	> 50

Level of service and capacity calculations were carried out for the morning and afternoon peak hours for:

- Existing (2012) traffic levels;
- Future (2021) traffic levels with projected background traffic growth including traffic from the proposed new developments; and
- Ultimate (2031) traffic levels with projected background traffic growth including traffic from the proposed new developments.

4.2 Existing Traffic Conditions

The existing 2012 lane configurations along with the existing AM and PM peak hour traffic flow are shown in **Figures 4-1** and **4-2**. Halton Region provided AM, Midday and PM peak hour turning movement counts. Field observations were also conducted by MH to confirm lane configurations and to observe existing traffic operations (presence of congestion and/or queues).

LOS analysis has considered operations for two distinct areas:

- Roadway segment (mid-block) areas of Sixth Line where operations are comparable to two-lane highway operations; and
- Operations of the existing intersections, either unsignalized or signalized.



Figure 4-1 Existing (2012) Lane Configuration

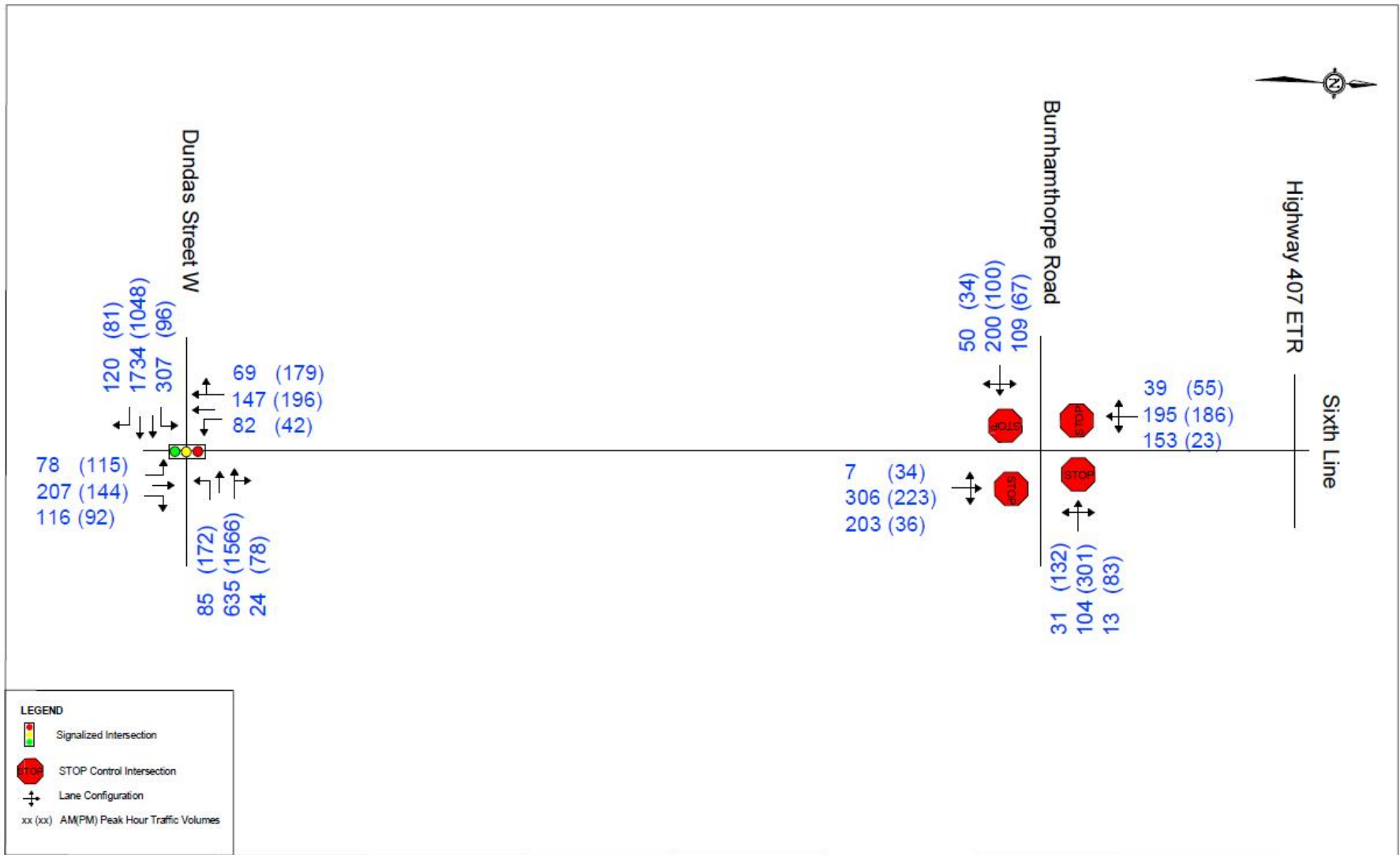


Figure 4-2 Existing (2012) Peak Hour Traffic Volumes

4.2.1 Roadway Segment Operations

Existing morning and afternoon peak hour total traffic volumes were used for analysis of the existing roadway segments. Each of these areas has been analyzed using the HCM analysis software (HCS 2000) to determine LOS.

All roadway segments are currently operating at an LOS of C, a satisfactory level for both AM and PM Peak Hour traffic volumes with average travel speed estimated to be approximately 60 km/h for all segments. The analysis summary is shown in **Table 4-2**.

Figure 4-3 illustrates the existing (2012) PM Peak Hour Mainline Analysis.

Table 4-2 – Two-Lane Highway Segment LOS Analysis – Existing 2012 Traffic Volumes

Segment	Section Description	Approx. Length (km)	AM Peak Hour					PM Peak Hour				
			Average Travel Speed (km/h)	Percent Time-Spent-Following (%)	Volume (vph)	V/C	LOS	Average Travel Speed (km/h)	Percent Time-Spent-Following (%)	Volume (vph)	V/C	LOS
1	Dundas St. to Burnhamthorpe Rd.	2.2	59.1	63.9	837	0.52	C	60.5	59.7	733	0.46	C
2	Burnhamthorpe Rd. to Hwy 407	1.1	59.7	62.4	815	0.51	C	62.0	55.6	637	0.40	C

Notes: %-Spent-Following – Percent of time spent behind another vehicle without a passing opportunity due to opposing traffic volumes
 LOS – Level of Service
 V/C – Volume over Capacity

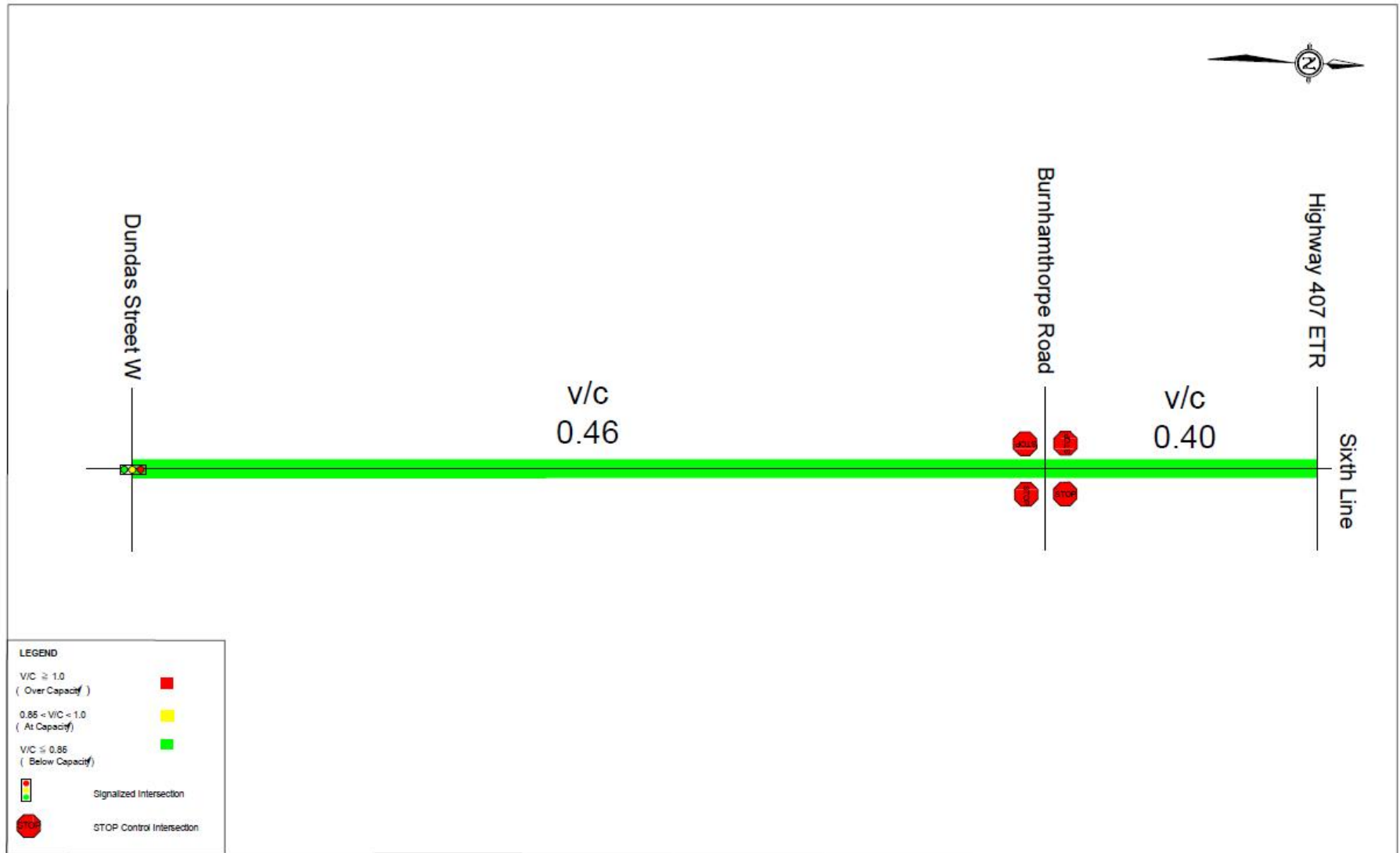


Figure 4-3 Existing (2021) PM Peak Hour Mainline Analysis

4.2.2 Intersection Operations

There are two existing intersections on Sixth Line within the study area: one at Dundas Street and the second at Burnhamthorpe Road. **Table 4-3** summarizes the signalized intersection LOS analysis results for Sixth Line and Dundas Street intersection while **Table 4-4** summarizes the unsignalized intersection results for Sixth Line and Burnhamthorpe Road intersection.

Table 4-3 – Signalized Intersection LOS Analysis – Existing 2012 Traffic Volumes

Intersection	Movement	AM Peak Hour				PM Peak Hour			
		v/c	LOS	Total Delay (s/veh)	Queue Length 95 th (m)	v/c	LOS	Total Delay (s/veh)	Queue Length 95 th (m)
Sixth Line at Dundas Street	EBL	0.80	C	32.7	101.9	0.64	C	33.2	31.9
	EBT	0.92	C	25.2	222.3	0.48	A	9.8	82.8
	EBR	0.13	A	2.4	7.6	0.08	A	1.8	5.5
	WBL	0.44	B	13.8	14.4	0.83	D	52.4	83.2
	WBTR	0.32	A	5.7	35.0	0.94	C	33.3	265.8
	NBL	0.40	C	33.2	23.9	0.62	D	47.7	37.8
	NBT	0.57	C	34.5	51.6	0.33	D	35.8	54.5
	NBR	0.29	A	8.5	13.8	0.21	A	7.9	12.8
	SBL	0.48	D	37.2	25.5	0.26	D	44.7	19.6
	SBTR	0.31	B	18.8	19.7	0.68	D	38.0	48.1
	OVERALL	0.92	C	21.3	-	0.94	C	27.5	-

Notes: v/c – Volume-to-capacity ratio
 LOS – Level of Service

The intersection of Sixth Line at Dundas Street is currently operating at an acceptable LOS of C during peak AM and PM total existing traffic conditions with the WBTR movement operating with the highest v/c ratio during the PM peak hour. The approach delay for this movement is 33.3 sec/veh.

Table 4-4 – Unsignalized Intersection LOS Analysis – Existing 2012 Traffic Volumes

Intersection	Movement	AM Peak Hour		PM Peak Hour	
		Approach Delays (s/veh)	LOS	Approach Delays (s/veh)	LOS
Sixth Line at Burnhamthorpe Road	EBLTR	42.0	E	17.3	C
	WBLTR	17.9	C	86.1	F
	NBLTR	118.5	F	23.5	C
	SBLTR	50.4	F	21.2	C
	OVERALL	69.8	E	47.4	B

Notes: LOS – Level of Service

The intersection of Sixth Line at Burnhamthorpe Road is currently operating at an overall LOS of E and B during the AM and PM peak hours, respectively. The NB and SB movements fail during the morning peak hour. The movement with the highest approach delay for this intersection is for the NB traffic during the morning peak hour.

Detailed HCM reports for the AM and PM peak hours under existing (2012) conditions are presented in **Appendix B**.

4.3 Forecasting Approach and Assumptions

For the purpose of this study, a 2021 and 2031 planning horizon was used consistent with other area studies such as the Region of Halton’s EMME model. Numerous discussions were held with the Town of Oakville and Halton Region regarding current proposed new development, anticipated future development, expected background traffic growth, and other related traffic matters. The following assumptions have been used for the purpose of the traffic analysis:

- A two percent annual growth rate was applied for Sixth Line and Dundas Street. This value was confirmed by Halton Region;
- Existing analysis to include the following developments:
 - Timsin;
 - Lower 4th Mattamy; and
 - Cityzen (Townhomes on Sixth Line south of Dundas and Apartment buildings on Dundas east of Sixth).
- Future 2031 horizon analysis to include the following developments:
 - Petcor Mattamy;
 - Argo;

- Star Oak (2 locations: North of Burnhamthorpe and South of Burnhamthorpe);
- Docasa; and
- 6th Line Corporation.
- Future 2021 horizon analysis to include all proposed new development for existing conditions. In addition, it was assumed that approximately 50% of future 2031 new developments would be completed by 2021;
- All development information obtained from the Town of Oakville;
- It was assumed that the existing development (Timsin, Lower 4th Mattamy and Cityzen) would take approximately two years for completion. An interim condition was analyzed for a 2015 year horizon to account for these developments;
- Trip generation calculated based on ITE Trip Generation 7th Ed Manual;
- Single Dwelling Units assumed for those developments without detailed information;
- Additional parks, schools and small commercial plazas were not included in the trip generation due to lack of detailed information. Also, the trips generated by these developments will be low and consist mainly of internal traffic; and
- It is the Town's goal to provide employment for residents of the Town. Review of the existing traffic distribution on Sixth Line indicate approximately 50-60% of residents are travelling out of the Town. For the future horizons, it was assumed that 70% of residents living within the vicinity of the site will travel southbound on Sixth Line. This includes employment within the Town and use of the QEW. The remaining 30% will travel northbound to use the New North Oakville Corridor and Highway 407.

In March 2010, Halton Region completed the New North Oakville Transportation Corridor (NNOTC) and Crossing of Sixteen Mike Creek Class EA Study, where the need for a new major transportation corridor was identified. The findings of this study recommended the NNOTC to be located between Burnhamthorpe Road and Highway 407 ETR within the study area. Construction was anticipated to begin in 2012. In addition, based on the North Oakville Master Plan, Secondary Plans and other traffic related studies in the area that have been submitted to the Town, it is anticipated that four new east-west connecting roadways will be provided between Dundas Street and Burnhamthorpe Road by 2021, creating four new intersections on Sixth Line. These new roadways will provide a connection for the new proposed development on the east and west side of Sixth Line as well as completing the road network for the North Oakville Master Plan.

4.4 Future Traffic Conditions

Future traffic operations were analyzed to determine the transportation demand and to identify any potential associated network improvements that would be required to accommodate future travel needs for the 2021 and 2031 horizon years.

To determine the 2021 and 2031 roadway operations, LOS capacity analyses were conducted for the following three scenarios:

- Do Nothing Scenario;
- Signal Control with Geometric Improvements Scenario; and
- New Roundabout Scenario.

4.4.1 Future 2021 Traffic Conditions

4.4.1.1 Roadway Segment Operations

As in the existing traffic conditions, segments of Sixth Line between Dundas Street and Highway 407 were analyzed for future 2021 traffic conditions under the do-nothing scenario. As discussed in the earlier section, a growth factor was applied to the background traffic to account for the 2021 traffic conditions. Total traffic volumes are shown in **Figure 4-4**. In addition, further analysis was completed under a widening option. **Table 4-5** summarizes the results of this analysis.

Analysis based on the do-nothing scenario indicates poor LOS and Volume to Capacity ratio that would exceed threshold limit of 0.85 between Burnhamthorpe Road to Dundas Street during the AM peak hour. Whereas, during the PM peak hour, Sixth Line would experience congestion with volume to capacity ratio exceeds 0.85 between Future Street D to Dundas Street (see **Figure 4-5**).

Alternatively, analysis based on widening Sixth Line to four lanes would project all roadway segments to operate at an LOS of B or better. It is forecasted that the PM peak hour conditions represent the worst-case scenario. **Figure 4-6** is a summary of the widening Sixth Line to four lanes scenario.

Table 4-5 – Two-Lane Highway Segment LOS Analysis – Future 2021 Traffic Volumes

Segment	Section Description	Approx. Length (m)	AM Peak Hour							PM Peak Hour						
			Average Travel Speed (km/h)	Percent Time-Spent-Following (%)	Volume (vph)	V/C	LOS	V/C With Widening	LOS With Widening	Average Travel Speed (km/h)	Percent Time-Spent-Following (%)	Volume (vph)	V/C	LOS	V/C With Widening	LOS With Widening
1	Dundas St. to Sixteen Mile Dr.	400	23.2	92.1	2008	1.26	F	0.63	C	20.5	94.2	2186	1.37	F	0.68	C
2	Sixteen Mile Dr. to North Park Dr.	300	25.7	89.8	1842	1.15	F	0.58	C	24.3	91.1	1936	1.21	F	0.61	C
3	North Park Dr. to Future St. C	500	28.7	86.6	1641	1.03	F	0.51	C	29.6	85.9	1579	0.99	E	0.49	B
4	Future St. C to Future St. D	500	29.8	85.8	1563	0.98	E	0.49	B	31.0	84.7	1485	0.93	E	0.46	B
5	Future St. D to Burnhamthorpe Rd.	500	32.0	83.8	1419	0.89	E	0.44	B	33.0	82.6	1348	0.84	D	0.42	B
6	Burnhamthorpe Rd. to NNOTC	500	33.4	82.2	1326	0.83	D	0.41	B	35.5	79.4	1186	0.74	C	0.37	A
7	NNOTC to Hwy 407	600	35.2	79.8	1204	0.75	C	0.38	A	37.5	76.7	1051	0.66	C	0.33	A

Notes: %-Spent-Following – Percent of time spent behind another vehicle without a passing opportunity due to opposing traffic volumes
 LOS – Level of Service

