Transportation

Town of East Gwillimbury

East-West Road Corridor Environmental Assessment
Environmental Study Report
Part 1 – Main Report

Prepared by:

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Project Number:

60281533

Date:

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AECOM: 2012-01-06

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May 19, 2015

Mr. Don Allan, CET, CST
Manager, Development Engineering
Town of East Gwillimbury
19000 Leslie Street
Sharon, ON L0G 1V0

Dear Mr. Allan:

Project No: 60281533

Regarding: East-West Road Corridor Environmental Assessment Environmental Study Report

Enclosed is the Environmental Study Report (ESR) and Preliminary Design for the East-West Road Corridor to be placed for public review per a Notice of Study Completion filed under *Environmental Assessment Act* requirements.

Sincerely,
AECOM Canada Ltd.

Peter Cholewa, P.Eng.
Manager, Transportation
Peter.cholewa@aecom.com

PC:mm
Encl.
cc:

Distribution List

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Revision Log

Revision #	Revised By	Date	Issue / Revision Description
1	D. Brutto	April 24, 2015	Revision in response LSRCA, MOECC, and York Region comments
2	D. Brutto	May 11, 2015	Revision in response to landowner comment

AECOM Signatures

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Executive Summary

Introduction

The Town of East Gwillimbury is planning for future population and employment growth and requires additional road capacity for this growth. The need for an east-west road link was established through the Town of East Gwillimbury Transportation Master Plan (2010), which addressed Phases 1 and 2 of the Municipal Class Environmental Assessment (EA) process.

This Study is classified as a Schedule 'C' project which involves the completion of Phases 3 and 4 of the Class EA process. As noted, Phases 1 and 2 were addressed during the Town of East Gwillimbury Transportation Master Plan.
The Town of East Gwillimbury, located in the Regional Municipality of York, is situated north of the Oak Ridges Moraine and within the designated lands of the Provincial Greenbelt Plan.

The purpose of this Class EA Study is to select an alignment for a future collector road (corridor) through the Town of East Gwillimbury that will minimize adverse impacts on the environment.

This ESR documents the planning and decision making process, including public consultation, which was followed to arrive at a preferred corridor alignment. This ESR also sets out mitigating measures proposed to avoid or minimize environmental impacts prior to, during, and after construction.

Specifically, this ESR documents:

- the background to the study;
- the consultation process;
- the need and justification for the study;
- description of existing conditions;
- the evaluation of the alternative corridor alignments;
- description of the preferred corridor alignment; and
- anticipated impacts and mitigation prior to, during, and after construction.

Consultation

The purpose of the EA Study consultation process is to provide an opportunity for stakeholder groups and the public to gain an understanding of the study process; contribute to the process for development and selection of alternatives; and provide feedback and advice at important stages in the EA process. This includes regulatory agency contact, as well as contact with local residents, stakeholders, and First Nations. The public and agency consultation for the East West Road Corridor EA had the following objectives:

- Generate awareness of the project and provide opportunities for involvement throughout the planning process; and
- Facilitate constructive input from public and agency stakeholders at key points in the EA process, prior to decision-making.

An enhanced consultation program was incorporated into the study, which exceeded the requirements of the Municipal Class EA process. The consultation program included:

- Posting project milestones on Town of East Gwillimbury's website (http://www.eastgwillimbury.ca);
- Direct mailing notice to First Nations contacts, review agencies, and property owners within the study area;
- Publication of notices in the *Newmarket Era* newspaper for project milestones;
- Holding two Public Information Centres to engage and obtain input from the public, regulatory agencies and stakeholders;
- Holding additional stakeholder and regulatory agency meetings;
- Continued notification to First Nations, affected land owners, general public and review agencies, and other stakeholders regarding project milestones; and
- Issuing a Notice of Study Completion.

Input received from this consultation was important in determining the preferred corridor alignment. The main areas of concern raised by the public related to existing traffic concerns, natural environment impacts, and the potential for the corridor alignment to physically divide the Sharon Burial Ground from the historic Sharon community. These issues have been addressed throughout the EA Study process and are documented in this ESR.

Need and Justification

The Town of East Gwillimbury Transportation Master Plan (TMP) was completed in 2010, establishing established a plan for a comprehensive transportation system to accommodate anticipated growth for the next 30 years. Phases 1 and 2 of the Municipal Class EA process were addressed in the TMP.

Phase 1: Problem/Opportunity Statement

Phase 1 of the Municipal Class EA process identifies the problem and/or opportunity statement and the need and justification for the study. The Town of East Gwillimbury TMP identified the Opportunity Statement:

> *"This Master Plan will address the transportation servicing infrastructure needed to support future population and employment growth, as well as increased traffic congestion emanating from areas within East Gwillimbury as well as outside of the Town's boundaries."*

Phase 2: Alternative Solutions

Phase 2 of the Municipal Class EA process identifies alternative solutions to address the problem or opportunity statement by taking into consideration the existing environment, and establish the preferred solution, taking into account public and regulatory agency review and input.

The preferred solution incorporated transportation network improvements and new road initiatives, including the East-West Road Corridor. The TMP established that most traffic on the East-West Road Corridor is expected to be local, with Green Lane still carrying the majority of through traffic.

The purpose of the East West Road Corridor was identified within the TMP as follows:

> *"To provide direct access to future development in Green Lane West and to businesses in Sharon and Queensville."*

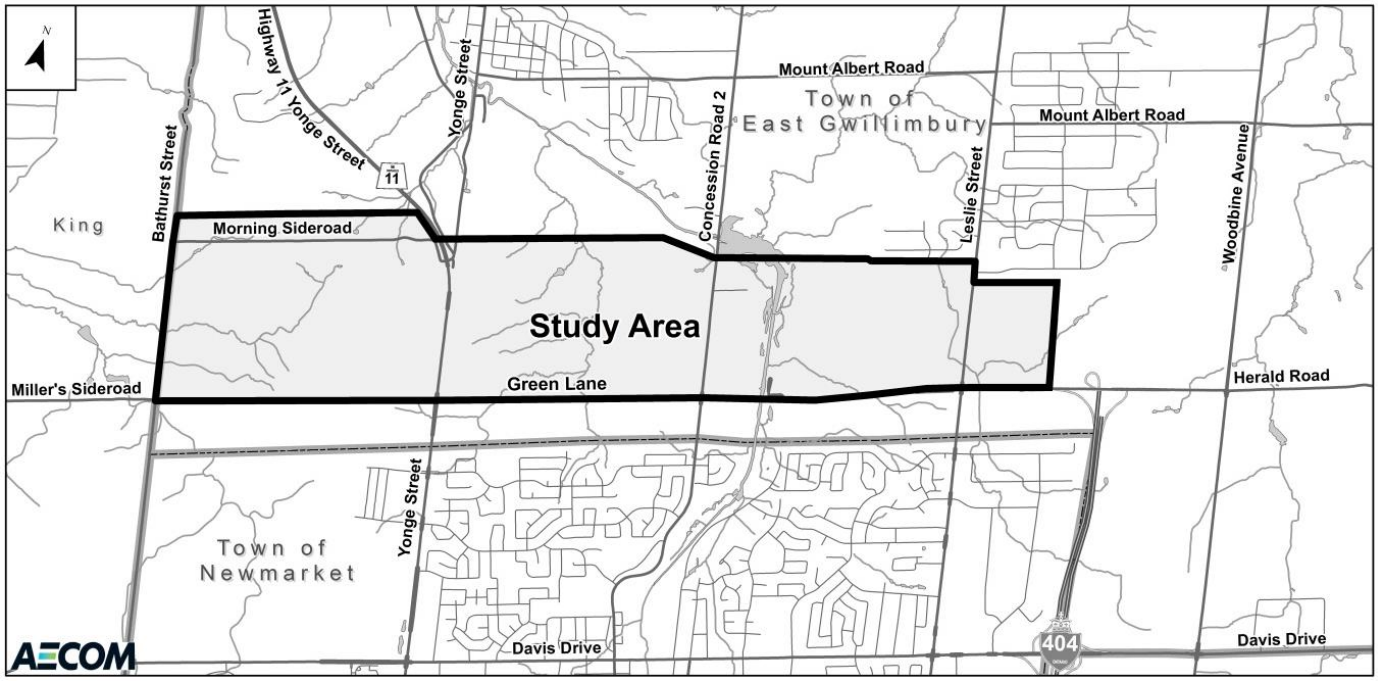
Phase 3: Alternative Design Concepts (Alternative Corridor Alignments)

Phase 3 of the Municipal Class EA explores and evaluates alternative methods of implementing the preferred solution, taking into account:

- The existing environment;
- Public and regulatory agency input;
- Anticipated environmental impacts; and
- Methods of minimizing negative impacts and maximizing positive impacts.

A review of existing policy early during Phase 3 of the study (including the East Gwillimbury Transportation Master Plan, future growth opportunities beyond 2013 under the Town's Official Plan, and Greenbelt Plan) determined that an extension of the East-West Road Corridor across Highway 404 does not currently support the study need and justification as established during Phase 2 of the Class EA process. The current EA study area was subsequently revised to exclude the areas east of the Highway 404 extension to Woodbine Avenue (see **Figure ES-1**). Accordingly, the Harry Walker Parkway Extension (also identified under Phases 1 and 2 of the Town of East Gwillimbury Transportation Master Plan), was added to the scope of this EA to provide a connection to Green Lane, west of the Highway 404 extension.

Figure ES-1 East-West Road Corridor Study Area



A long list of 22 corridor alignments was generated from early stakeholder and public input based on preliminary evaluation criteria for the East West Road Corridor. After reviewing the existing environmental conditions and engaging in further consultation with agencies and stakeholders, the list of corridor alignment options was refined to a short list of eight (8). These 8 alternative corridor alignments were compared based on a detailed evaluation framework that included the following main factor groups:

- Technical;
- Natural Environment:

- Socio-Economic Environment;
- Cultural Environment; and
- Cost.

Following a detailed comparative evaluation, an alternative corridor alignment (Option 2) was recommended to be carried forward as the Preferred Corridor Alignment, as this design option will comparatively yield:

- Lower Technical impacts;
- Least potential impacts to Natural Environment;
- Lower Socio-Economic impacts;
- Least impacts to Cultural Heritage Resources; and
- Lowest potential cost(s).

Figure ES-2 presents the Preferred Corridor Alignment for the East-West Collector Road and Harry Walker Parkway Extension.

Project Description

The Preferred Corridor Alignment will include the following roadway design elements:

- Four-lane roadway, including 1.5 m sidewalks on either side of the roadway and 1.5 m on-street bicycle lanes in each direction;
- 5 span bridge structure (overall length approximately 190 m) for the crossing of the CN rail corridor, Holland River and LSRCA property;
- 3.75 m outside curb lanes to accommodate potential future transit routes; and
- Full on-street illumination to be implemented in phase with adjacent land development.

The East West Road and Harry Walker Parkway Extension will be designed to adhere to stormwater management policies to be refined during detail design.

Implementation of the East-West Road and Harry Walker Parkway Extension will be undertaken through development under approved Secondary Plans. It is anticipated that development approvals may start emerging before 2018. The road right-of-way is within 10 private properties and crosses Lake Simcoe Region Conservation Authority (LSRCA) property. Property acquisition agreements with affected owners will be finalized during detail design. In addition, it is recognized that the exact location and alignment of the east-west road and bridge crossing that traverses and abuts lands municipally described as 842 Green Lane East may be modified as part of the detailed design phase of the Municipal Class Environmental Assessment or, alternatively, through the completion and approval of a detailed functional servicing plan and environmental impact assessment/natural heritage evaluation, to the satisfaction of the Town of East Gwillimbury and LSRCA.

The preliminary construction cost associated with the preferred design, including all road and structure works and mitigation measures, is estimated at $50.98 million.

The need for an easterly extension from the planned terminus of the East-West Road Corridor to include a Highway 404 crossing, as identified in the York Region Transportation Master Plan and East Gwillimbury Transportation Master Plan, will be addressed in future planning. This EA does not preclude a future EA for a Highway 404 crossing. Protection for the easterly extension of the East-West Road Corridor and Highway 404 crossing will be included in development approvals for the Green Lane Secondary Plan Area.

Figure ES-2 Preferred Corridor Alignment

Anticipated Impacts and Proposed Mitigation Measures

The ESR has identified potential impacts and recommended mitigation measures to address potential impacts relating to traffic, noise and vibration, air quality, erosion and sedimentation, groundwater and hydrogeology, surface water and aquatic habitat, wildlife and migratory birds, waste management, landscaping, archaeology, and cultural heritage.

Table ES-1 presents mitigation measures that are recommended to ensure that any disturbances are managed by the best available methods. These measures will be further confirmed and developed during detail design of the respective segments and associated construction phases in accordance with area secondary plan (land use designation) and development approvals.

Overall, the construction and operation of the East West Road Corridor will result in minor adverse impacts on the existing environment, following the implementation of the mitigation measures identified above. Many of the environmental concerns related to this project have been mitigated through the process by which the preferred corridor alignment was selected, as described in **Section 5.** Further development and refinement of the mitigation measures will be necessary during the detail design of the respective segments of roadway, as they are implemented. A preliminary listing of additional permits and approvals required to implement the roadway are identified in **Section 7.**

Table ES-1 Recommended Mitigation Measures

Factor	Potential Impacts	Recommended Mitigation
Traffic Management	During construction there may be temporary disruptions to traffic on: • Bathurst Street • Woodspring Avenue • Yonge Street • Future North South Collector Road • Second Concession • Leslie Street • Green Lane at the Harry Walker Parkway Extension During construction there may be temporary disruption to trail traffic (pedestrian, cycling, etc.) through the Rogers Reservoir Conservation Area. Alterations to traffic patterns post-construction.	**During Detail Design:** • Develop requirements for potential traffic disruption signing to be in place during construction. • Implement future intersection improvements with existing roadways as recommended in **Appendix D**. • Review and optimize signal timing phasing splits at intersections along the East West Road Corridor. ▪ Protective left-turn phases should be implemented for the proposed double left-turn lane at the East-West Road/Harry Walker Parkway Extension/Green Lane intersection. • Review need for traffic calming measures. • Develop a trail traffic management plan to address the impacts of the roadway construction on the trail users through the Rogers Reservoir Conservation Area. A Trail closure plan will be required and will include, but not be limited to the following: identifying restricted areas, proposed signage, and implementing an appropriate communications plan **Prior to Construction:** • Undertake notification to area residents and businesses. • Erect signs advising of vehicular and active transportation traffic disruptions. **During Construction:** • Relocate heavy equipment travel routes away from residential roads, if possible. **During Operation:** • Monitor traffic patterns and compare against EA estimates.
Noise and Vibration	Noise disruption to existing residences and businesses during construction and operation in the following key areas: • Properties adjacent to the alignment with access off Morning Sideroad • Properties adjacent to the alignment with access off Yonge Street • Properties adjacent to the alignment with access off Leslie Street Vibration disruption during construction to Heritage Structures adjacent to the proposed alignment. Disruption to future residences and businesses during construction and operation	**During Detail Design:** • Develop vegetated buffers and/or noise barriers to mitigate effects to existing sensitive receivers, where appropriate. Noise attenuation features in relation to existing sensitive receivers are recommended in the vicinity of Bathurst St (See **Appendix I**), subject to further refinement/review during detail design. • As the roadway is implemented through area secondary plan (land use designation) and development approvals, property developers will conduct noise assessments in accordance with MOE Publication NPC-300, Part C, and implement recommended noise attenuation as conditions of approval within their respective future residential developments. • Construction noise constraints will be incorporated into contract documents. • Where appropriate, future noise barrier designs should consider the use of transparent panels at the top of the wall to promote light through the noise barrier into rear yards and outdoor living areas. **Prior to Construction:** • Develop reactive complaint resolution procedure for responding to complaints resulting from construction. **During Construction:** • Comply with MOECC noise limits, and local noise control by-laws. • Construction activities throughout the project will conform to current local municipal noise by-laws giving due consideration to such factors as the time of day, proximity and size of equipment and type of operation. • Use construction equipment that meets the requirements of the MOECC Construction Equipment Publication (NPC 115). • Prevent unnecessary noise and vibration by maintaining equipment in proper operating condition, including but not limited to non-defective muffler systems, properly secured components, and the lubrication of moving parts. • Restrict use of equipment to the minimum necessary to perform the specified work. Do not allow excessive idling. • Monitor complaints resulting from construction. **During Operation** • Where implemented, noise barriers and vegetated buffers shall be maintained as continuous and free of gaps. • Arrange for post construction building condition surveys to be undertaken for sensitive structures (i.e., heritage structures in the vicinity of the alignment).

Table ES-1 Recommended Mitigation Measures

Factor	Potential Impacts	Recommended Mitigation
Air Quality	Potential for decrease in localized air quality due to construction dust. Potential air emission generating activities during construction include, but are not limited to: • material removal (cutting, chiseling, grinding, etc.) • materials processing and handling • transportation operation and maintenance • construction machinery operation and maintenance • material replacement (concrete pouring and patching, paving, etc.) • soil excavation • soil transport and stockpiling Based on the modelling results for operation of the roadway, specific local mitigation measures are not warranted as there were no exceedances of applicable standards predicted for the contaminants of concern for the future build scenarios evaluated.	**During Detail Design:** • Develop Dust Control Plan to minimize the generation of dust via materials handling, vehicle movement, and wind erosion • Develop vegetation restoration plan(s) to reduce potential cumulative particulate impacts. ▪ Special consideration should be given to Environmentally Protected areas ▪ Consider vegetating the area adjacent the roadway between the North South Collector Road and future Harry Walker Parkway Extension to further reduce potential cumulative particulate impacts. Coniferous trees plantings should be prioritized in this area. • Consider developing staging plans to avoid overlapping construction activities in any one area **During Construction:** • Apply water and dust suppressants during construction to protect air quality due to dust, in accordance with Dust Control Plan developed during detailed design • Construction vehicles/machinery and equipment should be in good repair, equipped with emission controls, as applicable, properly maintained and operated within regulatory requirements and manufacturer specifications. • The number of machines operating in one area should be minimized at any given point in time. • Idling time should be minimized and signage should be posted to this effect around construction site(s) • Stationary equipment (e.g., generators, compressors etc.) should be located as far away from sensitive receptors as practical
Erosion and Sedimentation	Potential for erosion and sedimentation at the following watercourses: • 1 permanent cold water watercourse: ▪ Sharon Creek • 1 permanent cold water watercourse: ▪ Sharon Creek as part of the Harry Walker Parkway Extension • 3 permanent warm water watercourses: ▪ Ansnorveldt Creek, East Holland River, tributary of the East Holland River • 1 intermittent warm water watercourse: ▪ Tributary of the East Holland River • 1 unevaluated intermittent watercourse ▪ Tributary B of the East Holland River	**During Detail Design:** • Develop erosion and sedimentation control strategy in accordance with LSPP/SWM guidelines and policies. • Develop detail bridge design over the East Holland River in consultation with LSCRA. This will include development of a sedimentation control plan for the area within and adjacent to the road corridor under the bridge crossing. **During Construction:** • Implement and monitor the erosion and sedimentation control strategy, including appropriate phasing to avoid impacts to watercourses within the study area. • Install silt fencing to prevent sediment runoff to adjacent wetland features. • Restore and stabilize any areas disturbed by construction as soon as practically possible.

Table ES-1 Recommended Mitigation Measures

Factor	Potential Impacts	Recommended Mitigation
Groundwater and Hydrogeology	Potential for groundwater discharge at Sharon Creek, East Holland River, and wetlands. Potential for localized decreases in groundwater levels due to construction dewatering activities. Potential for introduction of pollutants to the groundwater system, either during construction, or as part of regular road maintenance activities following project completion (e.g., road salting). Potential effects on wells. The introduction of permeable bedding for buried services such as storm sewers could permanently lower the water table and by extension, water levels in the wells.	**During Detail Design:** • Conduct further investigations on groundwater occurrence, movement, and water well use. Mitigation proposed as a result of further groundwater investigations will be incorporated into contract documents during the detail design phase(s). • Conduct construction dewatering assessment(s) to determine the need for a MOECC Permit To Take Water (PTTW) based on the results of further detailed groundwater investigations. **During Construction:** • Store all oils, lubricants, fuels and chemicals in secure areas. • Contractors to develop and institute a Spills Prevention and Response Plan. • Contact appropriate regulatory agencies in event of a spill to the environment. • Monitor the preconstruction well network throughout the construction period to confirm changes in water levels. After construction is completed, both grading and underground services, further monitoring should only be extended to confirm levels in well network are as expected. **During Operation:** • An appropriate monitoring well network should be installed and routine monitoring linked to surface water monitoring in local tributaries and wetlands to assess the effects of development during construction and post-development phases. In addition, a private water well monitoring program should be implemented.
Aquatic Habitat and Surface Water	Potential effects to aquatic habitat in Sharon Creek Potential effects to aquatic habitat in the East Holland River Potential effects to aquatic habitat in intermittent and unnamed tributaries	**During Detail Design:** • Complete Species at Risk surveys, as appropriate, including for Redside Dace within Sharon Creek (subject to approval from MNRF). • Initiate baseline monitoring in Sharon Creek and the East Holland River prior to construction to provide reference conditions for monitoring potential changes to the aquatic habitat and communities (fish community where permitted by the MNRF and benthic macro invertebrate community). ▪ A long-term post-construction effects Monitoring Plan will be developed once detail design specifications are determined. Updated information determined in surveys during detail design will be made available to LSRCA. The Monitoring Plan will be submitted to LSRCA and outlined in relevant detail design drawings. A qualified fisheries biologist should be available during the duration of construction to monitor the area to ensure no negative impacts to aquatic habitat have occurred. • Fish sampling in Sharon Creek and the East Holland River should be undertaken in the summer to minimize effects to spring spawning fish while sampling in the unnamed tributaries should occur in the spring as these systems are typically intermittent and will not have flow during the summer months. Benthic invertebrate sampling should be conducted between late November and late March. • Span crossings are recommended where the Preferred Alignment crosses watercourses within the West Holland watershed, East Holland watershed, and Sharon Creek subwatershed. Watercourse crossings should be designed to: ▪ Avoid negative impacts to natural landform and corridor function ▪ Enhance and restore aquatic habitats ▪ Cause no upstream or downstream impacts to habitat due to flooding and erosion ▪ Maintain valley or stream corridor function • As the Preferred Alignment is adjacent to the riparian zone of Tributary A east of Rogers Reservoir, improvements to this channel in the vicinity of the alignment should be included in detail design. • Valley span bridges should be considered across all areas of natural heritage system with multiple features (watercourse, wetland, and forest) • Review natural heritage studies completed as part of the Green Lane Secondary Plan and LSRCA subwatershed plans and refine mitigation proposed for existing natural heritage features, if necessary

Table ES-1 Recommended Mitigation Measures

Factor	Potential Impacts	Recommended Mitigation
		During Construction: • Monitoring during construction will be undertaken annually during the summer for Sharon Creek and East Holland River and spring in the unnamed tributaries to ensure that all mitigation (i.e., sediment and erosion control, fish removals, etc.) and enhancement measures (i.e., plantings) are being implemented, maintained and assessed for improvement as well as enforced to assure compliance with all approvals and Authorizations. Aquatic community and habitat monitoring should also be undertaken following site grading and should continue each year thereafter until construction is completed. Monitoring should take place at each of the monitoring stations established for baseline monitoring using the same protocol (and version) used in baseline monitoring to evaluate whether construction mitigation measures are effective and identify short term and potentially long term impacts that may be addressed during the construction phase. • Sediment and erosion control measures should be installed prior to construction and monitored regularly during construction. • Store all oils, lubricants, fuels and chemicals in secure areas. • Contractors to develop and institute a Spills Prevention and Response Plan. • Contact appropriate regulatory agencies in event of a spill to the environment. **During Operation:** • Effects monitoring should be continued following construction to document potential changes to aquatic communities and habitats. The effects monitoring should take place at each of the monitoring stations established for baseline monitoring using the same protocol (and version) used in baseline monitoring.
Wildlife and Migratory Birds	Disruption to wild life habitat, including Species at Risk Disruption to wildlife migration patterns.	**During Detail Design:** • Complete Species at Risk surveys along the alignment for those Species at Risk confirmed as potentially present within the study area (see **Table 4-3**). • Confirm Migratory Bird Nesting season. • Culverts and bridges are recommended to be designed to encourage wildlife crossing, and may include the following considerations: ▪ Wildlife species are more likely to enter a culvert if they can see the light at the other end. ▪ To encourage wildlife movement at watercourse/wetland crossings, the surface layer of substrates at culvert structures should consist of fine material, creating a solid, stable platform and covering any underlying rock. • Valley span bridges should be considered across all areas of natural heritage system with multiple features (watercourse, wetland, and forest). • Impacts to wildlife due to traffic noise, air quality, street lighting, road salt/brine, and resultant shade from the bridge crossing the East Holland River should be further assessed to ensure appropriate mitigation. **During Construction:** • Require contractor to avoid disturbance of any migratory birds found nesting in the project area during the peak breeding season (April 15th to August 15th); ▪ Removal of trees to be performed outside this period. ▪ Prevent bird nesting on bridge(s) during construction with the installation of exclusionary netting, and remove any nests after this period.
Waste Management and Control of Inadvertent Spills	Potential inadvertent spill of hazardous materials during construction.	**During Construction:** • Re-fueling of vehicles and equipment should only be conducted in a contained fueling bund to be situated, at a minimum, 30 m from any watercourse. • Store all oils, lubricants, fuels and chemicals in secure areas. • Contractors to develop and institute a Spills Prevention and Response Plan. • Contact appropriate regulatory agencies in event of a spill to the environment.