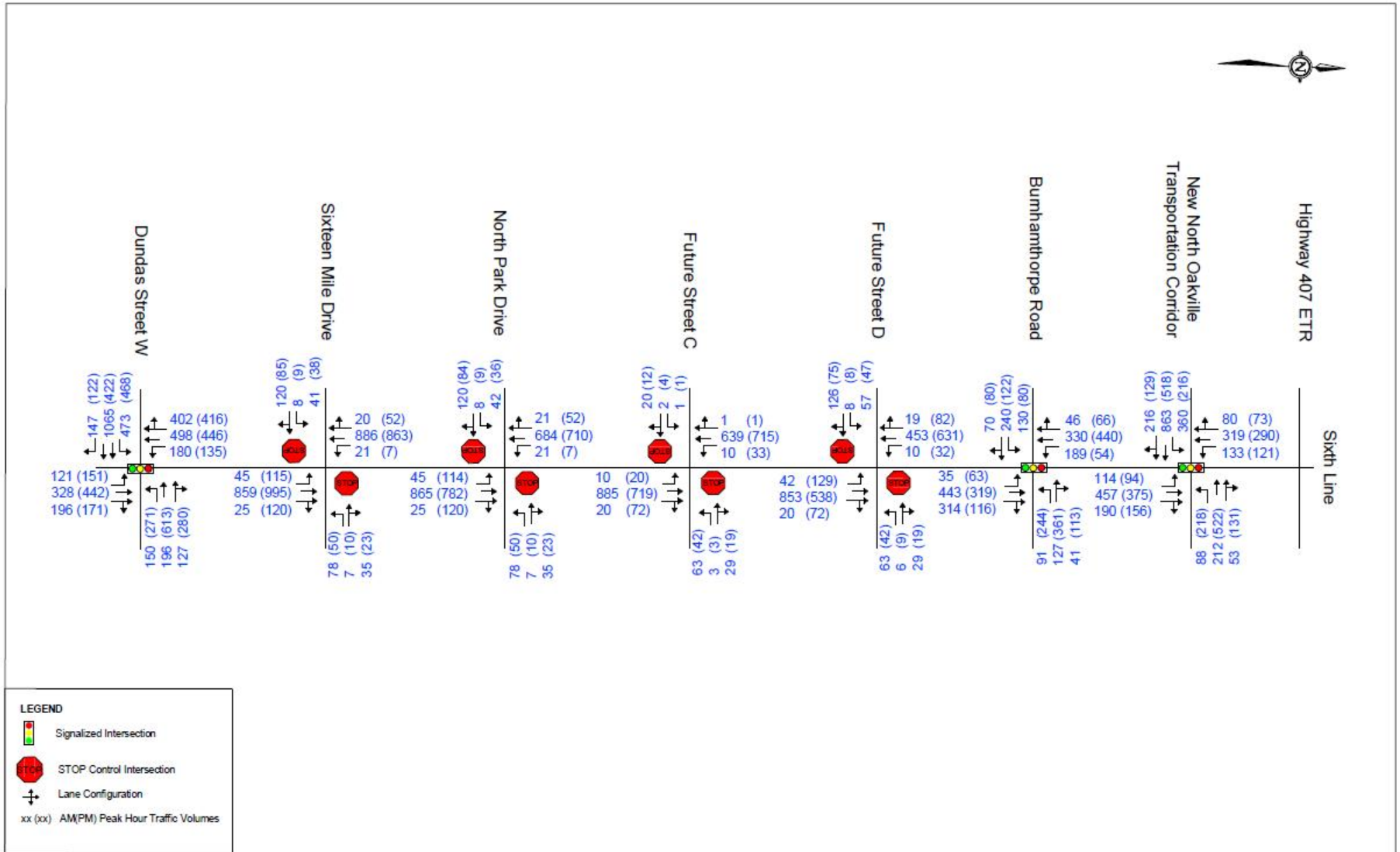


Figure 4-4 Future (2021) Peak Hour Traffic Volumes



Figure 4-5 Future (2021) PM Peak Hour Mainline Analysis – Do Nothing Scenario

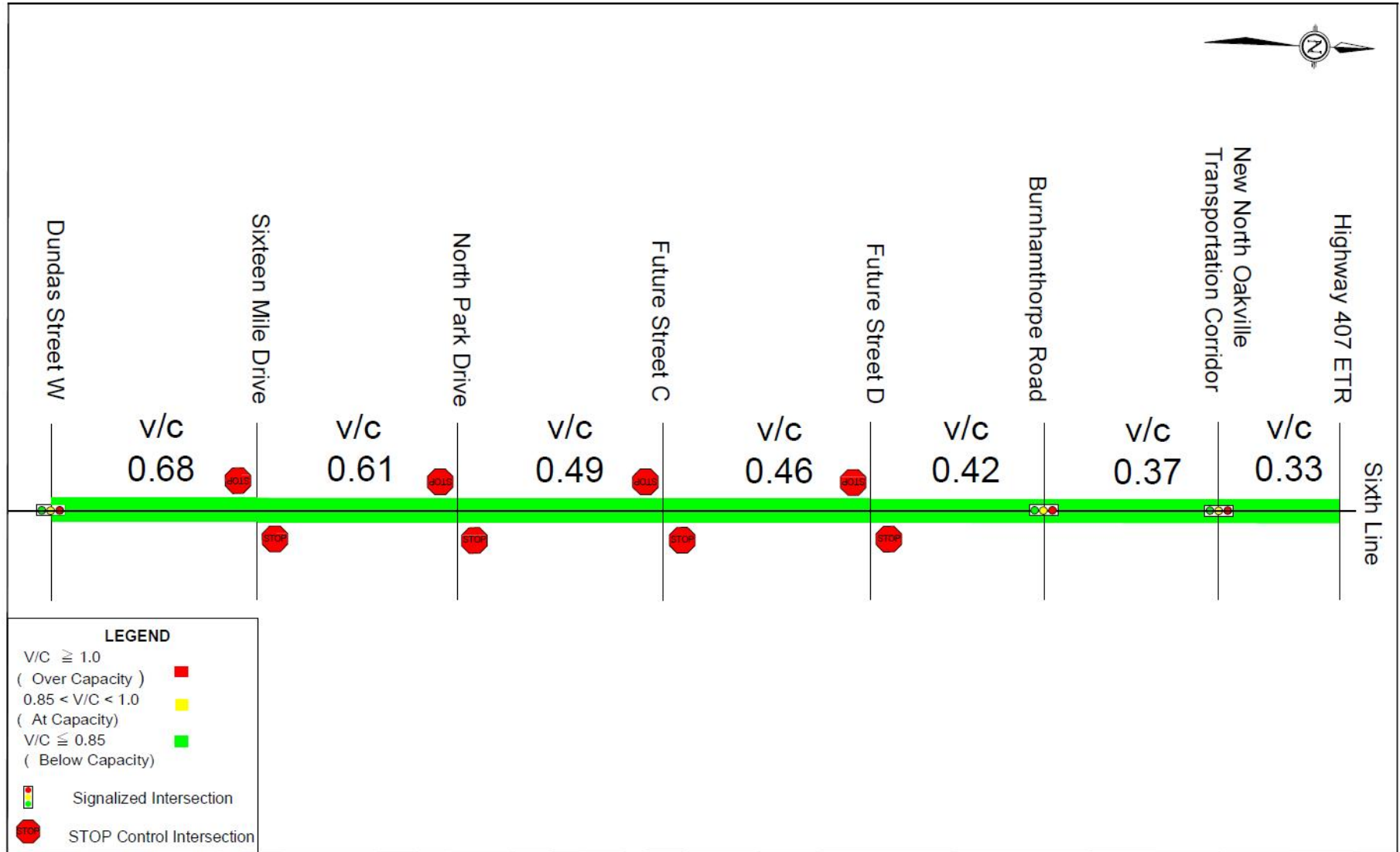


Figure 4-6 Future (2021) PM Peak Hour Mainline Analysis with Improvements (Widening to Four Lanes)

4.4.1.2 Signal Warrant Analysis (2021)

Signal warrant analysis was carried out to determine the feasibility of installing a traffic signal at the existing and new un-signalized intersections along Sixth Line. The 2021 turning movement count data was used in the warrant analysis as per Ontario Traffic Manual (OTM) Book 12 – “Traffic Signals” methodology to carry out the analysis.

The analyses reveal that traffic signals are not justified under future 2021 traffic conditions at the following intersection:

- Sixth Line and New North Oakville Transportation Corridor intersection;
- Sixth Line and Burnhamthorpe Road intersection;
- Sixth Line and Future Street D intersection;
- Sixth Line and Future Street C intersection;
- Sixth Line and North Park Drive intersection; and
- Sixth Line and Sixteen Mile Drive intersection.

Justifications must be used in combination with traffic engineering experience, professional judgment and economic analysis. The satisfaction of the signal installation justifications is only one criterion for determining the suitability of traffic signals for any location.

Even if a location being evaluated does not meet a justification, a traffic signal should be installed if it will result in reducing operational problems that create a potential for collisions and/or significantly increase delays to all users.

Other potential problems should also be assessed, including the extension of vehicle queues through upstream intersections. These broader network considerations must be taken into account and necessitate the application of engineering judgment over and above strict reliance on justification criteria alone.

The statistical model was developed in Highway Capacity Manual for un-signalized Sixth Line and New North Oakville Transportation Corridor intersection. The results of Synchro analysis suggest signalization of this intersection under future 2021 traffic condition.

The intersection of Sixth Line at Burnhamthorpe Road is currently operating at an overall LOS of E during the AM peak hour with failing NB and SB movements. Synchro analysis reveals that this intersection would fail while operating under unsignalized traffic control during the AM and PM peak hours under future (2012) conditions. Therefore, despite the signal warrant analysis results, installing a traffic signal at this intersection under future 2021 traffic condition is recommended.

Detailed signal warrant analysis report for this intersection under future (2021) conditions is presented in **Appendix B**.

4.4.1.3 Intersection Operations

Based on the signal warrant analysis conducted for the year of 2021, the New North Oakville Corridor (NNOC) was assumed to operate under traffic signals conditions and the new four intersections between Dundas Street and Burnhamthorpe Road to operate under unsignalized traffic control with a STOP condition on the minor roadways. **Table 4-6** summarizes the signalized intersection LOS analysis results for the 2021 planning horizon. **Table 4-7** summarizes the unsignalized intersection results for the 2021 planning horizon. In addition, signal warrant analysis was completed for all new intersections. Although the analysis does not justify installation of traffic signals, Traffic Impact Studies submitted to the Town for Timsin and Lower 4th Mattamy Developments indicate that a traffic signal will be installed for Sixteen Mile Drive and North Park Drive. Similarly, Future Street C and D are expected to operate under traffic signals for future conditions. The following section summarizes the intersection operations analysis based on widening Sixth Line to four lanes.

Table 4-6 – Signalized Intersection LOS Analysis – Future 2021 Traffic Volumes

Intersection	Movement	AM Peak Hour				PM Peak Hour			
		v/c	LOS	Total Delay (s/veh)	Queue Length 95 th (m)	v/c	LOS	Total Delay (s/veh)	Queue Length 95 th (m)
Sixth Line at New North Oakville Corridor	EBL	0.65	B	19.3	76.6	0.63	C	20.6	49.6
	EBTR	0.60	B	12.6	83.9	0.35	A	8.0	38.3
	WBL	0.59	C	33.2	34.5	0.66	C	22.2	51.9
	WBTR	0.15	A	7.6	16.3	0.36	A	8.0	38.6
	NBL	0.39	C	21.6	27.0	0.33	C	20.6	24.2
	NBTR	0.54	B	16.6	52.0	0.48	B	15.5	45.0
	SBL	0.71	D	41.9	40.0	0.59	C	31.8	34.7
	SBTR	0.36	B	15.3	32.6	0.35	B	15.1	32.1
	OVERALL	0.71	B	16.3	-	0.66	B	13.8	-
Sixth Line at Burnhamthorpe Road	EBL	0.40	C	21.3	32.9	0.31	B	12.7	11.7
	EBTR	0.57	C	20.9	65.9	0.28	A	7.8	17.4

Intersection	Movement	AM Peak Hour				PM Peak Hour			
		v/c	LOS	Total Delay (s/veh)	Queue Length 95 th (m)	v/c	LOS	Total Delay (s/veh)	Queue Length 95 th (m)
	WBL	0.43	C	24.8	26.3	0.58	B	16.8	31.5
	WBTR	0.31	B	16.3	34.7	0.65	B	15.4	51.3
	NBL	0.07	A	7.2	6.3	0.20	B	13.3	12.8
	NBTR	0.40	A	4.8	27.0	0.29	A	9.5	24.7
	SBL	0.62	B	19.8	40.9	0.15	B	12.6	11.0
	SBTR	0.21	A	6.6	19.8	0.35	B	11.1	31.9
	OVERALL	0.62	B	11.8	-	0.65	B	12.3	-
Sixth Line at Dundas Street	EBL	0.81	C	27.3	96.2	0.98	E	64.0	141.2
	EBT	0.80	C	28.8	11.3	0.33	C	23.8	44.8
	EBR	0.21	A	4.1	10.9	0.18	A	4.9	11.5
	WBL	0.70	D	35.5	38.8	0.57	B	18.0	42.9
	WBTR	0.33	B	15.7	24.5	0.96	D	54.6	127.1
	NBL	0.66	D	37.0	28.4	0.82	E	58.2	47.4
	NBTR	0.54	C	21.5	44.2	0.66	C	33.4	69.7
	SBL	0.66	C	32.4	38.4	0.65	D	39.2	35.2
	SBTR	0.81	C	27.7	82.5	0.87	D	36.6	91.6
	OVERALL	0.81	C	26.0	-	0.98	D	40.7	-

Notes: v/c – Volume-to-capacity ratio
 LOS – Level of Service

All signalized intersections are forecasted to operate at an LOS of D or better on an overall basis during peak AM and PM total traffic conditions. The EBL and NBL movements at the

intersection of Sixth Line and Dundas Street are projected to be operating at the lowest LOS. Although these movements are at capacity, they are still functional.

Table 4-7 – Unsignalized Intersection LOS Analysis – Future 2021 Traffic Volumes

Intersection	Movement	AM Peak Hour		PM Peak Hour	
		Approach Delays (s/veh)	LOS	Approach Delays (s/veh)	LOS
Sixth Line at Future Street D	EBL	21.2	E	41.6	F
	EBTR	21.2	B	41.6	C
	WBL	91.3	F	65.1	F
	WBTR	91.3	C	65.1	D
	NBL	0.4	A	1.7	A
	NBTR	0.4	A	1.7	A
	SBL	0.2	A	0.4	A
	SBTR	0.2	A	0.4	A
	OVERALL	8.0	A	6.8	A
Sixth Line at Future Street C	EBL	14.4	D	20.9	E
	EBTR	14.4	B	20.9	C
	WBL	54.8	F	40.8	F
	WBTR	54.8	C	40.8	C
	NBL	0.1	A	0.2	A
	NBTR	0.1	A	0.2	A
	SBL	0.2	A	0.4	A
	SBTR	0.2	A	0.4	A
	OVERALL	3.4	A	2.1	A

Intersection	Movement	AM Peak Hour		PM Peak Hour	
		Approach Delays (s/veh)	LOS	Approach Delays (s/veh)	LOS
Sixth Line at North Park Drive	EBL	30.5	F	43.6	F
	EBTR	30.5	C	43.6	C
	WBL	241.5	F	166.5	F
	WBTR	241.5	C	166.5	D
	NBL	0.4	A	1.1	B
	NBTR	0.4	A	1.1	B
	SBL	0.3	A	0.1	A
	SBTR	0.3	A	0.1	A
	OVERALL	17.8	A	10.3	A
Sixth Line at Sixteen Mile Drive	EBL	45.9	F	122.7	F
	EBTR	45.9	C	122.7	E
	WBL	352.0	F	540.1	F
	WBTR	352.0	C	540.1	F
	NBL	0.5	B	1.0	B
	NBTR	0.5	B	1.0	B
	SBL	0.2	A	0.1	B
	SBTR	0.2	A	0.1	B
	OVERALL	23.8	A	26.3	A

Notes: LOS – Level of Service

All unsignalized intersections are forecasted to be operating at an overall LOS of A during the AM and PM peak hours. Several movements on the minor roads are expected to experience long delays. High level of delay is not uncommon for minor side streets with a STOP condition and is

generally considered acceptable, particularly with low traffic volumes on the minor approaches. As previously noted, it is anticipated that all four unsignalized intersections will operate under traffic signal controls. This will significantly improve the operations for these movements.

Detailed HCM reports for the AM and PM peak hours under future (2021) conditions are presented in **Appendix B**.

4.4.2 Future 2031 Traffic Conditions

4.4.2.1 Roadway Segment Operations

As in the future 2021 traffic conditions, segments of Sixth Line between Dundas Street and Highway 407 were analyzed for future 2031 traffic conditions under the do-nothing scenario. As discussed in the earlier section, a growth factor was applied to the background traffic to account for the 2031 traffic conditions. Total traffic volumes are shown in **Figure 4-7**. In addition, further analysis was completed under a widening option. **Table 4-8** summarizes the results of this analysis.

Link analysis with future (2031) traffic shows that Sixth Line corridor from Dundas Street to Burnhamthorpe Road would fail operating during the AM and PM peak hours (see **Figure 4-8**).

Alternatively, analysis based on widening Sixth Line to four lanes would project all roadway segments to operate at an LOS of C or better. As in the future 2021 traffic conditions, it is forecasted that the PM peak hour conditions represent the worst-case scenario. **Figure 4-9** is a summary of the widening Sixth Line to four lanes scenario.

Table 4-8 – Two-Lane Highway Segment LOS Analysis – Future 2031 Traffic Volumes

Segment	Section Description	Approx. Length (m)	AM Peak Hour							PM Peak Hour						
			Average Travel Speed (km/h)	Percent Time-Spent-Following (%)	Volume (vph)	V/C	LOS	V/C With Widening	LOS With Widening	Average Travel Speed (km/h)	Percent Time-Spent-Following (%)	Volume (vph)	V/C	LOS	V/C With Widening	LOS With Widening
1	Dundas St. to Sixteen Mile Dr.	400	11.1	99.0	2815	1.76	F	0.88	D	5.6	100.7	3185	1.99	F	1.00	E
2	Sixteen Mile Dr. to North Park Dr.	300	14.5	97.6	2586	1.62	F	0.81	D	11.4	98.9	2795	1.75	F	0.87	E
3	North Park Dr. to Future St. C	500	18.4	95.6	2329	1.46	F	0.73	C	19.2	95.0	2274	1.42	F	0.71	C
4	Future St. C to Future St. D	500	20.3	94.3	2202	1.38	F	0.69	C	21.5	93.4	2118	1.32	F	0.66	C
5	Future St. D to Burnhamthorpe Rd.	500	24.6	90.8	1915	1.20	F	0.60	C	25.6	89.8	1844	1.15	F	0.58	B
6	Burnhamthorpe Rd. to NNOC	500	26.6	88.8	1779	1.11	F	0.56	C	28.9	86.5	1626	1.02	F	0.51	B
7	NNOC to Hwy 407	600	30.2	85.4	1536	0.96	E	0.48	B	32.9	82.7	1356	0.85	E	0.42	A

Notes: %-Spent-Following – Percent of time spent behind another vehicle without a passing opportunity due to opposing traffic volumes
 LOS – Level of Service

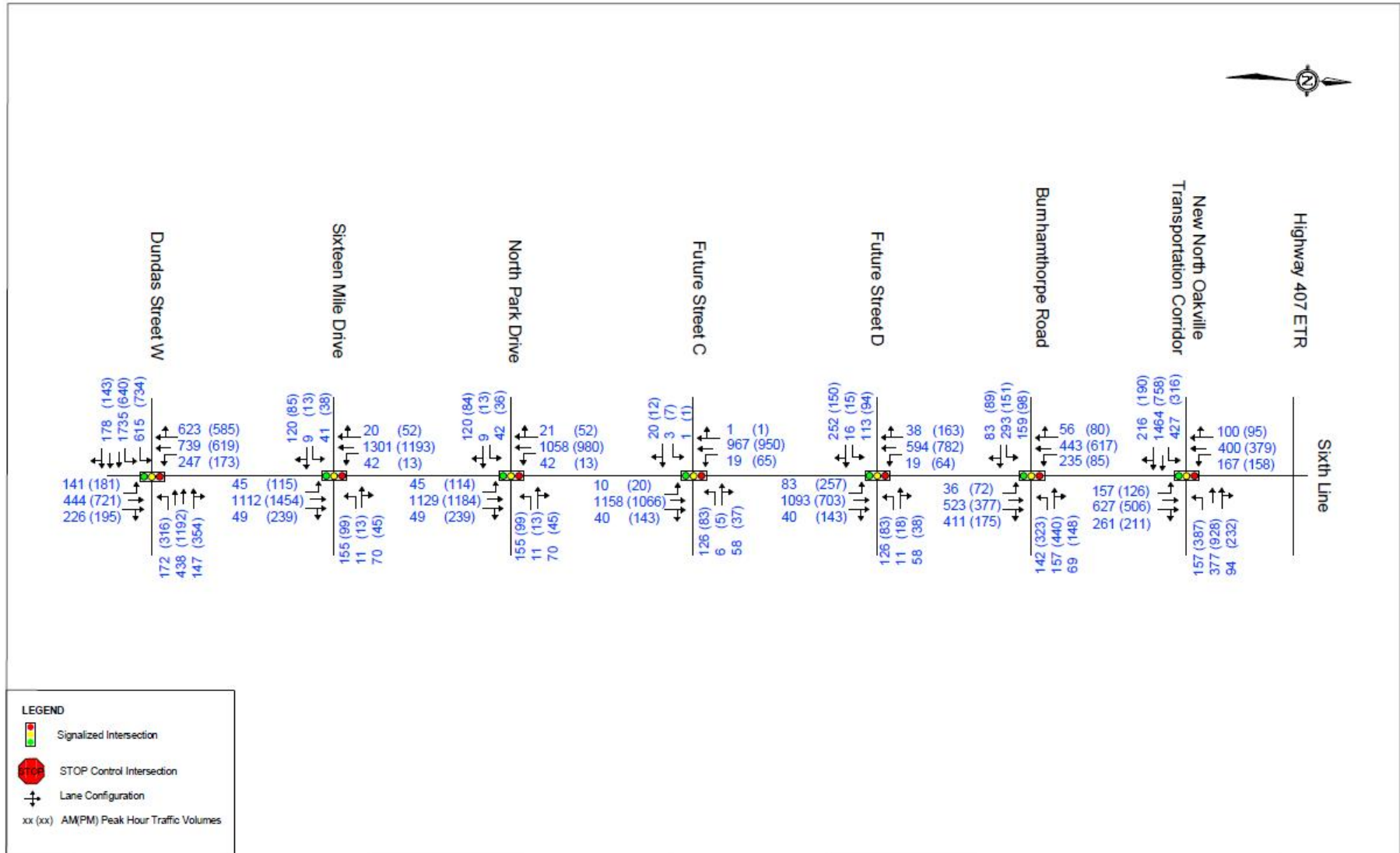


Figure 4-7 Future (2031) Peak Hour Traffic Volumes



Figure 4-8 Future (2031) PM Peak Hour Mainline Analysis – Do Nothing Scenario



Figure 4-9 Future (2031) PM Peak Hour Mainline Analysis with Improvements (Widening to Four Lanes)

4.4.2.2 Signal Warrant Analysis (2031)

Signal warrant analysis was carried out to determine the feasibility of installing a traffic signal at the existing and new un-signalized intersections along Sixth Line. The 2031 turning movement count data was used in the warrant analysis as per Ontario Traffic Manual (OTM) Book 12 – “Traffic Signals” methodology to carry out the analysis.

The analyses reveal that traffic signals are justified under future 2031 traffic conditions at the following intersection:

- Sixth Line and North Park Drive intersection; and
- Sixth Line and Sixteen Mile Drive intersection.

The analyses reveal that traffic signals are **not** justified under future 2031 traffic conditions at the following intersection:

- Sixth Line and New North Oakville Transportation Corridor intersection;
- Sixth Line and Burnhamthorpe Road intersection;
- Sixth Line and Future Street D intersection; and
- Sixth Line and Future Street C intersection.

As mentioned in **Section 4.4.1.2**, justifications must be used in combination with traffic engineering experience, professional judgment and economic analysis. The satisfaction of the signal installation justifications is only one criterion for determining the suitability of traffic signals for any location.

Even if a location being evaluated does not meet a justification, a traffic signal should be installed if it will result in reducing operational problems that create a potential for collisions and/or significantly increase delays to all users.

Other potential problems should also be assessed, including the extension of vehicle queues through upstream intersections. These broader network considerations must be taken into account and necessitate the application of engineering judgment over and above strict reliance on justification criteria alone.

The statistical model was developed in Highway Capacity Manual for all un-signalized intersections mentioned above that the traffic signals are justified for them under future 2031 traffic conditions. The results of Synchro analysis suggest signalization of all intersections under future 2031 traffic condition.

Detailed signal warrant analysis report for this intersection under future (2031) conditions is presented in **Appendix B**.

4.4.2.3 Intersection Operations

Under the future 2031 traffic conditions, all unsignalized intersections are expected to experience long queues. Therefore, all new intersections were analyzed based on signalized intersections. **Table 4-6** summarizes the signalized intersection LOS analysis results for the 2031 planning horizon. In addition, signal warrant analysis was completed for all new intersections. Although the analysis does not justify installation of traffic signals, the projected long queues for the unsignalized intersections justify the need for traffic signal controls. The following section summarizes the intersection operations analysis based on widening Sixth Line to four lanes.

Table 4-9 – Signalized Intersection LOS Analysis – Future 2031 Traffic Volumes

Intersection	Movement	AM Peak Hour				PM Peak Hour			
		v/c	LOS	Total Delay (s/veh)	Queue Length 95 th (m)	v/c	LOS	Total Delay (s/veh)	Queue Length 95 th (m)
Sixth Line at New North Oakville Corridor	EBL	0.80	C	27.3	83.2	0.88	D	49.2	90.7
	EBTR	1.02	E	59.0	267.6	0.92	D	45.7	129.4
	WBL	0.92	E	77.0	67.6	0.92	D	52.6	111.7
	WBTR	0.41	C	31.4	64.5	0.98	D	51.7	160.0
	NBL	0.58	D	36.9	42.2	0.55	D	38.9	37.9
	NBTR	0.98	E	67.2	149.4	0.78	D	35.1	77.8
	SBL	0.86	E	66.2	62.8	0.79	D	49.7	41.7
	SBTR	0.56	D	38.8	69.5	0.39	C	20.4	42.3
	OVERALL	1.02	D	52.6	-	0.98	D	43.6	-
Sixth Line at Burnhamthorpe Road	EBL	0.53	C	27.8	38.0	0.41	B	16.6	20.7
	EBTR	0.68	C	27.2	75.8	0.30	A	8.5	28.6
	WBL	0.74	D	46.3	41.3	0.72	C	22.6	63.0
	WBTR	0.40	B	19.4	41.6	0.73	B	17.8	94.2
	NBL	0.12	C	20.7	11.6	0.36	C	23.4	22.5

Intersection	Movement	AM Peak Hour				PM Peak Hour			
		v/c	LOS	Total Delay (s/veh)	Queue Length 95 th (m)	v/c	LOS	Total Delay (s/veh)	Queue Length 95 th (m)
	NBTR	0.71	B	19.5	82.5	0.39	B	13.0	44.8
	SBL	0.63	C	21.3	46.0	0.33	C	20.7	24.1
	SBTR	0.26	A	8.6	32.1	0.51	B	16.5	67.1
	OVERALL	0.74	C	20.7	-	0.73	B	16.4	-
Sixth Line at Future Street D	EBL	0.37	C	25.8	25.4	0.41	C	32.9	25.4
	EBTR	0.49	A	8.3	20.5	0.41	A	9.3	16.3
	WBL	0.59	D	35.6	30.9	0.44	D	35.0	23.4
	WBTR	0.16	A	8.5	9.4	0.17	B	14.0	10.9
	NBL	0.20	A	7.7	12.8	0.79	C	29.7	78.6
	NBTR	0.50	A	7.9	67.0	0.34	A	4.4	32.8
	SBL	0.10	A	8.1	4.4	0.17	A	5.4	8.1
	SBTR	0.29	A	6.2	32.4	0.39	A	4.8	38.6
	OVERALL	0.59	A	9.8	-	0.79	A	9.8	-
Sixth Line at Future Street C	EBL	0.00	C	21.0	1.3	0.00	B	17.0	1.1
	EBTR	0.07	B	11.7	5.3	0.05	B	11.8	5.1
	WBL	0.51	C	31.8	29.1	0.30	B	18.7	18.8
	WBTR	0.19	B	10.3	9.8	0.12	A	8.6	7.2
	NBL	0.03	A	4.7	2.0	0.07	A	4.9	2.7
	NBTR	0.46	A	5.5	55.3	0.51	A	6.0	44.4

Intersection	Movement	AM Peak Hour				PM Peak Hour			
		v/c	LOS	Total Delay (s/veh)	Queue Length 95 th (m)	v/c	LOS	Total Delay (s/veh)	Queue Length 95 th (m)
	SBL	0.10	A	6.1	3.5	0.35	B	11.5	10.7
	SBTR	0.38	A	5.0	42.1	0.41	A	5.3	32.8
	OVERALL	0.51	A	6.9	-	0.51	A	6.4	-
Sixth Line at North Park Drive	EBL	0.15	C	22.9	11.8	0.17	C	27.4	11.9
	EBTR	0.33	B	13.9	18.9	0.29	B	10.2	12.8
	WBL	0.59	C	34.1	35.4	0.47	C	34.9	26.2
	WBTR	0.21	B	10.9	12.1	0.19	B	12.3	10.4
	NBL	0.21	A	8.9	8.7	0.38	A	9.4	19.0
	NBTR	0.50	A	7.2	64.4	0.54	A	5.6	68.2
	SBL	0.24	B	10.4	9.1	0.09	A	5.6	2.6
	SBTR	0.47	A	7.0	58.1	0.40	A	4.6	43.4
	OVERALL	0.59	A	9.4	-	0.54	A	6.9	-
Sixth Line at Sixteen Mile Drive	EBL	0.15	C	24.1	12.1	0.18	C	29.0	12.7
	EBTR	0.35	B	18.8	23.2	0.30	B	11.7	14.0
	WBL	0.61	D	36.3	37.2	0.49	D	37.0	27.3
	WBTR	0.21	A	8.9	10.7	0.20	B	13.3	11.0
	NBL	0.32	B	13.8	11.6	0.51	B	16.2	36.6
	NBTR	0.48	A	7.1	64.4	0.63	A	6.7	95.8
	SBL	0.21	A	9.1	8.5	0.12	A	7.4	3.1

Intersection	Movement	AM Peak Hour				PM Peak Hour			
		v/c	LOS	Total Delay (s/veh)	Queue Length 95 th (m)	v/c	LOS	Total Delay (s/veh)	Queue Length 95 th (m)
	SBTR	0.57	A	8.1	80.8	0.48	A	5.1	57.7
	OVERALL	0.61	A	10.0	-	0.63	A	7.8	-
Sixth Line at Dundas Street	EBL	0.88	E	59.1	96.7	1.02	E	73.7	124.5
	EBTR	1.05	E	72.0	205.7	0.52	C	35.0	76.1
	WBL	0.89	E	69.9	64.4	0.81	D	40.0	78.6
	WBTR	0.52	C	33.7	50.6	1.06	E	78.3	186.3
	NBL	0.86	E	66.5	52.9	1.02	F	104.5	78.8
	NBTR	0.65	D	35.5	82.3	0.87	D	50.3	137.0
	SBL	0.78	D	39.4	66.1	0.88	E	69.0	68.2
	SBTR	1.05	E	69.6	201.5	1.04	E	73.8	192.0
	OVERALL	1.05	E	60.1	-	1.06	E	65.1	-

Notes: v/c – Volume-to-capacity ratio
 LOS – Level of Service

All signalized intersections are forecasted to operate at an LOS of E or better on an overall basis during the AM and PM total traffic conditions. As in the future 2021 conditions analysis, several movements at the intersection of Sixth line at Dundas Street are project to be operating at the lowest LOS. Although these movements are at capacity, they are still functional. Modifications to the signal timing and the anticipated improvements to Dundas Street, such as providing BRT lanes, will improve the operations at this intersection.

Detailed HCM reports for the AM and PM peak hours under future (2031) conditions are presented in **Appendix B**.

4.4.3 New Roundabout Operations

Another design alternative considered for the intersection improvement involves replacing the existing and the new intersections with a roundabout at the following intersections along Sixth Line:

- Sixth Line and Burnhamthorpe Road intersection;
- Sixth Line and Future Street D intersection;
- Sixth Line and Future Street C intersection;
- Sixth Line and North Park Drive intersection; and
- Sixth Line and Sixteen Mile Drive intersection.

In Ontario, the Region of Waterloo has emerged as a leader in roundabout implementation. As of November 2011, there are 17 roundabouts on Regional Roads in Waterloo. Consequently the Region of Waterloo has developed several screening tools and procedures in order to determine the feasibility of roundabouts at an intersection. In determining the feasibility of a roundabout for these intersections the project team has consulted the following documents:

- Transportation Impact Study Guidelines – Region of Waterloo (November 26, 2008);
 - Roundabout Feasibility – Initial Screening Tool Version 1.0;
- Roundabouts: An Informational Guide – U.S. Department of Transportation, Federal Highway Administration (FHWA) (June 2000).

4.4.3.1 Roundabout Screening

This section discusses the initial screening undertaken to determine the feasibility of a roundabout at the intersections mentioned above along Sixth Line.

The intent of Waterloo’s Roundabout Feasibility Initial Screening Tool is to provide a relatively quick assessment of the feasibility of a roundabout at an intersection in comparison to traditional road improvements such as construction of additional lanes and traffic control signals. The Initial Screening Tool and Traffic Flow worksheet forms can be found in **Appendix B**.

4.4.3.2 Roundabout Analysis Using SIDRA

For the initial roundabout concept for five intersections mentioned above, SIDRA computer software (version 5.1) was used to determine capacity, initial lane requirements, and other geometric aspects.

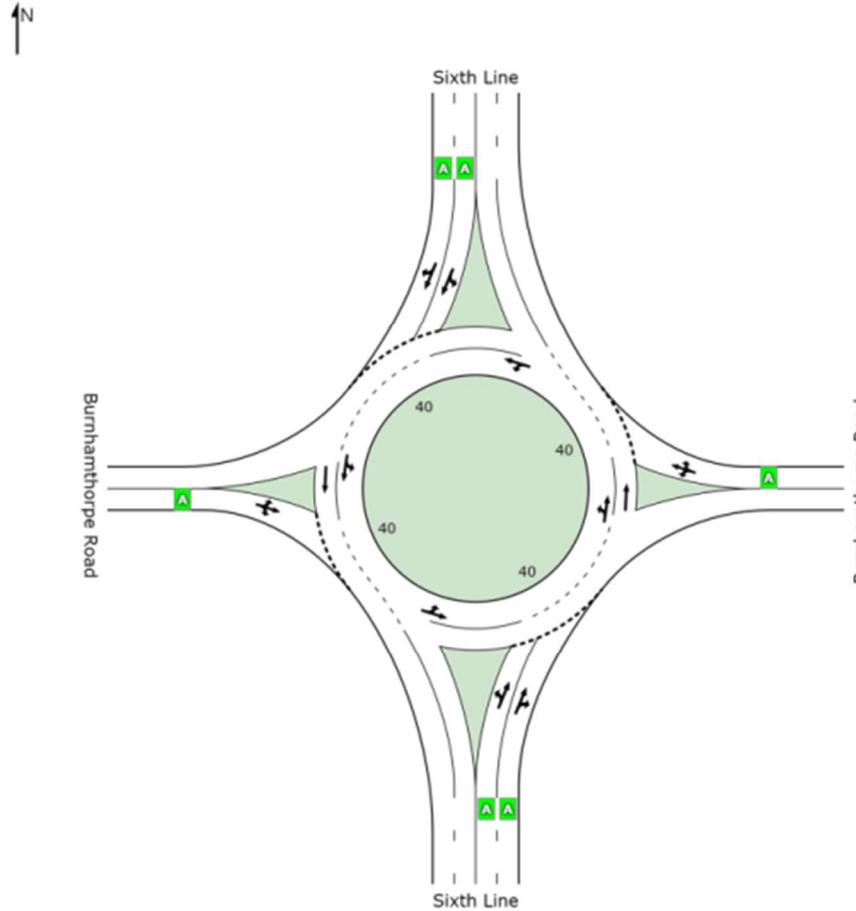
Based on capacity for 2031, the following is concluded:

Sixth Line and Burnhamthorpe Road intersection

Based on the Traffic Flow Worksheet developed by the Region of Waterloo, the sum of the entering and the circulating volumes is between 1400 and 2200 vehicles per hour (vph) for both the future AM and PM peak hours. Therefore, the screening guide recommends a two-lane entry for the intersection by the year 2031.

The proposed roundabout for Sixth Line and Burnhamthorpe Road intersection would have an inscribed circle diameter (ICD) of 55 metres. The results reveal that the overall intersection is expected to operate at a LOS A during the morning and afternoon peak hours in 2031.

The detailed analysis of the two lane roundabout is documented in **Appendix B**.



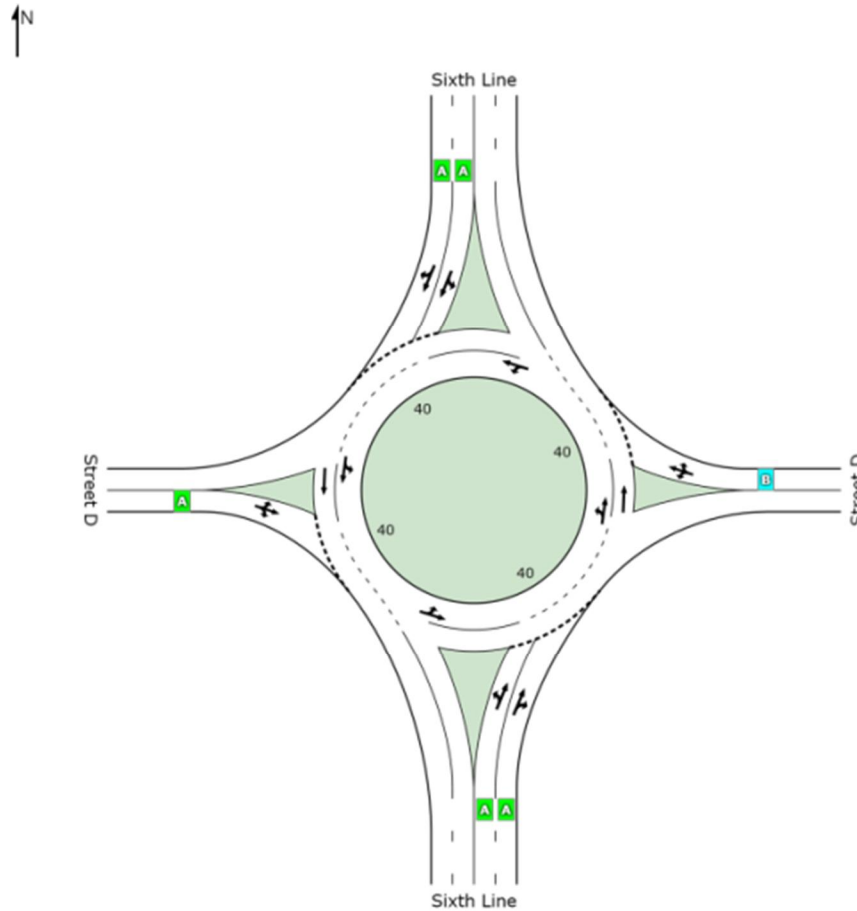
	South	East	North	West	Intersection
LOS	A	A	A	A	A

Sixth Line and Future Street D intersection

Based on the Traffic Flow Worksheet developed by the Region of Waterloo, the sum of the entering and the circulating volumes is less than 1400 vehicles per hour (vph) for both the future AM and PM peak hours. Therefore, the screening guide recommends a single-lane entry for the intersection by the year 2031. Although the traffic numbers warrant one lane roundabout, but based on the proposed widening of Sixth Line from two lanes to four lanes a two-lane roundabout is suggested. However, further evaluation for the number of roundabout lanes will be undertaken at Street D.

The results reveal that with this suggested lane geometry the overall intersection is expected to operate at a LOS A during the morning and afternoon peak hours in 2031.

The detailed analysis of the two lane roundabout is documented in **Appendix B**.



	South	East	North	West	Intersection
LOS	A	B	A	A	A

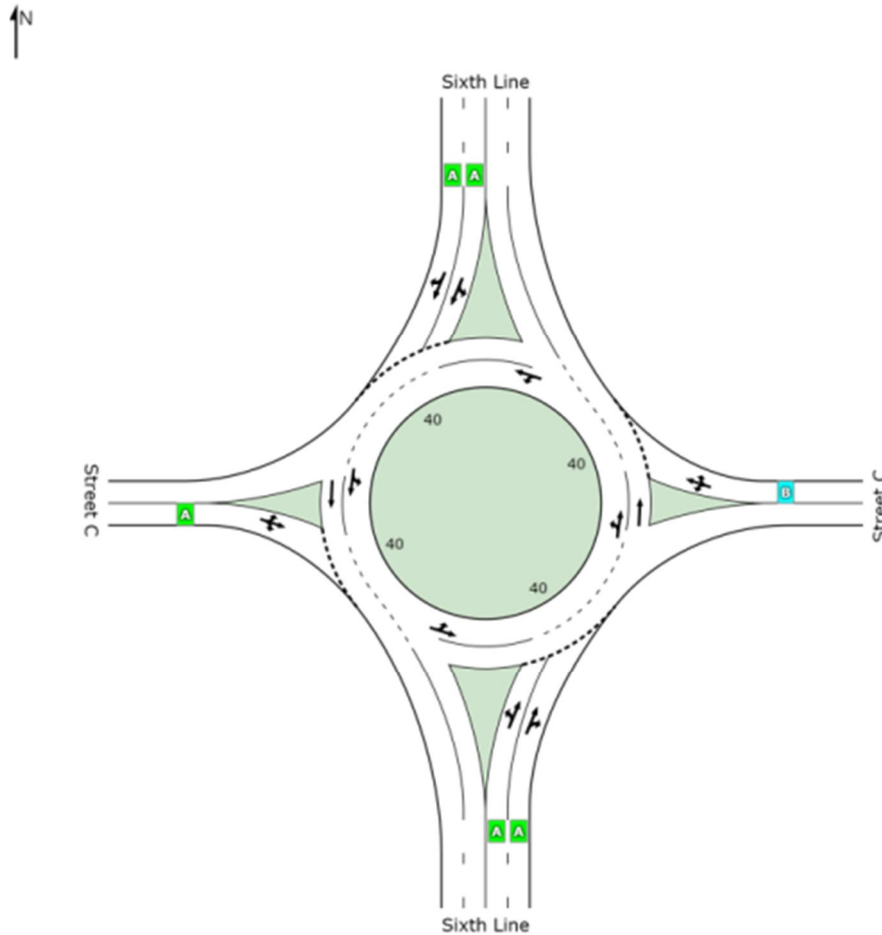
Sixth Line and Future Street C intersection

Based on the Traffic Flow Worksheet developed by the Region of Waterloo, the sum of the entering and the circulating volumes is less than 1400 vehicles per hour (vph) for both the future AM and PM peak hours. Therefore, the screening guide recommends a single-lane entry for the intersection by the year 2031.

Although the traffic numbers warrant one lane roundabout, but based on the proposed widening of Sixth Line from two lanes to four lanes a two-lane roundabout is suggested. However, further evaluation for the number of roundabout lanes will be undertaken at Street C.

The results reveal that with the suggested lane geometry the reveal overall intersection is expected to operate at a LOS A during the morning and afternoon peak hours in 2031.

The detailed analysis of the two lane roundabout is documented in **Appendix B**.



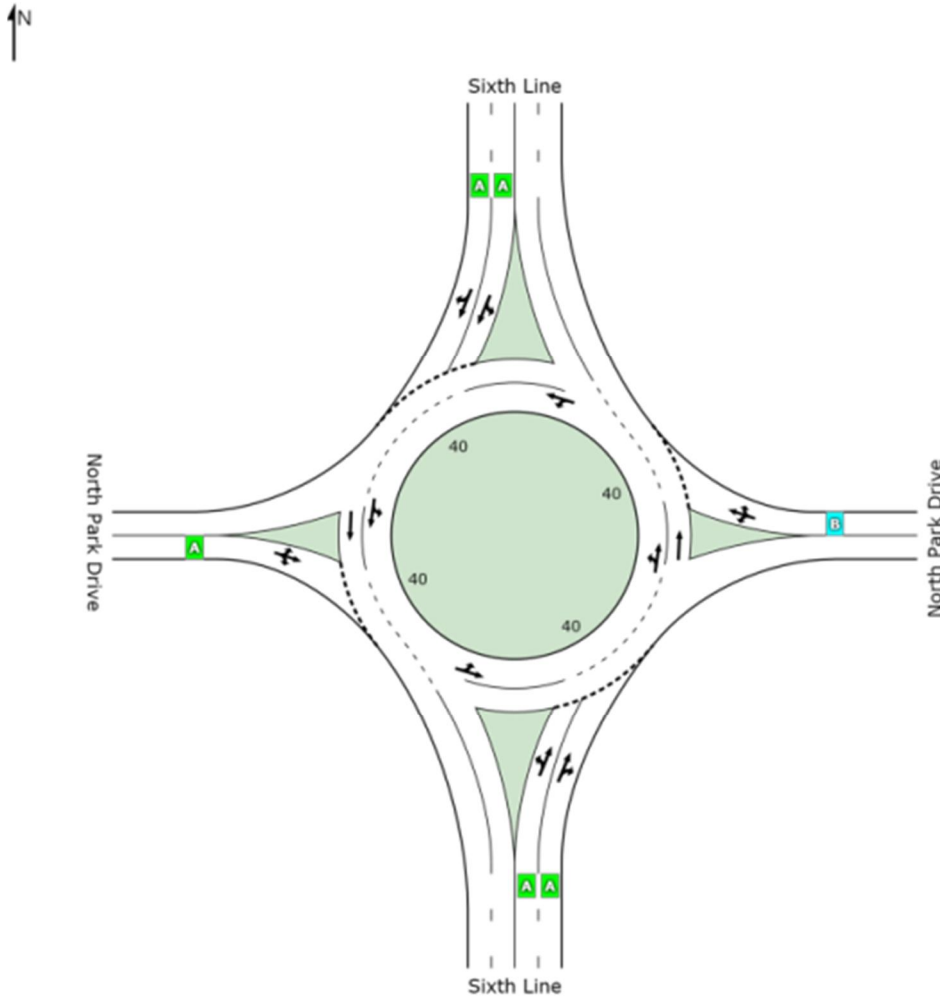
	South	East	North	West	Intersection
LOS	A	B	A	A	A

Sixth Line and North Park Drive intersection

Based on the Traffic Flow Worksheet developed by the Region of Waterloo, the sum of the entering and the circulating volumes is between 1400 and 2200 vehicles per hour (vph) for both the future AM and PM peak hours. Therefore, the screening guide recommends a two-lane entry for the intersection by the year 2031.