Table ES-1 Recommended Mitigation Measures

Factor	Potential Impacts	Recommended Mitigation
Landscaping and Vegetation Protection	Physical damage and loss of vegetation/trees for material management and construction activities	**During Detail Design:** • Complete Butternut surveys along the alignment • Develop Vegetation Restoration Plan to address possible tree removals and streetscape enhancement. ▪ The Plan should identify appropriate locations for vegetation restoration and compensation within the study area, or appropriate alternatives, if required. Vegetation compensation ratios will be in accordance with LSRCA standard wetland and woodland ratios of 3:1 and 2:1 respectively. • Valley span bridges should be considered across all areas of natural heritage system with multiple features (watercourse, wetland, and forest) • Ensure construction staging areas are planned as distant as possible from LSPP Natural Vegetation Protection Zones (NVPZ). • Site specific field investigations, including 3 season surveys that assess the impacts at the regional and local scale should be completed, as deemed necessary, and may include field surveys of: ▪ Breeding Birds ▪ Breeding Amphibians ▪ Ecological Land Classification ▪ Inventory of vascular plants during appropriate season ▪ Significant wildlife habitat and function ▪ Species at Risk Inventory ▪ Geomorphic surveys to correctly identify the size of watercourse crossing structures • Construction restrictions and maintenance practices such as the following should be considered for tree protection during development of the contract specifications: ▪ Tree protection fencing shall be erected and maintained to protect the tree and root zone. Tree protection fencing requirements shall be illustrated in construction drawings and should be in place and approved by the consultant prior to any construction activity on site. ▪ No activity shall be allowed within the tree protection fence area. Equipment shall not be driven over root zones, no materials shall be stockpiled near trees, and foot traffic shall be limited especially during rainy periods when soil is more prone to compaction. ▪ A construction work plan will be developed which designates locations for stockpiling of soils and other materials including fuel. Prior to commencement of construction, the limits of protection areas will be delineated and fenced to avoid inadvertent intrusion of machinery or other activities such as stockpiling of excess material • Review natural heritage studies completed as part of the Green Lane Secondary Plan and LSRCA subwatershed plans and refine mitigation proposed for existing natural heritage features, as necessary • Impacts to vegetation/trees due to air quality, road salt/brine, and resultant shade from the bridge crossing the East Holland River on LSRCA property and adjacent lands should be further assessed to ensure appropriate mitigation. ▪ Where features are removed or are projected to be negatively impacted, mitigation should include replacement/enhancement of vegetative units or tree replacement. If full mitigation cannot be accommodated on-site, alternative restoration areas should be identified. • An Environmental Monitoring Program for implementation during construction and operation of the roadway will be developed once detailed impacts to the terrestrial environment have been determined, as per surveys completed during detailed design. The intent of this program will be to monitor the success of the implementation of protection and mitigation measures of this ESR. The programs should include vegetation monitoring, streambank monitoring and identified corrective measures for negative impacts or failures and any additional information collected from the additional surveys.

Table ES-1 Recommended Mitigation Measures

Factor	Potential Impacts	Recommended Mitigation
		During Construction: • Following survey and documentation, Butternut trees not designated for removal adjacent to the ROW should be protected with fencing to restrict construction access to these sites. • Butternut trees of suitable size within the ROW will be salvaged and transplanted to suitable sites on the Project Lands, where feasible, in consultation with the MNR. If undocumented Butternut trees are detected during construction activities in any location not listed in the ESA, works occurring in those areas will stop immediately and the MNR SAR Biologist will be contacted. • Restrict removal of trees to work areas specified in construction contract. • Where tree roots are encountered during excavations, roots should be properly pruned to avoid damage and disease to remaining roots. • Maintain all construction activity, including construction staging areas outside of Natural Vegetation Protection Zones (NVPZ). • Fence areas of retained trees prior to construction commencement, and prohibit entry of equipment and materials within fenced areas until final grading and landscaping is completed. • Any exposed soils should be seeded with an appropriate native seed mix.
Archaeology	Loss or disruption to archaeological resources.	**During Detail Design:** • Conduct Stage 2 Archaeological Assessments for those required portions of the study area (see **Figure 4-13**), as required. ▪ Parts of the study area that are agriculturally active land should be ploughed, weathered, and then subjected to pedestrian survey at 5-metre intervals, in accordance with Section 2.1.1 in the 2011 S&G. ▪ Portions of the study area that have not been agriculturally active land in the recent past, or cannot be subjected to ploughing, should be subjected to a shovel test pit form of survey at 5-metre intervals, in accordance with Section 2.1.2 in the 2011 S&G. • Conduct Stage 3 Archaeological Assessment for any potential disturbance to ground within 10 m of Sharon Buying Ground, **During Construction:** • No excavations shall take place within the study area prior to the Ministry of Tourism, Culture and Sport (Heritage Operations Unit) confirming in writing that all archaeological licensing and technical review requirements have been satisfied. • Should previously unknown or unassessed deeply buried archaeological remains be uncovered during construction; ▪ Cease alteration of the site immediately and engage a licensed archaeologist to carry out archaeological field work, in compliance with Section 48 (1) of the Ontario *Heritage Act*. The office of the Heritage Operations Unit, Ministry of Tourism and Culture (416-314-7146) should be contacted immediately. ▪ Any person discovering human remains must immediately notify the office of the Heritage Operations Unit, Ministry of Tourism and Culture (416-314-7146), the police or coroner, and the Registrar of Cemeteries, Cemeteries Regulation Unit, Ministry of Government Services (416-326-8404).
Cultural Heritage	Disruption to Cultural Heritage Resources due to the introduction of new physical, visual, audible or atmospheric elements.	**During Detail Design:** • Develop landscaping plans in the vicinity of identified heritage resources to soften the effect of the new roadway in the landscape. • Complete a Heritage Impact Assessment (HIA) for the East Holland River/ Newmarket Canal and its associated landscape ▪ The new bridge design over the East Holland River/Newmarket Canal should complement the existing character and setting of the canal to lessen the physical and visual impact of the new road on the existing character and setting of the area. This should include appropriate landscaping treatments and provision of access to the canal and trail from both east and west sides of the bridge. The existing Rogers Reservoir Conservation interpretive trail should be addressed as part of the HIA. ▪ The isolation of approximately 10 ha of the lower part of the Rogers Reservoir Conservation Area due to the new roadway implementation should be considered in future heritage evaluation and impact assessment.

Table ES-1 Recommended Mitigation Measures

Factor	Potential Impacts	Recommended Mitigation
		• Complete Heritage Impact Assessments (HIA) for the following properties: ▪ Sharon Burial Ground (18391 Leslie Street) ▪ Residence at 18335 Leslie Street ▪ Agricultural Complex at 18474 Yonge Street • The Town of East Gwillimbury may consider cultural heritage assessment process(es) for additional properties in the study area, if deemed appropriate. **During Construction:** • Limit construction noise and vibration in the vicinity of identified built heritage resources. Mitigation and/or monitoring to be specified through the completion of HIA for individual cultural heritage resources.

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Appendices

1. Introduction

As the Town of East Gwillimbury plans for future population and employment growth, additional road capacity is required to serve the needs of the community. The need for an east-west road link was established through the Town of East Gwillimbury Transportation Master Plan (2010), which addressed Phases 1 and 2 of the Municipal Class EA process.

AECOM was retained by the Town of East Gwillimbury to undertake a Schedule 'C' Municipal Class Environmental Assessment (Class EA) to identify a preferred route and preliminary design of the East-West Road Corridor.

As noted, this Environmental Study Report (ESR) documents the Phases 3 and 4 of the planning and preliminary design components for the East West Corridor Road Class Environmental Assessment (EA) Study. A variety of tasks were undertaken for this Class EA, including the confirmation of a project need/justification, public / agency consultation, assessment of corridor design alternatives, physical, natural environment, cultural, and socio-economic impact reviews, development of a preferred corridor alignment including preliminary design for the bridge over the East Holland River and GO Transit tracks, and preparation of this ESR.

1.1 Background and Study Purpose

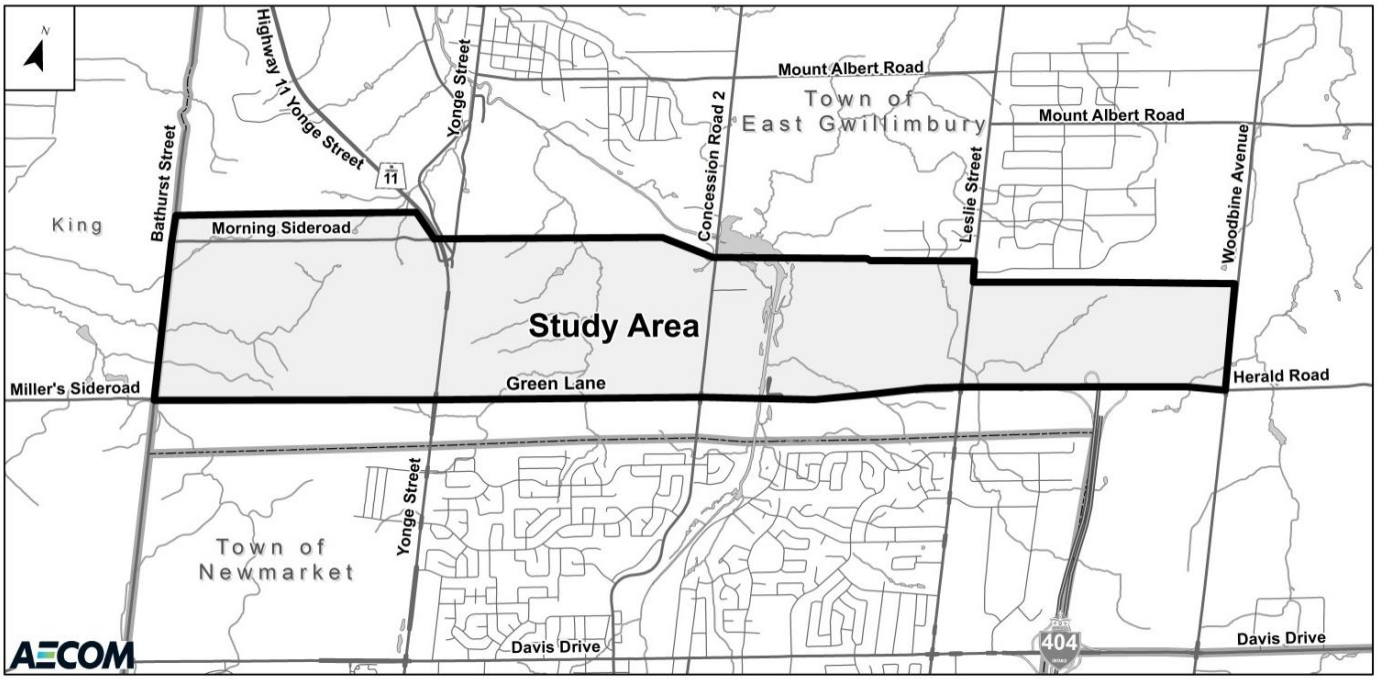
The Town of East Gwillimbury is located in the Regional Municipality of York encompassing an area of 238 square kilometres (km^2) north of the Oak Ridges Moraine and within the designated lands of the Provincial Greenbelt Plan. The Town was formed by the amalgamation of the Township of East Gwillimbury with all the previously incorporated villages and hamlets within the Township. The Town consists of a number of growing urban areas and villages including Holland Landing, Queensville, Mount Albert, River Drive Park, and Sharon.

In 2005, the Province of Ontario passed legislation under the Greenbelt Protection Act (Bill 135) that established a Greenbelt Plan for the Greater Toronto Area and Golden Horseshoe. The Greenbelt Plan incorporates the Oak Ridges Moraine and Niagara Escarpment Plan areas, plus an additional 1.8 million acres as an area of countryside, which will be protected from urban development. Within East Gwillimbury, the Greenbelt area generally covers the entire rural area east of Woodbine Avenue and north of Queensville and Holland Landing. Areas protected by the Greenbelt Plan are referred to as Greenbelt lands. Lands within the Greenbelt boundary not protected by the Greenbelt Plan are typically identified as Settlement Areas or 'Whitebelt' lands.

This portion of the Town of East Gwillimbury is identified as a 'Settlement Area' within the 'Protected Countryside' which is governed by policies protecting areas of natural heritage, hydrologic and/or landform features. The communities of Queensville, Sharon and Holland Landing are surrounded by the provincially designated Greenbelt Plan area. As a result, the Town of East Gwillimbury is projected to experience significant population and employment growth over the next 30 years. Accordingly, a number of community development plans have been prepared to accommodate anticipated growth in East Gwillimbury. Many of these community development areas will be served by the proposed East-West Road Corridor.

The initial Study Area for the East-West Road Corridor is shown in **Figure 1-1**.

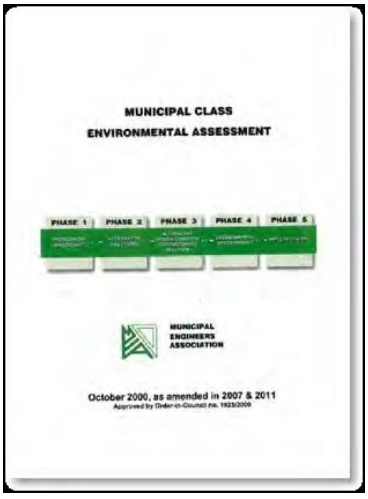
Figure 1-1 East West Road Corridor Study Area



1.2 Municipal Class Environmental Assessment Process

To address the need and justification for the proposed road and develop and evaluate a range of alternative design concepts to address the multi-modal transportation needs, the Town of East Gwillimbury must comply with the requirements of the Municipal Engineers Association (MEA) *Municipal Class Environmental Assessment* document (2000, as amended in 2007, 2011). Approved under the Ontario *Environmental Assessment Act*, the Municipal Class EA process incorporates the following key principles of EA planning:

- consultation with affected parties early in and throughout the process, such that the planning process is a co-operative venture;
- consideration of a reasonable range of alternatives, both the functionally different 'alternatives to' and the 'alternative methods' of implementing the solution;
- identification and consideration of the effects of each alternative on all aspects of the environment;
- systematic evaluation of alternatives in terms of their advantages and disadvantages, to determine their net environmental effects; and,
- provision of clear and complete documentation of the planning process followed, to allow 'traceability' of decision-making with respect to the project.



The Municipal Class EA document outlines a mandatory five-phase planning and design process. Each phase is summarized below:

Phase 1. **Problem or Opportunity**:
Identify the problem and/or opportunity, need and justification.

Phase 2. **Alternative Solutions:**
Identify alternative solutions to address the problem or opportunity by taking into consideration the existing environment, and establish the preferred solution taking into account public and regulatory agency review and input.

Phase 3. **Alternative Design Concepts for Preferred Solution**:
Examine alternative methods of implementing the preferred solution taking into account the existing environment, public and regulatory agency input, anticipated environmental impacts, and methods of minimizing negative impacts and maximizing positive impacts.

Phase 4. **Environmental Study Report:**
Document, in an Environmental Study Report (ESR), a summary of the rationale and the planning, design and consultation process undertaken through Phases 1 to 3. The ESR is made available for public and agency review and comment.

Phase 5. **Implementation:**
Complete contract drawings and documents and proceed to construction and operation. Monitor construction and operation where necessary for adherence to environmental provisions and mitigation. Phase 5 is not part of this study. This phase will be undertaken immediately prior to construction.

In addition, the Municipal Class EA document classifies projects into four separate categories (i.e., schedules). These are referred to as Schedule A, A+, B or C projects based on the anticipated level of impact, and for some projects, the anticipated construction costs. Projects are categorized according to their environmental significance and their effects on the surrounding environment. Planning methodologies are described within the Class EA and are different according to the Class type. Each schedule is described as follows:

Schedule A: Projects are limited in scale, have minimal adverse environmental impacts, and include a number of municipal maintenance and operational activities. These projects are pre-approved and may proceed to implementation without following the fill Class EA planning process. Schedule A projects generally include normal or emergency operational and maintenance activities where environmental effects of these activities are usually minimal. Examples of Schedule A projects include culvert repairs and replacements where capacity is not increased or road resurfacing with no change to road alignment. As such, these projects are pre-approved and consequently do not require any further planning and public consultation.

Schedule A+: The purpose of Schedule A+ is to ensure some type of public notification for certain projects that are pre-approved under the Class EA. It is appropriate to inform the public of municipal infrastructure project(s) being constructed or implemented in their area; however, there would be no ability for the public to request a part II Order. If the public has comment, they should be directed to municipal staff and/or municipal Council where they would be appropriately addressed. Examples of Schedule A+ projects include construction of localized operations improvements at specific locations (e.g., addition of turning lanes at an intersection, but not a continuous centre left turn lane).

Schedule B: The projects have the potential for some adverse environmental impacts. The proponent is required to undertake a screening process, involving mandatory contact with the directly affected public and regulatory agencies, to ensure that they are aware of the project and that their concerns are addressed. If there are no outstanding concerns, then the proponent may proceed to implementation. Examples of Schedule B projects include reconstruction or widening where the reconstructed road results in additional lanes. As a result, the proponent is required to proceed through the screening phase (Phases 1 and 2) including consultation with those who may be affected. At the end of Phase 2, a Project File documenting the planning process shall be finalized and made available to the public and agency review. However, if the screening process raises a concern which cannot be resolved, a Part II Order may be requested and considered by the Minister of the Environment. Alternatively, the proponent may elect voluntarily to plan the project as a Schedule C undertaking.

Schedule C: Projects have the potential for significant environmental impacts and must proceed under the full planning and documentation (Phase 1 to 4) procedures of the Municipal Class EA document. Schedule C projects require that an ESR be prepared and filed on the public record for review by the public and regulatory agencies. If concerns are raised that cannot be resolved than a Part II Order may be requested.

1.2.1 Class EA Schedule

This Study is classified as a Schedule C project which involves completion of Phases 3 and 4 of the planning and design process. As noted, Phases 1 and 2 were addressed during the TMP.

Schedule ‘C’ projects are documented within an ESR. The ESR is prepared for a minimum 30-day public review period. During this review period, any person or party with an outstanding issue may bring the issue forward to the City for resolution. If the issue cannot be resolved, the person or party with the concern may request the Minister of the Environment to order the City to comply with ‘Part II’ of the Environmental Assessment Act. ‘Part II’ of the Environmental Assessment Act requires the completion of an individual EA study with formal government review and approval. This request is called a ‘Part II Order Request’ (formerly ‘Bump-up Request’) and must be submitted to the Minister in writing within the review period from May 22, 2015 to June 21, 2015. If no requests for a ‘Part II Order’ are received during the public review period, the project will proceed to Phase 5 (Design and Construction).

1.2.2 Canadian Environmental Assessment Act (CEAA)

The Canadian Environmental Assessment Act (CEAA) was recently repealed and replaced with CEAA 2012 which received Royal Assent on July 6, 2012. Recent changes to CEAA include replacing “triggers” with the CEAA 2012 Regulation Designating Physical Activities list. A proponent is not required to complete the Federal EA Process if a project is not on this list. A review of this list has determined that the East-West Road Corridor Class EA Study does not include physical activities identified on the list and is therefore not a Designated Project. This study is not subject to the federal EA process.

1.2.3 EA Documentation Filing

The filing of this ESR completes the planning and preliminary design stage of the project. The ESR is placed on the public record and made available for review for a period starting May 25, 2015 and ending on June 24, 2015. A public notice (Notice of Study Completion) was published to announce commencement of the review period. To

facilitation public review of the document, hard copies of the report were made available for during regular business hours at the following location:

Town of East Gwillimbury
19000 Leslie Street
Sharon, ON L0G 1V0

The Notice of Study Completion advises that if, after reviewing the report, stakeholders had questions or concerns they should follow this procedure:

- Contact Don Allan, Town of East Gwillimbury Project Manager, at the address below to discuss your questions or concerns:

  Don Allan, CET, CST
  Town of East Gwillimbury Project Manager
  Development Engineering Department
  19000 Leslie Street, Sharon, ON L0G 1V0
  Tel: 905-478-3819, Fax: 905-478-8545
  Email: dallan@eastgwillimbury.ca

- Arrange a meeting with the above, if you have significant concerns that require more detailed explanations.

- If you raise major concerns, the Town will attempt to resolve the issue(s). A mutually acceptable time period for this meeting will be set. If the issues remain unresolved, you may request that the Minister of the Environment (see address below), by order, to require the Town to comply with Part II of the *EAA* before proceeding with the project, this is called a Part II Order request. The Minister may make one of the following decisions:
  - Deny the request with or without conditions
  - Refer to matter to mediation; or
  - Require the Town to comply

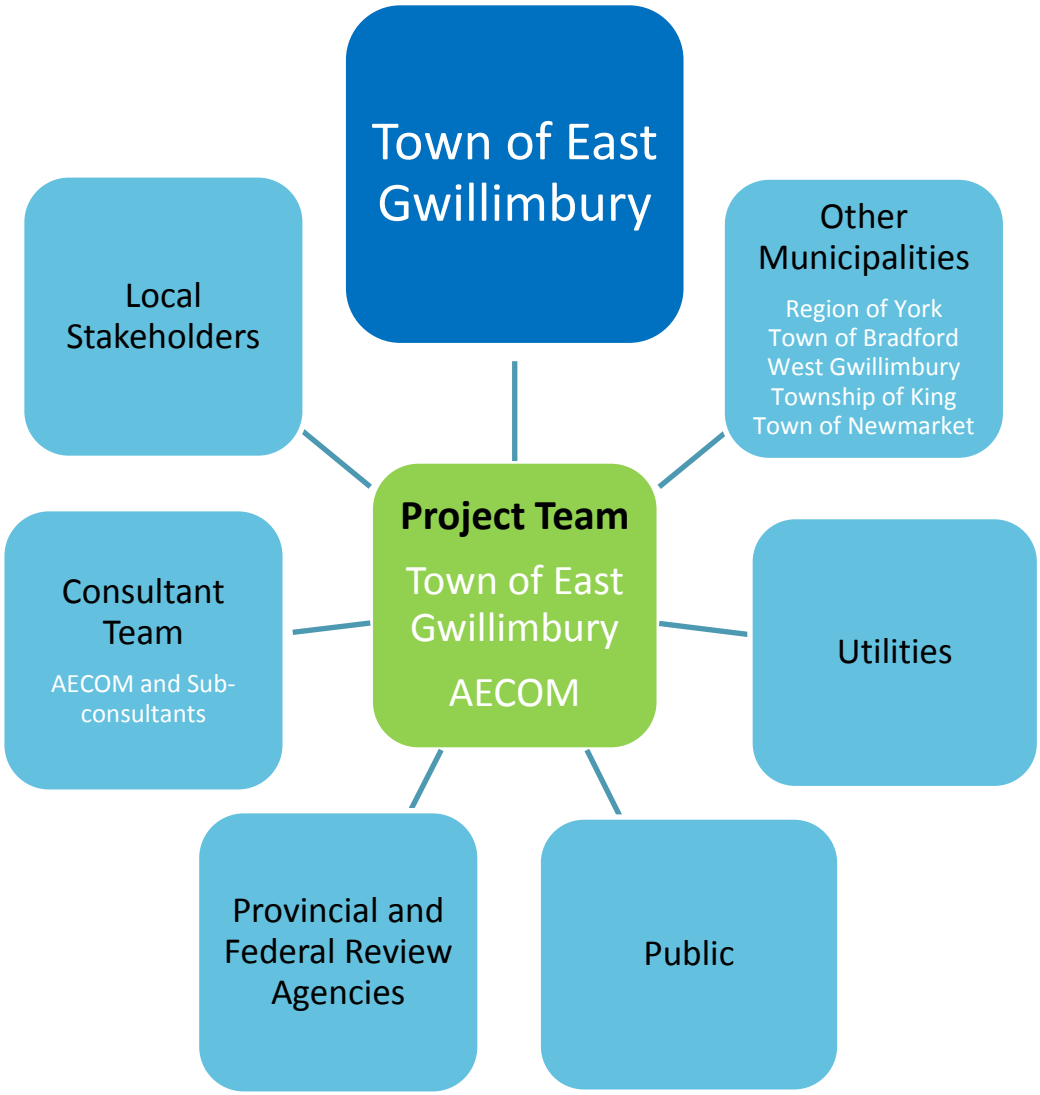
The Class EA process contains a provision that allows for changing the status of a project from a Class EA to an Individual Environmental Assessment. This is called a 'Part II Order'. Members of the public, interest groups, government agencies and others may request that an Individual Environmental Assessment be prepared for a specific project if they feel their concerns have not been addressed through the Class EA planning process. The Ministry of the Environment and Climate Change determines whether or not this is necessary and the decision in this regard is final. If the 'Part II Order' is granted, the project cannot proceed unless an Individual Environmental Assessment is prepared. The Individual Environmental Assessment is subject to a formal government review and approval process and may result in a formal public hearing. Anyone wishing to request a 'Part II Order' of the East-West Road Corridor Class Environmental Assessment Study must submit a written request by the end of the review period (June 24, 2015) to the Minister of the Environment and Climate Change at the following address, with a copy sent to the Town of East Gwillimbury:

Ministry of the Environment and Climate Change address:	**Town of East Gwillimbury address:**
Honourable Glen R. Murray	Mr. Don Allan, CET, CST
Minister of the Environment and Climate Change	Manager, Development Engineering
77 Wellesley Street West	Town of East Gwillimbury
11th Floor, Ferguson Block	19000 Leslie Street
Toronto, ON M7A 2T5	Sharon, ON L0G 1V0

1.3 Project Team

The Town of East Gwillimbury retained AECOM Canada Ltd. (AECOM) to undertake the Class EA for this study. The Project Team included representatives from the Town of East Gwillimbury and AECOM. General direction was provided by the project stakeholders (landowners, review agencies and residents) with Project Team meetings held at key points in the process and prior to presenting the study findings to the public and agencies. **Figure 1-2** depicts the study organization.