The proposed roundabout for Sixth Line and North Park Drive intersection would have an inscribed circle diameter (ICD) of 55 metres. The results reveal that the overall intersection is expected to operate at a LOS A during the morning and afternoon peak hours in 2031.

The detailed analysis of the two lane roundabout is documented in **Appendix B**.



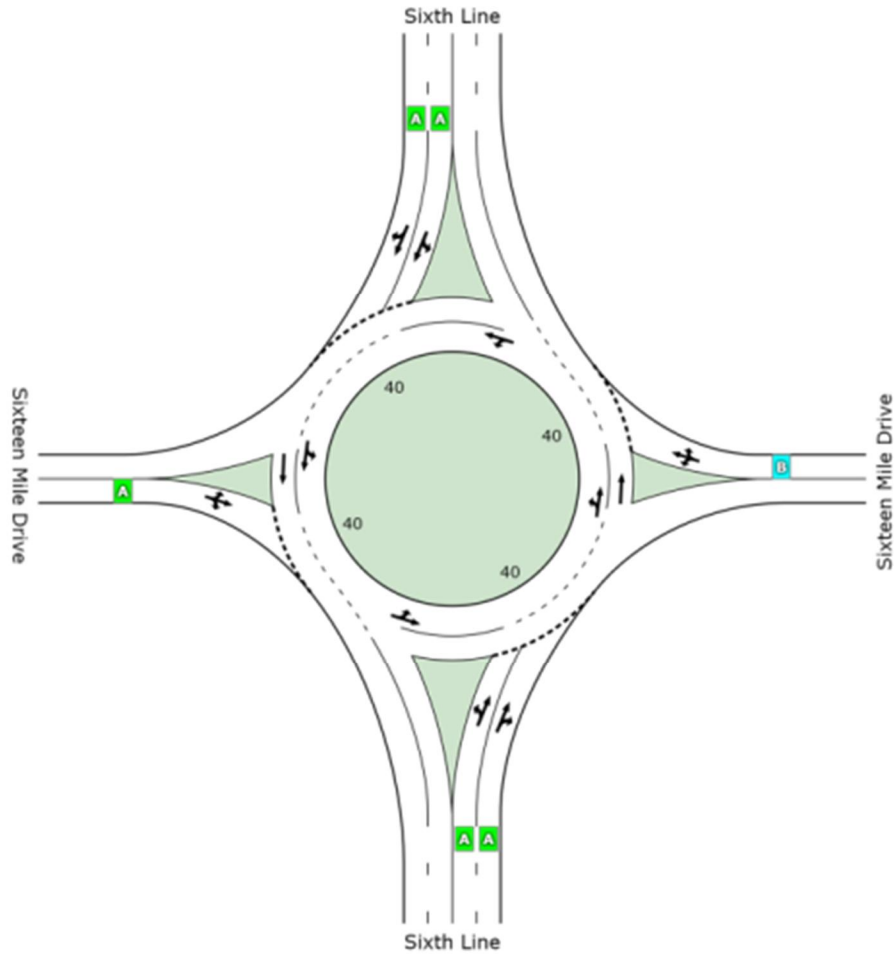
	South	East	North	West	Intersection
LOS	A	B	A	A	A

Sixth Line and Sixteen Mile Drive intersection

Based on the Traffic Flow Worksheet developed by the Region of Waterloo, the sum of the entering and the circulating volumes is between 1400 and 2200 vehicles per hour (vph) for both the future AM and PM peak hours. Therefore, the screening guide recommends a two-lane entry for the intersection by the year 2031.

The proposed roundabout for Sixth Line and Sixteen Mile intersection would have an inscribed circle diameter (ICD) of 55 metres. The results reveal that the overall intersection is expected to operate at a LOS A during the morning and afternoon peak hours in 2031.

The detailed analysis of the two lane roundabout is documented in **Appendix B**.



	South	East	North	West	Intersection
LOS	A	B	A	A	A

4.4.3.3 Additional Considerations

In determining the feasibility of a roundabout for an intersection, there are key geometric criteria related to the approach roads that must also be considered. These include:

- **Horizontal Alignment** – It is preferred to locate roundabouts at intersections with relatively straight approaches. Roundabouts should not be considered at intersections where the radius of the approach road limits the visibility of the roundabout to the approaching driver. As a general guideline, roundabouts should not be considered at intersections where one of the approaches will not provide the minimum stopping sight distance to either the cross-walk or yield line.

- **Profile** – It is preferred to locate roundabouts at intersections with relatively flat grades along the approaches. Roundabouts should not be considered at intersections where the approach grade limits the visibility of the roundabout to the approaching driver. As a general guideline, roundabouts should not be considered at intersections where one of the approaches has an upgrade steeper than 5%.
- **Entrances** – It is preferred to locate roundabouts at intersections that are free of entrances along the approaches. Roundabouts should not be considered at intersections where there are entrances along the approach in close proximity to the intersection as turning movements to/from the entrance will conflict with the free-flow characteristics of a roundabout. As a general guideline, roundabouts should not be considered at intersections where entrances are located at or near the splitter island.

There is a general consensus that a roundabout is safer than a traditional signalized intersection since a roundabout will likely be operating at a reduced speed. As a result, the chances for high-speed right angle collisions that are inherent to a traditional signalized intersection will be reduced. However, the installation of a roundabout is not common in the Halton Region and the problem may be further aggravated because drivers would not be familiar with and may not be fully comfortable with manoeuvring at such installation.

In addition, the property impacts for a roundabout will be significantly higher than that of a signalized intersection. As suggested in the Roundabouts: An Informational Guide, Second Edition (2010) by the U.S. Department of Transportation, a common inscribed circle diameter range for a multilane roundabout such as the one proposed is 67 to 91 m. A roundabout of such magnitude will have significant impact to the adjacent properties. In comparison, the property impacts for widening of the existing intersection will be much less than that of the roundabout. Similarly, a roundabout installation will also have significant impact to the existing utilities within the study area.

With regard to aesthetics, a roundabout may be perceived as more aesthetically pleasing for drivers. There is also the potential for streetscaping at the centre circular median, though proper sight lines must be maintained

In general, the roundabout will result in a higher cost. The property required for a roundabout will be significant compared to that of the widening. Since widening the intersection will allow the use of the existing facility, the construction costs will be significantly higher for the roundabout, which will include the cost to remove the existing pavement, and increase in grading.

A sensitivity analysis to determine the exact year for the intersection improvements was not carried out since it is out of the scope of work of this assignment.

4.5 Conclusions of Transportation Network Analysis

Based on the network analysis, the following conclusions can be drawn:

- All roadway segments are currently operating at an LOS of C, a satisfactory level for both AM and PM Peak Hour traffic volumes with average travel speed estimated to be approximately 60 km/h for all segments;

- The intersection of Sixth Line at Dundas Street is currently operating at an acceptable LOS of C during peak AM and PM total existing traffic conditions with the WBTR movement operating with the highest v/c ratio during the PM peak hour. The approach delay for this movement is 33.3 sec/veh;
- The intersection of Sixth Line at Burnhamthorpe Road is currently operating at an overall LOS of E and B during the AM and PM peak hours, respectively. The NB and SB movements fail during the morning peak hour. The movement with the highest approach delay for this intersection is for the NB traffic during the morning peak hour;
- It is anticipated that the New North Oakville Transportation Corridor (NNOTC) will begin construction in 2015. In addition, based on the North Oakville Master Plan, Secondary Plans and other traffic related studies in the area that have been submitted to the Town, it is anticipated that four new east-west connecting roadways will be provided between Dundas Street and Burnhamthorpe Road by 2021, creating four new intersections on Sixth Line. These new roadways will provide a connection for the new proposed development on the east and west side of Sixth Line as well as completing the road network for the North Oakville Master Plan;
- 2021 analysis based on the do-nothing scenario indicates poor LOS and Volume to Capacity ratio that would exceed threshold limit of 0.85 between Burnhamthorpe Road to Dundas Street during the AM peak hour. Whereas, during the PM peak hour, Sixth Line would experience congestion with volume to capacity ratio exceeds 0.85 between Future Street D to Dundas Street. Alternatively, analysis based on widening Sixth Line to four lanes would project all roadway segments to operate at an LOS of C or better. Similarly, analysis based on widening Sixth Line to four lanes would project all roadway segments to operate at an LOS of E or better under the future 2031 traffic conditions; and
- It is anticipated that all four future intersections between Dundas Street and Burnhamthorpe Road will operate under traffic signal controls by 2031. All intersections are forecasted to operate satisfactorily with several movements on the minor streets operating at a low LOS. Although these movements are at capacity, they are still functional.

4.6 Problem and Opportunity

Based on existing capacity needs along the Sixth Line corridor between Dundas Street and Highway 407, projected increases in traffic volumes will further reduce Levels of Service along the corridor and at the intersections. Transportation solutions are necessary to enhance the safety and mobility of existing and future users of Sixth Line.

This study will identify a preferred planning alternative that recognizes the needs of the road users, respects provincial, regional and municipal planning policies and will be sustainable under future conditions. The following objectives have been identified:

- Respond to current and anticipated pressures in travel demand through the corridor;
- Investigate how to best improve the corridor and intersection operations and safety along Sixth Line including opportunities to improve deficient roadway geometrics;



- Opportunity to maintain and enhance the character of the existing area through landscaping opportunities;
- Support the movement of people and goods;
- Opportunity to enhance facilities for pedestrians and cyclists; and
- Minimize any adverse impact that the above objectives will have on the natural and social environment.

5 Alternative Planning Solutions

Based on the review of existing and future conditions as presented in previous sections of this report, it was determined that Sixth Line cannot accommodate the travel demand growth anticipated over the next twenty years. The development of this problem statement and preliminary consultation with stakeholders identified the following needs/improvement opportunities for the Sixth Line corridor:

- Provide sufficient roadway capacity for projected traffic volumes;
- Enhance vehicle and pedestrian safety, particularly at intersections;
- Enhance street design and landscaping;
- Discourage additional traffic, air pollution and noise on collector and local roads; and
- Encourage sustainable transportation solutions.

5.1 Development of Alternative Planning Solutions

The Class Environmental Assessment process for municipal roads in Ontario requires consideration and evaluation of all reasonable alternative solutions to accommodate for future travel demand. Environmental and technical impacts on each alternative solution are carefully examined and a preliminary preferred solution is selected. The following alternative planning solutions have been assessed from a traffic perspective and been identified as possible alternative solutions:

5.1.1 Do Nothing Alternative

This transportation planning alternative consists of doing nothing to the existing arterial road network beyond currently planned improvements and normal maintenance.

The Do Nothing alternative represents the “status quo” and is identified as a measure of baseline conditions upon which the other transportation planning solutions can be evaluated and compared. By definition, the Do Nothing alternative does not meet the Town’s commitment to an innovative, pedestrian-friendly and transit-supportive community.

5.1.2 Limit Growth and Development

This option involves the implementation of policies that would place additional constraints on where growth may occur and/or how much development may occur.

5.1.3 Transportation Demand Management (TDM):

This option involves spreading out peak travel periods by shifting demands to periods outside of critical congestion, and reducing the number of vehicles on the road, by encouraging car-pooling and transit use. In addition, this option provides opportunities for Pedestrians and Cyclists in the study corridor.

5.1.4 Transportation System Management (TSM):

This option involves no widening on Sixth Line. It includes the use of other measures to improve the capacity of the road flow through traffic signal synchronization, incident management, and other methods.

5.1.5 Provide Additional Traffic Lanes along Sixth Line:

This option involves widening Sixth Line from two lanes to four lanes in the study corridor. Also includes geometry adjustments to correct operational, geometric, and structural deficiencies.

5.1.6 Intersection Improvements

This option involves implanting traffic signal and improving possible lane configuration to accommodate left and right turn lanes.

5.1.7 Upgrade other Arterials Corridors or Build a new Corridor:

This option involves no widening or other improvements on Sixth Line. Instead, it involves making all required improvements and widening to nearby roads to accommodate the expected additional traffic demand and address existing capacity and safety issues.

5.2 Alternative Solutions Evaluation Criteria

Following the identification of alternative planning solutions, the Project Team developed a number of criteria presented in **Table 5-1** to comparatively evaluate the alternative solutions.

The overall objective of the evaluation was to identify a preliminary Preferred Solution that will address the problem, while minimizing impacts to the environment.

Table 5-1 - Evaluation Criteria

Category	Criteria
Transportation/Technical	Planning Objectives
	Transit Services
	Overall Safety
	Opportunities for Pedestrians and Cyclists in the study corridor
	Network Capacity and Level of Service
Cultural Environment	Archaeological Resources
	Cultural and Built Heritage Features
Natural Environment	Terrestrial/Vegetation
	Aquatic/Watercourse
Socio-Economic Environment	Residential/Business Access
	Property Requirements



Category	Criteria
	Emergency Response
	Noise
	Air Quality
Aesthetics/Streetscapes	Aesthetics
Cost	Capital Cost

5.3 Assessment of Alternative Solutions

After the evaluation criteria have been established, alternatives planning solutions 1 to 7 were evaluated and assessed. The assessment of each alternative under the different criteria within each evaluation category, namely, Transportation / Technical, Cultural Environment, Natural Environment, Socio-Economic Environment, Aesthetics/Streetscapes and Cost are summarized in **Table 5-2**. The alternatives were ranked from being the most desirable to the least desirable under each criterion in each category and an overall evaluation within each category was established.

5.3.1 Transportation/Technical Aspect

Through the transportation/technical evaluation, the alternatives were evaluated based on its ability to meet the Town’s *Official Plan-Livable Oakville (LO)* and *Transportation Master Plan (TMP)* goals and objectives, its ability to improve from existing and/or integrate transit services into the overall transportation system, its ability to improve safety from existing conditions, its ability to provide opportunities for pedestrians and cyclists in the study corridor and its ability to improve traffic congestion and level-of service.

The “Do Nothing” option would not improve any of the current problems; therefore, it is the least desirable technically. Alternative 5 was considered more desirable than Alternatives 3, 4 and 6.

5.3.2 Cultural Environment

The impacts of alternatives to the cultural environment were assessed by their impacts to the surrounding archaeological resources and cultural and built heritage features. The grading required for Alternative 6 would result in major impacts to the surrounding cultural and built heritage features.

5.3.3 Natural Environment

The impacts of alternatives to the natural environment were assessed by their impacts to the surrounding vegetation, impact to wild life habitat, and impact to watercourses. Alternatives 1, 2, 3 and 4 were considered more desirable compared to Alternatives 5, 6 and 7 as it has minimal impacts to natural environment.

5.3.4 Socio Economical / Cultural Heritage / Archaeological

Through the socio-economical evaluation, the alternatives were assessed based on its ability to maintain and/or maximize opportunities for improved access into adjacent residential and commercial properties, its ability to minimize the amount of property acquisition, its ability to provide access for emergency vehicles, its ability to minimize impacts on ambient noise levels after construction and its ability to minimize the air particulate matter and emissions.

Do Nothing scenario does not accommodate future development and traffic and is not compatible with the Town's Plan to maximize opportunities to improve access into adjacent residential and commercial properties. Alternatives 5, 6 and 7 would result in more significant impacts to the adjacent properties than Alternatives 1, 2, 3 and 4. Alternatives 5 and 6 would provide better access for emergency vehicles and were considered more desirable compared to other alternatives as they have minimal impacts to air quality.

5.3.5 Aesthetics/ Streetscape

Through the Aesthetics/ Streetscape evaluation, the alternatives were assessed based on its ability to improve Aesthetics/ Streetscape. Alternatives 5 and 6 have no impacts to existing landscape and aesthetics but they have potential to significantly improve aesthetics along Sixth Line.

5.3.6 Costs

The costs were compared by assessing the alternatives based on the construction costs, and the resulting maintenance and operational costs. The overall cost of alternatives 4 and 5 would be higher compared to alternative 2 and 3.

5.4 Selection of Preferred Alternative Solution

Based on the evaluation outlined in **Table 5-2**, Alternative 5 had achieved high preference ratings against the Technical / Transportation, Socio- Economic Environment and Aesthetics / Streetscape and the overall evaluation of all categories recommends alternative 5 for developing preliminary preferred design of Sixth Line between Dundas Street and Highway 407 ETR.

Table 5-2 - Evaluation of Alternative Design Solution to the Problem

Category	Criteria	Indicator	Alternative 1		Alternative 2		Alternative 3		Alternative 4		Alternative 5		Alternative 6		Alternative 7	
			Do Nothing		<i>Limit Growth and Development</i>		<i>Transportation Demand Management Initiatives (TDM)</i>		<i>Transportation System Management (TSM)</i>		<i>Provide Additional Traffic Lanes along Sixth Line</i>		<i>Intersection Improvements</i>		<i>Upgrade other Arterial Corridors or Build a New Corridor</i>	
Transportation/ Technical	Planning Objectives	Ability to meet the Town's Official Plan-Livable Oakville (LO), Transportation Master Plan (TMP) Goals and Objectives	○	Does not meet LO and TMP objectives	○	Does not meet LO and TMP objectives	●	Meets LO and TMP objectives by supporting alternative modes	●	Meets LO and TMP objectives	●	Meets LO and TMP objectives	●	Meets LO and TMP objectives	○	Does not meet LO and TMP objectives
	Transit Services	Ability to Improve from existing and/or integrate transit services into the overall transportation system	○	No improvement to transit services	●	Some improvement to transit services due to reduce congestion	●	Potential for improvements to transit services	●	Potential for improvements to transit services	●	Potential for improvement to transit services	●	Potential for improvement to transit services	●	Some improvement to transit services due to diversion of traffic to other routes
	Overall Safety	Ability to Improve Safety from existing conditions	○	No safety improvements	●	Reduced traffic congestion would result in some safety improvements	●	Reduced traffic congestion would result in some safety improvements	●	Reduced traffic congestion would result in some safety improvements	●	Potential for safety improvements	●	Potential for safety improvements at intersections	●	Reduced traffic congestion would result in some safety improvements
	Opportunities for Pedestrians and Cyclists in the study corridor	Ability to provide opportunities for Pedestrians and Cyclists in the study corridor	○	No impacts	○	No impacts	●	Encourages active transportation.	●	Encourages active transportation through improvements to the road cross-section	●	Potential to improve access for pedestrians and cyclists	●	Potential for improvements to pedestrian and cycling facilities at Intersections	○	No impacts
	Network Capacity and Level of Service	Ability to improve traffic congestion and level-of service	○	Increase in congestion due to increase in traffic volume	●	Potential to limit traffic congestion by limiting traffic growth	●	Provides some relief from traffic congestion	●	Provides some relief from traffic congestion	●	Improved corridor capacity and level of service on Sixth Line	●	Provides relief from traffic congestion	●	Provides some relief from traffic congestion

LEGEND: ● Most Desirable ● More Desirable ● Neutral ○ Less Desirable ○ Least Desirable 108

Category	Criteria	Indicator	Alternative 1		Alternative 2		Alternative 3		Alternative 4		Alternative 5		Alternative 6		Alternative 7	
			Do Nothing		<i>Limit Growth and Development</i>		<i>Transportation Demand Management Initiatives (TDM)</i>		<i>Transportation System Management (TSM)</i>		<i>Provide Additional Traffic Lanes along Sixth Line</i>		<i>Intersection Improvements</i>		<i>Upgrade other Arterial Corridors or Build a New Corridor</i>	
Cultural Environment	Archaeological Resources	Potential for disruption of archaeological resources	●	No impacts	●	No impacts	●	No impacts	●	No impacts	●	Low potential impacts as widening would occur within areas with archaeological potential	●	Potential impacts as improvements would occur within areas with archaeological potential	●	Potential impacts to archaeological resources on other roads
	Cultural and Built Heritage Features	Potential for disruption of built heritage and cultural landscape features	●	No impacts	●	No impacts	●	No impacts	●	No impacts	●	Low potential impacts to heritage properties or features within project area	○	Potential impacts to heritage properties or features within project area	●	Potential impacts to heritage properties on other roads
Natural Environment	Terrestrial Resources (Wildlife and Vegetation)	Impacts on Terrestrial Species and Habitats	●	No impacts on terrestrial resources	●	No impacts on terrestrial resources	●	No impacts on terrestrial resources	●	No impacts on terrestrial resources	●	Some impacts on terrestrial resources with potential for mitigation	●	Some impacts on terrestrial resources with potential for mitigation	●	Some impacts on terrestrial resources with potential for mitigation
	Aquatic Species/Watercourses	Impacts on watercourses within the project area	●	No impacts	●	No impacts	●	No impacts	●	No impacts	●	Some impacts with potential for mitigation	●	Some impacts with potential for mitigation	●	Some impacts with potential for mitigation
Socio-Economic Environment	Residential/Business Access	Ability to maintain and/or maximize opportunities for improved access into adjacent residential and commercial properties	○	No opportunity for access improvements	○	No opportunity for access improvements	○	Marginal opportunity for access improvements	○	Marginal opportunity for access improvements	●	Opportunity for Access improvements along the corridor	●	Opportunity for access improvements at Intersections	○	No opportunity for access improvements
	Property Requirements	Amount of property required	●	No property required	●	No property required	●	No property required	●	No property required	○	Property requirements along Sixth Line	○	Property requirements at Intersections	○	Property requirements along other roads

Category	Criteria	Indicator	Alternative 1		Alternative 2		Alternative 3		Alternative 4		Alternative 5		Alternative 6		Alternative 7	
			Do Nothing		<i>Limit Growth and Development</i>		<i>Transportation Demand Management Initiatives (TDM)</i>		<i>Transportation System Management (TSM)</i>		<i>Provide Additional Traffic Lanes along Sixth Line</i>		<i>Intersection Improvements</i>		<i>Upgrade other Arterial Corridors or Build a New Corridor</i>	
	Emergency Response	Access for emergency vehicles	○	Increased response time due to increase in traffic.	◐	No improvement over the existing conditions	◐	Potential for marginal reduction in response time	◑	Potential for marginal reduction in response time	●	Potential for reduction in response time	●	Potential for reduction in response time	◑	Potential for marginal reduction in response time
	Noise	Ability to minimize impacts on ambient noise levels after construction	○	Increase in noise levels due to increase in traffic and congestion	◑	Existing noise levels to remain the same	◑	Marginal decrease in noise levels due to reduction in traffic volume	◑	Marginal decrease in noise levels due to reduced traffic congestion	◑	Minor increase in noise levels according to MOE guideline	◑	Minor increase in noise levels according to MOE guideline	◑	Potential increase in noise along other roads
	Air Quality	Ability to minimize the air particulate matter and emissions	○	Decrease in air quality due to increase in traffic	◑	Air quality to remain the same	◑	Increase in air quality due to decrease in congestion	◑	Marginal Increase in air quality due to decrease in congestion	◑	Increase in air quality due to reduction in congestion	◑	Increase in air quality due to decrease in congestion	◑	Potential improvement in air quality with reduced traffic congestion
Aesthetics/ Streetscape	Aesthetics	Ability to improve Aesthetics/ Streetscape	◑	No improvement over the existing conditions	◑	No improvement over the existing conditions	◑	No impacts	◑	No impacts	●	No impacts to existing landscape and aesthetics but has potential to significantly improve aesthetics along Sixth Line	●	No impacts to landscape areas at intersections but has potential to significantly improve aesthetics at intersections	◑	Potential impacts to landscape areas along other roads
Cost	Capital Costs	Cost of implementation and property	●	No cost impacts	●	No cost impacts	◑	Some cost impacts	◑	Some cost impacts	○	High cost impacts	○	High cost impacts	○	High cost impacts
Ability to Address Problem/Opportunity Statement			No		No		Somewhat		Somewhat		Yes		Somewhat		Somewhat	
Recommendation			Still viable alternative Does not address the problem statement, but will be carried forward for comparison purposes		Not carried forward Policies already exist that place constraints on where growth may occur and/or how much development may occur.		Carried forward In combination with Alternative 5.		Carried forward In combination with Alternative 5.		Carried forward Meets Town's Official Plan-Livable Oakville (LO) and Transportation Master Plan (TMP) Goals and Objectives.		Carried forward In combination with Alternative 5.		Not Carried forward as part of this study	

6 Alternative Design Concepts

Based on the screening of the Alternative Solutions noted in the previous section, methods of implementing the preferred alternative solution were developed for the improvement of Sixth Line between Dundas Street and Highway 407 ETR.

6.1 Development of Alternative Designs

Various alternative designs concepts for the widening of Sixth Line were investigated. All of the alternatives considered pedestrian realm features and active transportation opportunities. The alternative design drawings are shown in **Appendix F**.

A brief description of the design alternatives is discussed below:

Alternative 1 – Do Nothing – Existing 2 Lane Rural Cross-Section

Continuation of existing conditions and would involve no change to the existing roadway (For comparison purposes only).

Alternative 2 – Widening About Existing Centre Line

Widen Sixth Line on both the west and east sides of the existing centreline to accommodate 4 lanes (2 per direction).

Alternative 3 – Widening About the Centre Line and To The East Along Natural Heritage System

Widen Sixth Line on both the west and east sides of the existing centreline and shifting towards the east along the Natural Heritage System to accommodate 4 lanes (2 per direction).

Alternative 4 – Use of Roundabouts at Intersections

Implement roundabouts at the Sixth Line intersections as part of the intersection improvements solution.

6.2 Alternative Design Evaluation Criteria

Evaluation of the alternative designs involved formulation of evaluation criteria and a methodology to evaluate these criteria. The evaluation criteria were developed based on the transportation impacts and impacts to the natural, social, economic and cultural environments. The criteria are shown in **Table 6-1**.

Table 6-1 - Evaluation Criteria

Category	Criteria
Technical	Geometry
	Road Safety
	Future development and traffic
	Transit Service
	Stormwater Management
	Utility relocation
	Compatibility with Active Transportation Master Plan (ATMP)
Socio Economical / Cultural Heritage / Archaeological	Property Impact
	Compatibility with Town’s North Oakville Secondary Plan/ Future Land Use and Development
	Cultural Heritage Resources
	Archaeological Resources
	Access (residential, commercial, and institutional)
	Noise impact
	Air quality
Natural Environment	Potential Impacts to Vegetation
	Potential Impacts to Wild life Habitats
	Potential Impacts to Watercourses
	Potential Impacts to Natural Hazards
Cost	Construction Cost
	Maintenance / Operational Cost

6.3 Assessment of Alternative Designs

A detailed assessment of the alternative alignment designs was completed based on the criteria and is included in **Table 6-2**.

Table 6-2 - Evaluation of Alternative Designs

Category	Criteria	Alternative 1		Alternative 2		Alternative 3		Alternative 4	
		<i>Do Nothing (For Comparison Purpose Only)</i>		<i>Widen About the Centre Line</i>		<i>Widen About the Centre Line and To The East Along Natural Heritage System</i>		<i>Use of Roundabouts at Intersections.</i>	
Technical	Geometry	●	No opportunities to improve road geometry.	●	High potential for road geometry improvements.	●	High potential for road geometry improvements.	●	High potential for intersection geometry improvements.
	Road Safety	○	No improvements from existing conditions.	●	High potential for road safety improvements.	●	High potential for road safety improvements.	●	Potential for road safety improvements at intersections.
	Future development and traffic	○	Does not accommodate future development and traffic requirements.	●	Accommodates future development and traffic requirements.	●	Accommodates future development and traffic requirements.	●	Accommodates future development and traffic requirements.
	Transit Service	○	Does not accommodate future transit service requirements.	●	Accommodates future transit requirements.	●	Accommodates future transit requirements.	●	Does not fully accommodate future transit service requirements.
	Stormwater Management	○	No improvements from existing drainage conditions.	●	High potential for improvements to stormwater management	●	High potential for improvements to stormwater management	●	Potential for improvements to stormwater management at intersections.
	Utility relocation	●	No utility relocations required.	○	Major utility impacts and relocation required.	○	Major utility impacts and relocation required.	○	Major utility impacts and relocation required.
	Compatibility with Active Transportation Master Plan (ATMP)	○	Not compatible with ATMP	●	Compatible with ATMP	●	Compatible with ATMP	●	Compatible with ATMP
Socio Economical / Cultural Heritage / Archaeological	Property Impact	●	No property required.	●	Property required along the east and west sides of Sixth Line.	○	Property required along the east and west sides of Sixth Line with additional property required along the east side at the Natural Heritage System.	○	Large amount of property required at intersection compared to traffic signals.
	Compatibility with Town's North Oakville Secondary Plan/ Future Land Use and Development	○	Not compatible with North Oakville Secondary Plan and future land use.	●	Compatible with North Oakville Secondary Plan and future land use.	●	Compatible with North Oakville Secondary Plan and future land use.	●	Compatible with North Oakville Secondary Plan and future land use.
	Cultural Heritage Resources	●	No impacts to cultural heritage resources.	●	Minor impacts to cultural heritage resources.	○	Minor impacts to cultural heritage resources.	○	Moderate impacts to cultural heritage resources.
	Archaeological Resources	●	No impacts to archaeological resources.	●	Potential archaeological impacts.	○	Potential archaeological impacts.	○	Potential archaeological impacts.
	Access (Residential, Commercial, and Institutional)	●	No opportunity for access improvements.	●	High potential for access improvements.	●	High potential for access improvements.	●	No opportunity for access improvements.
	Noise Impacts	○	Large increase in noise levels due to increase in traffic and congestion.	●	Minimal increase in noise levels.	○	Minimal increase in noise levels.	○	Minimal increase in noise levels.
	Air Quality	○	Potential decrease in air quality with increase in traffic over time.	●	Potential improvements in air quality with increase in roadway capacity to accommodate traffic.	●	Potential improvements in air quality with increase in roadway capacity to accommodate traffic.	●	Potential improvements in air quality with reduction of idle time at intersections.

Category	Criteria	Alternative 1		Alternative 2		Alternative 3		Alternative 4	
		<i>Do Nothing (For Comparison Purpose Only)</i>		<i>Widen About the Centre Line</i>		<i>Widen About the Centre Line and To The East Along Natural Heritage System</i>		<i>Use of Roundabouts at Intersections.</i>	
Natural Environment	Potential Impacts to Vegetation	●	No impacts to vegetation.	●	Moderate impacts to vegetation with potential for mitigation.	●	Minor impacts to vegetation with potential for mitigation.	●	Moderate impacts to vegetation with potential for mitigation.
	Potential Impacts to Wild life Habitats	●	No impacts to wild life habitats.	●	Moderate impacts to wild life habitats with potential for mitigation.	●	Minor impacts to wild life habitats with potential for mitigation.	●	Moderate impacts to wild life habitats with potential for mitigation.
	Potential Impacts to Watercourses	●	No impacts to watercourses.	●	Moderate impacts to watercourses with potential for mitigation.	●	Minor impacts to watercourses with potential for mitigation.	●	Moderate impacts to watercourses with potential for mitigation.
	Potential Impacts to Natural Hazards	●	No impacts to natural hazards.	●	Moderate impacts to natural hazards with potential for mitigation.	●	Minor impacts to natural hazards with potential for mitigation.	●	Moderate impacts to natural hazards with potential for mitigation.
Cost	Construction Cost	●	No construction costs.	●	High construction costs.	○	Higher construction costs due to additional required work.	○	Higher construction costs due to additional required work at intersections.
	Maintenance / Operational Cost	○	High maintenance and operational costs.	●	Low maintenance and operational costs.	●	Low maintenance and operational costs.	●	Low maintenance and operational costs.
Recommendation		Still viable alternative; Does not address the problem statement, but will be carried forward for comparison purposes.		Not Carried forward; Meets Town's North Oakville Secondary Plan and Active Transportation Master Plan (ATMP) Goals and Objectives and implements the preferred solution but impacts the Natural Heritage System located south-west of the Sixth Line/Burnhamthorpe Road intersection.		Carried forward; Meets Town's North Oakville Secondary Plan and Active Transportation Master Plan (ATMP) Goals and Objectives and implements the preferred solution while minimizing environmental impacts at the Natural Heritage System.		Not Carried forward; The property and environmental impacts required to implement roundabouts at intersections are too high when compared to the installation of traffic signals at intersections.	

LEGEND: ● Most Desirable ● More Desirable ● Neutral ● Less Desirable ○ Least Desirable



6.4 Selection of Preferred Alternative Design

Based on the evaluation of the alternative design concepts and consultations, the preliminary preferred alternative design is widening Sixth Line along the existing centreline and shifting to the east along the Natural Heritage System (Alternative 3) to minimize impacts to properties, cultural heritage resources and natural heritage features including existing vegetation. The design also provides an opportunity to provide enhanced landscaping and streetscaping features to the corridor.

The Preliminary Preferred Design was presented to the agencies, utilities and the public as part of Public Information Centre #2 for review and comment. All input received during Phase 3 was taken into consideration and was used to refine the Preliminary Preferred Design, where appropriate.

7 Project Description

Based on the evaluation of Alternative Designs, Alternative #3 was selected as the Preliminary Preferred Design with refinements and carried forward for further design considerations. The Preferred Design widens the road about the centerline between Dundas Street and Future Street “D”, minimizing property impacts to the property owners on both sides of the road. Between Future Street “D” and Burnhamthorpe Road, the widening shifts east to mitigate impacts to the Natural Heritage System located to the south-west of the Sixth Line and Burnhamthorpe Road intersection. The alignment then shifts back to the existing centreline between Burnhamthorpe Road to Highway 407 ETR.

The key elements of the Preliminary Preferred Design are as follows:

- Sixth Line widened to four lanes from Dundas Street to Highway 407 (ETR);
- Left turn lanes provided throughout the corridor;
- The signalization of intersections;
- The provision of sidewalks and on-street bicycle lanes and potential for on street parking layby’s in front of Neighbourhood Centre and Park lands;
- The provision of continuous medians to enhance the streetscape and landscaping features; and
- Culvert structure replacements.

The following sub-sections provide the details of the Preferred Design in order to meet the requirements of the Class EA process.

7.1 Design Criteria

Sixth Line is currently is a two-lane road with a rural cross section and a posted speed of 60 km/h between Dundas Street and Highway 407 ETR. Once the improvements have been implemented, the posted speed limit on Sixth Line will be maintained at 60 km/h; this is consistent with the transformation of Sixth Line from a rural corridor to a pedestrian and cyclist-friendly transit corridor.

To develop the preliminary design for the widening of Sixth Line, design criteria for the roadway geometrics were established based on direction from the Town of Oakville staff, the Town of Oakville’s road design standards and design standards from Transportation Association of Canada (TAC) – *Geometric Design Guide for Canadian Roads*. TAC guidelines were used to select and assess the horizontal and vertical curve geometry for the recommended design.

The preliminary design criteria for the recommended road design are presented in **Table 7-1** and **Appendix J**.

Table 7-1 – Sixth Line Design Criteria

Description	ESR Standard
Classification	
Road Classification	UAU 70
Design Speed (km/h)	70
Posted Speed (km/h)	60
Horizontal Alignments	
NC Normal Crown (-0.02m/m) Rmin (m)	1680
Curve Radius with Super-Elevation Rate e=0.06 Rmin (m)	190
RC Reverse Crown (+0.02m/m) Rmin (m) , for e=0.06	330
Curve Radius with Super-Elevation Rate e=0.04 Rmin (m)	200
RC Reverse Crown (+0.02m/m) Rmin (m) , for e=0.04	290
Minimum Tangent Between Curves (m)	75
Minimum Tangent at Intersections (m)	60
Transition Between 4 Lane and 2 Lane :	
Parallel Lane (m)	120-195
Merging Taper (m)	115
Diverging Taper (m)	60
Right Turn Taper	60-70
Right Turn Parallel	50-110
Left Turn Taper	50-140
Left Turn Parallel	95-110
Vertical Alignments	
Maximum Grade (%)	5
Minimum Grade (%)	0.5
Sag Vertical Curve Kmin.	12
Crest Vertical Curve Kmin.	23
Length of Curve (min) (m)	70
Minimum Stopping Sight Distance (m)	115
Cross Sections	
Through Lane Width (m)	3.35
Left Turn Lane Width (m)	3.25
Right Turn Lane Width (m)	3.25
Curb Lane Width (m)	3.35
Tangent Section Crossfall (%)	2%
Sidewalk Width (m) (min)	1.50
Sidewalk Crossfall (%)	2%
Layout	
Radius of Curbs at Intersections:	
Arterial to Local (m)	10.5
Arterial to Collector (m)	10.5
Arterial to Arterial (m)	15.0
ROW Width (m)	31.0



7.2 Road Geometry

7.2.1 Horizontal Alignment

The proposed Sixth Line horizontal alignment shifts in order to minimize the impacts to the different constraints. From the north of Dundas Street to the south of Future Street ‘D’, the alignment maintains the existing tangent centreline. The alignment then shifts towards the east to avoid the Natural Heritage System through the use of a reverse curve. The alignment then shifts back to the existing tangent centreline with another reverse curve. A reverse crown will be required to accommodate the radii of the reverse curves. The alignment then follows the existing centreline to the end of the study limit at the Highway 407 ETR bridge structure.

7.2.2 Vertical Alignment

After identifying the overall vertical profile elements for the existing Sixth Line corridor (Section 3.2.1.3), profile improvements and corridor illumination were recommended. Transportation Association of Canada (TAC) – *Geometric Design Guide for Canadian Roads* was used to assess and select the proposed vertical curve (K) values for the preliminary vertical alignment design.

The new vertical alignment proposed for Sixth Line generally follows the existing road profile with some minor variations increasing the road grade to ensure improved curves as well as to maintain a minimum 0.5% grade for improved drainage.

7.2.3 Pavement Design

Considering the traffic requirements and subgrade conditions, the recommended pavement design for Sixth Line is detailed in Table 7-2. The geotechnical recommendations are further discussed in Section 8.4.

Table 7-2 – Sixth Line Recommended Pavement Design

Pavement Structure	Reconstruction and New Construction (mm)
HL3 Asphaltic Concrete	50
HL8 Asphaltic Concrete	100
Granular ‘A’ or 20mm Crusher Run Limestone	150
Granular ‘B’ or 50mm Crusher Run Limestone	450

7.2.4 Typical Cross-Sections

Typical cross-sections for the Sixth Line corridor were developed based on the design criteria presented in Section 7.1.1 and discussions with Town of Oakville staff. The typical sections have been developed to implement the *North Oakville East Secondary Plan’s* “Avenue/Transit Corridor” classification for Sixth Line, which permits on-street parking outside the Natural Heritage System areas and encourages transit supportive development and the *Active Transportation Master Plan’s* recommended on-road bike lanes.



Three typical cross-sections are proposed for Sixth Line which are comprised of an urban cross-section with no on-street parking, an urban cross-section with on-street parking for use in front Neighbourhood Centre and Neighbourhood Park Areas and an urban cross-section for the shifted alignment at the Natural Heritage System. Common elements to all include a 31.0m right-of-way, 3.35m through lanes, 1.66m on-street bike lanes and a 4.50m landscaped median. At the intersections, a 3.25m left turn lane and 1.25m raised median are provided instead of the landscaped median.