Figure 1-2 Study Organization



1.4 Project Schedule

As noted, Phases 1 and 2 of the Class EA process were completed as part of the East Gwillimbury Transportation Master Plan, completed in June 2010. Phase 3 and 4 of the Class EA process documented in this Environmental Study Report was initiated in late 2012. See **Section 2** for key consultation milestone dates.

2. Consultation

2.1 Public Consultation

An essential component of the Class EA process is public consultation. This includes regulatory agency contact, as well as contact with local stakeholders and First Nations. Input received from this consultation is important in determining the preferred alternative. The main components of consultation which took place for this project included:

- Notice of Study Commencement;
- Agency Meetings;
- Stakeholder Meetings;
- Public Information Centres (2); and
- Notice of Study Completion

At the initiation of this study, a mailing list (see **Appendix A**) was created from regulatory agencies, First Nations contacts, and potential interested stakeholders, including adjacent property owners. The agencies were identified according to Appendix 3 of the Municipal Class EA Document, which outlines relevant agencies, based on the nature of a project, as well as guidelines for establishing contact with these review agencies. In total, over 150 potential adjacent property owners were included on the mailing list. Throughout the study, this list was used to notify stakeholders of study milestones and upcoming public consultation events. The list was updated regularly.

2.1.1 Notice of Study Commencement

A Notice of Study Commencement was posted on the Town of East Gwillimbury website in December, 2012. The Notice was also delivered via direct mail to a number of First Nations contacts, review agencies, and property owners in the study area on December 13, 2012.

Copies of the Notice of Study Commencement and letters provided to the public and review agencies, and First Nations are provided in **Appendix A**.

2.1.2 Public Information Centre #1

All appropriate review agencies, First Nations contacts, and interested members of the public were invited to a Public Information Centre (PIC), held on June 19, 2013, from 4:00 p.m. to 7:00 p.m. at the Town of East Gwillimbury, Holland Landing Room, 19000 Leslie Street, Sharon, ON.

Notification of PIC #1 was provided through direct mailings in June 2013, to those stakeholders and review agencies contained in the project's mailing list, as well as to all residents within the project study area. The Notice was also posted on the Town of East Gwillimbury website and through newspaper advertisements within the *Newmarket ERA* in June 2013.

The PIC was conducted in an open-house format, providing an opportunity for ministries, agencies, public and other stakeholders to discuss the proposed undertaking, including existing conditions, evaluation criteria and preliminary corridor alternative alignments, and allow the public to discuss their issues or concerns directly with the Town and their consulting team. This feedback was used to confirm a short list of alternative corridor alignments and was incorporated into the subsequent evaluation of the alignments.

A total of 29 people registered at the PIC, with a few others in attendance, but opting not to sign-in. The main issues raised included:

- A corridor alignment north of Sharon Burial Ground would create a barrier between the burial ground and the historic Sharon community
- Existing traffic on Leslie Street is a concern

Following the meeting, the presentation was also posted on the Town of East Gwillimbury website at http://www.eastgwillimbury.ca/About_Us/About_the_Town/Community_Information/Green_Lane_Corridor.htm.

Copies of the notification materials, presentation boards, reference materials, summary of comments and responses to comments are provided in **Appendix A**.

2.1.3 Public Information Centre #2

All appropriate review agencies, First Nations contacts, and interested members of the public were invited to a Public Information Centre (PIC), held on May 28, 2014, from 4:00 p.m. to 7:00 p.m. at the Town of East Gwillimbury, Holland Landing Room, 19000 Leslie Street, Sharon, ON.

Notification of PIC #2 was provided through direct mailings in May 2014, to those stakeholders and review agencies contained in the project's contact database, as well as to all residents within the project study area. The Notice was also posted on the Town of East Gwillimbury website and through newspaper advertisements within the *Newmarket ERA*.

A total of 14 people registered at PIC #2[1], with a few others in attendance, but opting not to sign-in.

Overall, the comments received indicated support for the preferred corridor alignment, including two requests for copies of presentation materials.

Following the meeting, the presentation was posted on the Town of East Gwillimbury website at http://www.eastgwillimbury.ca/About_Us/About_the_Town/Community_Information/Green_Lane_Corridor.htm.

Copies of the notification materials, presentation boards, reference materials, and summary of comments are provided in **Appendix A**.

2.1.4 Notice of Study Completion

A Notice of Study Completion was posted on the Town of East Gwillimbury website in May 2012 and published in the *ERA/Express* Newspaper on May 17 and 22, 2015. The Notice was also delivered via direct mail and email to a number of First Nations contacts, review agencies, and property owners in the study area during the week of May 20, 2015.

A copy of the Notice of Study Completion is provided in **Appendix A**.

1. *PIC #2 was held concurrently with a statutory Public Meeting to review the draft Green Lane Corridor Secondary Plan. Information on the Green Lane Corridor Secondary Plan as it relates to the East-West Road Corridor can be found in* ***Section 3.3.2****. Further information on the Green Lane Corridor Secondary Plan can be accessed at http://www.eastgwillimbury.ca/About_Us/About_the_Town/Community_Information/Green_Lane_Corridor.htm.*

2.1.5 Stakeholder Meetings

2.1.5.1 Resident Meetings

In order to obtain detailed feedback on the study, local residents were invited to a meeting with the Project Team on June 5, 2013. The Project Team provided an introduction to the study, including a detailed summary of existing conditions. A discussion was held thereafter where residents provided input on the development of the evaluation criteria and alternative corridor alignments.

A copy of the meeting presentation is provided in **Appendix A**.

2.1.5.2 Landowner Meetings

In order to obtain detailed feedback on the study, the following stakeholders were invited to a meeting with the Project Team on March 28, 2013:

- Green Lane Participating Owners Group
- KLM Planning Consultants

An introduction to the study was provided by the project team, followed by a roundtable discussion on the existing conditions and potential alternative alignments. Among other topics, it was agreed that the location of the Second Concession intersection with the East-West Road Corridor be fixed for the development of the alternative corridor alignments, to accommodate the provision for a fixed crossing established in the Second Concession Environmental Assessment. It was also agreed that the locations of the Bridge Crossing the East Holland River/GO Rail Tracks and future intersection with the North-South Collector Road be fixed as soon as possible to allow for long term planning.

With the alternative corridor alignments refined and a revised study area in place, the following stakeholders were invited to a meeting with the Project Team on May 5, 2014, in advance of PIC #2:

- Green Lane Participating Owners Group
- KLM Planning Consultants
- Catholic Archdiocese of Toronto
- Sharon Burying Ground Association

The Project Team presented the evaluation of the alternative corridor alignments, and the recommended corridor alignment, including the preliminary design for the Bridge over the East Holland River and GO Rail Tracks. A roundtable discussion was held following the presentation. Comments obtained from the meeting were considered in the development/refinement of the preferred corridor alignment and Bridge Design.

Meridian Planning, as the Town of East Gwillimbury Planning Consultant for the Green Lane Secondary Plan, also participated in each of these meetings. Refer to **Appendix A** for Meeting Minutes.

An additional meeting was held April 29, 2015 between AECOM, LSRCA, Town of East Gwillimbury and representatives for the property municipally described as 842 Green Lane East to discuss refinement to the alignment and bridge crossing within, and abutting the property. All parties agreed that any refinements to the alignment in the area will be addressed as appropriate, in future, as noted in **Section 6**.

2.2 Agency Consultation

2.2.1 Notice to Agencies

All agencies included on the study mailing list were provided notification of the project at each milestone, including;

- Notice of Study Commencement;
- Public Information Centres (2); and
- Notice of Study Completion

Correspondence received was used to inform corridor alignment/East Holland River Bridge Design (see **Section 6**) and mitigation/permitting requirements (see **Section 7**).

Agency correspondence is included in **Appendix A.**

2.2.2 Agency Meetings

In order to gain detailed feedback on the study, the Project Team invited agencies to a meeting[2] in advance of each Public Information Centre. The following agencies were invited to meetings held on March 28, 2013 and May 5, 2014:

- Township of King
- Lake Simcoe Region Conservation Authority (LSRCA)
- GO Transit
- York Region
- Town of Bradford West Gwillimbury
- York Region Transit
- Town of Newmarket

Meridian Planning, as the Town of East Gwillimbury Planning Consultant for the Green Lane Secondary Plan, also participated in each of these meetings.

At the first agency meeting on March 28, 2013, an introduction to the study was provided by the Project Team, followed by a roundtable discussion on the existing conditions and potential alternative alignments. Among other topics, it was agreed that the location of the Second Concession intersection with the East-West Road Corridor be fixed for the development of the alternative corridor alignments to accommodate the provision for a fixed crossing established in the Second Concession Environmental Assessment. It was also agreed upon that the locations of the Bridge Crossing the East Holland River/GO Rail Tracks and future intersection with the North-South Collector Road be fixed as soon as possible to allow for long term planning.

At the second agency meeting on May 5, 2014, the Project Team presented the evaluation of the alternative corridor alignments, and the recommended corridor alignment, including the preliminary design for the Bridge over the East Holland River and GO Rail Tracks. A roundtable discussion was held following the presentation. Comments obtained from the meeting were considered in the development/refinement of the preferred corridor alignment and Bridge Design.

Refer to **Appendix A** for Agency Meeting Minutes.

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*2. The study area was reduced to exclude the Highway 404 crossing area prior to agency meetings. See **Section 4.1.1** for further detail.*

2.3 First Nations Involvement

As noted in **Section 2.1.1**, a Notice of Study Commencement was mailed to the Ministry of Aboriginal Affairs (MAA) and Aboriginal Affairs and Northern Development Canada (AANDC) (formerly Indian and Northern Affairs Canada) in December 2012. The purpose of the letter was to inform each agency of the project and to solicit their respective input. In addition to the government contacts, the following First Nations were mailed notification of the study in December 2012:

- Alderville First Nation
- Beausoleil First Nation
- Chippewas of Georgina Island First Nation
- Chippewas of Rama First Nation
- Curve Lake First Nation
- Hiawatha First Nation
- Huron Wendat Nation
- Iroquois Confederacy
- Kawartha-Nishnawbe First Nation of Burleigh Falls
- Metis Nation of Ontario
- Metis National Council
- Mississaugas of Scugog Island
- Mississaugas of the New Credit First Nation
- Mohawks of the Bay of Quinte
- Moose Deer Point First Nation
- Six Nations of the Grand River
- Williams Treaties First Nations
- Mississaugas of Scugog Island

In correspondence received June 17, 2013, Aboriginal Affairs and Northern Development Canada indicated that the list of First Nations, Aboriginal groups and organizations appears to be inclusive based on the size of the project area.

Alderville First Nation, Hiawatha First Nation, and Chippewas of Rama First Nation acknowledged receipt of study notification materials and requested to be kept informed of the study as it progresses.

MAA, AANDC and all First Nations groups were subsequently sent Notices of PIC#1, PIC#2 and Study Completion. No additional correspondence was received from First Nations Communities.

Refer to **Appendix A** for the study mailing list and a summary of comments.

3. Project Need and Justification

This section outlines municipal, regional and provincial policies and plans that provide context and support for the East West Road Corridor Class EA. It concludes by confirming the needs assessment and justification for the proposed East West Road Corridor as set out by the Town of East Gwillimbury Transportation Master Plan.

3.1 Provincial Planning Context

3.1.1 Provincial Policy Statement

The *Provincial Policy Statement* (PPS) is the complementary policy document to the *Planning Act*. Issued under the authority of Section 3 of the *Planning Act*, the PPS provides direction on matters of provincial interest related to land use planning and development, and promotes the provincial 'policy-led' planning system that recognizes and addresses the complex inter-relationship among environmental, economic and social factors in land use planning (MMAH, 2005; MMAH Website, 2007).

The PPS took effect in 2005[3] and provides for enhanced protection of the environment by identifying the significance of the natural heritage system and water resources, including natural hazards and water quality, air quality and energy use. The PPS ensures that transportation systems are provided which are safe, energy efficient, facilitate the movement of people and goods, and are appropriate to address projected needs.

Several of the objectives outlined in Part V, Sections 1.0 and 2.0 of the PPS (i.e., Building Strong Communities and Wise Use and Management of Resources, respectively) are considered applicable to this study. The following policies of the PPS are most relevant to the study area:

Section 1.6 - Infrastructure and Public Service Facilities

1.6.5 Transportation Systems

1.6.5.1 Transportation systems should be provided which are safe, energy efficient, facilitate the movement of people and goods, and are appropriate to address projected needs.

1.6.5.2 Efficient use shall be made of existing and planned infrastructure.

1.6.5.5 Transportation and land use considerations shall be integrated at all stages of the planning process

1.6.6 Transportation and Infrastructure Corridors

1.6.6.1 Planning authorities shall plan for and protect corridors and rights-of-way for transportation, transit and infrastructure facilities to meet current and projected needs

Section 2.1 – Natural Heritage

2.1.1 Natural Heritage Features and areas shall be protected for the long term

Section 2.6 – Cultural Heritage and Archaeology

2.6.1 Significant built heritage resources and significant cultural heritage landscapes shall be conserved

3. PPS was updated in 2014, however the provisions of the PPS 2005 apply to this study

3.1.2 Places to Grow Act and Growth Plan for the Greater Golden Horseshoe

In June 2006, the Province of Ontario released the Growth Plan for the Greater Golden Horseshoe (Growth Plan). The Growth Plan was prepared under the *Places to Grow Act*, 2005 which provides a legal framework for growth planning in Ontario. The Growth Plan guides decisions on a wide range of issues including transportation, infrastructure, land use planning, housing, natural heritage and resource protection. Planning and strategic investment for transportation, water and wastewater systems and community infrastructure to support efficient growth is outlined in the Growth Plan.

The Growth Plan establishes the Province's vision for managing population and employment growth in the Greater Golden Horseshoe (GGH) and presents population and employment forecasts for Region of York up to the year 2031. Amendment 2 to the Growth Plan came into effect on June 17, 2013, and extends the Growth Plan's population and employment forecasts up to 2041. This amendment also includes updated forecasts for the 2031 forecasts indicated in the 2006 Growth Plan. Population and employment growth forecasts for the Region of York are presented in **Table 3-1** below (Amendment 2 (2013) to The Growth Plan For The Greater Golden Horseshoe, 2006),

Table 3-1. York Region Employment and Population Forecasts

	2011	2031 Forecast	2041 Forecast
Population	1,032,500	1,590,000	1,790,000
Employment	1F[4]459,051	790,000	900,000

Section 3 of the Plan contains policies for Infrastructure to Support Growth, including policies specific to transportation. The following policy of the Growth Plan is most relevant to the study:

Section 3.2.2 Transportation – General

1. *The transportation system within the Greater Golden Horseshoe will be planned and managed to –*
   a) *provide connectivity among transportation modes for moving people and for moving goods*

The East-West Road Corridor and its connection to Green Lane through the Harry Walker Parkway Extension have been identified in the East Gwillimbury Transportation Master Plan as key components of an integrated transportation system. Given the planned growth for the Region and Town (see **Section 3.3**), the planned East West Road Corridor is necessary to move people and goods through the community and provide enhanced connectivity to the Regional Road network and beyond.

3.1.3 Greenbelt Act and Greenbelt Plan

The *Greenbelt Act (2005)* establishes a Greenbelt Plan for the Greater Toronto Area and Golden Horseshoe. The Greenbelt Plan incorporates the Oak Ridges Moraine (described below) and Niagara Escarpment Plan areas, plus an additional 1.8 million acres as a permanent area of countryside, which will be protected from urban sprawl and development.

The intended outcome of the Greenbelt Plan is to encourage compact urban planning with the Golden Horseshoe. The Greenbelt Plan acts to protect against the loss and fragmentation of the agricultural land base and supports

4. York Region Employment and Industry Report, 2011

agriculture as the predominant land use. The Plan provides protection to the natural heritage and water resource systems that sustain ecological and human health and that form the environmental framework around which major urbanization in south-central Ontario will be organized. In addition, the Plan provides a wide range of economic and social activities associated with rural communities, agriculture, tourism, recreation and resource uses (MMAH, 2005b).

As noted within the 10 km by 10 km grids – detailed mapping of the Greenbelt Plan Area, a portion of the study area falls within the 'Protected Countryside' designation. This includes a small area east of Bathurst St. and east of Highway 404 to Woodbine Avenue. A 'River Valley Connection' also follows the East Holland River in the central portion of the study area. These areas are governed by additional policies protecting areas of natural heritage, hydrologic and/or landform features. In the northeast portion of the study area, a portion of the community of Sharon is designated as a 'Settlement Area outside the Greenbelt' within the Plan.

Section 4.2 of the Greenbelt Plan provides the policies that apply to lands falling within the Protected Countryside with respect to infrastructure.

Section 4.2.1 General Infrastructure Policies

1. *All existing, expanded or new infrastructure subject to and approved under the Canadian Environmental Assessment Act, the Environmental Assessment Act, the Planning Act, ……or which receives a similar environmental approval, is permitted within the Protected Countryside, subject to the policies of this section and provided it meets one of the following two objectives:*
    a. *It supports agriculture, recreation and tourism, rural settlement areas, resource use or the rural economic activity that exists and is permitted within the Greenbelt; or*
    b. *It serves the significant growth and economic development expected in southern Ontario beyond the Greenbelt by providing for the appropriate infrastructure connections among urban growth centres and between these centres and Ontario's borders.*
2. *The location and construction of infrastructure and expansions, extensions, operations and maintenance of infrastructure in the Protected Countryside, are subject to the following:*
    a. *Planning, design and construction practices shall minimize, wherever possible, the amount of the Greenbelt, and particularly the Natural Heritage System, traversed and/or occupied by such infrastructure;*
    b. *Planning, design and construction practices shall minimize, wherever possible, the negative impacts and disturbance of the existing landscape, including, but not limited to, impacts caused by light intrusion, noise and road salt;*
    c. *Where practical, existing capacity and co-ordination with different infrastructure services is optimized so that the rural and existing character of the Protected Countryside and the overall urban structure for southern Ontario established by the Greenbelt and any provincial growth management initiatives are supported and reinforced;*
    d. *New or expanding infrastructure shall avoid key natural heritage features or key hydrologic features unless need has been demonstrated and it has been established that there is no reasonable alternative; and,*
    e. *Where infrastructure does cross the Natural Heritage System or intrude into or result in the loss of a key natural heritage feature or key hydrologic feature, including related landform features, planning, design and construction practices shall minimize negative impacts and disturbance on the features or their related functions, and where reasonable, maintain or improve connectivity.*

In accordance with Section 4.2.1.1(b) of the Greenbelt Plan, the proposed roadway is expected to serve the significant growth and economic development expected in Sharon and the remainder of the Town of East Gwillimbury, and it will help connect to surrounding communities in York Region beyond the Greenbelt.

In accordance with Section 4.2.1.2(a) of the Greenbelt Plan, the proposed roadway traversing the 'Protected Countryside' and further, roadway traversing the 'River Valley Connection' areas will be minimized.

3.1.4 Oak Ridges Moraine Conservation Plan

The Oak Ridges Moraine is one of the Province's most significant landforms. This irregular ridge stretches 160 km from the Trent River in the east to the Niagara Escarpment in the west.

The Moraine and Escarpment together form the foundation of south-central Ontario's natural heritage and green space systems. Strategically located north of and parallel to Lake Ontario, the Moraine divides the watersheds draining south into western Lake Ontario from those draining north into Georgian Bay, Lake Simcoe and the Trent River system. The Moraine shapes the present and future form and structure of the Greater Toronto Region, and its ecological functions are critical to the Region's continuing health.

The Oak Ridges Moraine is under increasing pressure for new residential, commercial, industrial and recreational uses, which compete with the present natural environment. The Oak Ridges Moraine Conservation Plan, released in April 2002, provides clarity and certainty about the long-term protection and management of this vital natural resource.

The purpose of the plan is to provide land use and resource management planning direction to provincial ministries and agencies, municipalities, municipal planning authorities, landowners and other stakeholders on how to protect the Moraine's ecological and hydrological features, and functions.

The study area does not include Oak Ridges Moraine Area. However, the Greenbelt Plan's Protected Countryside, including components of the Natural Heritage System within the study area, provide important ecological connection to the Oak Ridges Moraine southwest and east of the study area.

3.1.5 Lake Simcoe Protection Plan

The Lake Simcoe Protection Plan (LSPP) addresses environmental protection of the Lake Simcoe watershed. The plan sets a new standard for environmental protection in the province and provides a roadmap to help restore and protect the health of Lake Simcoe by:

- Promoting immediate action to address threats to the ecosystem, such as excessive phosphorus in the lake, and
- Targeting new and emerging causes of stress in Lake Simcoe such as invasive species and climate change.

The plan is supported by a regulation that builds on and supports Ontario's framework for promoting sustainable growth in communities in the Lake Simcoe watershed.

The study area lies within the Lake Simcoe watershed. Some of the key policies of the LSPP pertinent to this study are discussed below.

Stormwater Management controls for the project are required. The Town of East Gwillimbury Stormwater Management Master Plan (Cole Engineering, 2011) adheres to the LSPP requirements (Policy 4.5-SA) and provides guidelines for stormwater management within the study area – for which the East West Road Corridor will be designed to adhere.

As mentioned, it is recognized that there is a need to reduce loadings from all sources (including new roadway infrastructure) that contribute to excess phosphorus throughout the Lake Simcoe Watershed. As per LSPP Policy 4.24-SA (c) and (d), practical and effective actions to ensure appropriate reductions of phosphorus loadings within the watershed will be considered during design of the East West Road Corridor and are documented within this ESR.

Policy 6.23-DP states:

> *"Development or site alteration is not permitted within a key natural heritage feature, a key hydrologic feature and within a related vegetation protection zone referred to in policy 6.24, except in relation to the following:*
>
> *g. Infrastructure, but only if the need for the project has been demonstrated through an Environmental Assessment of other similar environmental approval and there is no reasonable alternative; and*

Section 6.24-DP of the LSPP states:

> *'The minimum vegetation protection zone for all key natural heritage features and key hydrologic features is the area within 30 metres of the key natural heritage feature and key hydrologic feature…..'*

The East West Road Corridor alignment will be selected in accordance with policies 6.23-DP and 6.24-DP of the LSPP, with the key goal of avoiding, or reducing impacts to key natural heritage features within the study area.

3.2 Regional Planning Context

3.2.1 York Region Official Plan

The Region of York Official Plan (RYOP) - 2010 was approved by the Minister of Municipal Affairs and Housing on September 7, 2010 and appealed to the Ontario Municipal Board (OMB). Since then, the York Region Official Plan - 2010 has been partially approved by the OMB and specific policies of the York Region Official Plan - 1994 have been repealed; effective the following dates: July 11, 2012, September 21, 2012, November 19, 2012 and January 14, 2013.

One of the primary objectives in the RYOP 2010 is to develop road infrastructure that supports future urban and rural structure and can accommodate all future transportation demands. The RYOP encourages road improvements that support all modes of transportation including walking, cycling, and automobile, transit and truck so that increased carrying capability of the regional street and road network is consistent with the overall RYOP goals and objectives.

The East-West Road Corridor is consistent with the policy objectives of the RYOP. Regarding new collector roads, the RYOP provides the following guidance:

> <u>*Section 7.2 Moving People and Goods*</u> (in-force)
>
> > *7.2.59 - To require local municipalities to plan and implement, including land takings necessary for, continuous collector streets in both east-west and north-south directions in each concession block, in all new urban developments, including new community areas.*

3.2.2 York Region Transportation Master Plan Update

According to the York Region Transportation Master Plan 2002 (TMP 2002), York is the fastest growing region in both population and employment the Greater Toronto Area. Current York Region residents are highly dependent on auto, as evidenced in the majority of trips made within the Region by automobile. For this reason, York Regions transportation system is under considerable strain.

On November 19, 2009, York Regional Council adopted the Transportation Master Plan Update, the Region's transit and roads plan to 2031.

The Transportation Master Plan Update includes a number of policies to support the establishment of a new collector road.

Additionally, the TMP identifies:

- A 'Pedestrian Zone' around the Village of Sharon.
- A 'Lake to Lake' Cycling Route running northward through the central portion of the study area

3.3 Municipal Planning Context

3.3.1 East Gwillimbury Official Plan

The Town of East Gwillimbury's Official Plan was adopted by Town Council on June 28, 2010. Following adoption, the Plan was submitted to the Regional Municipality of York for approval. Prior to Regional approval, the Official Plan was appealed to the Ontario Municipal Board (OMB) under Section 17(40) of the Planning Act. The Town of East Gwillimbury Official Plan (2010) was partially approved by the OMB effective March 27, 2013, July 18, 2013 and October 4, 2013.

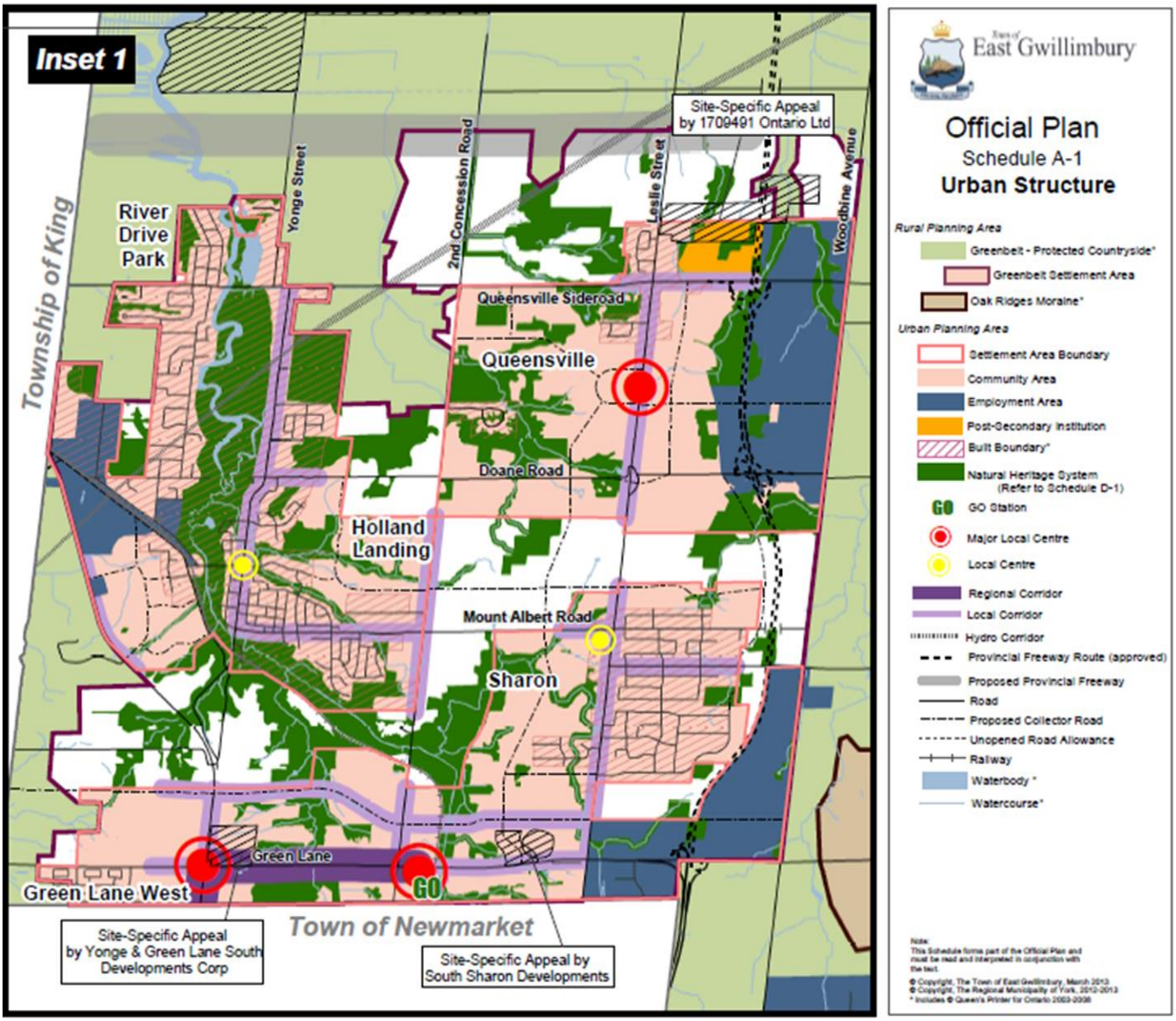
Provisions for Collector Roads are contained within Section 7.2.4.4 of the Official Plan. Specifically, the Official Plan protects for a continuous east-west road north of Green Lane. The road is planned to facilitate additional traffic flow from future development contained within the Green Lane Secondary Plan.

> *7.2.4.4.6 In recognition of the need for the continued function of Green Lane as a high capacity Regional arterial road with bus rapid transit facilities, it is the policy of this plan to protect for a continuous east/west local collector north of Green Lane, as shown conceptually on Schedule E, to facilitate additional traffic flows resulting from urban expansion as contemplated by this plan. Through the review and approval of the necessary Secondary Plan(s) for urban development within the area the Town shall work with landowners to secure and provide for the early delivery and construction of the east/west collector.*

3.3.1.1 Land Use Designations/Urban Structure

The East-West Road Corridor is noted and designated a 'Proposed Collector Road' and 'Local Corridor' within Schedule A-1, Urban Structure (see **Figure 3-1**) of the Town of East Gwillimbury Official Plan.

Figure 3-1 Urban Structure within the East-West Road Corridor Study Area, Town of East Gwillimbury Official Plan



The majority of the East West Road Corridor study area lies within the 'Urban Planning Area'. Most of this area is identified as a Community Area, with the eastern portion designated as an Employment Area. Portions of the Natural Heritage System are also interspersed within the Urban Planning Area.

The Official Plan designates land use within the study area as follows:

Community Areas: Places for people to live, shop, learn and obtain services to meet daily needs

Employment Areas: Places for business and economic activities, including manufacturing, warehouses and offices.

Natural Heritage System: Section 5 of the Official Plan indicates that the Natural Heritage System (NHS) includes features listed within the Provincial Policy Statement, Greenbelt Plan, Oak Ridges Moraine Conservation Plan (ORMCP) and Lake Simcoe Protection Plan (LSPP), as well as those identified in the Region of York Official Plan and previously approved Town planning documents. These features include wetlands, habitat of endangered and threatened species, habitat for fish, woodlands, valleylands, wildlife habitat, Areas of Natural and Scientific Interest, as well as linkages and corridors that connect these features. The Natural Heritage System is generally comprised of two levels of policy protection for environmental features: Core and Supporting Areas, as well as identifying opportunities for environmental corridors. The delineation of Natural Heritage System features was refined and confirmed through the Green Lane Secondary Plan Natural Heritage Evaluation and field work for this study. Detail on the Natural Heritage System features is provided **Section 4.5**.

The westernmost portion of the study area, and areas east of Leslie Street comprise the “Rural Planning Area’, and are composed of ‘Rural Area’ and ‘Environmental Protection Area’.

Rural Areas: Primary locations for a range of institutional and commercial / industrial uses serving the rural resource and agricultural sectors and a range of recreational and tourism uses that are appropriate in a rural setting. Subject to Greenbelt Plan, ‘Protected Countryside’ policy provisions (see **Section 3.1.3**). Additionally, they include environmental features that have been incorporated into the Town’s Natural Heritage System.

Environmental Protection Area: Subject to the Greenbelt Plan, these areas generally provide for a higher level of environmental protection than ‘Rural Areas’. These features have also been incorporated into the Town’s Natural Heritage System.

The Community of Sharon also lies northeast of the study area. Sharon is designated as a ‘Local Centre’ within the Town of East Gwillimbury.

Refer to **Sections 4.5** and **4.6** for the Natural and Socio-Economic Environment Existing Conditions.

3.3.2 Draft Green Lane Secondary Plan

The future Green Lane Secondary Plan will establish detailed land use designations for the study area, incorporating the preferred alignment for East-West Road Corridor within its boundaries.

The Green Lane Corridor Secondary Plan is being drafted by the Town of East Gwillimbury concurrently with the East West Corridor Road EA. Refer to **Section 4.6.3** for planned future development, including detail on draft land use designations and future development proposed within the Green Lane Secondary Plan.

3.3.3 Town of East Gwillimbury Stormwater Management Master Plan (SWMMP)

The SWMMP investigates opportunities to prevent flooding, mitigate changes in water balance and reduce phosphorus loadings to Lake Simcoe, and assesses erosion issues and opportunities to maintain / improve water quality. The Plan examines the existing environmental characteristics of the Town, land use changes, peak flow impacts, phosphorus loadings, water budget and erosion analysis.

The plan outlines requirements to mitigate stream bank erosion, including the use of rip-rap or amourstone however; the LSRCA encourages the use of natural channel designs and “soft solutions”. This includes improving riparian vegetation that may have been removed or damaged, and increasing the ‘buffer’ zone to at least 15 m around watercourses that will help increase bank stability, filter excess nutrients from surface runoff, reduce soil erosion and

improve water quality. In addition, SWM pond retrofits may reduce erosion by eliminating uncontrolled outfalls and upgrading existing SWMF to higher protection levels.

Specifically, the SWWMP included site-specific recommendations within 'Sharon' and the 'Green Lane Expansion Areas', both of which are within the East West Road Corridor EA Study Area. These included:

Table 3-2 Applicable East- West Road Corridor Study Area Stormwater Management Policies

Settlement Area	Preferred Alternative	Recommended Best Management Practices (where appropriate)	Rationale
Sharon	• Traditional SWM with BMP Implementation • Traditional SWM with Urban Retrofits	• Downspout disconnection • Grassed swales • Vegetated filter strips	• Moderate amount of growth • Retrofit existing urban infrastructure where appropriate • Few BMPs can be implemented due to poor infiltration
Green Lane Expansion Areas	• Traditional SWM with BMP Implementation	• Green roofs Infiltration chambers • Permeable pavement • Rainwater harvesting	• Proposed commercial / industrial area • Small existing urban area

Stormwater Quantity Control is also addressed in the plan with the requirement that post-development peak flows be reduced to pre-development levels for all storm events up to and including the 100-year storm. Unit flow rates are to be applied for specific drainage areas requiring overcontrol to meet pre-development peak flows.

All future Stormwater Management facilities in the Town of East Gwillimbury are required to adhere to the contents of the plan, and are to be designed to Ministry of the Environment and Climate Change (MOECC) and Lake Simcoe Protection Plan (LSPP) standards.

3.3.4 East Gwillimbury Transportation Master Plan

The Town of East Gwillimbury Transportation Master Plan (TMP) was completed in 2010, establishing a plan for a comprehensive transportation system to accommodate anticipated growth for the next 30 years. Phases 1 and 2 of the Municipal Class EA process were addressed in the TMP.

3.3.4.1 Problem/Opportunity Statement

Phase 1 of the Municipal Class EA Process completed under the TMP identified the following Opportunity Statement:

> *"This Master Plan will address the transportation servicing infrastructure needed to support future population and employment growth, as well as increased traffic congestion emanating from areas within East Gwillimbury as well as outside of the Town's boundaries."*

The Opportunity Statement holds true for the East West Road Corridor as a part of the TMP and is being used to justify Phase 1 of this Class EA.

3.3.4.2 Alternative Solutions

Phase 2 identified and evaluated alternative solutions to address the opportunity and provided opportunities for public and agency consultation.

The preferred solution incorporated transportation network improvements and new road initiatives, including the East-West Road Corridor. The TMP established that most traffic on the East-West Road Corridor is expected to be local, with Green Lane still carrying the majority of through traffic.

Figure 3-2 TMP Preliminary Evaluation Criteria for the East-West Road Corridor

Evaluation Criteria	East-West Road Corridor
Economic Impacts	• Direct access to employment areas and businesses
Social Impacts	• Improved access to area schools and places of worship • Potential effects on adjacent properties
Cultural Heritage	• Potential effects to nearby heritage resources and features
Sustainable Policies and Growth Management	• Ease of movement in a growing community • Supportive of future population and employment growth
Transportation System	• Intersects key arterials • Proposed to include pedestrian and cycling infrastructure • Direct transit service to new developments and close proximity to the East Gwillimbury GO Station
Natural Heritage	• Crossing of Holland River and smaller watercourses • May traverse wetlands and woodlands

Based on travel demand modeling and high traffic volumes on Green Lane, the TMP established the need for a new east-west connection in the southern part of the municipality. Green Lane was determined to be at or approaching capacity in several areas based on projected population growth.

Figure 3-2 illustrates the preliminary evaluation criteria for the East-West Road Corridor, as identified within the TMP.

The purpose of the East West Road Corridor was identified within the TMP as follows:

> *"To provide direct access to future development in Green Lane West and to businesses in Sharon and Queensville."*

4. Description of the Existing Environment

4.1 Data Collection and Review

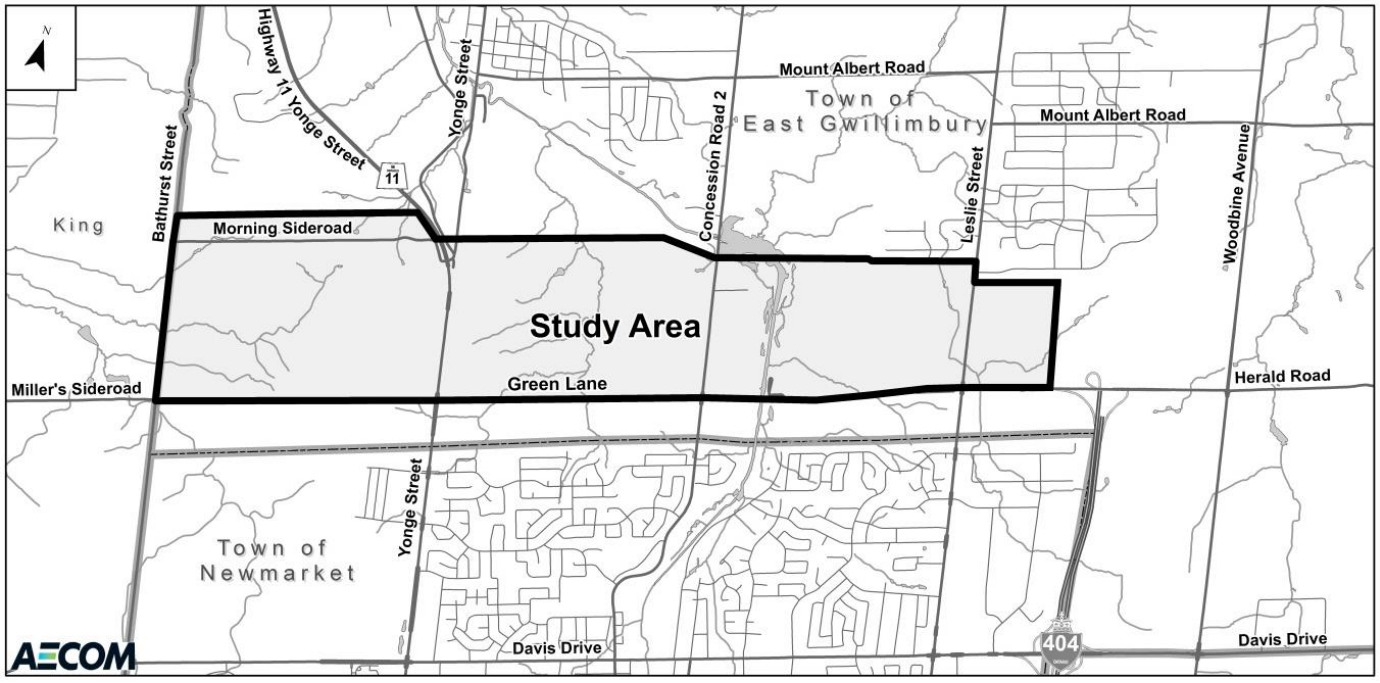
This section provides a description of the existing and future conditions for the East-West Road Corridor study area. Specifically, it provides a detailed summary of the technical, physical, natural, socio-economic, and cultural environment conditions for the study area. In preparing the baseline descriptions of the study area, available background information was assembled and reviewed. A number of secondary source information (e.g., maps, reports) were used to characterize the study area corridor and record significant physical, natural, socio-economic and cultural features. Much of the data collected were obtained from provincial agencies, the Town of East Gwillimbury, and York Region.

In addition, site reconnaissance activities and technical studies were carried out to confirm and/or augment the secondary information collected and reviewed. The scope of the data collection exercise was to provide the Town of East Gwillimbury with sufficient information to identify, evaluate and compare planning alternatives.

4.1.1 Revision of Study Area

A review of existing policy during Phase 3 of the study (including the East Gwillimbury Transportation Master Plan, future growth opportunities beyond 2013 under the Town's Official Plan, and Greenbelt Plan) determined that an extension of the East-West Road Corridor over Highway 404 would not support the study need and justification. The study area was subsequently revised to exclude the areas east of the Highway 404 extension to Woodbine Avenue[5] (see **Figure 4-1**).

Figure 4-1 Revised East-West Road Corridor Study Area



5. *Due to study area revision, some of the information documented within **Section 4** reflects the original, larger study area to Woodbine Avenue. This information may be useful in planning future infrastructure improvements in the area.*

Accordingly, the Harry Walker Parkway Extension (also identified under Phases 1 and 2 of the Town of East Gwillimbury Transportation Master Plan), was added to the scope of this Class EA to provide a connection to Green Lane, west of the Highway 404 extension.

Subsequent sections of this ESR are based on the revision to the study area and incorporation of the Harry Walker Parkway Extension as a continuation of the East West Road Corridor to connect to Green Lane.

4.2 Transportation System

The following background study reports were reviewed in the assessment of transportation system conditions:

- Town of East Gwillimbury, Transportation Master Plan, Final Report, June 2010
- Green Lane Employment Lands Block Plan, Master Servicing Plan, Rice Commercial Group, Tab 8 (Transportation Network Analysis), Cole Engineering, May 2010
- Sharon Community Plan, Master Environmental and Serving Plan, Traffic and Transportation (Volume 3), MMM Group, Feb 2009
- Class Environmental Assessment, North-South Collector Road in the Community of Sharon, MMM Group, December 2010
- York Region Transportation Master Plan (TMP) Update, November 2009
- Consolidated East Gwillimbury Official Plan (OP), June 2010
- Bathurst Street Class Environmental Assessment, Green Lane West Northerly to Yonge Street, Environmental Study Report, Dillon Consulting, May 2010
- 2nd Concession, Green Lane to Queensville Sideroad, Region of York, Class Environmental Assessment Study, McCormick Rankin Corporation, November 2009

4.2.1 Road Network

The following is a description of the road network within the study area.

Green Lane (Regional Road 19): ..... east-west four-lane arterial road under the jurisdiction of the Region; posted speed limit of 80 km/hr.

Morning Side Road: ..... east-west two-lane local roadway between Yonge Street and Bathurst Street under the jurisdiction of the Town; posted speed limit of 50-60 km/hr.

Bathurst Street (Regional Road 38): ..... north-south two-lane arterial road under the jurisdiction of the Region; posted speed limit of 60 km/hr north of Green Lane. This road is currently discontinuous between Morning Side Road and Graham Side Road and there is construction planned to improve Bathurst Street between Green Lane and Yonge Street and remove the discontinuity in the near future.

Yonge Street (Regional Road 1): ..... north-south five-lane arterial road under the jurisdiction of the Region; posted speed limit of 80 km/hr. North of Green Lane, Yonge Street is currently more rural in nature.

2nd Concession Road: ..... north-south two-lane rural arterial road under the jurisdiction of the Region; posted speed limit of 60 km/hr.

Leslie Street:..... north-south two-lane arterial road under the jurisdiction of the Region; posted speed limit of 60 km/hr.

Harry Walker Parkway: ..... north-south two-lane collector road under the jurisdiction of the Town of Newmarket; posted speed limit of 50 km/hr.

Woodbine Avenue: ..... north-south two-lane arterial road under the jurisdiction of the Region; posted speed limit of 80 km/hr.

Highway 404: ..... north-south four-lane highway under the jurisdiction of the Ministry of Transportation of Ontario (MTO). At the time of study, the northbound off-ramp terminates at Green Lane and this ramp terminal is included in the existing traffic study.

4.2.2 Traffic Conditions

Existing traffic condition analysis shows that several of the intersections in the East West Road Corridor study area are operating at or over capacity with LOS E or F and v/c ratio greater than 1.0 during either the AM or PM peak hours. Those intersections include:

- Leslie Street/ Green Lane,
- Highway 404 NB Off-Ramp/ Green Lane,
- Woodbine Avenue/ Green Lane,
- Yonge Street/ Green Lane, and
- Harry Walker Parkway/ Green Lane.

Operations at these intersections during the PM peak hours indicate capacity deficiencies and a few of the individual movements are experiencing excessive delays and above-capacity operations.

Based on the transportation demand analysis results, it is recommended that the Town of East Gwillimbury protect for a four-lane cross-section between Yonge Street and Harry Walker Parkway Extension under both the High and Low Population scenarios for the 2031 year horizon. A two-lane cross-section is expected to be sufficient between Bathurst Street and Yonge Street under the Low Population scenario. However, under the more congested High Population scenario, a four-lane cross-section may be considered between Woodspring Avenue and Yonge Street, while minor capacity additions such as turning lanes and signal optimization would address the remaining capacity issues between Bathurst Street and Woodspring Avenue.

The sub-area demand analysis was conducted based on York Region EMME model forecasts that assume that the Highway 400-404 Link (Bradford Bypass) is in place. If the Highway 400-404 Link is not implemented by 2031, study area capacity issues (especially on Green Lane) can be expected to be more significant and recommendations for a four-lane East-West Road corridor cross-section would be further reinforced.