The typical sections for the preferred design are shown in **Figures 7-1, 7-2 and 7-3.**

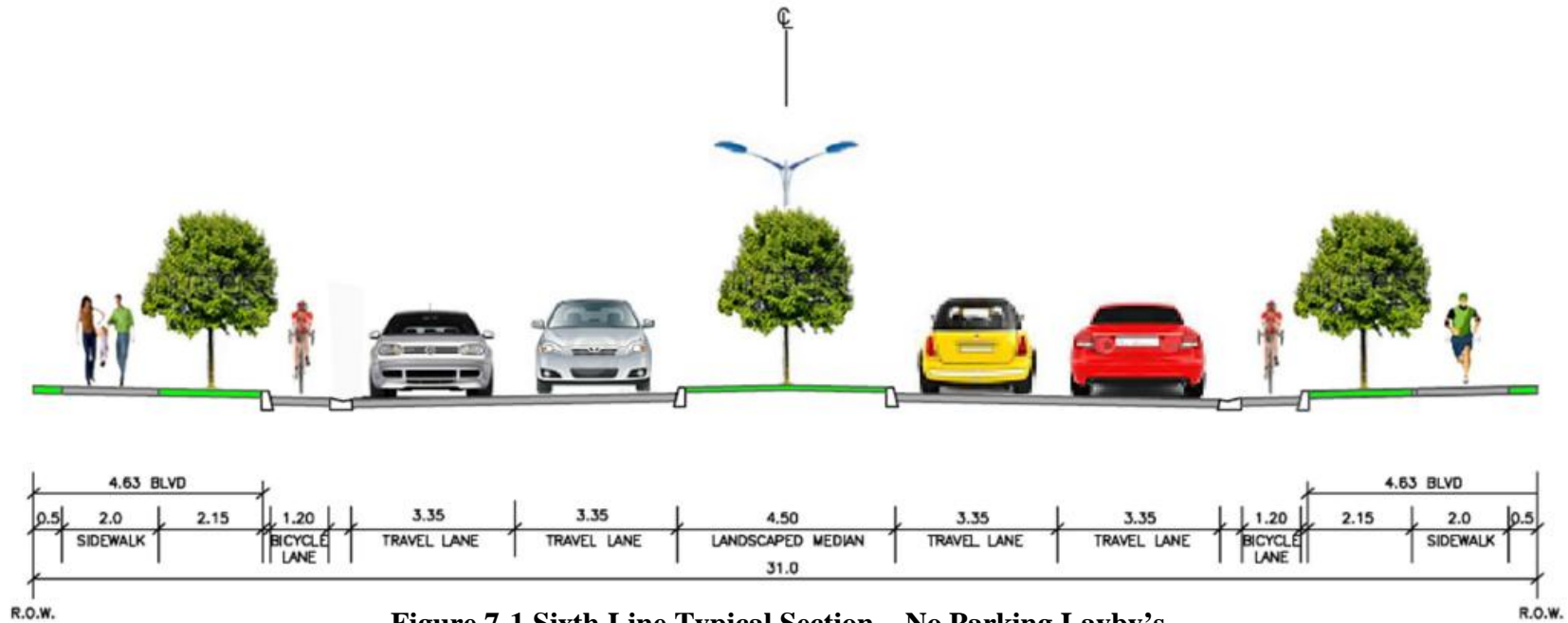


Figure 7-1 Sixth Line Typical Section – No Parking Layby's

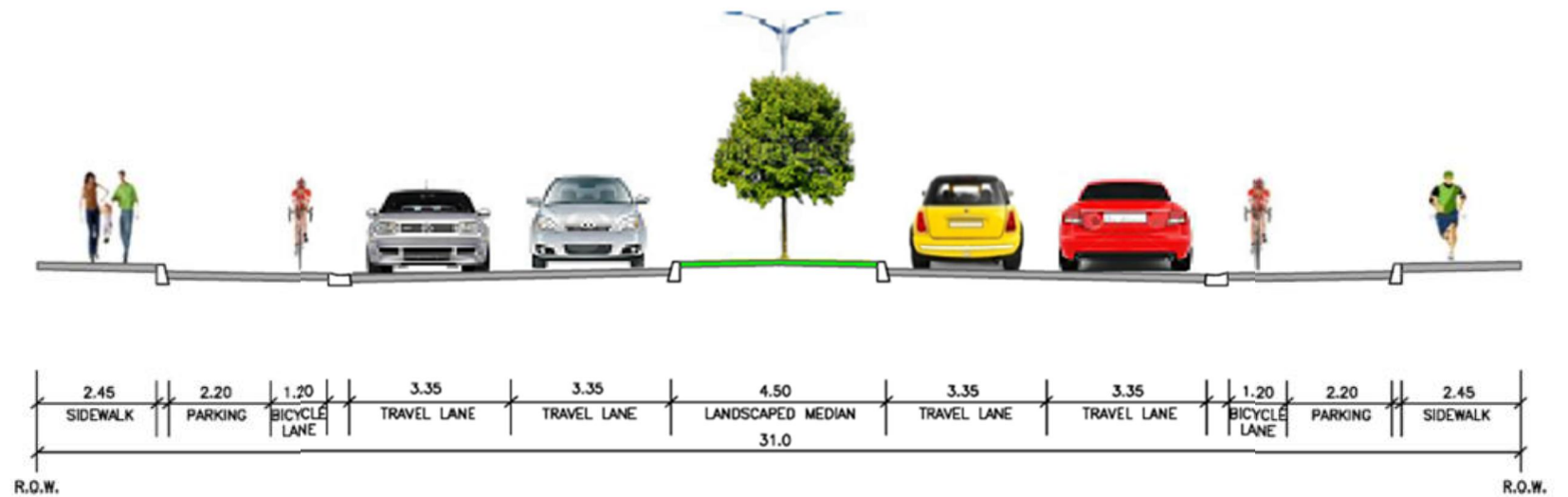


Figure 7-2 Sixth Line Typical Section – Parking Layby's on Both Sides

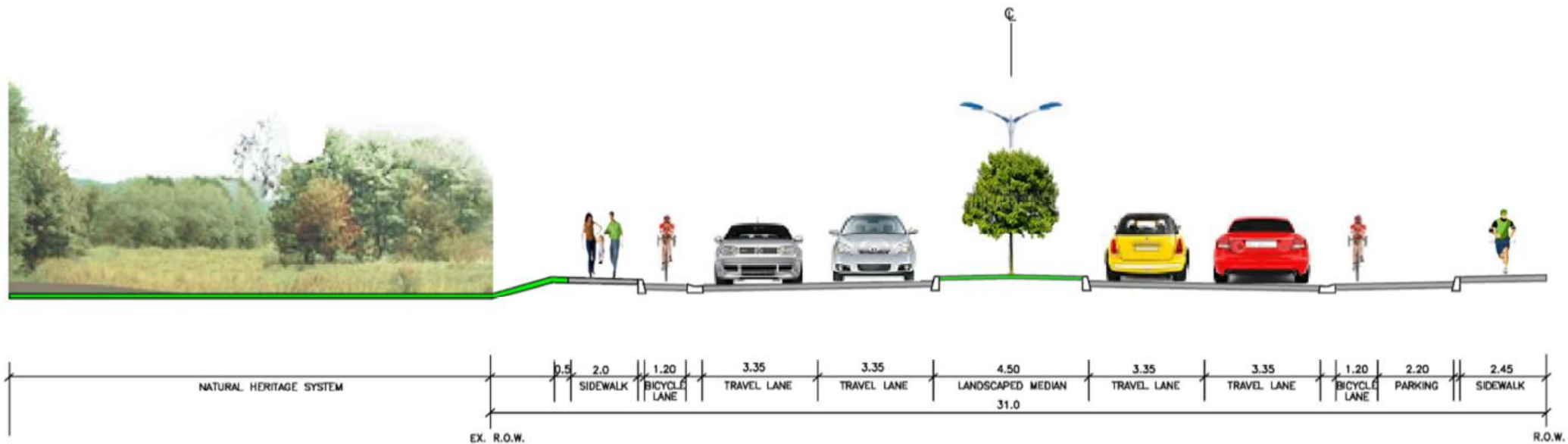


Figure 7-3 Sixth Line Typical Section – Natural Heritage System



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7.3 Pedestrian and Cyclist Facilities

Provisions for cyclists and pedestrians have been included in the preferred design for the widening of Sixth Line through the use of both sidewalks and on-street bike lanes as per the Town of Oakville's *Active Transportation Master Plan*. The preferred alternative includes a minimum 2.0m wide sidewalk along both sides of Sixth Line throughout the corridor. The sidewalks are generally separated from the travel lanes by means of a minimum 2.15m wide boulevard or 2.20m wide parking layby's depending on the location. On-street bike lanes are also proposed along both sides of Sixth Line with a minimum width of 1.66m. The on-street bike lanes are currently separated from the travel lanes through the use of a mountable curb and gutter. This separation of the bike lanes and travel lanes will be further examined during the detailed design stage.

7.4 Intersections

The preferred design will maintain all existing intersections along Sixth Line with the following configurations:

- Sixth Line and Dundas Street – Signalized, exclusive left turn lanes on all approaches, eastbound exclusive right turn lane;
- Sixth Line and Kaiting Trail – Exclusive northbound and southbound left turn lanes;
- Sixth Line and Sixteen Mile Drive – Signalized, exclusive left turn lanes on all approaches; and
- Sixth Line and Burnhamthorpe Road - Signalized, exclusive northbound and southbound left turn lanes.

A total of 4 new intersections will be introduced along Sixth Line due to the Region of Halton's New North Oakville Transportation Corridor as well as adjacent development. The new identified intersections will have the following configurations:

- Sixth Line and North Park Drive – Signalized, exclusive left turn lanes on all approaches;
- Sixth Line and Future Street "C" – Signalized, exclusive northbound and southbound left turn lanes;
- Sixth Line and Future Street "D" – Signalized, exclusive northbound and southbound left turn lanes; and
- Sixth Line and New North Oakville Transportation Corridor – Two lane roundabout.

The traffic movements and configurations of the remaining intersections will be reviewed as part of the draft plan approval process during the detailed design stage.

7.5 Improvements at Sixth Line and Dundas Street

The Region of Halton, as part of its Dundas Street Rapid Bus Transit Corridor, is completing an Environmental Assessment for Dundas Street from Neyagawa Boulevard to Oak Park Boulevard to widen Dundas Street to six lanes including transit/HOV lanes. The Sixth Line and Dundas Street intersection is located within the project area. Due to the intersection's close proximity to the Munn's United Church and Munn's Cemetery, the widening of Dundas Street in this area



will be shifted completely to the north. Coordination was undertaken with the Region of Halton who provided the intersection design which was implemented in the Sixth Line preferred design. The construction of the Sixth Line and Dundas Street intersection by the Region is scheduled to start in late 2016 to early 2017.

7.6 Improvements at Sixth Line and the New North Oakville Transportation Corridor

The Region of Halton is completing the detail design of the New North Oakville Transportation Corridor which involves the construction of a new four lane roadway to improve the transportation system capacity in north Oakville. The New North Oakville Transportation Corridor intersects Sixth Line between Burnhamthorpe Road and Highway 407 ETR. The Sixth Line intersection, as proposed by the Region, will consist of a two lane roundabout. The Region provided the roundabout design which was implemented in the preferred design for Sixth Line. The construction of the Sixth Line intersection by the Region is scheduled to start in late 2015.

7.7 Driveway Access / Restrictions

Due to the planned subdivision developments adjacent to the Sixth Line corridor, most existing driveway entrances will be removed and property access will be provided through the future local roads intersecting Sixth Line. The proposed 4.5m centre landscaped medians allows for the possible inclusion of centre turn lanes to access properties fronting Sixth Line. The access to the individual properties will be reviewed during detailed design to determine if full movement entrances can be provided.

7.8 Drainage and Stormwater Management

Under the proposed conditions, Sixth Line will be widened and the adjacent properties will include subdivisions on both sides. The road cross-section will be updated to a more urbanized, four lane cross section. Storm sewers are proposed in place of roadside ditches. The proposed right-of-way is 31.0 m. Approximately 83.4% of the proposed cross-section is made up of impermeable surface material (lanes, shoulders). The remaining 16.6% is permeable material (green landscaping).

Further details can be found in the Drainage Conditions Report located in **Appendix H**.

7.8.1 Stormwater Management Strategy and Alternatives

The proposed widening of Sixth Line will require an updated stormwater management strategy that addresses the targets established in NOCSS and incorporates the additional drainage from the increased impervious area.

The recommended design for conveyance of the minor system is installation of a trunk storm sewer on Sixth Line. With the urbanization of surrounding property, roadside ditches will no longer be a viable option for conveyance.

A number of alternatives have been considered to meet NOCSS targets. These alternatives are discussed in detail below.

Alternative 1 Sixth Line SWM pond(s): Stormwater management ponds designed for treatment of drainage from Sixth Line alone.



Alternative 2 Low Impact Development (LID) SWM on Sixth Line: Using LID techniques within the Sixth Line ROW as part of the overall SWM strategy.

Alternative 3 Underground pipe storage and oil grit separators: Using oversized storm sewer pipes and orifice plates to meet quantity control targets and oil grit separators to meet quality control targets.

Alternative 4 Collaborate with adjacent developers on SWM design: Considering Sixth Line drainage in tandem with drainage from proposed, adjacent residential developments to design a SWM strategy that encompasses drainage from both developments.

The advantages and disadvantages of these alternatives are discussed in **Table 7-3**.

Table 7-3 – Stormwater management alternatives for Sixth Line

#	Description	Advantages	Disadvantages	Recommendation
1	Sixth Line SWM pond(s)	N/A	Implementing SWM ponds solely for the purpose of treating Sixth Line drainage is not feasible due to limited space constraints in the ROW.	Not recommended
2	LID SWM on Sixth Line	LIDs can be integrated into landscaped and parking areas. Can provide some quality and quantity control. Facilitates evapotranspiration and infiltration. Some of the drainage can be managed within the Sixth Line ROW.	Space within Sixth Line ROW is limited and implementing LID may not be possible.	Consider the use of LIDs in the detailed design stage.
3	Underground pipe storage and oil grit separators	Can attenuate peak post development flows to existing levels. Water quality targets addressed through the use of oil grit separators. Drainage can be managed within the Sixth Line ROW.	Would not allow any infiltration for evapotranspiration to occur. Expensive in comparison to other SWM alternatives.	Recommended only when other alternatives are not feasible



#	Description	Advantages	Disadvantages	Recommendation
4	Collaborate with adjacent developers on SWM pond design	An economical management strategy when drainage from Sixth Line and adjacent developments is considered in tandem. SWM ponds would also allow for potential evapotranspiration and infiltration.	Proposed development of Sixth Line stormwater management strategy depends on timing of adjacent developments moving forward	Recommended alternative

The preferred alternative for providing quality and quantity treatment is Alternative 4; collaborate with adjacent developers on stormwater pond design. Alternative 3, underground pipe storage and oil grit separators, is recommended only when Alternative 4 is not feasible. Alternative 2, the use of a LID strategy, should be considered in the detailed design stage if there is available space within the ROW.

7.8.2 Drainage Areas

This section is to provide a preliminary indication of volume and space requirements and the stormwater strategy for the drainage areas identified in **Section 3.3.5**.

7.8.2.1 D1: Highway 407 to 470m north of Burnhamthorpe Road

It is expected that in the future, undeveloped land to the east of this catchment will be replaced by residential subdivision. 68.83 ha east of Sixth Line is owned by Star Oaks Development Limited. This development will require stormwater management measures to control post to pre development flows. These measures will likely consist of one or more of the following: SWM ponds, underground storage tanks, bioretention areas and rain water harvesting. It is recommended that the Town collaborate with developers on stormwater management design. It is recommended that these ponds be sized to meet targets as outlined in NOCSS.

The 100 year design flow from D1 is 0.74 m³/s. Based on the hydrologic model, 971 m³ of storage is required to control the 100 year post development flow to NOCSS pre development levels.

7.8.2.2 D2: 470m north of Burnhamthorpe Road to Burnhamthorpe Road

Catch basins and storm sewers will replace roadside ditches on Sixth Line under future conditions. The road profile slopes from north to south throughout catchment D2 which will be maintained in the future. Therefore, end of pipe facilities for D2 will be south of the catchment.

The EIR & FSS (2012) completed for the Sixth Line Corporation shows a number of future ponds south of catchment D2 off of Sixth Line. There are three ponds that should be investigated including SWM 17A. At this time, no information has been provided for any of the three ponds. It is recommended that the Town collaborate with the developers on design of the above



mentioned ponds. The Town should work together with developers to ensure that ponds meet quality and quantity control targets as outlined in NOCSS.

The 100 year design flow from D2 is 0.57 m³/s. To control this flow from post development to NOCSS pre-development levels 822 m³ of storage would be required.

7.8.2.3 D3: Burnhamthorpe Road to 425m South of Burnhamthorpe Road

Catch basins and storm sewers will replace roadside ditches on Sixth Line under future conditions. The road profile slopes from north to south throughout catchment D3 which will be maintained in the future. Therefore, end of pipe facilities for D3 will be south of the catchment.

The EIR & FSS completed for the Sixth Line Corporation shows two future ponds downstream from D3 that should be investigated. At this time, no information has been provided for these two ponds. It is recommended that the Town collaborate with the developers on design of the above mentioned ponds. The Town should collaborate with developers to ensure that ponds meet quality and quantity control targets as described in NOCSS and.

The 100 year design flow from D3 is 0.52 m³/s. To control this flow from post development to NOCSS pre-development levels 682 m³ of storage would be required.

7.8.2.4 D4: 425m South of Burnhamthorpe Road to 675m North of Dundas Street

Catchment D4 has been considered by the EIR & FSS completed for the Sixth Line Corporation. SWM pond 22A will include drainage from this portion of Sixth Line. In the preliminary modeling results for 22A (included in an appendix of the EIR & FSS), the entire catchment flowing into 22A has been considered as just one area. It is assumed that during the detailed design of 22A, the impact of drainage from the future Sixth Line will be considered thoroughly.

It is recommended that storm sewers and catch basins be installed on Sixth Line to collect drainage and divert it to Pond 22A. It is recommended that the Town collaborate with Sixth Line Corporation and Argo Development Corporation to design this storm sewer. Sixth Line Corporation is investigating three connection points to a future storm sewer on Sixth Line. The connections shown are at future streets “C” and “D.” The third connection point is at future street “AS” as described in the Phase I Environmental Site Assessment for the Proposed Housing Development prepared for Argo Development Corporation (June 2005). The storm sewer system will outlet to SWM 22A, located at the south end of the development

The 100 year design flow from D4 is 0.84 m³/s. Approximately 1880 m³ of storage will be required to control the post development 100 year flow to NOCSS predevelopment levels.

7.8.2.5 D5: 675m North of Dundas Street to 150m north of Dundas Street

Catchment D5 has not been incorporated in the future SWM 22A by the Sixth Line Corporation. This is due to the channel on the east side of Sixth Line that separates Sixth Line from this future development. Crossing the channel is not a viable option.

The residential development on the west side of catchment D5 is owned by Timsin/ Arrassa. SWM pond 22 is planned for south end of this development. Drainage from catchment D5 has not been considered in the design of SWM 22. Therefore, it is not recommended for treatment of Sixth Line drainage.



There are two options for treatment of drainage from D5. In option 1, an adjacent pond can be designed to over control to account for this section of Sixth Line. In option 2, underground pipe storage for quantity control and an oil grit separator for quality control can be used.

The 100 year post development flow from D5 is 0.62 m³/s. Based on modeling results, 874 m³ of storage is required to attenuate post development flow to NOCSS pre development levels.

In option 1, the 874 m³ of storage can be accounted for in future SWM pond 22A. This pond can be designed to over control for D5.

In option 2, the 874 m³ of storage can be accounted for in oversized underground pipes. Orifice plates can be used to restrict post development flows to pre development levels. Preliminary orifice calculations and pipe storage sizing have been completed for this catchment. There is an existing low point in the Sixth Line profile near the existing 800 mm CSP culvert. This would be an ideal location to outlet future storm sewers. The outlet could be directed towards to the future realigned channel on the east side of Sixth Line. It is recommended to use a 97 mm orifice plate. The approximate diameter required for pipe storage is 1650 mm.

In option 2, for quality control, it is recommended to use oil grit separators designed for enhanced level protection at the outlet point.

The preferred option by Conservation Halton and the Town of Oakville is over control in an adjacent SWM pond, therefore option 1 is recommended.

7.8.2.6 D6: 150m north of Dundas Street to Dundas Street

Catchment D6 is located at the south end of the study area. As such, it is the lowest section of Sixth Line based on the existing road profile. Therefore, drainage from this section cannot be directed to any of the future ponds mentioned in the previous sections.

A very minimal amount of roadway work is proposed as part of the Sixth Line widening in catchment D6. As such, no additional water quantity control measures are proposed.

There is an existing 450 mm concrete storm sewer in this catchment running south towards Dundas Street. The 450 mm sewer connects to a 700 mm storm sewer near the intersection of Dundas Street and Sixth Line. The 700 mm storm sewer outlets to a ditch at the Dundas Street and Sixth Line intersection. Drainage into this sewer includes Catchment 6 and the church property east of Catchment 6.

The capacity of this storm sewer was checked to verify if it can handle increased drainage from Sixth Line. The calculations show that the sewer is undersized at one length of pipe. It is recommended to maintain the existing connection and upsize the length of pipe that is under capacity from a 450 mm to a 525 mm.

For water quality control, it is proposed to use oil grit separators designed for enhanced level protection at the outlet.



7.8.3 Culverts

Under proposed conditions, only two culverts will be crossing Sixth Line between Dundas and Burnhamthorpe. The crossings are at Culvert 2 and Culvert 4. New culverts are proposed in place of existing.

A hydraulic analysis has been completed for these two culverts to determine the feasibility of replacement alternatives.

Residential developments are proposed for the east and west sides of Sixth Line. The catchments of the two proposed culverts will be affected by these developments.

The details of the stormwater management plan for the adjacent developments will be discussed in their corresponding EIR & FSS reports. For the purpose of this discussion, it is assumed that flow rates into the culverts will be controlled to the existing condition flow.

During the detailed design phase, it is necessary to refine the existing flow targets for the two culvert crossings. Significant drainage area exchanges have been proposed by adjacent developers that will affect the catchment area upstream the two culverts. At the time of writing, not all of these exchanges have been finalized and therefore are not considered in this analysis. Any future drainage area exchanges must be taken into account during the detailed design phase.

7.8.3.1 Culvert 2

As discussed in **Section 3.3.1.4**, West Morrison Creek will be realigned as part of the developments of the adjacent lands. Culvert 2 is affected by this channel realignment.

A fluvial geomorphology assessment is required for the section of West Morrison Creek that will be realigned, including Culvert 2. At this time, allocation has not yet been finalized for Culvert 2 works. Culvert 2 replacement and lowering should be left to when development works proceed. The party that proceeds first with development, be it adjacent land owners with residential development or the Town with Sixth Line widening, will be responsible for a full fluvial geomorphologic assessment.

At the time of writing, Rand Engineering has conducted a review of Culvert 2 as part of an EIR & FSS Study for Upper West Morrison Creek for Star Oaks. Based on their hydraulic and geomorphic assessment of this culvert, they concluded that this culvert is undersized and does not meet NOCSS requirements with respect to wildlife and fish passage. They have recommended that Culvert 2 be replaced with a 7.32 m x 1.75 m CONSPAN open bottom culvert. According to Rand, the installation of the new culvert will result in a grade lowering of the existing grade by about 0.85 m at the upstream invert.

A hydraulic analysis of the culvert proposed by Rand Engineering has been conducted to verify its hydraulic adequacy. Assumptions in the analysis are based on what has been proposed by Rand.

Future Culvert 2 will be extended in length to fit in with the proposed road widening. The outlet of Culvert 2 will be at the realigned reach MOC-W1.

The inlet of this culvert has been estimated based on the existing channel elevations and the proposed grade lower of 0.85 m. The approximate length required for this culvert is 47 m.



Although the existing alignment of the culvert can be maintained, the vertical profile will change with the proposed works.