Based on the projected future traffic volume extracted from the demand forecasting model, and comments received from York Region, a capacity analysis was conducted to determine additional road improvement requirements at intersections along the proposed East-West Collector Road using Synchro/SimTraffic. The following is a summary list of recommended road improvements along the proposed East-West Road Corridor:

- **Future East-West Collector Road/ Bathurst Street:**
  1 exclusive northbound right lane (with 1 existing through lane), 1 exclusive southbound left lane (with 1 existing through lane), 1 exclusive westbound left lane, and 1 exclusive westbound right lane;

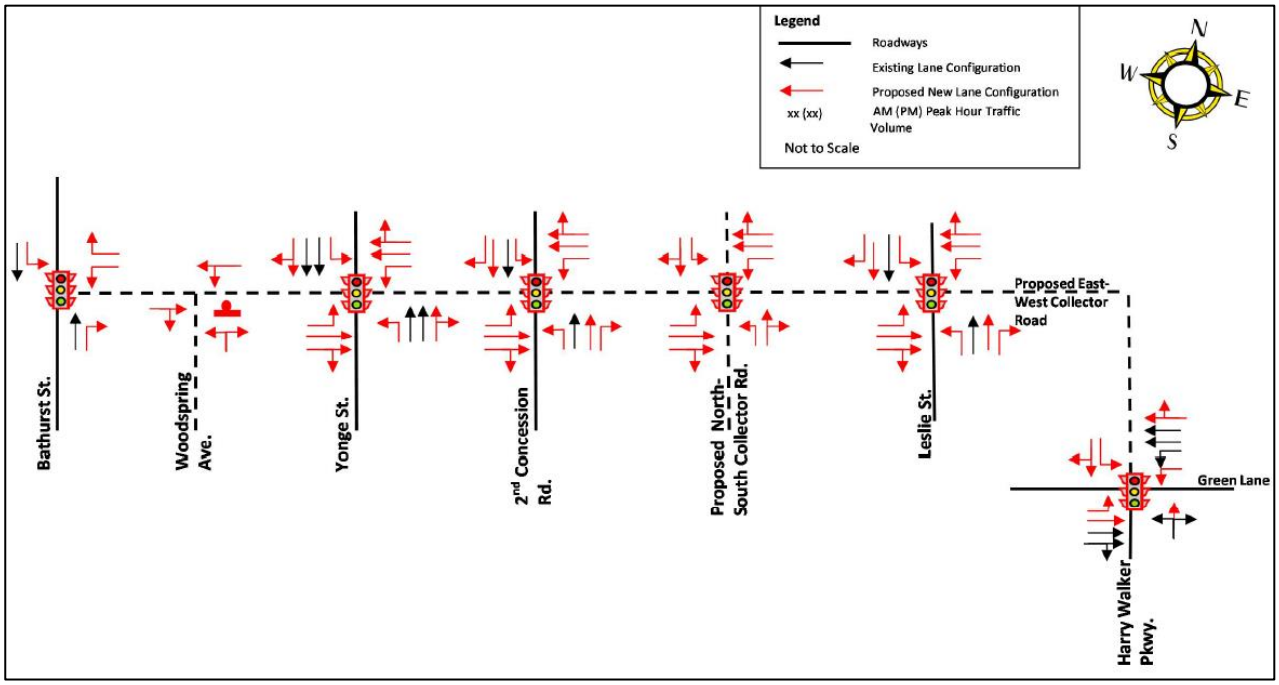
- **Future East-West Collector Road/ Woodspring Avenue:**
  1 shared northbound left-right lane, 1 shared eastbound thru-right lane and 1 shared westbound thru-left lane
- **Future East-West Collector Road/ Yonge Street:**
  1 exclusive northbound left-turn lane, 1 shared northbound through-right turn lane (in addition to the 2 existing through lanes), 1 exclusive southbound left-turn lane, 1 shared southbound thru-right lane (in addition to the 2 existing through lanes), 1 exclusive eastbound left-turn lane, 1 eastbound through lane, 1 shared eastbound thru-right lane, 1 exclusive westbound left-turn lane, 1 westbound through lane and 1 shared westbound thru-right lane
- **Future East-West Collector Road/ 2nd Concession Road:**
  1 exclusive northbound left turn lane, 1 additional northbound through lane (with 1 existing through lane), 1 exclusive northbound right lane, 1 exclusive southbound left-turn lane, 1 additional southbound through lane (with 1 existing through lane), 1 exclusive southbound right lane, 1 exclusive eastbound left-turn lane, 1 eastbound through lane, 1 shared eastbound thru-right lane, 1 exclusive westbound left-turn lane, 1 westbound through lane and 1 shared westbound thru-right lane;
- **Future East-West Collector Road/ Proposed North-South Collector Road:**
  1 exclusive northbound left-turn lane, 1 shared northbound thru-right lane, 1 exclusive southbound left-turn lane, 1 shared southbound thru-right lane, 1 exclusive eastbound left-turn lane, 1 eastbound through lane, 1 shared eastbound thru-right lane, 1 exclusive westbound left-turn lane, 1 westbound through lane and 1 shared westbound thru-right lane;
- **East-West Collector Road/ Leslie Street:**
  1 exclusive northbound left-turn lane, 1 additional northbound through lane (with 1 existing through lane), 1 exclusive northbound right lane, 1 exclusive southbound left-turn lane, 1 additional southbound through lane (with 1 existing through lane), 1 exclusive southbound thru-right lane, 1 exclusive eastbound left-turn lane, 1 eastbound through lane, 1 shared eastbound thru-right lane, 1 exclusive westbound left-turn lane, 1 westbound through lane and 1 shared westbound thru-right lane
- **Future East-West Collector Road/ Harry Walker Parkway Extension/ Green Lane:**
  1 shared northbound left-thru-right turn lane (adding the through traffic movement onto the existing shared left-right turn lane), 1 exclusive southbound left-turn lane, 1 shared southbound thru-right lane, 1 exclusive eastbound left-turn lane, 1 additional eastbound through lane (with 1 of the 2 existing through lanes converting to a shared thru-right), a second westbound left-turn lane (to create a double-left turn configuration), 1 additional shared westbound through-right lane (with 2 existing through lanes).

The future (2031) proposed lane configuration is shown in **Figure 4-2**.

The analysis results also show that with the recommended road improvements, the majority of the intersections are expected to operate at acceptable LOS D or better, except for the intersection of the East-West Road/ Harry Walker Parkway Extension/ Green Lane. This level of intersection operation is considered to be reasonable due to the conservative underlying assumption made in the peak hour period traffic analysis (i.e., assuming no transit trips/ mode split) and demand forecasting model (i.e., high population scenario which assumed the worst case of planned development) in year 2031.

It is recommended that that signal timing phasing splits at intersections along the East-West Road be optimized with the new lane configurations and that protective left-turn phases be implemented for the proposed double left-turn lane at the East-West Road/Harry Walker Parkway Extension/Green Lane intersection. Traffic signals are recommended for implementation at those intersections as shown on **Figure 4-2**.

Figure 4-2 Future 2031 Proposed Lane Configuration



4.2.3 Transit Service

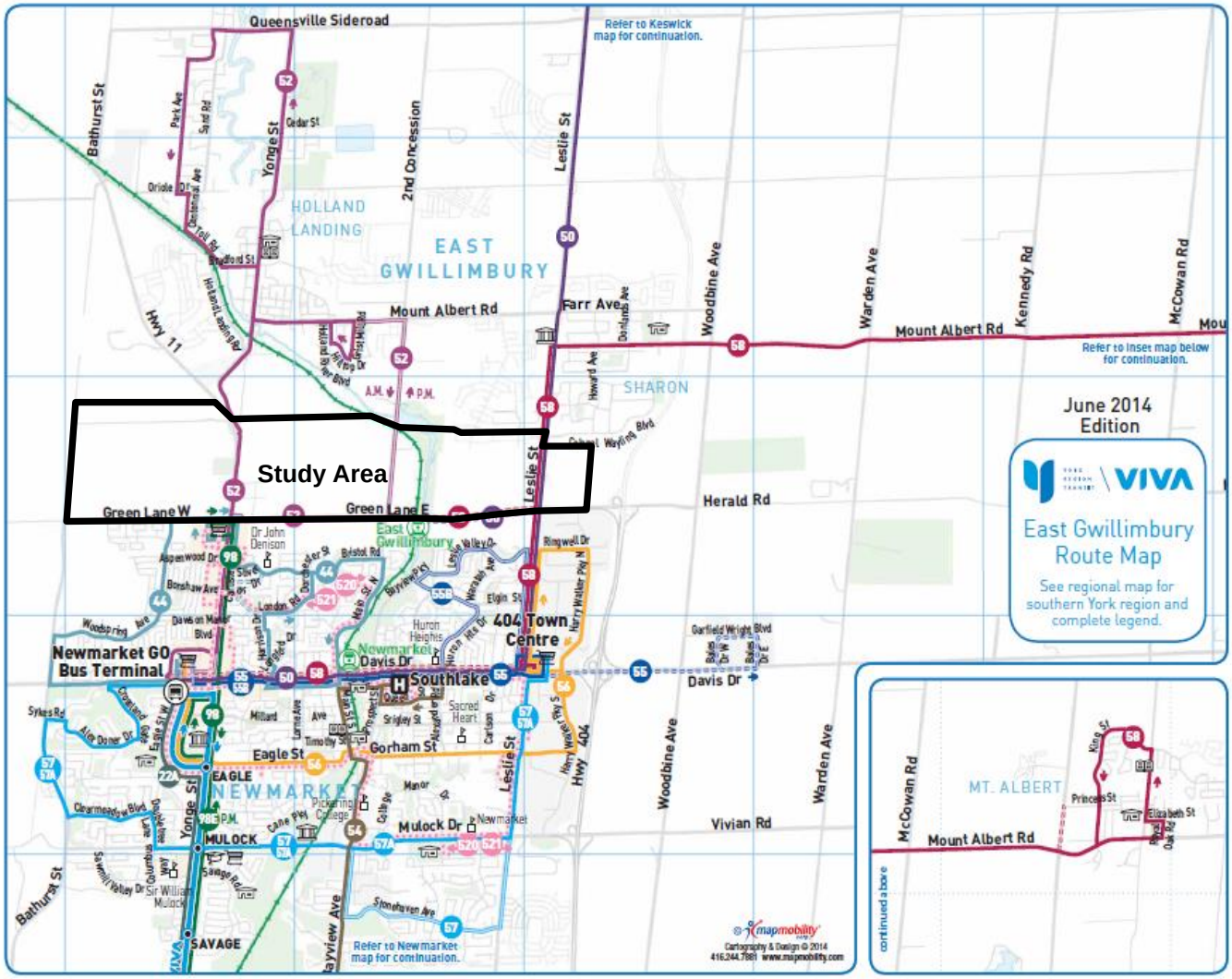
The following York Region Transit Routes are present within the study area (see **Figure 4-3**):

- ***Route 50 – Queensway*:**
  North/south along Leslie Street with limited service extending to the East Gwillimbury GO Station east/west along Green Lane.
- ***Route 52 – Holland Landing*:**
  Along Yonge Street, 2nd Concession, and Green Lane East within the study area.
- ***Route 58 – Mount Albert*:**
  Along Leslie Street with limited service extending to the East Gwillimbury GO Station along Green Lane East.
- ***Route 99 – Yonge*:**
  North/south along Yonge Street with northern terminus at Green Lane West.

Additionally, the East Gwillimbury GO Transit Station on the GO Transit Barrie Corridor is located on the south side of Green Lane East, west of the Holland River. The GO Transit Barrie corridor roughly bisects the study area.

The East Gwillimbury Transportation Master Plan (TMP), June 2010, identifies that with future population and employment growth in the Town, there is a need for additional transit service. Transit service should be planned in advance of the future developments for seamless adaptation by the residents and employers to future services. There are proposed plans for expanded bus service along Second Concession Road and Leslie Street, as well as adjacent roads, to support the new population and employment growth north of Sharon and in Queensville. To align with the Town's vision to improve transit service, new transit routes operating along the East West Road Corridor would also be considered to accommodate future planned developments, alleviating auto traffic demand on the roadways. Peak period express shuttle service between the East Gwillimbury GO Station and Future East-West Road Corridor should also be considered to provide direct access to employment centres for GO Transit commuters.

Figure 4-3 Existing Transit Routes - East West Road Corridor Study Area



4.2.4 Pedestrians and Cyclists

The existing cycling and pedestrian network in the study area is limited, as much of the area is rural. In future, the existing cycling and pedestrian network will be significantly altered to accommodate the planned future growth.

The East Gwillimbury Transportation Master Plan identifies the need to improve walking and cycling infrastructure to promote active transportation and encourage sustainable transportation modes. According to the TMP, new north-south trails will be located east and west of Yonge Street to connect with the existing trail system.

In the TMP, collector roads are recommended to be considered for cycling routes. There are plans for the proposed North-South Collector Road parallel to Leslie Street to provide a cycling route between Green Lane and Doane Road, which will then be connected to Queensville Sideroad. On-street bicycle lanes on each side of the future East-West Road Corridor will provide linkages between communities and existing or future cycling routes or trail systems.

The Regional Pedestrian and Cycling Master Plan (adopted by Regional Council in April 2008), was incorporated into the future proposed Pedestrian and Trail System in the Town's TMP, identifying the "Pedestrian Zones" and "

Future Pedestrian Zones" based on the Town's plan for growth. The study area is within these two zones, and for this reason, sidewalks should be provided within road rights-of-way in order to develop an interconnected web of pedestrian facilities within the Town's urban areas. Sidewalks on both sides of the road are encouraged for the preliminary design of the East-West Road Corridor, and connections to transit stops should also be considered to improve pedestrian accessibility to the transit system.

4.3 Utilities

An existing 44 kV above-ground electricity line owned by Hydro One is located adjacent to the eastern embankment of the East Holland River. Additional above ground utilities were observed during site reconnaissance along major roadways within the study area.

Utility companies will need to be contacted during detailed design to confirm the locations of above ground utilities and/or existing plants within the study area.

4.4 Physical Environment

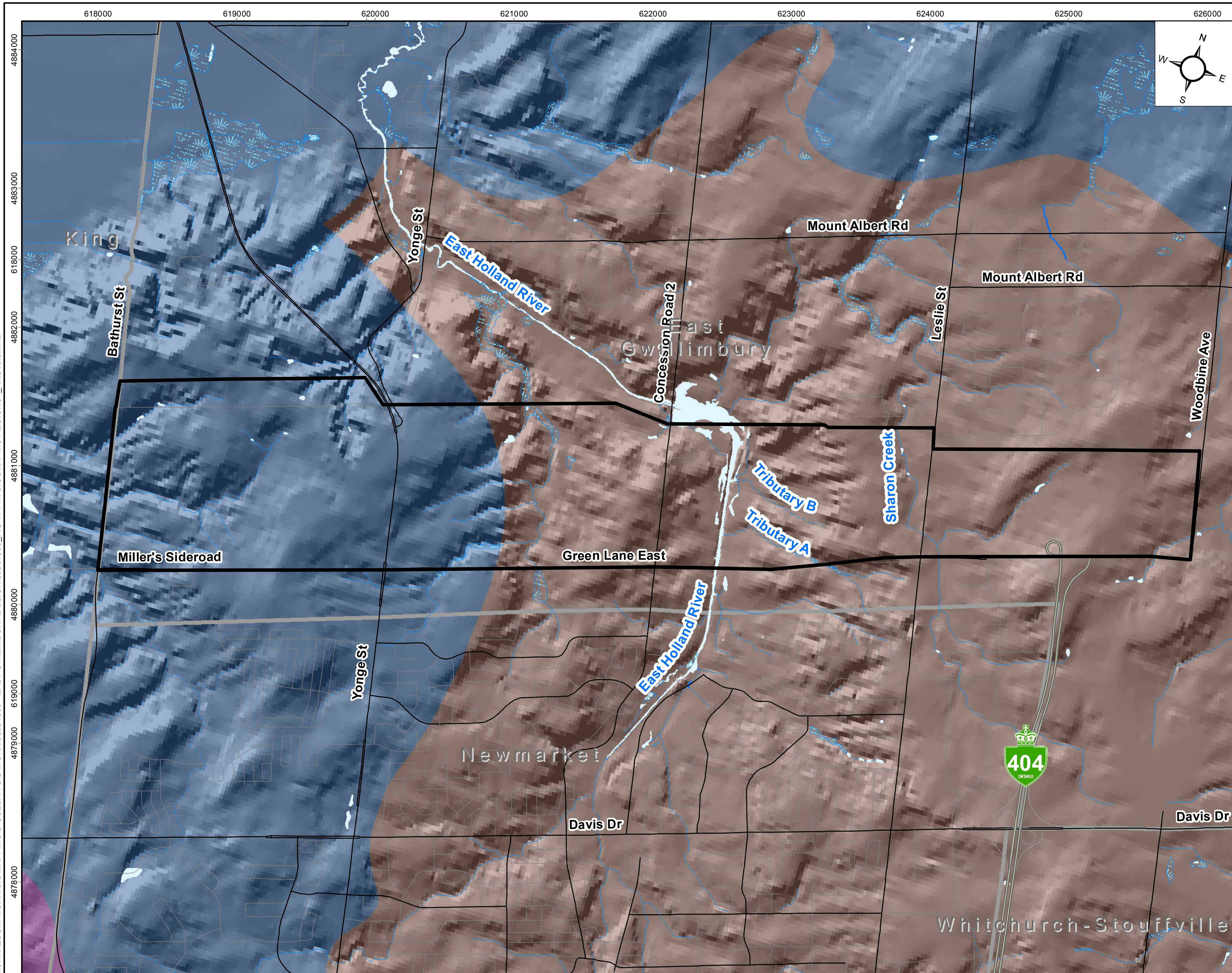
The physical setting of Southern Ontario is well documented and a background review of available literature and mapping provides an understanding of the sequence of glacial and post-glacial events that have shaped the region and resulted in the deposition of the geologic units that are present today. This knowledge has significance because it permits further understanding of the hydrogeology within the region, the behaviour of fluvial systems that drain the study area, the type and nature of vegetation that grows within the study area, and the suitability for different types of land use. These aspects of the physical environment all contribute to the natural environment character, influencing both terrestrial and aquatic habitat. In addition, knowledge of the geology of an area permits identification of nearby aggregate resources that could aid in road building, or constraints to development that may be posed by the nature of underlying materials. The following sections present a discussion of physical environment of the study area.

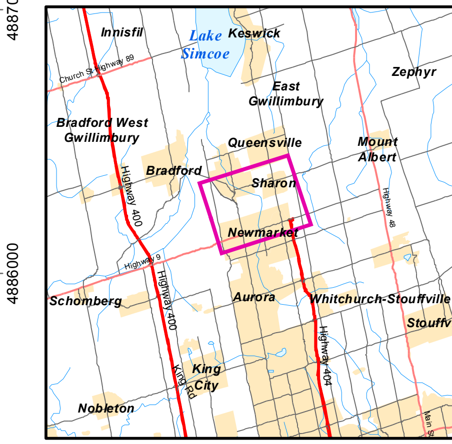
4.4.1 Physiography and Topography

The study area lies within two physiographic regions: the eastern two thirds lies within the Schomberg Clay Plains physiographic region, and the western third lies within the Simcoe Lowlands (see **Figure 4-4**).

The northern slope of the Oak Ridges Moraine lies at the southern border of these two regions, south of the study area. The Schomberg Clay Plains region consists of stratified clay and silt, having an average thickness of approximately 4.5 m, which was deposited in a proglacial lake ponded between the Oak Ridges Moraine to the south and the retreating Simcoe lobe of the Laurentide ice sheet to the north. The area is underlain by a drumlinized till plain which causes the topography to exhibit rolling hills and more relief than is typical of most glaciolacustrine environments (Chapman and Putnam, 1984). The Simcoe Lowlands are characterized by low-lying swampy sand plains.

The topography within the study area generally exhibits low to moderate relief (**Figure 4-5**). Rolling hills are common, supported by the drumlinized till plain underlying the surficial deposits. Regionally, elevations decrease gradually from north to south, as the land surface slopes down from the northern flank of the Oak Ridges moraine towards Lake Simcoe. However, within the study area, topography is marked grade changes at the stream valleys of the East Holland River and Sharon Creek, which run north-south through the study area. These rivers have incised through the clays of the Schomberg Clay Plain, with elevation lows of 230 mASL and 260 mASL in the East Holland River valley and Sharon Creek valley, respectively. In contrast, the highest elevations within the study range from 290 to 295 mASL.





Key Map

Legend

- Study Area
- Municipal Division
- Freeway
- Expressway / Highway
- Major Road
- Local Road
- Ramp
- Unevaluated Wetland
- Lake
- River
- River
- Permanent Stream
- Intermittent Stream

Physiographic Regions

- 30, Oak Ridges Moraine
- 34, Schomberg Clay Plains
- 35, Simcoe Lowlands

Figure 4-4

1:30,000
NAD 1983 UTM Zone 17N

400 200 0 400 800 1,200
Metres

Basemap: Ontario Ministry of Natural Resources.
Additional Sources: York, 2013
Ortho-Imagery: York, 2011

AECOM

Physiographic Regions

East Gwillimbury East-West Road Corridor EA

Project No.: 60281533 Date: 2013-11-06

ANSI B 279.4mm x 431.8mm

Approved: Checked: Designer: Project Management Initials:

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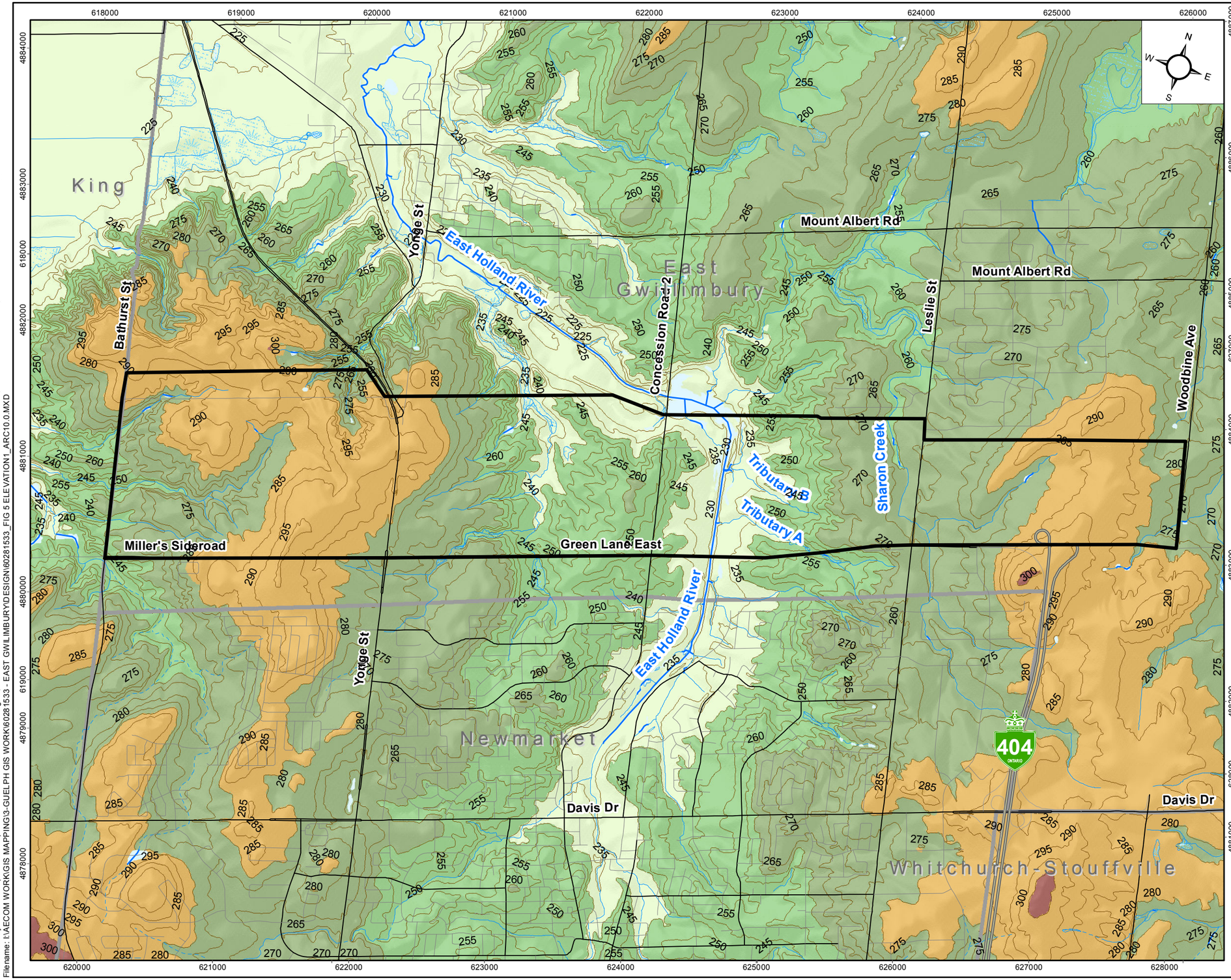

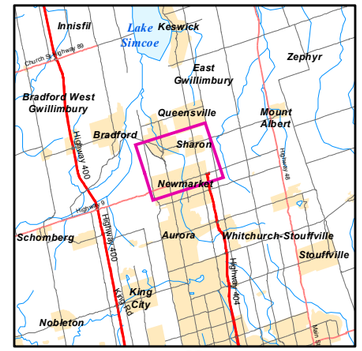

Key Map

Legend

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- Local Road
- Ramp
- River
- Permanent Stream
- Intermittent Stream
- Unevaluated Wetland
- Lake
- River
- Contours (5m)

Elevation (m)

- 212 - 220
- 221 - 240
- 241 - 260
- 261 - 280
- 281 - 300
- 301 - 320
- 321 - 340
- 341 - 360
- 361 - 380
- 381 - 400

Figure 4-5

1:30,000
NAD 1983 UTM Zone 17N

400 200 0 400 800 1,200
Metres

Basemap: Ontario Ministry of Natural Resources.
Additional Sources: York, 2013
Ortho-Imagery: York, 2011

Elevation
East Gwillimbury East-West Road Corridor EA
Project No.: 60281533 Date: 2013-11-06

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4.4.2 Regional Geology

The geology within the study area consists of a sequence of glacial and post-glacial overburden deposits that overlie Ordovician-aged bedrock. Available resources consulted for review of the geological setting included bedrock and surficial geology mapping by the Ontario Geological Survey (OGS, 2010; Barnett *et al.*, 1999; Armstrong and Dodge, 1997), and the Geological Survey of Canada (Barnett and Gwyn, 1997). Additional information was also available from regional geological models by the Conservation Authority Moraine Coalition (CAMC) / York-Peel-Durham-Toronto (YPDT) studies (CAMC, 2006, 2007, 2009).

4.4.2.1 Bedrock Geology

Over most of the study area, the upper most bedrock unit is the Lindsay Formation, a finely crystalline limestone interbedded with shale (Hewitt, 1972). The total formation thickness of the Lindsay Formation is about 61 m (Liberty, 1969). A small portion of the study area in the east is underlain by the Blue Mountain Formation, a blue-grey to grey-brown shale with minor interbeds of limestone and siltstone (Armstrong and Carter, 2010). Bedrock is interpreted to gently dip to the south and southwest. **Figure 4-6** shows Paleozoic geology mapping after the OGS (Armstrong and Dodge, 2007). No bedrock outcrops are present within the study area.

4.4.2.2 Quaternary Geology

The study area is overlain by glacial sediments (overburden) deposited during the Pleistocene era by the Laurentide Ice Sheet. These deposits are of Quaternary age and were largely deposited during the Wisconsinan stage, which started approximately 115,000 years ago and ended approximately 10,000 years ago (Dreimanis and Karrow, 1972).

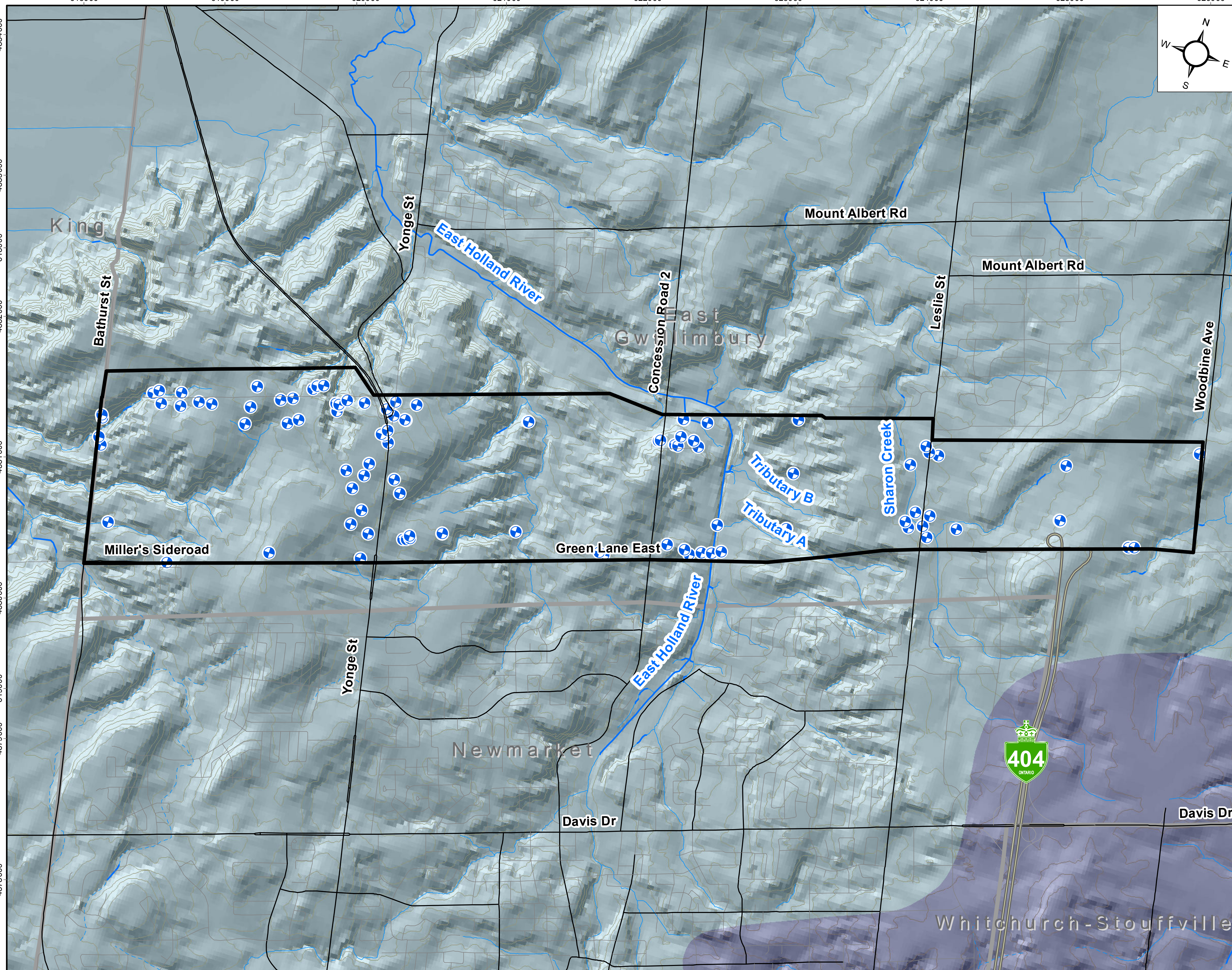
Surficial deposits in the study area consist entirely of overburden, and are primarily massive, well-laminated glaciolacustrine silts and clays of the Schomberg clay plain. In the east of the study area, coarser grained glaciolacustrine (foreshore-basinal) deposits are present. Where glaciolacustrine deposits are absent as surface, underlying silty-sand Newmarket Till may be exposed, or ice-contact sands and gravels may occur. Within the valleys of the East Holland River and Sharon Creek recent alluvium overlies glacial deposits. **Figure 4-7** shows surficial geology mapping after OGS, 2010.

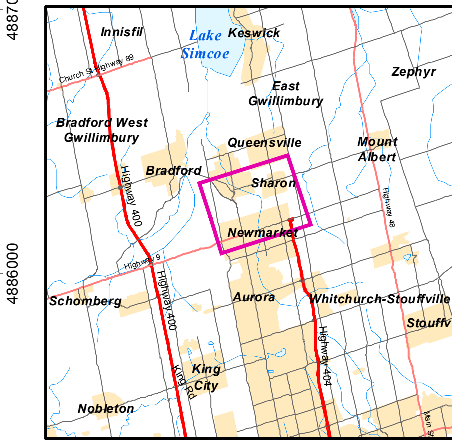
Major regional sedimentary units are well documented in the literature and a brief summary of each is presented below from youngest to oldest.

Modern Alluvial and Recent Deposits

During the post-glacial period, regional rivers cut down rapidly through the Pleistocene sediments creating the Holland River East Branch floodplain and smaller floodplains. Alluvial deposits of silt, sand and gravel up to several metres thick were laid down in the river floodplains, and organic deposits accumulated in depressions and poorly drained wetland areas.

Modern alluvial deposits are mapped within the study area in the valley along the east branch of the Holland River. These deposits are characterized as recent accumulations of predominantly sand and silt, along with minor gravel, clay, and organic deposits, which make up modern floodplains.





Key Map

Legend

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- Local Road
- Ramp
- River
- Permanent Stream
- Intermittent Stream
- Waterwell (MOE)
- Contours (5m)

Paleozoic Geology

- 12: Blue Mountain Formation Shale
- 11: Lindsay Formation Limestone

Figure 4-6

1:30,000
NAD 1983 UTM Zone 17N

400 200 0 400 800 1,200
Metres

Basemap: Ontario Ministry of Natural Resources.
Additional Sources: York, 2013
Ortho-Imagery: York, 2011

AECOM

Quaternaryl Geology
East Gwillimbury East-West Road Corridor EA
Project No.: 60281533 Date: 2013-11-06

ANSI B 279.4mm x 431.8mm
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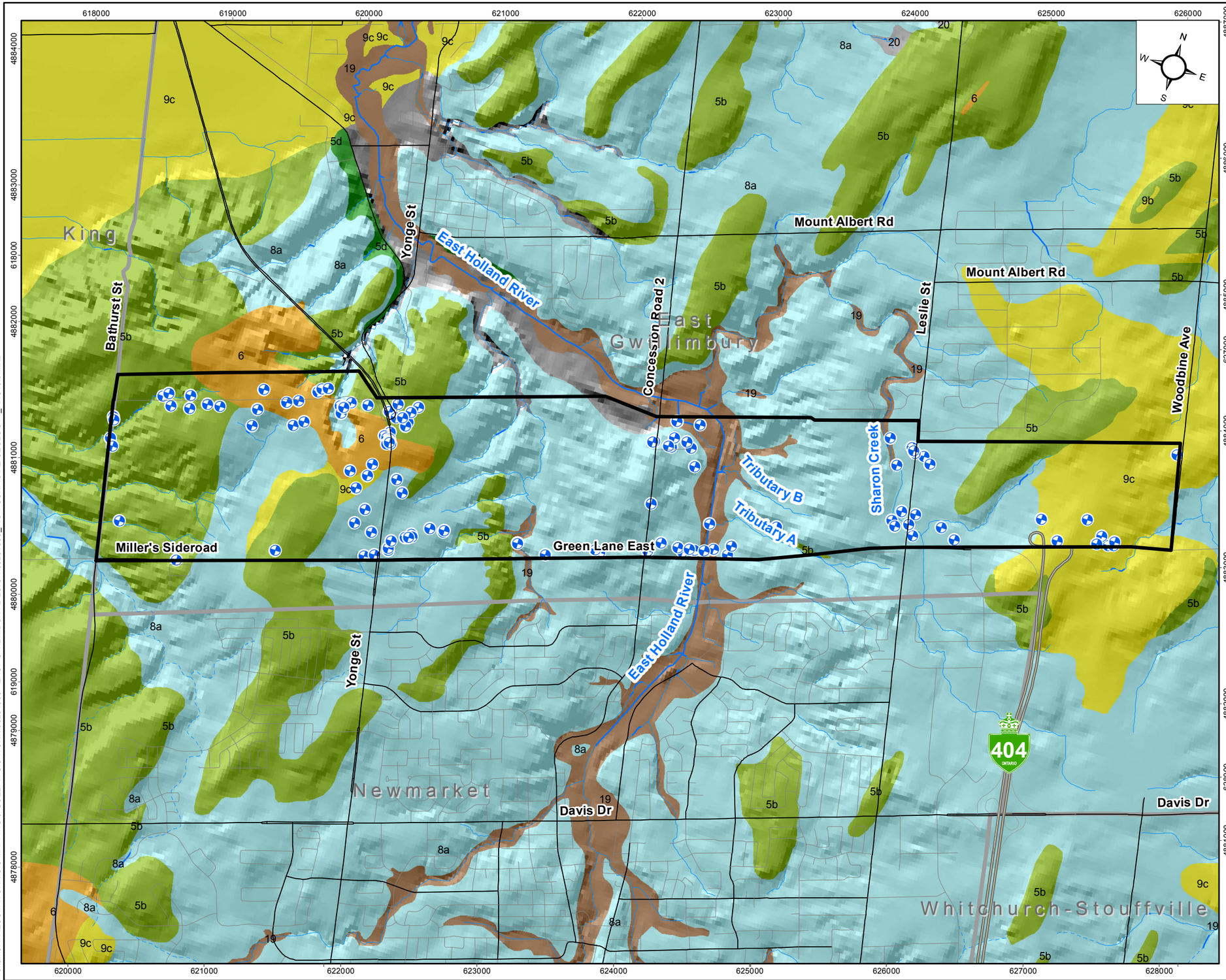

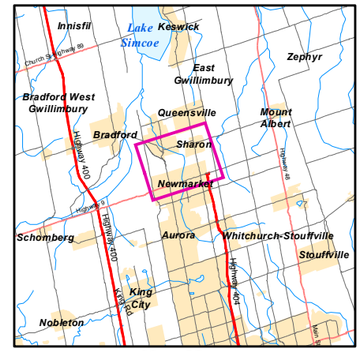

Key Map

Legend

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- Municipal Division
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- Major Road
- Local Road
- Ramp
- River
- Permanent Stream
- Intermittent Stream
- Waterwell (MOE)

Surficial Geology

- 20: Organic deposits
- 19: Modern alluvial deposits
- 12: Older alluvial deposits
- 9c: Foreshore-basinal deposits (glaciolacustrine, sand)
- 9b: Littoral-foreshore deposits (glaciolacustrine, sand and gravel)
- 8a: Massive-well laminated (glaciolacustrine, clay and silt)
- 6: Ice-contact stratified deposits (glaciofluvial, sand and gravel)
- 5d: Glaciolacustrine-derived silty to clayey till
- 5b: Stone-poor, carbonate-derived silty to sandy till

Figure 4-7

1:30,000
NAD 1983 UTM Zone 17N

400 200 0 400 800 1,200
Metres

Basemap: Ontario Ministry of Natural Resources.
Additional Sources: York, 2013
Ortho-Imagery: York, 2011

Surficial Geology
East Gwillimbury East-West Road Corridor EA
Project No.: 60281533 Date: 2013-11-06

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Project Management Initials: Designer: Checked: Approved: ANSI B 279.4mm x 431.8mm

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Glaciolacustrine Deposits

The central portion of the study area is characterized by massive to laminated fine-textured glaciolacustrine deposit (silts and clays) which were deposited in the Schomberg Ponds that formed between the Oak Ridges Moraine to the south and the retreating ice of the Simcoe lobe to the north during and following the Wisconsinan glaciation. Coarser-textured nearshore (foreshore-basinal) glaciolacustrine deposits, consisting of massive to laminated sand and silt, are mapped at surface along the eastern edge of the study area, and locally in the western portion.

Ice-Contact Stratified Drift

Ice-contact stratified drift is mapped locally within the western portion of the study area and is characterized predominantly by un-subdivided sand and gravel, although minor silt, clay, and flowtills are also present. It may be associated with morainal or subaqueous fan deposits.

Kettleby Till

The Kettleby Till represents the final advance of ice southwards out of the Lake Simcoe basin at the end of the Wisconsinan glaciations, approximately 13,000 years ago, and is generally equivalent in age to the Halton Till south of the moraine. The Kettleby Till is composed of glaciolacustrine-derived clayey-silt to silt. It occurs predominantly as a surface till on topographic highs, is discontinuous, and generally less than about 20 m in thickness. Historical OGS (2000) mapping suggests the Kettleby Till occurs in the eastern part of the study area.

Oak Ridges Moraine / Mackinaw Interstadial

The Oak Ridges Moraine is interpreted as moraine deposits formed approximately 13,300 ybp between the Laurentide ice sheet to the north and a separate lobe in the Ontario basin, to the south. The boundary of the Oak Ridges Moraine is located outside the study area, however its presence affected the sequence of younger sediments deposited within the area, and it acts as a drainage divide between Lake Ontario to the south and Lake Simcoe to the north. Oak Ridges Moraine deposits occur above the Newmarket Till, and consist mainly of glaciofluvial sand and gravel deposits up to 150 m thick (Barnett *et al.*, 1998). The dominant sediments in the moraine are rhythmically interbedded fine sands and silts with prominent local deposits of coarse sands and gravels.

Deposition of glaciolacustrine silts and clays is also associated with the retreat of Newmarket ice within a proglacial lake environment bounded by the Oak Ridges Moraine to the south and the retreating ice sheet to the north. These deposits represent the first round of deposition that occurred in the Schomberg ponds, which is expressed as the clay plains mapped throughout the central portion of the study area.

Subsequent to deposition of the Oak Ridges Moraine, the ice sheet margin retreated resulting in a brief ice-free interval, referred to as the Mackinaw Interstadial (13,300 to 13,800 ybp). Beyond the moraine, sand deposits on the surface of the Newmarket Till have been categorized as belonging to the Mackinaw Interstadial. During this period, thin but extensive spreads of coarse textured sediments were deposited from rivers flowing from the ice front. The Interstadial deposits are typically less than 5 m in thickness, are comprised of sand and gravel, and are considered to be an approximate time equivalent of the Oak Ridges Moraine. They are believed to form a widespread, but thin and discontinuous layer extending in the subsurface beyond the boundary and surface expression of the Moraine.

Channel Deposits

Prior to the formation of the Oak Ridges Moraine, and during the period of ice cover in the Late Wisconsin, large, late stage subglacial meltwater floods resulted in the development of a network of erosional tunnel valleys and channels cut into or through the underlying sediment (Barnett, 1990; Russell *et al*., 2003). These form a regional

unconformity at the top of the Newmarket Till (Sharpe *et al*., 1999), with major erosional channels occurring beneath the Holland Marsh extending from Lake Simcoe through Schomberg and Newmarket. The tunnel channels were infilled by a fining-upward sequence of sands and silts deposited as meltwater energy waned. The lower portions of the channel deposits are often composed of sandy sediments, and some channels have been found to contain a thick layer (10 to 15 m) of gravel. Where present the coarser channel fill (sand and gravel) function to transmit and provide a source of groundwater for some municipal production wells. Thick sequences of silt (greater than 40 m) deposited within these channels is encountered within the Simcoe Lowland and Holland Marsh areas.

Newmarket Till

The lower sediments described above are overlain by a regionally extensive blanket of subglacial till (Newmarket Till) that was deposited during the maximum advance of the Laurentide Ice Sheet which occurred during the Late Wisconsin, approximately 20,000 ybp (Sharpe *et al*., 1994). The Newmarket Till is a thick, widespread deposit that underlies the Oak Ridges Moraine and most of south central Ontario (Sharpe *et al*., 1997). It is typically a dense, over-consolidated till deposit, ranging in thickness from 5 to 30 m, and reaching up to 100 m thick or more, locally. It is primarily comprised of dark grey sandy silt to silt, with trace gravel content. It is generally massive, but also contains coarser textured sand dykes, sand and gravel interbeds, inclusions, boulder pavements marking erosional surfaces, and other secondary porosity features such as fractures, joints, and shear surfaces.

Recent work completed by CAMC-YPDT suggests that the Newmarket Till may be made up of a number of units, which differ in terms of their lithology (S. Holysh, pers. comm.). As such, recent regional models (CAMC, 2007, 2009) subdivide the Newmarket Till into an Upper and Lower Newmarket Till unit, which are composed of finer grained lithologies (silts); and an Inter-Newmarket Sediments unit, which is composed of coarser grained lithologies (sands).

Thorncliffe Formation

Overlying the bedrock are sediments of the Thorncliffe Formation, Sunnybrook Drift, and Scarborough Formation. These units are collectively referred to as ‘Lower Sediments’. The Thorncliffe Formation is the upper most of these units and it represents glaciofluvial and glaciolacustrine sediments associated with an early, deep glacial lake, which occupied the Lake Ontario basin during the Middle Wisconsin, approximately 45,000 years before present (ybp). The Thorncliffe Formation is comprised of extensive stratified sands, silty sand, and commonly silt and clay near the base of the deposit. The Thorncliffe Formation forms a thick, extensive sand deposit underlying the Newmarket Till within the study area and surrounding region. This unit is an important source of potable water to both private and municipal supplies.

Sunnybrook Drift

Overlying the Scarborough Formation, the Sunnybrook Drift is typically described as a clast-poor mud (silt and clay) deposited on the floor of a glacially dammed lake, or derived by the overriding of pre-existing lake sediments by advancing ice.

Scarborough Formation

The Scarborough Formation is the lowest unit in the ‘Lower Sediments’ assemblage and it marks the start of the Wisconsinan glaciations. It is interpreted as being deposited in a fluvio-deltaic system that was fed by large braided meltwater streams and rivers draining from an advancing ice sheet (Eyles, 1997). The Scarborough Aquifer is interpreted to underlie much of York Region, but is generally thin within the study area. Appreciable thicknesses are observed in bedrock lows and valleys, including the Laurentian valley and its tributaries.

4.4.3 Fluvial Geomorphology

The study area is drained by several tributaries of the East Holland River and a portion of its main branch. The existing conditions of a watercourse is a result of the interaction between controlling (e.g., geology, flow) and modifying (e.g., vegetation) factors. Alteration in any one of these factors and/or anthropogenic modifications may cause a temporary or permanent channel response both locally and within the broader drainage network. Characterization of existing conditions should therefore not focus only on observations made at a site, but also consider a broader spatial and temporal context to identify conditions and factors that contribute to existing channel form and function.

Review of existing conditions included a review of existing reports, available geologic and topographic mapping, and both historical and recent aerial imagery. While some of the analyses focused on the study area, a broader spatial perspective was used, where relevant, to inform study area and watercourse conditions. The geomorphology of a watercourse forms the basis of physical aquatic habitat characteristics and thus informs the natural environment understanding.

4.4.3.1 Drainage Network and Reaches

The study area lies within three subwatersheds that form part of the larger Lake Simcoe Watershed. While the majority of the study area is situated within the East Holland Subwatershed, the westernmost edge crosses into the West Holland Subwatershed and the easternmost edge crosses into the Black River Subwatershed. The East Holland River Subwatershed exhibits a dendritic drainage pattern, and the overall drainage direction within the study area is from south to north towards Lake Simcoe.

The drainage network of a watercourse conveys water and sediment from an area to a downstream receiving waterbody. The general pattern of the drainage network and the total length of channel within a watershed reflect the climate, geology, soils, vegetation and topographic conditions. Review of aerial photography and mapping indicate that the drainage network within the study area includes a large number of swale features. Swales can be continuous (i.e., directly connected to headwater channels) or discontinues features that are connected to a tributary only during precipitation events. While small, the features play an important role in terms of affecting hydrologic characteristics of the main branch of the watercourse and conveying sediment to downstream reaches.

Organization and representation of data and observations along a watercourse is best accomplished by dividing the river into spatial units. Typically, this follows the sequence of watershed → subwatershed → valley segment → reach → field site which is based on an increasing level of consideration regarding site level controls and modifiers of channel form. Reaches are defined as sections of channel that display homogeneity in variables such as valley setting, underlying geology, channel pattern, riparian vegetation, hydrology, surrounding land use, and flow. Reach boundaries occur when there is a notable change in any one of these variables. The channel within a reach shows similarity in natural channel characteristics (bed morphology, substrate materials, cross-section) and geomorphological processes. While reach delineation is first undertaken through review of background data, reach boundaries are confirmed/adjusted during field reconnaissance of the study area (see **Section 4.5.1**).

Where there is general homogeneity in the variables that define a reach, stream order may be an appropriate surrogate for organizing spatial data. Stream order is a method of classifying channel sections according to their placement within the drainage network. One of the generally accepted methods of determining stream order was developed by Strahler (1957). Using this system, headwater tributaries are assigned a number of one (1). When two channels of the same stream order join, then the resulting downstream channel is assigned the next highest order (e.g., the channel downstream of two first order tributaries is assigned the order of two (2)). Assuming similar surrounding conditions, streams of the same order within a drainage basin will often display similar morphological characteristics.

Stream order, was used as the basis for geomorphologically classifying watercourses within the Upper York Sewage Solutions Natural Environment Baseline Study (UYSS, 2012) which encompasses the current East Gwillimbury study area. To avoid replication of work, these data formed the basis from which reach boundaries were further delineated by including consideration of land use, vegetation, and channel form from both recent and historical imagery. In addition, reports documenting results of fluvial geomorphology assessments completed within the study area were also reviewed (e.g., Parish Geomorphic, 2007; Lake Simcoe Conservation Authority (LSRCA), 2010 a,b& c). A description of reach characteristics is provided in **Table 4-2- Stream Reach Characteristics within the East-West Road Corridor Study Area** and further described in **Section 4.4.3.4**.