The 7.32 m x 1.75 m replacement alternative for Culvert 2 is able to discharge the 100 year design flow and the Regional flow without overtopping the roadway. It is expected that there will be no increase to upstream flood levels due the large increase in culvert span under proposed conditions. It is recommended that the existing culvert be replaced with the 7.32 m x 1.75 m culvert as proposed by Rand Engineering or an alternative open bottom culvert with equivalent hydraulic capacity.

7.8.3.2 Culvert 4

The future culvert 4 will be extended in length to fit in with the proposed road widening. The existing inlet of this culvert is at the ditch east of Sixth Line that runs perpendicular to the roadway. In the future, the inlet of this culvert will be at the outlet of SWM pond “17A.” Because of this, horizontal alignment of this culvert will also change. The approximate culvert length required is 36.4 m. The inlet and outlet elevations were estimated based on survey information of the existing ditches.

The road sag elevation reported is much higher under proposed conditions. This because under existing conditions, drainage is able to continue south via roadside ditches until it reached the lowest point in the road profile, where overtopping would occur. This point was considered the road sag elevation in the existing analysis.

Under proposed conditions, there are no road side ditches and developed area surrounds Sixth Line. There is a local low point over top of the culvert where overtopping would be expected to occur.

The calculations show that an 825 mm culvert at this location does meet Town of Oakville standards for overland flow. Therefore, it is recommended that the minimum size of the replacement culvert at crossing 4 is 825 mm.

Since the recommendation for the replacement culvert 4 is larger than existing and the proposed road profile at this location is similar to existing, therefore no increase in flood levels is expected.

7.8.4 Phasing

The stormwater management strategy for Sixth Line relies on the implementation of SWM facilities by adjacent developers. It has been recommended that all drainage from north of the West Morrison Channel Crossing (Culvert 2) be considered by adjacent developers in their pond design. Therefore, management of drainage from the widened Sixth Line depends on developers moving forward with pond construction.

In terms of SWM, the ideal timing of Sixth Line widening is after adjacent pond development. If development of Sixth Line precedes adjacent pond construction, it is recommended that a temporary drainage strategy be implemented.



7.8.4.1 Culvert 2

As discussed in **Section 7.8.3.1**, a fluvial geomorphology assessment is required for the section of West Morrison Creek that will be realigned, including Culvert 2. At this time, allocation has not yet been finalized for Culvert 2 works. Culvert 2 replacement and lowering should be left to when development works proceed. The party that proceeds first with development, be it adjacent land owners with residential development or the Town with Sixth Line, will be responsible for a full fluvial geomorphologic assessment.

If development of Sixth Line precedes the West Morrison Creek channel realignment, a fluvial geomorphologic assessment must complete for this crossing as part of Sixth Line widening works. A temporary culvert will be required at this crossing until adjacent channel works are completed.

The preference is to wait to do widening works north of the channel (i.e. north of North Park Drive) until EIR & FSS reports are finalized.

7.8.4.2 Culvert 4

The outlet of SWM Pond 17A will be at the inlet of Culvert 4. It is recommended that the construction of this culvert go in tandem with the construction of SWM 17A. If widening of Sixth Line precedes construction of SWM Pond 17A, a temporary culvert crossing will be required.

7.8.4.3 Spill Areas

Reach MOC-W3

As noted in **Section 3.3.1.4**, the existing reach MOC-W3 on West Morrison Creek flows partially within the ditch on the west side of Sixth Line. During major storm events, there is a possibility that even more flow would spill into the Sixth Line ditch system. Under post development conditions, this reach will be realigned as previously described.

If widening of Sixth Line precedes the realignment of reach MOC-W3 on West Morrison Creek, an interim drainage strategy will be required. This strategy should involve a temporary ditch on the west side of Sixth Line. The ditch should extend from south of Core Area #7 to the West Morrison Creek culvert crossing (Culvert 2). During the detailed design, the location and extent of the spill areas should be verified so that any temporary ditches that may be required can be designed accordingly.

Reach MOC-W1

As noted in **Section 3.3.1.4**, reach MOC-W1 encounters the ditch on the west side of Sixth Line approximately 330 m north of Dundas Street West. During major storm events, it is likely that even more flow would spill into the Sixth Line ditch system. Under post development conditions, this reach will be realigned as previously described.

If widening of Sixth Line precedes the realignment of reach MOC-W1 on West Morrison Creek, an interim drainage strategy will be required. This strategy should involve a temporary ditch on the east side of Sixth Line. During the detailed design, the location and extent of the spill areas



should be verified so that any temporary ditches that may be required can be designed accordingly.

7.9 Traffic Signals and Illumination

There is currently no existing illumination along Sixth Line between Dundas Street and Highway 407 ETR. As part of the urbanization of the Sixth Line corridor along with the adjacent development, new illumination is proposed as part of the preferred design to ensure adequate lighting levels along the roadway are provided. The proposed lighting pole locations will be in the centre landscaped median to illuminate both directions of travel. The need and type of illumination along the Sixth Line corridor will be confirmed at the detail design stage.

All existing signalized intersections along Sixth Line will be maintained as signalized. Temporary traffic control signals will be installed and maintained during the construction phases. Permanent traffic control signals will be installed during the final stages of the project to accommodate the intersection layouts.

7.10 Landscaping

The proposed widening of the Sixth Line corridor provides an opportunity to improve both the aesthetics and ecological conditions of the corridor. The proposed design provides a 4.5m centre landscaped median throughout the study area as well as boulevards on both sides of the road in areas where parking laybys are not provided such as near intersections.

The *North Oakville Urban Forest Strategic Management Plan* outlines the policies to be implemented in the preparation of the landscaping design. *The Conservation Halton Guidelines for Stormwater Management Pond and Creek Realignment Planting Plans and Tree Preservation Plans (2005)* must also be followed for any landscaping within the Conservation Halton Regulatory Areas including the future Natural Heritage System.

A landscape plan prepared by a qualified OALA Landscape Architect will be required during the detail design stage and shall conform to the Town of Oakville's current standard for street trees within the Town's right-of-way.

7.11 Transit

The preferred design includes a 30m setback from any potential parking layby's to the intersections which allows sufficient spacing for transit stops including bus pads at both the near-side and far-side of all the intersections. The location of the transit stops will be determined during the detailed design stage in coordination with the transit authorities.

7.12 Utilities

The utility impacts noted in this study are determined from the mark-up drawings provided by the utility companies. It is anticipated that all the utilities located within the proposed right-of-way for Sixth Line may require relocation to implement the proposed widening. Formal definition of utility impacts and relocation strategy will be determined during the detailed design. All utility information should be updated prior to construction to ensure that the data is accurate and to finalize relocation requirements as necessary.



7.12.1 Oakville Hydro

The proposed improvements will require the relocation of the Oakville Hydro poles which are currently running on the both sides of the road. During a coordination meeting with Oakville Hydro which Oakville held on September 30, 2013, it was determined that relocating the hydro plant underground was not recommended. Given the proposed typical sections leaving little to no boulevard to relocate the poles, some parking layby's may need to be eliminated to allow for boulevard bump-outs to install the pole. The relocation options will be reviewed during detailed design.

7.12.2 Bell Canada

Bell Canada owns underground ducts and aerial lines running along both sides of Sixth Line north of Dundas Street. The east side of the road is primarily aerial. Fibre-optic cables are also located on both sides of Sixth Line. Since the existing ducts will be located under the proposed widening of Sixth Line, it is recommended that during detail design Bell Canada be contacted and further site investigation be conducted to determine if the facilities need to be relocated. Above grade, the Bell poles and pedestals will require relocation to accommodate the widening.

7.12.3 Union Gas

Union Gas owns a 150mm gas main that runs on the east side of the road from south of Dundas Street to slightly north of the property for #3043 Sixth Line. A 100mm gas main along the north side of Kaitting Trail crosses Sixth Line to connect to the main line. Most of the gas main will be located under the proposed pavement structure. As a consequence, it is very important that during detail design, the pipe elevation is surveyed to determine if the required cover is available. The gas main will need to be relocated in areas where the cover does not meet the design requirements.

7.12.4 Cogeco Cable

Cogeco Cable owns underground fibre-optic ducts along the west side of Sixth Line from Dundas Street to Sixteen Mile Drive. The Cogeco ducts may be impacted by the proposed road widening and will need to be further studied during detail design as they may require relocation.

7.12.5 Existing Watermain

The Region of Halton owns a 750mm watermain that runs on the east side of Sixth Line from the south of Dundas Street to the RJ Moore Reservoir. It will be necessary to relocate a number of existing hydrants to accommodate the widening and to ensure they are clear of obstructions. The design will need to be coordinated with the Region of Halton through subsequent design phases to ensure that all requirements are met.

7.12.6 Existing Storm Sewer

The existing storm sewer is described in detail in **Section 3.3.5.6**. The proposed improvements to the storm sewer system are described in **Section 7.8**.



7.13 Property Requirements

Property takings will be required along both sides of the Sixth Line corridor to facilitate the widening and grading. The preliminary design was prepared with the goal of minimizing the need for property along the Sixth Line corridor. A total of 39,052m² of property is required to accommodate the proposed road widening. Most of the property has been or will be dedicated as part of adjacent subdivisions review and approval process.

The locations where property requirements have been identified for this project are shown on the plan and profile drawings (**Appendix G**). The property requirements are preliminary only and subject to further review and confirmation during detailed design. The approximate property requirements are summarized in **Table 7-4** (properties are listed from south to north)

Table 7-4 – Sixth Line Property Requirements

Station (South Corner of Property)	Municipal Address	Minimum Property Required (m ²)
1+125 RT	3043 Sixth Line	266
1+179 LT	N/A	42
1+205 LT	3060 Sixth Line	423
1+207 RT	41 Dundas Street	5063
1+270 LT	3072 Sixth Line	364
1+402 LT	3108 Sixth Line	394
1+468 LT	3130 Sixth Line	358
1+533 LT	3148 Sixth Line	355
1+599 LT	3158 Sixth Line	354
1+665 LT	N/A	2105
2+008 LT	3270 Sixth Line	1875
2+065 RT	N/A	2498
2+313 LT	3380 Sixth Line	1080
2+481 RT	N/A	555
2+510 LT	N/A	1520
2+583 RT	N/A	619
2+684 RT	N/A	1296
2+786 RT	3483 Sixth Line	1665
2+938 RT	40 Burnhamthorpe Road	1887
3+143 LT	103 Burnhamthorpe Road	865



Station (South Corner of Property)	Municipal Address	Minimum Property Required (m ²)
3+148 RT	N/A	9227
3+489 RT	4115 Sixth Line	1465
3+697 LT	4182 Sixth Line	3907
3+954 LT	4243 Sixth Line	869
Total		39,052

A total of 24 properties will be impacted to accommodate the proposed road widening. Of the 24 properties, none are full acquisitions.

7.14 Construction Staging

Construction staging will likely proceed as follows:

- Relocation of above and underground utilities in conflict with the proposed road widening. This will include relocation of above ground utility pole, and other above and underground utility services and the construction of temporary pavement where necessary;
- Reconstruct/construct one side of the road at a time and provide continuous traffic lanes in both directions on the other side of the roadway;
- Reconstruct the other side of the roadway after the first side is completed. A minimum of one lane in each direction will be provided during the roadway reconstruction;
- Construct the centre medians including landscaping elements;
- Resurface the roadway after reconstruction;
- Construct streetscaping and urban design elements on both sides of the roadway where included in the plan; and
- Property owners and tenants may experience interruption to their property access during construction. To reduce this impact, all property owners should be notified prior to construction and in advance of work related to their access.

The construction staging design will be developed during the detail design stage of the project.

7.15 Implementation and Timing

Based on operational analysis and strategic needs as identified through the *North Oakville East Secondary Plan*, widening Sixth Line to 4 lanes is required from Dundas Street to Highway 407 ETR by 2021.

As discussed in **Section 4.4**, the traffic analysis identifies that Sixth Line between Dundas Street and Future Street ‘D’ will be at capacity in 2021 the section between Future Street ‘D’ and Burnhamthorpe Road be at capacity in 2031 and will need to be widened by then.



The reconstruction of Sixth Line is currently planned to be undertaken in 3 phases:

- Phase 1: Dundas Street to North Park Drive (Construction Start: 2015)
- Phase 2: North Park Drive to Burnhamthorpe Road (Construction Start: 2020)
- Phase 3: Burnhamthorpe Road to Highway 407 (ETR) (Construction Start: 2023)

The schedule will be subject to annual priority review, funding and Council approval. The Region of Halton has planned improvements to the Dundas Street and Sixth Line intersection by 2016/2017 and the construction of the New North Oakville Transportation Corridor and Sixth Line intersection by 2015. Coordination of design, tendering and construction between the Town of Oakville and the Region of Halton will be required.

7.16 Permits and Approvals

As part of the detailed design phase of this project, several permits and approvals will be required from the agencies identified in **Table 7-5**.

In addition, the Town of Oakville will be required to obtain temporary easements and/or permissions to enter from various property owners throughout the project.

Table 7-5 – Sixth Line Permits and Approvals

Regulatory Agency	Legislation	Permit/Approval	Comments
Ministry of the Environment	Ontario Water Resources Act	Permit to Take Water	Required if more than 50,000 L/day of surface or groundwater is taken including temporary dewatering during construction. The need will be reviewed during detailed design.
		Certificate of Approval for Storm, Sanitary and Watermain construction	Required for the construction of the storm sewer system along Sixth Line.
Ministry of Natural Resources	Endangered Species Act	Permit to Authorize works with potential to affected listed species or Letter of Advice	Several Species at Risk have potential habitat within the study area. The need will be confirmed with MNR during detailed design.
Ministry of Labour	Construction Projects Regulation (O.Reg. 213/91)	Notice of Project	Required prior to the start of construction.
Conservation Halton	Development, Interference with	Permit	Required for the widening of Sixth line and the culvert replacements.



Regulatory Agency	Legislation	Permit/Approval	Comments
	Wetlands & Alterations to Shorelines & Watercourses (O.Reg. 162/06)		
Halton Region	N/A	Design Approval	The Region will need to approve the design for any construction impacting regional roads including Dundas Street, Burnhamthorpe Road and the New North Oakville Transportation Corridor.
	N/A	Road Occupancy Permit	A permit from the Region will be required for any construction undertaken within the Region's Right-of-Way.
Town of Oakville	Noise Control Bylaw (2008-098)	Exemption	Required to allow construction works outside of normal hours (7 pm to 7 am) and during weekends.

7.17 Cost Estimate

The total capital construction cost of the widening of Sixth Line is estimated to be approximately \$17.8 million for all 3 phases. The cost summary is shown below in **Table 7-6**.

Table 7-6 – Construction Cost Summary

Construction Phase		Construction Cost
Phase 1	Dundas Street to North Park Drive	\$5,819,469.50
Phase 2	North Park Drive to Burnhamthorpe Road	\$7,776,366.00
Phase 3	Burnhamthorpe Road to Highway 407 ETR	\$4,247,925.50
Total Cost		\$17,843,761.00

This includes full depth reconstruction, utility relocations, traffic signals and illumination, storm sewer and drainage items as well as engineering and contingency costs. The property acquisition costs are not included in the estimate. These figures are expressed in 2014 dollars and do not carry any escalation allowance for work undertaken in future fiscal periods. The preliminary cost estimate is provided in **Appendix K**.



8 Environmental Impacts, Mitigation Measures and Monitoring

This section describes the anticipated or potential environmental impacts, both positive and negative, associated with the recommended widening design of Sixth Line. Mitigation measures, to minimize any adverse effects of the project, and recommended monitoring activities are also identified in this chapter.

8.1 Drainage and Stormwater

The stormwater management strategy for the widening of Sixth Line was previously discussed in **Section 7.8.1**. The following sections will identify the water quality and quantity targets for the implementation of the stormwater management strategy.

8.1.1 Water Quality

The following criteria are the targets for water quality along Sixth Line.

- Future SWM facilities should be designed to meet Enhanced Level Protection for (80% TSS removal) Morrison Creek subwatersheds;
- 80% TSS removal should be achieved through the use of SWM ponds wherever possible. This is proposed for catchments D1, D2, D3 and D4; and
- 80% TSS removal should be achieved through the use of oil-grit separators when it is not possible to utilize SWM ponds. Oil-grit separators are proposed for catchments D5 and D6. Alternative best management practices such as tree pits may also be considered for quality and quantity control.

8.1.2 Water Quantity

The following criteria are the targets for water quantity along Sixth Line.

Drainage from Sixth Line should be incorporated in to future SWM ponds in adjacent developments for Catchments D1, D2, D3 and D4. The Town should collaborate with developers on pond design. Storage requirements for the Sixth Line catchments are shown below:

- Catchment D1: 971 m³
- Catchment D2: 822 m³
- Catchment D3: 682 m³
- Catchment D4: 1880 m³

Drainage from Catchment D5 should be controlled through the use of underground pipe storage and an orifice place. Storage requirements for D5 are shown below:

- Catchment D5: 874 m³

Drainage from Catchment 6 should be directed to the existing 450 mm storm sewer running south towards Dundas Street. Roadway improvement work in this section of Sixth Line is minimal and therefore no water quantity controls are proposed.



8.1.3 Erosion and Sediment Control

The widening of Sixth Line will require clearing of vegetation, topsoil stripping and earth grading. A detailed erosion and sedimentation control (ESC) plan is required to ensure the adjacent natural heritage system is not negatively impacted by construction activities.

The following ESC measures should be considered for application during the construction phase (non-limited list):

- Sediment traps, dewatering traps;
- Sediment control fencing;
- Check dams;
- Inceptor swales and ditches;
- Temporary stabilization measures of exposed soils (e.g., erosion control matting, seeding, hydro seeding, and mulches);
- Construction mud mats; and
- Protect surface inlets with filter cloth.

During the detailed design phase, an ESC plan should be developed and tailored to meet the needs of the Sixth Line widening site. Prior to construction this plan must be submitted to the Town of Oakville and the Conservation Authority for approval.

Monitoring and inspection of ESC measures is required to ensure the success of the plan. All ESC measures must be monitored regularly by the contractor, ensuring they are in proper working order, until the site has become fully stabilized. The ESC plan must include details of the monitoring and inspection procedures.

8.2 Geotechnical

8.2.1 Pavement Design

As previously discussed in **Section 7.2.3**, the proposed pavement structure for the reconstruction of Sixth Line between Dundas Street and Highway 407 ETR consists of the following:

- 50mm - HL3 Asphaltic Concrete
- 100mm - HL8 Asphaltic Concrete
- 150mm - Granular 'A' or 20mm Crusher Run Limestone
- 450mm - Granular 'B' or 50mm Crusher Run Limestone

All topsoil, organics, wet or loose fill and other deleterious materials should be removed from all areas to be paved. The subgrade should be inspected and proof-rolled prior to construction of the pavement. Any soft or wet areas identified should be removed and replaced with approved compacted fill. Backfill should be placed in not more than 200mm thick horizontal loose lifts and compacted to at least 98% of its Standard Proctor maximum dry density.

The base and sub-base granular materials should be compacted to at least 98% Standard Proctor maximum dry density and the asphaltic concrete to 96% Marshall Density. The recommended thicknesses are compacted thicknesses. The top course asphalt should not be placed until the base course asphalt has been in place for one winter season.



Frequent inspection by qualified geotechnical personnel should be carried out during construction to verify the compaction of the subgrade, base courses and asphaltic concrete by in-situ density testing using nuclear gauges.

8.2.2 Sub-Drains

Where the subgrade is comprised of granular soil of medium to high permeability, sub-drains are not considered necessary. Where the subgrade is composed of silty clay fill or native clayey silt till to sandy silt till, which have a generally low permeability, then sub-drains are recommended.

8.2.3 Culverts

For planning purposes, the very stiff till may be assumed to have an allowable bearing capacity (and SLS capacity) of at least 150 kPa (150 kPa in ULS). The hard and very dense till may be assumed to have an allowable bearing capacity (and SLS capacity) of up to 300 kPa (450 kPa in ULS).

The foundation of the culverts should extend below the maximum scour level plus the frost cover requirement and onto competent subgrade. Site-specific investigations are recommended for the detailed design of the culverts.

8.2.4 Services

The preliminary preferred design includes the installation of storm sewers to convey the surface runoff. Based on the borehole data, the subgrade of the pipes will likely be comprised of weathered shale or very dense sandy silt till, which will generally provide adequate support for the pipes and allow the use of normal Class 'B' bedding using Granular 'A' material.

Clear crushed stone should not be used as bedding, otherwise the fines from the surrounding subsoils may migrate into the voids of the stone and cause undesirable settlements. If loose or soft soil is encountered, this should be sub-excavated and replaced with compacted granular fill or the bedding thickness may have to be increased.

8.2.5 Foundations

The native sub-soils are generally competent and are considered capable of supporting normal footings designed to bearing pressures in SLS of between 150 kPa and 300 kPa (225 kPa to 450 kPa in ULS), depending on the type of subgrade. Site-specific geotechnical investigations should be carried out for the detailed design of significant structures.

8.2.6 Excavation and Groundwater Control

Excavations for the culverts will require effective diversion of the existing flow. In this case, no major construction problems, due to water, are anticipated with excavations extending less than 2.5m to 3.5m below the existing road grade. Provisions should be made for the control of surface runoff or sub-surface seepage from perched water, which will likely be controlled by pumping from local sumps as and where required.

Excavations of more than 1.2m deep should be cut back to a side slope of 1:1. Alternatively, the excavation should be supported using adequately braced sheeting.



It is expected that the excavated granular fill and native sandy silt till soils will generally be suitable as backfill (except in trenches) as long as their moisture content is within 3% of the optimum value. Backfill should be placed in not more than 150mm to 200mm thick lifts and compacted to at least 98% of its Standard Proctor maximum dry density.

The existing granular base may be re-used as Granular 'B' sub-based or as engineered fill. The asphalt may also be re-used as Granular 'B' sub-base by grinding and sieving.

8.3 Natural Environment

8.3.1 Potential Impacts on Aquatic Ecosystems

No direct impacts to the aquatic system are anticipated to result from the proposed development activities. Providing proper sediment and erosion control measures are implemented, no indirect impacts to the watercourse are expected to result from sediment discharges during construction.

If works are to occur within 30m of the aquatic system, a fisheries assessment is required and authorization from Department of Fisheries and Oceans may be required.

8.3.2 Potential Impacts on Terrestrial Ecosystems

The deciduous forest community within the study area is a high quality forest stand that should be protected to the greatest extent possible. The remainder of the study area is primarily cultural meadow community, which is not sensitive to changes or impacts on the local environment. Any areas of disturbed cultural meadow should be replanted within 30 days with native species to reduce the invasion of non-native species.

Recommended mitigation measures to protect terrestrial habitat include:

- Design to avoid the deciduous forest stand to the greatest extent possible;
- Minimize tree removal;
- Fence the deciduous forest stand during construction to prevent entrance by construction equipment. The fence should be installed where possible at least 2 metres from the tree line to protect the root system;
- Utilize standard best management practices;
- Minimize vegetation removals;
- All vegetation removal should be completed prior to April 1;
- Appropriate lengths of silt fencing along the perimeter of minimized, designated work areas to limit construction impacts;
- Conscientious design, installation and maintenance of sediment traps, silt fencing, and check dams (with preference for alternatives to the traditional straw bale check dams);
- Staged and timely (within 30 days) re-vegetation of exposed soils, both for temporary work areas and final grades with native vegetation species;
- The contractor will be required to specify construction access routes and fuelling areas to avoid watercourse and groundwater contamination and siltation; and



- The contractor will be reminded of the requirement to report contaminant spills (including the discharge of sediment into waterways) as per the *Environmental Protection Act* and the *Fisheries Act*. All toxic chemicals and contaminants must be disposed of off-site in approved disposal sites under appropriate Ministry of the Environment (MOE) regulation.

8.3.3 Potential Impacts on Species at Risk

The project study area provides potential habitat for 6 Species at Risk: Barn Swallow, Canada Warbler, Eastern Meadowlark, Jefferson Salamander, Milksnake and Whip-poor-will.

The recommended mitigation measures to protect potential Species at Risk habitat include:

- Minimize the disturbance on the terrestrial environment by minimizing the project footprint, in particular minimize the footprint within the deciduous forest;
- Advise workers not to harm or harass any snakes or other wildlife;
- Advise workers to stop work and inform the Contract Administrator if any snakes, turtles or other potential SAR are encountered;
- All workers should be provided with awareness training (e.g., factsheets) that addresses the existence of SAR on site, identification of those species and proper actions when an individual is encountered and/or needs to be moved out of harm's way;
- Prior to construction the contractor shall inspect the construction area for nests and eggs and advise the Contract Administrator of any locations of nests and eggs immediately;
- Prior to commencing work the work area shall be inspected for individual SAR and any individuals found shall be left to move on their own or moved properly out of harm's way in the direction they were heading;
- The contractor shall not destroy nests and eggs of protected migratory birds during migratory bird nesting season;
- The works should be completed outside of the migratory bird nesting season (April 1 – July 15) and the Barn Swallow nesting season (April 1 – August 31);
- The contractor shall, prior to the removal of any nests, notify the Contract Administrator who shall contact the Environmental Office and the environmental consultant responsible for birds;
- Following the removal of a nest, the structure will be netted to prevent the recurrence of nesting activity;
- The contractor shall monitor the area daily for the recurrence of nesting activity upon removal of nests and notify the Contract Administrator immediately if a nest reappears;
- Report all SAR sightings and encounters to the MNR Parry Sound District office using the appropriate reporting form within two business days; and
- If a nesting snake is found the MNR shall be notified immediately and a 5 m buffer zone shall be flagged around the site and that area protected from harm during the nesting season.



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8.4 Socio-Economic Environment

8.4.1 Land Use

The preferred preliminary design is consistent with the designated land uses outlined in the *North Oakville East Secondary Plan (2008)*. As such, no impacts on land use are anticipated as a result of the proposed road widening.

Short term impacts during construction are anticipated within the Study area and would include temporary lane closures. Other short term impacts, such as noise, dust and exhaust emissions are anticipated due to construction activities. Management plans (for traffic, noise, dust, etc.) will be implemented and monitored to ensure effective mitigation of these impacts during construction.

8.5 Cultural Environment

8.5.1 Archaeological Impacts

The entire corridor originally had archaeological potential, with the exception of the areas noted above as disturbed, and should undergo a Stage 2 archaeological assessment.

The *Standards and Guidelines for Consultant Archaeologists, 2011* requires that agricultural areas greater than 10 metres along linear survey corridors be subject to pedestrian survey of ploughed and weathered fields at five metre intervals. The preferred seasons for pedestrian survey are in the spring and fall prior to crop seeding or after harvest so any future Stage 2 assessment should be scheduled accordingly.

Other areas including the partially landscaped residential properties and the forested lands that are part of the Natural Heritage System should be subject to Stage 2 test pit survey at five metre intervals in accordance with the *Standards and Guidelines for Consultant Archaeologists (2011a:30)*.

A Stage 3 investigation will be required to confirm the presence or absence of unmarked graves at the Munn's Cemetery prior to any land-disturbing activities. This should involve either the monitoring of the area by a licensed archaeologist during construction, or the removal of the topsoil with a Gradall followed by the shovel shining of the exposed surfaces and inspection for grave shafts.

8.5.2 Cultural Heritage Landscapes and Built Heritage Resources

The conservation of cultural heritage resources in planning is considered to be a matter of public interest. Generally, changes to a roadway such as widening projects and modifications to interchanges have the potential to adversely affect cultural heritage landscapes and built heritage resources by displacement and/or disruption during and after construction. Cultural heritage landscapes and/or built heritage resources may experience displacement, i.e., removal, if they are located within the rights-of-way of the undertaking. There may also be potential for disruption, or indirect impacts, to cultural heritage resources by the introduction of physical, visual, audible or atmospheric elements that are not in keeping with their character and/or setting.

The following sections provide a preliminary assessment of the potential adverse effects and recommended mitigation measures associated with the proposed improvements to Sixth Line.



8.5.2.1 Direct Impacts

There are no identified direct impacts, i.e., removal or relocation, of identified cultural heritage resources with regard to the Preliminary Preferred Design for this project.

8.5.2.2 Indirect Impacts

The proposed design for improvements to Sixth Line will introduce new physical, visual, audible and/or atmospheric elements, including urban design elements such as median landscaping, sidewalks, curbs, on-street bicycle lanes and on-street parking laybys, that are not in keeping with the existing rural character and, or setting, of the identified cultural heritage resources along the Sixth Line study corridor.

Munn's Corners (Site # 1) includes Munn's Church (Site # 2) and Munn's Cemetery (Site # 3). The Region of Halton will conduct future work at the intersection of Sixth Line and Dundas Street outside of this EA.

There are six (6) identified indirect impacts or disruptions associated with the Preliminary Preferred Design for this project. They include:

- **Site # 4 - 3060 Sixth Line** – This property is included on the Town of Oakville Heritage Register, Appendix E. The character and/or setting of this municipally recognized heritage resource will be disrupted, i.e., changes to the entrance drive and property frontage, due to the improvements to Sixth Line. The property acquisition of the existing frontage will result in a reduction of the buffer area between the residence and Sixth Line. This will result in significant change to the character of the existing setting, and potentially change to the residence. There is the possibility that the frontage loss could result in a vacant building or future abandonment, thus resulting in a direct impact, i.e., removal of the resource.
- **Site # 5 - Burnhamthorpe Road** – Burnhamthorpe Road at Sixth Line will be improved resulting in a change to the existing roadscape, as a result of the introduction of new physical, visual, audible or atmospheric elements that are not in keeping with their character and, or setting.
- **Site # 6- Sixth Line** – The existing rural roadscape of Sixth Line will be transformed into from a two lane roadway to a four lane urban roadway with a landscaped median. This will result in a change to the existing rural roadscape due to the introduction of new physical, visual, audible or atmospheric elements that are not in keeping with their character and, or setting.
- **Site # 7 – 3369 Sixth Line** – This property is municipally designated under Part IV of the OHA and is included on the Town of Oakville Heritage Register, Appendix E. There will be some property acquisition at Sixth Line resulting in a change to the existing landscape character of the resource. The residence has been dismantled and the barn and silo located on the property demolished.
- **Site # 8 –4243 Sixth Line** – This property is included on the Town of Oakville Heritage Register, Appendix E. There will be some property acquisition at Sixth Line resulting in a minimal change to the existing character of the built resources, which are set back from the road.



- **Site # 9: Agricultural Land-** The character of the existing rural lands will be disrupted through the removal of existing tree lines, fencing and hedgerows and the introduction of urban road design and pathways/trails as part of the improvements to Sixth Line

8.5.2.3 Mitigation Recommendations

Mitigation recommendations are provided for the following cultural heritage resources identified in **Section 8.5.2.2**.

- **Site # 4 - 3060 Sixth Line** – This property is included on the Town of Oakville Heritage Register, Appendix E. It is associated with the historical crossroad settlement of Munn’s Corners. A Cultural Heritage Impact Assessment Report (CHIA) should be completed for this recognized heritage resource with regard to recommendations for heritage designation under the OHA. Reference to the cultural heritage landscape associated with the historical crossroads settlement of Munn’s Corners should it be included in the CHIA.
- **Site # 6- Sixth Line** – The existing roadscape should be documented with photographs and key plans in a Cultural Heritage Documentation Report.
- **Site # 8 –4243 Sixth Line** – This property is included on the Town of Oakville Heritage Register, Appendix E. It is associated with the historical crossroad settlement of Munn’s Corners. Halton Region shall complete a Cultural Heritage Impact Assessment Report (CHIA) for this recognized heritage resource with regard to recommendations for heritage designation under the OHA.
- **Site # 9: Agricultural Land** – Preserve existing tree lines, hedgerows and fencing along Sixth Line were feasible.

8.6 Noise

With the potential for future developments along the subject alignment, assessments for possible noise mitigation for all future developments will be required and will be the responsibility of the developers as part of the site plan approval process.

8.6.1 Noise Controls during Construction

In addition to the noise emitted by the operation of vehicles on the proposed undertaking, noise during the construction phase is an issue that should also be addressed.

Unlike operational noise, construction noise is temporary in nature depending on the type of work required and its location relative to the noise-sensitive receptors.

The significance of the construction noise impact depends on the number of pieces of equipment, their types, time of operation and their proximity to the receptors in question.

The following is a brief outline of the procedures to be followed in handling construction noise during the detailed design and construction phases:

- Noise sensitive areas will be identified;
- Applicable local municipal noise control by-laws will be identified and obeyed. The by-laws include those enacted under the authority of the Municipal Act, the Environmental Protection Act or any other Provincial Legislation. Where timing constraints or any other provisions of the municipal by-law may cause hardship to the proponent, an explanation



of this will be outlined in a submission to the MOE and an exemption from such by-law will be sought directly from the area municipality in question;

- "General noise control measures" (not sound level criteria) will be referred to or placed into the contract documents;
- Should the municipality receive any complaint from the public, the municipality staff will verify that the "general noise control measures" agreed to, are in effect. The municipality will investigate any noise concerns, warn the contractor of any problems and enforce its contract;
- If the "general noise control measures" are complied with, but the public still complain about noise, the municipality will require the contractor to comply with the MOE sound level criteria for construction equipment contained in the MOE's Model Municipal Noise Control By-Law. Subject to the results of field investigation, alternative noise control measures will be required, where these are reasonably available; and
- In selecting the appropriate construction noise control and mitigation measures, the municipality will give consideration to the technical, administrative, and economic feasibility of the various alternatives.

The above noted procedures are based on the construction noise provisions included in Section 8 of the MOE/MTO Noise Protocol.

8.7 Summary of Potential Impacts and Mitigation Measures

A summary of potential impacts associated with the proposed road widening and proposed mitigation measures is provided in **Table 8-1**.

Table 8-1 Summary of Potential Impacts, Mitigation Measures, Monitoring and Future Actions

Factor	Environmental Issue	Anticipated Impact	Proposed Mitigation	Monitoring/Future Work/Contingency
Traffic	Level of service for vehicular traffic	<ul style="list-style-type: none"> Proposed intersections modifications will improve traffic operations and safety at the intersection. Driveways along Sixth Line will be impacted by the widening. 	Re-profile/re-grade or relocate impacted driveways to match the proposed road design.	<ul style="list-style-type: none"> Property owners of impacted driveways will be contacted during the detailed design stage. Alternate access will need to be provided during construction.
Utilities	Conflict with existing utilities	The existing system of utilities plants will be impacted by the proposed widening of Sixth Line	It is anticipated that all the utilities located within the proposed right-of-way for Sixth Line will require relocation to implement the proposed widening.	<ul style="list-style-type: none"> Formal definition of utility impacts and relocation strategy will be determined during the detailed design. All utility information should be updated prior to construction to ensure that the data is accurate and to finalize relocation requirements as necessary.
Drainage/ Stormwater	Surface runoff and quality of runoff	The widening of Sixth Line would increase the amount of impervious coverage. The effects include increases in runoff volume and mass loading of pollutants.	Stormwater management (SWM) ponds planned for the developments adjacent to the study area will be designed to provide quantity and quality control for the additional runoff.	Monitor runoff quality to ensure SWM pond effectiveness.

Factor	Environmental Issue	Anticipated Impact	Proposed Mitigation	Monitoring/Future Work/Contingency
Geotechnical	The asphalt thickness on Sixth Line varies and is thin in some areas. Underlying the pavement is a variable fill.	Pavement on Sixth Line should be reconstructed.	None required	Frequent inspection by qualified geotechnical personnel should be carried out during construction to verify the compaction of the subgrade, base courses and asphaltic concrete by in-situ testing using nuclear gauges.
Natural Environment	Terrestrial Habitats	<ul style="list-style-type: none"> • Potential impacts to the terrestrial habitat in the project area include loss of/damage to vegetation, disturbance to bird's nests and loss of habitat to other animals. 	<ul style="list-style-type: none"> • Appropriate lengths of silt fencing along the perimeter of minimized, designated work areas to limit construction impacts. • All migratory bird nests and eggs are protected in accordance with the <i>Migratory Birds Convention Act</i> during the active nesting season (the main nesting season is between April 1st and July 15th however, nesting may occur outside of these dates). • Visual survey of machinery and work area prior to commencing work. 	Inspection of mitigation measures to assess the effectiveness of the measures and to identify deficiencies in the operation or expected results of the measures.
Natural Environment	Designated Natural Areas	There are Provincially Significant Wetlands, Areas of Natural and Scientific Interest, Environmentally Significant/Sensitive Areas or other Natural Areas located within or near the study area.	<ul style="list-style-type: none"> • Ensure that construction machinery does not enter the watercourse or wooded areas. • Construction access routes should be planned around existing Designated Natural Areas. • Any stockpiles will be located and isolated to ensure material will not enter 	Inspection of mitigation measures to assess the effectiveness of the measures and to identify deficiencies in the operation or expected results of the measures.

Factor	Environmental Issue	Anticipated Impact	Proposed Mitigation	Monitoring/Future Work/Contingency
			any wetland, watercourse or drainage ditch. <ul style="list-style-type: none"> • Areas for refueling of machinery will be located well away from any watercourse or drainage ditch. 	
Natural Environment	Sediment and Erosion	Impacts resulting from any excavating or cut and fill operations will be temporary in nature.	<ul style="list-style-type: none"> • Conscientious design, installation and maintenance of sediment traps, silt fencing, and check dams. • Timely re-vegetation of exposed soils, both for temporary work areas and final grades. • Minimized vegetation removal. • Specify construction access routes and fuelling areas to avoid watercourse and groundwater contamination and siltation. 	Monitoring of these erosion and sedimentation control measures during and after construction will be implemented to ensure their effectiveness.
Natural Environment	Fisheries and Aquatic Habitat	<ul style="list-style-type: none"> • Introduction of contaminants from the work occurring over and or near the waterway may result from activities such as asphaltting, waterproofing, etc. • Potential release of construction related sediment into the watercourse; • Temporary disruptions to existing aquatic habitat. • Temporary disruptions to fish passage and water flow. • Erosion and downstream sediment 	<ul style="list-style-type: none"> • Complete all instream work in the dry by isolating and dewatering the work area. • Design and implementation of a containment plan/technology to isolate all work above water and prevent entry of potentially deleterious materials into the waterbody. • Typical erosion and sediment control measures including sediment fences, check dams and/or straw bales will be employed in affected drainages. • Restoration of temporary disruptions to 	A permit will be required from Conservation Halton for in-water work and areas that are located within the Regulation Limits associated with the watercourse in accordance with O.Reg. 162/06.

Factor	Environmental Issue	Anticipated Impact	Proposed Mitigation	Monitoring/Future Work/Contingency
		transport during culvert works.	in-stream fish habitat promptly.	
Natural Environment	Disturbance and displacement of vegetation and vegetation communities	Clearing of trees and vegetation will be required to accommodate the widening of Sixth Line.	<ul style="list-style-type: none"> All vegetation identified for removal should be assessed for nesting habitat prior to removal. Trees not slated for removal will be protected by erecting and maintaining a temporary fence for tree protection. 	A Landscape plan will be developed during the detailed design stage of the project.
Land Use	Construction disturbances	<ul style="list-style-type: none"> Short term impacts during construction are anticipated and include temporary lane closures. Other short term impacts, such as noise, dust and exhaust emissions are anticipated due to construction activities. 	Prepare management plans (for traffic, noise, dust, etc.).	Implement management plans and monitor to ensure effective mitigation of these impacts during construction.
Property	Loss of property	A total of 24 properties (41,254m ²) will be impacted to accommodate the proposed road widening.	<ul style="list-style-type: none"> Property requirements will be documented in the property request plan. Compensation for residential and commercial impacts will be provided for temporary and permanent property requirements. 	The formal property acquisition process will be initiated after the completion of the Class EA Study.
Archaeology	Loss of archaeological resources	The archaeological potential factors indicate that nearly all of the lands adjacent to the Sixth Line right-of-way, which remain undisturbed and have not been previously assessed, have archaeological potential	Written confirmation is required from the proponent that a licensed consultant archaeologist will monitor construction in areas within the 50m monitoring buffer zone, and that the consultant archaeologist	Any future design changes that require expansion beyond current right-of-way should be subject to a Stage 2 archaeological

Factor	Environmental Issue	Anticipated Impact	Proposed Mitigation	Monitoring/Future Work/Contingency
		<ul style="list-style-type: none"> The areas within the right-of-way which have not been disturbed should be subject to Stage 2 testing by a licensed archaeologist prior to any construction or alterations 	is empowered to stop construction if there is a concern for impact to an archaeological site	assessment by a licensed archaeologist.
Built Heritage and Cultural Landscapes	Loss or displacement or disruption of built heritage and cultural landscapes features	There are a total of 6 Cultural Heritage resources with identified indirect impacts or disruptions due to the proposed Sixth Line design.	Cultural heritage landscape documentation reports should be prepared in advance of construction activities to serve as a final record of each of the resources and the study corridor in general.	Post-construction landscaping and rehabilitation plans should be undertaken in a manner that is sympathetic to the overall setting.
Noise	Increase in noise levels with road widening	The noise level increase resulting from the road widening and construction.	Noise assessments for possible noise mitigation for all future developments will be required and will be the responsibility of the developers.	Assessment of construction noise and related mitigation measures will be completed during the detail design stage.



9 Conclusions

This Environmental Study Report presents the results of the Environmental Assessment Study carried out to determine the specific needs for Sixth Line between Dundas Street and Highway 407 ETR to address the identified transportation deficiencies pursuant to the Municipal Class EA. The report provides a full and complete account of Phases 1 through 4 of the planning process followed for the project.

This study involved undertaking an inventory of the natural, physical, socio-economic, cultural and technical setting within the Sixth Line study area. This information was used to facilitate the identification of Alternative Solutions and Designs. The Alternative Solutions and Designs were then compared and a Preliminary Preferred Solution/Design was selected, which minimizes environmental and socio-economic impacts in a cost-effective manner.

Regulatory agencies, affected property owners and stakeholders have participated in the planning process by providing input throughout the study. Two PICs were held to inform the public and regulatory agencies about the project and to solicit feedback on the environmental features inventoried within the study area, the planning process followed, proposed evaluation criteria, the Alternative Solutions/Alternative Designs identified, and the Preliminary Preferred Solution/Design. Based on the EA process and the public/regulatory agency consultation carried out throughout the study, and as described throughout the ESR, a Preliminary Preferred Design for the Preferred Solution was chosen. The Preliminary Preferred Design for Sixth Line will be to widen from a 2-lane cross-section to a 4-lane (plus a centre left turn lane/landscaped median) cross-section from Dundas Street to Highway 407 ETR. Additional improvements to Sixth Line will include:

- The signalization of intersections;
- The provision of sidewalks and on-street bicycle lanes and potential for on street parking layby's in front of Neighbourhood Centre and Park lands;
- The provision of continuous medians to enhance the streetscape and landscaping features; and
- Culvert structure replacements.

The project was found to be feasible with no major impediments or unacceptable environmental impacts. It conforms to the requirements for Schedule 'C' projects, in accordance with the Municipal Engineers Association, Municipal Class Environmental Assessment (October 2000, as amended in 2007 and 2011).