The largest watercourse within the study area is the East Holland River; it flows through the centre of the study area and is classified as a 5th order stream. The next highest stream orders occur along an un-named tributary to the Holland River between 2nd Concession and Yonge Street (3rd order), and Sharon Creek (2nd order), which flows along the west side of Leslie Street. All other watercourses within the study area include swales (zero order) or un-named, first and second-order tributaries.

4.4.3.2 Controlling and Modifying Influences

The form and function of a watercourse are due to the interaction between controlling (e.g., geology, climate) and modifying factors (e.g., vegetation, human activity). When these factors are relatively constant over time, then the channel attains a dynamic equilibrium state. When a change occurs in one or more of these factors, then the channel may respond by altering its form or processes. If the change is greater than the ability of the channel to absorb, then the watercourse will work to attain a new quasi-equilibrium form. A brief summary of specific controlling and modifying factors that affect the study area watercourses is provided below:

Surficial Geology: ..... The composition of floodplain materials will determine the relative rate of erodibility, and characteristics of channel form. The surficial geology within the study area are predominantly mapped as glaciolacustrine silt and clay, or well-consolidated clayey-silt to silt till (Section 4.4.1). This suggests that the channels will typically have finer grained substrate materials, and will tend to be somewhat narrower and deeper than channels situated in alluvial materials.

Vegetation:..... The type and density of vegetation affects infiltration capacity and the potential for sediment delivery to the watercourse on a drainage-basin scale, and root networks provide stabilization for channel banks on a local scale. The vegetation cover within populated regions is typically dictated by land use. Within the study area, agricultural fields have replaced the natural forested landscape that once occupied the area; and have likely resulted in the ploughing over of swales. Typically, channels are wider when banks are occupied by trees, and narrower when bank vegetation consists of grasses and herbaceous vegetation. While the dense rooting network of grasses typically provides good bank stabilization, ploughing and harvesting practices regularly introduce the potential for delivery of excess fine sediment to the channel. Banks with little or no riparian buffer tend to be more unstable and prone to erosion, especially when bankside vegetation consists of annual crops. The riparian area along several portions of the stream corridors within the study area are naturally vegetated. Natural riparian vegetation along a stream indicates that direct impacts to the channel are less likely to have occurred in the past.

Land Use (agriculture): Sediment runoff from agricultural fields is typically greater than from other land uses, unless a substantial riparian buffer occurs around the watercourses. Sedimentation within the channel may affect the quality of aquatic habitat.

Land Use (urban): Urban development has occurred, and is continuing, within the upstream watershed area of many of the tributaries that flow through the study area. Even with stormwater management (SWM), which regulates peak flows, a change in the hydrologic regime occurs when the land use becomes urbanized. This includes an increase in the number of larger-than baseflow events within the channel (i.e., precipitation events that previously infiltrated into the ground now produce surface runoff), and increased duration of flows below an erosion threshold (i.e., if erosion control is incorporated into the SWM). These changes are referred to as urban hydromodification which may result in a channel response. Thus, watercourses situated downstream of urbanizing areas may now, or in the future, demonstrate some instability.

Channel Alteration: Channel straightening or realignment often occurs in both agricultural and urban land use. In the study area, the East Holland River and parts of Sharon Creek have previously been straightened. Flow control measures are present on the East Holland River at Holland Landing, north of the study area. Unless channels are reinforced with engineering countermeasures, they will rarely remain straight and thus will attempt to regain a meandering planform. Straightening results in an increase in channel slope, thereby increasing the energy of flows that are conveyed through it, which leads to a potential increase in erosion and stream instability. Other alterations include establishment of on-line pools and grade controls. Both of these affect the continuity of sediment movement and serve as local base level controls to which the channel profile will adjust.

4.4.3.3 Historic Conditions

When a change to channel form (e.g., straightening) or land use/cover occurs, then the channel will initiate a response (see **Section 4.4.2.2**) to regain equilibrium channel form and function. While the channel response to watershed changes may be gradual and take decades to complete, others may occur more rapidly. Historical imagery is often used to identify changes that have occurred within the drainage basin and to the watercourses of interest, as this information can offer a context for observed channel conditions and enable a prediction of future channel change (e.g., direction and/or rate of channel movement).

Historical imagery spanning a time period of 65 years, from 1946 and 2011, was analyzed as part of the current investigation. A single image for the East Holland River was also available for the year 1988. Few changes have occurred to the land use and land cover within the study area over the period of record. The current agricultural land use practices were already in place by 1946, and the drainage pattern exhibited by the agricultural swales is consistent with that seen in the recent imagery. By 1988, the Town of Newmarket, south of the study area, was almost completely developed. A slight increase in development density was observed between 1988 and 2011. Natural vegetation succession in the woodlots throughout the study area has occurred steadily over the entire period of record.

Development within the watershed generally affects the hydrologic regime of channels due to an overall decreased infiltration capacity within the watershed and may result in flashy flows following heavy precipitation events.

The configuration of watercourses within the study area exhibited little change over the period of record. Channelization of the East Holland River and the installation of locks at Holland Landing occurred prior to 1946. Ponding behind the locks and backwatering through the entire reach was observed in the 1988 image, and likely occurs periodically as part of flow regulation. The review completed by Parish Geomorphic (2007) indicates that the East Holland River has been stable since at least 1964. The channel straightening observed on Sharon Creek was also completed prior to 1946 and, aside from a slight increase in sinuosity noted in the most recent imagery, no significant adjustment to the channel planform have occurred. Changes that have occurred to specific reaches along study area watercourses between 1946 and 2011 are summarized in **Table 4-1**.

Table 4-1 Historical Changes to Watercourses Within the Study Area

Location/Reach	Time Frame	Description of Change
• **EH1 (East Holland River)**	Prior to 1946	East Holland River channelized and locks constructed at Holland Landing. Restricts channel migration and periodic damming behind locks causes backwatering through reach.
• **S (Sharon Creek)**	Prior to 1946	
• **HTr2 (Holland River Tributary 2)** • **EHTr3 (East Holland River Tributary 3)** • **EHTr4 (East Holland River Tributary 4)**	1946 – 2011	Construction of stormwater ponds at the channel headwaters provide increased discharge to channels. May help sustain flow during dry periods.
• **EHTr6a(East Holland River Tributary 6)** • **EHTr7b(East Holland River Tributary 7)**	1946 – 2011	Online ponds created within reach – either the result of anthropogenic creation (e.g., irrigation ponds) or beaver activity. Causes localized backwatering within reaches resulting in sediment deposition.

Results from the historical air photo review suggest that the watercourses should be generally stable, given the lack of change that has occurred within the study area. Watercourses that receive water from upstream reaches situated in urbanizing areas are likely to exhibit some response to the altered flow regime that is due to the urban hydromodification.

4.4.3.4 Existing Conditions

Information regarding the existing conditions of watercourses situated within the study area was obtained from background reports and a review of current aerial photography. Reaches were defined along the main branches of all watercourses situated within the study area that might be crossed by the proposed east-west road. Review of background materials regarding existing conditions was intended to focus on the well-defined channels and not the many swale-like features that are also visible on the air photos.

All of the mapped watercourses east of Yonge Street within the study area were assessed in the Upper York Sewage Solutions (UYSS) Natural Environment Baseline Study (AECOM *et al.*, 2012) which included a detailed classification of those watercourses. Available background data from this and other studies are summarized by tributary within this section. A summary of watercourse and reach characteristics are provided below and in **Table 4-2**.

As discussed in the previous sections, agriculture is the current dominant land use within the study area.

Holland River Tributaries

Two tributaries to the Holland River flow in a general east to west direction in the western portion of the study area. These are small, first and second order tributaries. The headwaters of these features, which exhibit swale-like forms, flow unconfined through agricultural fields. The surficial geology in which the channels are situated changes from glaciolacustrine silts and clays in the headwaters to Newmarket Till further downstream. The downstream extent of these reaches within the study area flow through naturally vegetated, deciduous forests over Newmarket Till. Bankfull width is estimated to be on the order of 1 to 3 m. A single reach (HTr1) is used to describe the northern tributary within the study area, while the southern tributary is split into three separate reaches (HTr2-a – HTr2-c).

East Holland River

The East Holland River has been straightened along its entire length, and a single reach has been assigned to it, within the study area. It was classified as a B-type channel in the Upper York Sewage Solutions (UYSS) Natural Environment Baseline Study (AECOM *et al.*, 2012), which correspond to large, anthropogenically altered watercourses having bankfull widths larger than 6 m. The portion of channel that is within the study area was included in the UYSS field investigation. The channel flows straight across an alluvial floodplain and cuts through modern alluvial sediments. Bed material is composed dominantly of silty sand with a lesser amount of pebbles, and some organic material on the surface. Bankfull width is approximately 15 to 20 m, and bankfull depth is approximately 0.6 to 1.5 m. The channel banks are composed of clayey silt with a lesser amount of sand. Scour and erosion of both banks was observed during the field visit and was also reported by Parish Geomorphic (2007) in their assessment of fluvial geomorphology within York Region watersheds. The East Holland River addressed as part of the Parish Geomorphic (2007) report was assigned a Rapid Geomorphic Assessment (RGA) value of 0.26, corresponding to a system in transition, with widening being the dominant process.

A small, first order tributary discharges into the East Holland River from the eastern side (EHTr2-a and 2b). It is situated within modern alluvial floodplain sediments of the East Holland River and flows through a naturally vegetated area of deciduous trees and shrubs.

A slightly larger, second order tributary (Reach HTr1) discharges into the East Holland River, further upstream than Reach EHTr2). The channel flows through both naturally vegetated woodlot and agricultural environments along its length, and exhibits anthropogenic straightening within the agricultural areas. The tributary is separated into two descriptive reaches (EHTr1-a and EHTr1-b).

East Holland River Tributary

This tributary to the East Holland River has its headwaters in the Town of Newmarket and flows northward, west of Yonge Street. The channel is partly confined within a naturally vegetated valley, and displays a natural irregularly meandering pattern across a discontinuous floodplain. An online pond is present along the channel length. The underlying surficial material is mapped as fine-textured glaciolacustrine deposits. The entire length of the channel within the study area was classified as a D-type channel in the Upper York Sewage Solutions Natural Environmental Baseline Study (UYSS, 2012), which correspond to small, natural watercourses having bankfull widths less than 6 m and exhibiting little evidence of anthropogenic influence. A segment of the channel within EHTr7 was also viewed in the field as part of the UYSS study. The bed morphology displays pool-riffle sequences, and bed

material consists predominantly of coarse sand and gravel with a lesser amount of silt and clay. Bankfull width is approximately 4 to 5 m, and bankfull depth is approximately 0.9 m. The channel banks are composed of sand and silt. Erosion and undercutting of both banks was extensive throughout the area observed, with the outer edges of meander bends showing increased scour. Trees and grasses extend to the top of both banks. The channel appears to be undergoing natural planform development and meander evolution processes. Both point bar and medial bar deposits and developing meander cut-offs were observed. For the purposes of the East West Road Corridor investigation, the tributary to the East Holland River within the study area was further divided into three sub-reaches, EHTr7-a to EHTr7-c.

Several smaller, mainly first order tributaries discharge into the larger 3rd order East Holland Tributary from the west (EHTr3, EHTr4, EHTr5, EHTr6 and their sub-reaches). These systems, particularly in the upstream reaches, can be described as sinuous agricultural swales that have a width of approximately 1 m and often exhibit poorly defined planforms and multi-thread channels as they flow across the low clay plain. An online pond exists within Reach HTr6-a which may represent an irrigation pond, anthropogenically constructed for agricultural purposes. As the downstream reaches of these lower order tributaries cross into a more naturally vegetated environment, channel planforms generally become better defined and display a sinuous to irregularly meandering pattern. Bankfull width in the downstream reaches is estimated to be between 2 to 4 m. The smaller tributaries were classified as mainly E and F-type channels in the York Sewage Solutions Natural Environment Baseline Study (AECOM *et al.*, 2012). E-type channels correspond to small watercourses with bankfull widths less than 6 m wide that have undergone some level of anthropogenic alteration. F-type channels refer to small channels or agricultural drains exhibiting swale-like conditions, which frequently dry up for extended periods of time during the summer months. They typically correspond to fairly straight headwater features draining agricultural fields. Defined floodplains are normally not present, and dense grass and meadow vegetation line both banks. Bed materials are typically characterized by soft organic muck and clayey-silt with lesser sand and pebbles. Little erosion is present within F-type channels due to the low discharge rates resulting from generally low channel gradients, the stabilizing influence of dense, grassy riparian vegetation, and the cohesive nature of the glaciolacustrine substrate materials.

Sharon Creek

The headwaters of Sharon Creek sit on the eastern edge of the Town of Newmarket. The channel flows through agricultural, industrial, urban, and naturally vegetated sections along its length before discharging into the East Holland River. The underlying surficial material is mapped as fine-textured glaciolacustrine deposits. The entire length of the channel within the study area was classified as an E-type channel in the Upper York Sewage Solutions Natural Environment Baseline Study (AECOM *et al.*, 2012), which correspond to small, altered watercourses that have bankfull widths less than 6 m wide. Within the study area, Sharon Creek flows through a predominantly agricultural environment and shows moderate evidence of anthropogenic influence through localized channel straightening. More natural sections of the channel outside of the study area exhibit a sinuous to irregularly meandering pattern. Bankfull width is approximately 3 m. Sharon Creek within the study area was further divided into 5 sub-reaches for the purposes of the East-West Road Corridor investigation, S1 to S5, based upon channel pattern and level of anthropogenic influence.

A small, un-named tributary to Sharon Creek flows unconfined through agricultural fields in a general east to west direction before discharging to Sharon Creek just north of Herald Road. The underlying surficial material is mapped as fine-textured glaciolacustrine deposits. The entire length of the channel within the study area was classified as an F-type channel in the Upper York Sewage Solutions Natural

Environment Baseline Study (AECOM *et al.*, 2012), which refers to small channels or agricultural drains exhibiting swale-like conditions, that frequently dry up for extended periods of time during the summer months. A small, online pond is exists along the tributary (Reach STr1-b), the presence of which was also noted in the historical aerial photography from 1946. Within the study area, the channel exhibits a sinuous to irregularly meandering pattern that has been locally straightened. Bankfull width is approximately 1 to 2 m. Three sub-reaches (STr1-a to STr1-c) are used to describe the channel for the purposes of this investigation.

4.4.3.5 Summary

Review of background materials indicate that many of the watercourses within the study area are relatively small swale-like features. Well defined, permanently flowing watercourses include the East Holland River, Sharon Creek, and their tributaries. The channels within the study area flow across agricultural fields and are generally not confined within a valley. The surficial geology is primarily glaciolacustrine silts and clays; modern alluvial sediments have been deposited within the valleys of the larger watercourses such as the East Holland River. Characterization of existing conditions was undertaken primarily of the larger, mapped watercourses within the study area. Unmapped swale-like features along the preferred corridor alignment will be assessed in further study during detail design.

Changes in controlling and modifying influences to which the channels are responding include urbanization within the Newmarket area and direct anthropogenic adjustments to the channels such as straightening, grade control, and the construction of online ponds. Sharon Creek may be adjusting to the urban hydromodification through a slight increase in sinuosity along the straightened planform; the channel however, does not appear to have shifted or change dramatically over the period of record. The East Holland River, which has undergone the most anthropogenic modification, has remained stable over the period of record. This conclusion was also reached by Parish (2007), in their fluvial geomorphology assessment for watersheds within York Region. The effects of increased flows associated with urban development upstream in the watershed and straightening of the planform are offset by the grade control structure at Holland Landing.

Many of the channels within the study area have a riparian zone characterized by dense grass that extends to the top of the channel banks within the agricultural land use. As mentioned in **Section 4.4.2.2,** the dense rooting network of grassy vegetation serves to stabilize channel banks, leading to deeper, narrower channels that generally do not exhibit as much active planform movement. The channels flowing through this type of environment within the study area typically displayed straight to sinuous planforms, whereas those flowing through areas characterized by woodlots, displayed more erosion and active planform development over the period of record (e.g., HTr2-c, EHTr1-a, EHTr3-b, EHTr4-b, and EHTr7).

Table 4-2 Stream Reach Characteristics within the East-West Road Corridor Study Area

Watercourse	Reach	Length (m)	Geology[1]	Valley Setting	Surrounding Vegetation	Slope (%)	Sinuosity	Strahler Stream Order	UYSS Stream Group Class[2]	Average Stream Power[3]	Channel Planform	Bankfull Width (m)	Bankfull Depth (m)	Bank Materials	Substrate Material	Comments
Holland River Tributary 1	HTR1	392	Newmarket Till	Unconfined	Woodlot	3.57	1.023	1	n/a	-	Sinuous / Irregularly Meandering	2 – 3	-	-	-	▪ Ponded areas in reach
Holland River Tributary 2	HTr2-a	507	Glaciolacustrine silt and clay	Unconfined	Woodlot; Dense grass	1.49	1.088	2	n/a	-	Sinuous	-	-	-	-	
	HTr2-b	525	Glaciolacustrine silt and clay; Newmarket Till	Unconfined	Agricultural; Dense grass	1.74	1.087	2		-	Sinuous	1 – 3	-	-	-	
	HTr2-c	777	Newmarket Till	Partly Confined	Dense Woodlot	1.83	1.123	2		-	-	-	-	-	-	
East Holland River	EH1	1772	Modern alluvium	Confined	Deciduous trees and shrubs; Grasses	0.20	1.000	5	B	617.39	Straight	15 - 20	0.6 – 1.5	Silt / clay, some sand	Gravel / pebbles; sand / silt; organic material	▪ Anthropogenic straightening; ▪ Erosion of both banks
East Holland River Tributary 1	EHTr1-a	456	Glaciolacustrine silt and clay	Unconfined	Woodlot; Dense grass	2.02	1.056	2	F	-	Sinuous	-	-	-	-	
	EHTr1-b	351		Unconfined	Cleared Land – grasses and shrubs	1.97	1.073	2	F	-	Straight	1 – 3	-	-	-	▪ Anthropogenic straightening
East Holland River Tributary 2	EHTr2-a	157	Modern alluvium	Partly Confined	Woodlot	2.69	1.047	1	n/a	-	Sinuous	-	-	-	-	
	EHTr2-b	434	Modern alluvium	Partly Confined	Grasses; Woodlot	1.88	1.110		F	-	Sinuous	-	-	-	-	
East Holland River Tributary 3	EHTr3-a	228	Glaciolacustrine silt and clay; Newmarket Till (silt-sand till)	Unconfined	Dense grass	1.56	1.051	2	G	-	-	-	-	-	-	▪ Diffuse, marsh-like channel, fed by SWM pond
	EHTr3-b	766		Unconfined	Woodlot; Grasses	2.59	1.093	2	D	-	Irregularly Meandering	2 – 4	-	-	-	
East Holland River Tributary 4	EHTr4-a	258	Glaciolacustrine silt and clay; Newmarket Till	Unconfined	Agricultural; Grasses	4.37	1.032	1	E	-	Straight	1 – 2	-	-	-	▪ Channel fed by SWM pond
	EHTr4-b	347		Unconfined	Woodlot	4.82	1.089	1	E	-	-	-	-	-	-	
East Holland River Tributary 5	EHTr5-a	559	Glaciolacustrine silt and clay; Newmarket Till	Unconfined	Agricultural	2.42	1.077	1	F	-	Sinuous	1	-	-	-	▪ Multi-thread channel
	EHTr5-b	228		Unconfined	Woodlot	6.10	1.051	1	F	-	Sinuous / Irregularly Meandering	-	-	-	-	
	EHTr5-c	161		Unconfined	Dense Grass	4.04	n/a	1	F	-	Sinuous	1	-	-	-	
East Holland River Tributary 6	EHTr6-a	642	Glaciolacustrine silt and clay	Unconfined	Agricultural; Grasses	4.78	1.035	1	F	-	Sinuous	1	-	-	-	▪ Ponded areas in reach; ▪ Locally multi-thread channel
	EHTr6-b	119		Partly Confined	Agricultural; Woodlot	2.58	1.035	1	F	-	-	-	-	-	-	
East Holland River Tributary 7	EHTr7-a	908	Glaciolacustrine silt and clay; Modern alluvium	Unconfined	Agricultural; Woodlot	0.72	1.160	3	D	136.21	Sinuous	1 – 3	-	Sand, silt	Coarse sand and gravel, lesser silt and clay	▪ Potential historic anthropogenic straightening
	EHTr7-b	486	Glaciolacustrine silt and clay	Partly Confined	Grasses	0.71	1.366	3	D	167.17	Irregularly Meandering	2 – 5	0.9			▪ Erosion of both banks, particularly outer meander bends, bank undercutting; ▪ Large woody debris; ▪ Grassy, mid-channel bars; ▪ Meander scars; ▪ Cut-off channels
	EHTr7-c	669		Partly Confined	Woodlot	0.68	1.076	3	D	164.84	Irregularly Meandering	-	-			

Table 4-2 Stream Reach Characteristics within the East-West Road Corridor Study Area

Watercourse	Reach	Length (m)	Geology[1]	Valley Setting	Surrounding Vegetation	Slope (%)	Sinuosity	Strahler Stream Order	UYSS Stream Group Class[2]	Average Stream Power[3]	Channel Planform	Bankfull Width (m)	Bankfull Depth (m)	Bank Materials	Substrate Material	Comments
Sharon Creek	S1	132	Glaciolacustrine silt and clay	Unconfined	Dense Grass	0.31	1.048	2	E	198.51	Straight	1 – 2	-	-	-	▪ Anthropogenic straightening
	S2	216		Unconfined	Dense Grass	0.76	1.019	2	E	189.84	Sinuous	2 – 3	-	-	-	▪ Grassy lateral and mid-channel bars; ▪ Historically straightened, developing sinuosity
	S3	293		Unconfined	Agricultural	0.41	1.014	2	E	221.09	Straight	2	-	-	-	▪ Anthropogenic straightening
	S4	317		Unconfined	Cleared land – grasses and shrubs	0.37	1.003	2	E	190.69	Straight	2 – 4	-	-	-	▪ Anthropogenic straightening; ▪ Ponded areas in reach; ▪ Adjacent to livestock paddocks
	S5	165		Unconfined	Dense grass	0.48	1.086	2	E	158.65	Straight / Sinuous	2 – 4	-	-	-	▪ Anthropogenic straightening; ▪ Developed regular sinuosity; ▪ Many grassy mid-channel bars
Sharon Creek Tributary 1	STr1-a	171	Glaciolacustrine silt and clay	Unconfined	Agricultural	1.94	1.103	1	F	-	-	-	-	-	-	▪ Intermittent swale
	STr1-b	242		Unconfined	Dense grass	1.22	n/a	1	F	-	-	-	-	-	-	▪ Intermittent swale; ▪ Ponded area in reach
	STr1-c	991		Unconfined	Agricultural; Grasses	1.27	1.031	1	F	-	Straight / Sinuous	2 – 4	-	-	-	▪ Anthropogenic straightening; ▪ Possible erosion of south bank

Notes: 1: Geological mapping from the Ontario Geological Survey
2: Refer to UYSS, 2012
3: Based on Ferencevic, 2011. Refer to UYSS, 2012.

4.4.4 Hydrogeology

A review of available background information was conducted to gain an understanding of the hydrogeological characteristics of the study area. Since groundwater presence and behaviour is dictated by the nature and sequence of the surficial materials in which it is hosted, a review of the geology of the study area, as described in **Section 4.4.2**, is an important part of any hydrogeological investigation.

Groundwater characteristics in and around the study area were investigated as part of the Upper York Sewage Solutions (UYSS) Natural Environment Baseline (NEB) Study (AECOM *et al.*, 2012). Information gathered from Source Water Protection Studies (South Georgian Bay-Lake Simcoe Source Protection Committee, 2011); the Oak Ridges Moraine CAMC-YPDT study technical reports (CAMC, 2006, 2007, 2009), and the Ministry of Environment (MOE) Water Well database (MOE, 2013) were used to characterize groundwater conditions. Results of UYSS NEB study, as they pertain to the East West Road Corridor study area, are presented below with updates as relevant (e.g., updated MOE water well database are referenced).

4.4.4.1 Hydrostratigraphy

Hydrostratigraphy is the classification of stratigraphic units into aquifers and aquitards, with some simplification or combination of units with similar properties. An aquifer is classically defined as a geological unit that is permeable enough to permit a usable supply of water to be extracted, whereas an aquitard is a relatively impermeable unit that inhibits groundwater movement. Aquifers within the study area are typically comprised of coarse-textured, unconsolidated sediments. Aquitards are generally comprised of glaciolacustrine silts and clays and consolidated till deposits.

The hydrostratigraphic framework of the study area corresponds to its layered regional stratigraphy, with multiple aquifers and aquitards in the overburden. Regional hydrostratigraphic units are listed below, in order of occurrence from surface downward. Units defined as ‘aquifer or aquitard’ vary spatially in terms of their sediment content, and they may be defined as poor aquifers or weak aquitards depending on their lithology at a given location.

- Recent Deposits (alluvium, e.g., gravel, sand, silt, clay; organics; fill) – ***Aquifer or Aquitard****;*
- Glaciolacustrine Deposits (gravel, sand, silt and clay) – ***Aquifer or Aquitard****;*
- Kettleby Till (clayey silt to silt till) – ***Aquitard****;*
- Oak Ridges Moraine / Interstadial Sands (silt to sand and gravel) – ***Aquifer***
- Channel Silt Deposits (silt) – ***Aquitard***;
- Newmarket Till (sandy silt to sand till) – ***Aquitard****;*
- Thorncliffe Formation (silty sand, sand) – ***Aquifer***;
- Sunnybrook Drift (silty clay) – ***Aquitard***; and
- Scarborough Formation (fine to coarse sand) – ***Aquifer***.

The most significant regional aquifers are the Oak Ridges Moraine/Interstadial Sand Deposits, the Thorncliffe Formation and the Scarborough Formation. Recent and glaciolacustrine deposits are generally thin and / or discontinuous, and tend to have only local significance for supplying low-volume water needs, e.g., domestic supply. Where coarse-textured, these surficial deposits may function as a pathway for surface water runoff and shallow groundwater flow to wetlands and other areas. Although not listed above as individual hydrostratigraphic units, Channel Sand Deposits and Inter-Newmarket Sediments may also have local significance in supplying water supply, particularly for municipal supplies that tap into particularly thick deposits of these units.

Descriptions of the significant regional aquifers are provided below.

Oak Ridges Moraine / Interstadial Aquifer

The Oak Ridges Moraine does not form a significant aquifer within the study area as it is located further south; however sediments extending from the flanks of the northern slope form a near surface aquifer across much of the study area. The predominantly sandy, gravelly texture of Oak Ridges Moraine and the higher elevation of the feature make it an important groundwater recharge area, and topographically-controlled flow occurs down the north slope to down-gradient aquifers (Sharpe *et al.*, 1996).

In-filled channels in the Newmarket till composed of Oak Ridges Moraine sediments may also result in productive 'lower' aquifers. The in-filled channels form significant hydraulic connections between Moraine sediments and lower drift, resulting in high yield aquifers. The hydraulic conductivity is on the order of 10^{-7} to greater than 10^{-3} cm/s due to the presence of silt, sand and gravel. As a result, these channels are potential targets for municipal water supplies. Due to the hydraulic connection to the Oak Ridges Moraine sediments to the south, groundwater flow to the gravel could be high, and aquifers may capture recharge from a broad surface area.

Lower drift sands (e.g., Thorncliffe or Scarborough Formation) are primary aquifers where the Oak Ridges Moraine is not present. In areas where the Oak Ridges Moraine is present, and vertical flow is significant through the in-filled channels, recharge will also supply groundwater to the lower drift.

The Interstadial Aquifer may be locally connected to the Oak Ridges Moraine Aquifer due to the close proximity of the Moraine. The Interstadial Aquifer corresponds to thin, discontinuous sand deposits that generally occur between the Kettleby and Newmarket Till deposits. Due to the close proximity of the moraine, the Interstadial Aquifer has a thickness of up to about 10 m, but is generally less than about 5 m and frequently pinches out. The aquifer is typically confined beneath the till on the moraine slopes, but has local unconfined conditions where it is overlain by glaciolacustrine sands in the lowlands.

The Interstadial Aquifer typically has a relatively high hydraulic conductivity ranging from approximately 5×10^{-3} to 1×10^{-2} cm/s, which reflects the coarse texture of these deposits. Single well response tests completed in the Interstadial Aquifer as part of the Upper York Sewage Solutions Natural Environment Baseline Study (AECOM *et al.*, 2012) provided hydraulic conductivity values ranging from 6.5×10^{-3} to 2.3×10^{-4} cm/s, with the geometric mean of the hydraulic conductivity of the Interstadial Aquifer at the measured locations equal to 1.1×10^{-3} cm/s.

The Interstadial Aquifer has limited thickness and extent, and typically dug/bored type wells obtain water from this aquifer for water supply. Occasionally, good yielding, shallow drilled wells are encountered, which are completed at depths consistent with the Interstadial Aquifer.

Thorncliffe Aquifer

The Thorncliffe Aquifer corresponds to the Thorncliffe Formation sands, and is regionally extensive across the study area. The aquifer is overlain and confined by the Newmarket Till aquitard.

The Thorncliffe Aquifer is the primary source of potable water in the study area. The aquifer is generally encountered beneath the confining glacial till deposits at depths of about 30 to 40 metres below ground surface (mBGS), but decreases in depth within the lowlands, where it is typically encountered within 10 to 20 m of ground surface. The top of the aquifer displays a regional, gradually decreasing slope from south to north. The Thorncliffe Aquifer is approximately 10 m thick; however thicknesses of 20 m have been reported locally.

Scarborough Aquifer

The Scarborough Aquifer corresponds to the Scarborough Formation sands, and is regionally extensive across the study area. The aquifer is overlain and confined by the Sunnybrook drift, where present. The Scarborough Formation is an important source of potable water in the study area, particularly for municipal supply. Numerical studies for CAMC/YPDT suggest the bulk horizontal hydraulic conductivity of the Scarborough Aquifer is 5.0×10^{-3} cm/s. (CAMC, 2006)

Regionally significant aquitards include the Kettleby (Till) Aquitard, the Newmarket (Till) Aquitard, and the Sunnybrook (Drift) Aquitard. Locally, the Kettleby Till has limited in extent, however it may form an aquitard assemblage with the Newmarket Till and Channel Silt deposits where interbedded aquifer units are absent. Finer-grained glaciolacustrine or recent surficial deposits may function as aquitards, and combine with underlying till units to limit recharge. The till deposits typically have a low hydraulic conductivity and limited ability to transmit groundwater, however, local features such as heterogeneities, secondary porosity, permeability features and fractures may permit a low yield, and/or provide groundwater recharge-discharge pathways.

Descriptions of regionally significant aquitards are provided below. The Kettleby (Till) Aquitard has been excluded from this discussion due to its limited significance local to the study area. A description of the Channel Silt Aquitard is included in this discussion due to its local significance.

Newmarket (Till) Aquitard

The Schomberg Clay Plain and Simcoe Lowlands are underlain locally by Kettleby Till, and regionally by the Newmarket Till and Channel Deposits (silt). The Kettleby Till and Newmarket Till have been grouped together as having similar hydrogeologic characteristics. These tills can form a thick, fine textured sediment package that along with Channel Silt Deposits, can act as a predominant regional aquitard unit where the interbedded aquifer units are absent.

Where the Newmarket till is present within the study area, it acts to limit the rate of groundwater recharge and contaminant migration. The aquitard contains thin, discontinuous, intervening sand layers, which represent heterogeneity in the till.

Overlying the aquitard are local, thin deposits of glaciolacustrine sands, ice-contact stratified drift, and recent alluvial deposits. The aquitard forms a base that supports local groundwater flow and surface runoff in the shallow overlying deposits. Perched aquifers may locally sit on this aquitard unit, where coarser grained surficial deposits occur.

The bulk horizontal hydraulic conductivity of the Newmarket (Till) Aquitard is approximately 5×10^{-6} centimetres per second (cm/s), and the vertical hydraulic conductivity is 5×10^{-7} cm/s, based on the regional groundwater modelling (CAMC-YPDT, 2006).

Weathered Newmarket Till is considered to have a higher hydraulic conductivity, ~ 5×10^{-4} cm/s, than unweather till (CAMC-YPDT, 2006). Increases in hydraulic conductivity as high as 3 orders of magnitude, have been measured from pumping test and isotope data, (Gerber Geoscience Inc. and Earthfx Inc., 2005). This wide range in hydraulic conductivity is due to heterogeneity in the till unit, which is expressed as sand and gravel interbeds, sand dykes and inclusions, and joints and fractures within the till. Weathered till displaying heterogeneity may locally form a marginal aquifer capable of supplying groundwater to lower yielding, large diameter dug/bored type wells.

The Newmarket Till separates the Thorncliffe and Scarborough aquifers from the Oak Ridges Moraine/Interstadial Sand Deposits. It therefore, effectively forms a protective barrier for the deeper aquifers; however, it has been breached by tunnel channel deposits throughout the study area. Depending on their sediment infill, these tunnel channel deposits (e.g., Channel Sands) may allow for the transfer of groundwater between the shallow and deeper aquifer systems.

Channel Silt Aquitard

The channel silt fill forms a thick silt aquitard, which underlies the Interstadial deposits in the lowland areas, and extends into the subsurface to the south between the moraine slopes. In the lowland area, the channel silt forms a base that supports local groundwater flow and surface runoff in the shallow overlying glaciolacustrine and interstadial sand and silt deposits. Locally, small shallow (perched) groundwater systems can 'sit' on this aquitard unit. The thickness of this regional aquitard ranges from less than 10 m to greater than 30 m thick.

Single well response tests were completed in the aquitard as part of the Upper York Sewage Solutions Natural Environment Baseline Study (AECOM *et al.*, 2012). Based on the single well response test results, the hydraulic conductivity of the aquitard ranges from 3.8×10^{-4} to 3.0×10^{-6} cm/s. The geometric mean of the hydraulic conductivity values measured was 1.3×10^{-5} cm/s. Permeameter testing indicated that the vertical hydraulic conductivity of the aquitard is two to three orders of magnitude lower than the horizontal hydraulic conductivity.

Sunnybrook Aquitard

The Sunnybrook Aquitard separates the Thorncliffe Aquifer from the Scarborough Aquifer. It is comprised of silty to clay deposits and is typically 10 to 20 m thick, with variable regional continuity. Numerical studies by CAMC/YPDT suggest the bulk horizontal hydraulic conductivity of the Scarborough Aquifer is similar to that of the Newmarket (Till) Aquitard ~5.0×10^{-6} cm/s (CAMC, 2006). The vertical hydraulic conductivity of the unit is estimated at 5.0×10^{-7} cm/s (CAMC, 2006).

4.4.4.2 Groundwater Flow

Groundwater flow is the result of differences in hydraulic head or, simply stated, groundwater levels, from one location to another. Flow occurs from areas with higher groundwater levels to areas with lower groundwater levels. Groundwater levels contours at the water table subtly reflect the topographic contours in the study area, emphasizing the influence of topography on the shallow groundwater flow system. Regional groundwater flow is north-northwest from the Oak Ridges Moraine towards the Simcoe Lowlands. Locally, a component of groundwater flow is towards rivers and topographic depressions.

4.4.4.3 Groundwater Recharge and Discharge

Groundwater recharge is the term used to describe downward flowing groundwater, that is, from the ground surface towards the water table. Of all precipitation that reaches the ground surface, some is lost to evapotranspiration and some runs off the surface directly into streams. The remainder infiltrates into the ground. Recharge areas are important because they replenish the groundwater. The potential for recharge in a given area is influenced by both soil type and topography. For example, higher recharge rates are generally associated with more permeable soils. Within the study area, surficial areas of permeable coarse-grained sediment, e.g., glaciolacustrine sands and gravels or ice-contact stratified drift; represent locations where higher recharge rates are estimated. Estimated annual average recharge rates for these soils types range from 180 to 360 mm/year; in contrast estimated rates over till and

glacioclacustrine silts and clay are only 90 mm/year (CAMC, 2009). In addition, areas of flat topography are more likely to promote recharge rather than steep areas, which promote runoff. In general then, topographic highs form recharge areas where groundwater can flow slowly downward, e.g., within ridges between streams and within drumlins; and topographic lows form recharge areas where water can pool and infiltrate over time, e.g., within river valleys.

Groundwater discharge is defined as groundwater flow to surface where the groundwater table intersects ground surface. It has a number of ecological functions:

- it sustains a minimum flow in some streams, commonly during the dry months of summer;
- it moderates stream temperatures, particularly during hot summer days; and
- it supports wetland vegetation and terrestrial ecological habitat.

When discharge occurs to streams it is commonly referred to as baseflow. Baseflow is enhanced when stream bed sediments are highly permeable and there is a strong upward hydraulic gradient in the shallow subsurface. The volume of baseflow varies seasonally, from reach to reach, and from stream to steam. For instance, during the dry summer months baseflow contributions to streams may be greater than other types of contributions (e.g., runoff, precipitation, snow melts). In contrast, during and immediately after storms, and during the spring freshet, baseflow may comprise only a small fraction of the total stream flow.

Sharon Creek, within the study area, is mapped as a cold-water stream per the Ontario Ministry of Natural Resources (MNR) stream thermal dataset. This suggests the potential for groundwater discharge (baseflow) contributions to the stream at least seasonally. The East Holland River is mapped as a warm water stream, however LSRCA (2010c) has interpreted the river valley and associated wetland (within the study area), to be an area of potential groundwater discharge based on a comparison of shallow subsurface groundwater elevations to ground surface (i.e., where the shallow subsurface groundwater elevations are higher than ground surface there is the potential for groundwater discharge).

4.4.4.4 Hydrogeological Significance

Certain components of the hydrogeological system may be regarded as potentially sensitive areas based on their function as a recharge and/or discharge area, or as a source of groundwater to well users. The following paragraphs discuss the hydrogeological significance of the study area as it relates to these functions.

Recharge areas are the water source for the groundwater system. Therefore the proximity of infrastructure to such areas may affect the quantity and quality of water resources that are used by humans and/or support the natural environment. High recharge areas within the East-West Road Corridor are limited to the local, isolated surficial deposits of coarser grained glaciolacustrine and ice-contact deposits. The remainder of the study area is overlain by fine-textured glaciolacustrine sediments, over which groundwater recharge is low and surface runoff to streams more prevalent. As such the study area is not thought to function as a high recharge area, and it is not considered potentially sensitive based on this function.

Discharge areas are significant because it is at these locations where groundwater upwelling supports aquatic and/or terrestrial habitat. Reduced upwelling in groundwater-fed wetlands could reduce vegetation diversity by starving those species that require the most moisture. Reductions in the volume of baseflow provided to creeks and rivers may cause them to dry up seasonally, or influence the temperature regime. This could impact the health of aquatic species, and affect cold-water fish habitat and spawning grounds. Reductions in baseflow volumes are possible with the construction of the East-West Road corridor based given potential construction dewatering needs, and expected reductions in pervious land area that would reduce the recharge available to support baseflow volumes. In addition, changes to groundwater flow paths and patterns may redirect groundwater discharge, which

could lead to flooding of low-lying areas. Within the study area, there is some potential for groundwater discharge at Sharon Creek, East Holland River and its associated wetlands. Although the actual contribution of baseflow volumes to the function of aquatic/terrestrial habitat is unknown, based on the potential discharge function that exists, the study area may be considered potentially sensitive.

Locally significant aquifers include surficial aquifers (e.g., perched aquifers) and deeper overburden units (e.g., Thorncliffe or Scarborough Aquifer). Surficial aquifers are shallow and of limited extent, thus they are not widely used for water supply needs. The deeper Thorncliffe and Scarborough Aquifers are regionally extensive with high transmissivities and are used for both municipal and domestic supply. Potential impacts of construction of the East-West Road corridor include localized decreases in groundwater levels due to construction dewatering activities, and the introduction of pollutants to the groundwater system, either during construction, or as part of regular road maintenance activities following project completion (e.g., road salting).

The deeper Thorncliffe Aquifer is confined by surficial glaciolacustrine fines and the Newmarket (Till) Aquitard. These low permeability units provide the Thorncliffe Aquifer with protection from surficial contamination due to their low permeability, and form a hydraulic barrier against the effects of construction dewatering. The same is true of the Scarborough Aquifer, which underlies the Thorncliffe Aquifer and is confined by the Scarborough (Drift) Aquitard. Given the above, it is unlikely that any groundwater level declines would be experienced, or that surface pollutants would reach, the deeper aquifers. As such these units are not thought to be potentially sensitive.

However, localized impacts to groundwater levels and groundwater quality could occur in shallow unconfined aquifers, and any water wells screened within this unit. For example, the building of infrastructure may temporarily lower the water levels in shallow water wells; or the introduction of permeable bedding for buried services such as storm sewers could permanently lower the water table and by extension, water levels in the wells. In addition, shallow wells are typically large diameter dug wells that rely on tile joints to allow water entry to the well bore. As such they are particularly susceptible to contamination due to the short travel distance from surface to aquifer and the absence of extensive aquitards that may slow contaminant migration to the well.

Figure 4-6 shows the locations of water wells in the study area, as queried from the MOE water well database (MOE, 2013). Water use information is provided for 105 of the 129 records, with approximately 78% (82) of the wells being used for commercial, livestock, public or domestic purposes (the remaining wells are listed as test holes, monitoring wells, or not used). Approximately 16% of the commercial, livestock, public and domestic wells are shallow, being finished in the upper 12 m of the subsurface. Given the above potential impacts, the function of the shallow unconfined aquifers as a source of water for these wells could signify sensitivity. However, further investigations on groundwater occurrence, movement, and water well use should be included prior to implementation of the East-West Road Corridor and Harry Walker Parkway Extension, to better understand the hydrogeological significance of the area, especially as it relates to this function.

4.5 Natural Environment

Information on existing natural environmental conditions was derived from secondary source reviews and focused field investigations. In order to develop a more detailed understanding of the natural environment existing conditions, field investigations focused on areas in the vicinity of the long list of corridor alignment alternatives identified early on in the study (see **Figure 4-8**). Refer to **Section 5.1** for information on the development of the long list of corridor alignment alternatives.

This section includes a summary of the natural environmental features found in the study area as they relate to the long list of corridor alignment alternatives. Long listed corridor alignments were subsequently refined to avoid significant natural features, develop, and further evaluate a short list of alternative corridor alignments (see **Section 5**).

Figure 4-8 Long List of Corridor Alignment Alternatives

Refer to **Appendix C – Natural Environment Existing Conditions Report** for detailed information on the natural environment within the East-West Road Corridor study area.

4.5.1 Aquatic Conditions

4.5.1.1 Description of Watercourses and Associated Fish Habitat

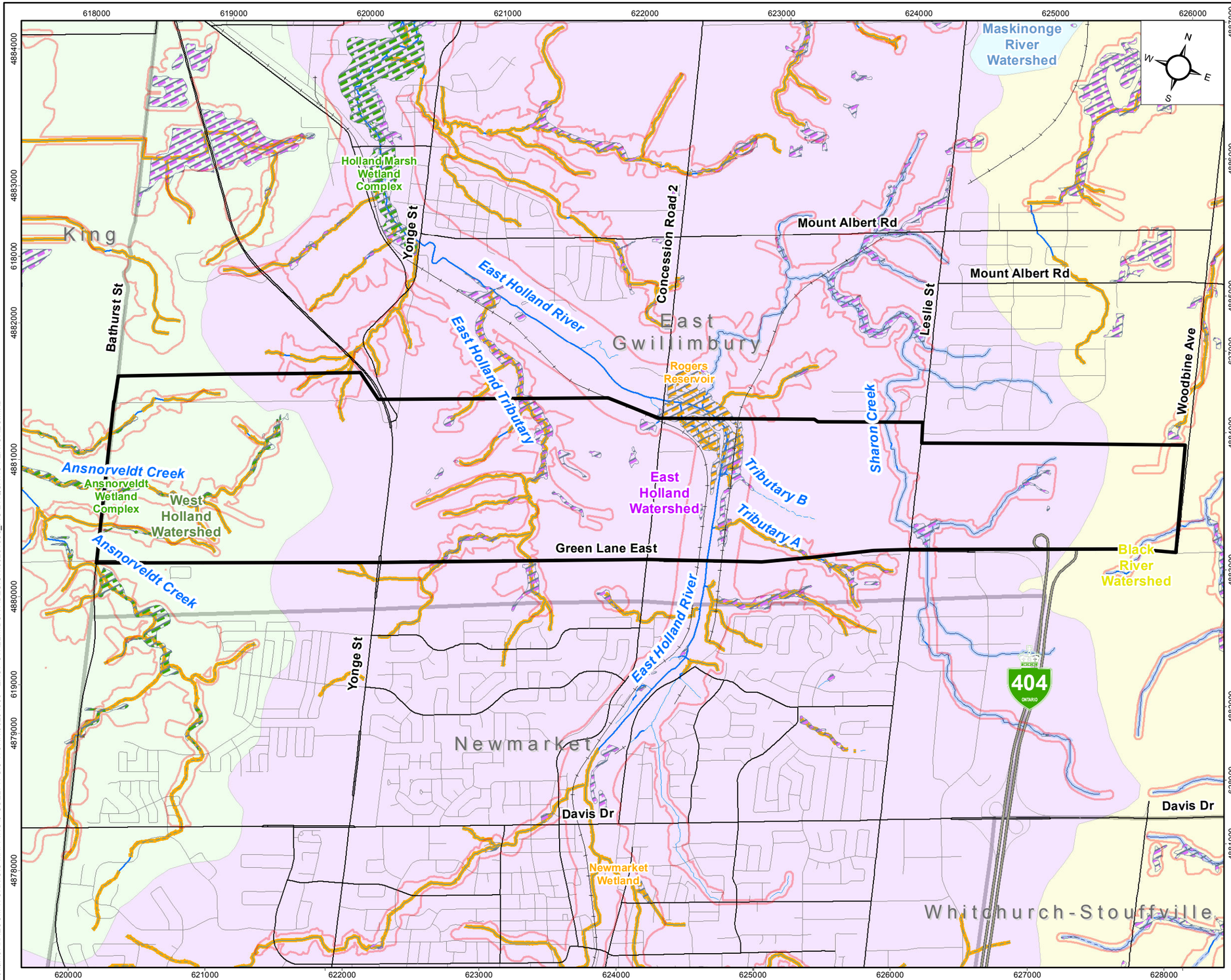
Following a detailed secondary source review, aquatic field investigations were conducted by AECOM biologists on October 17th, 2013.

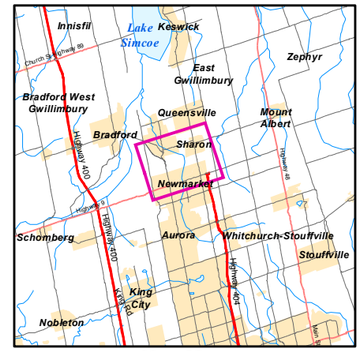
As noted in **Section 4.4.3.1**, the study area is located within three subwatersheds under the jurisdiction the Lake Simcoe Region Conservation Authority (LSRCA). These are the East Holland River subwatershed, West Holland River subwatershed and the Black River subwatershed, which can be seen in **Figure 4-9 – Aquatic Features**. Details on the watercourses within the study area are presented below:

East Holland River

The portion of East Holland River located within the study area has been identified as a warm water fishery and is flowing as a straight channelized system through an agricultural area with a narrow forest buffer.

A total of 26 fish species that have been documented in the East Holland River. Of these species, two are non-native and introduced species (Goldfish and Common Carp). With the exception of one species (Blacknose dace), that is ranked as uncommon, but not rare (G4), all species are common, widespread, abundant, and secure on a global level (G5). In the province of Ontario, all fish species found within the East Holland River are classified as either apparently secure, uncommon but not rare; or secure, common, widespread and abundant in the province (SRanks S4-S5). There are no records or observations of aquatic Species at Risk, or special concern, and all species range between intermediate to tolerant in their tolerance to environmental conditions and perturbations. The fish community of the East Holland River reflects the overall poor water quality and thermal regime of the East Holland River, with no sensitive or coldwater species present within the waters.





Legend

- Study Area
- Municipal Division
- LSRCA Regulation Limit
- Freeway
- Expressway / Highway
- Major Road
- Local Road
- Ramp
- Railway

Evaluated Wetlands

- Locally Significant Wetland
- Provincially Significant Wetland
- Unevaluated Wetland
- Lake
- River
- Pond
- Reservoir
- Canal
- Beaver Pond
- Kettle Lake

Stream Type & Thermal Assessment

- Permanent, Coldwater
- Permanent, Warmwater
- Intermittent, Coldwater
- Intermittent, Warmwater

LSRCA Sub-watersheds

- Black River
- East Holland
- Maskinonge River
- West Holland

Figure 4-9

1:30,000

NAD 1983 UTM Zone 17N

400 200 0 400 800 1,200

Metres

Basemap: Ontario Ministry of Natural Resources.
Additional Sources: York, 2013
Ortho-Imagery: York, 2011

Aquatic Features

East Gwillimbury East-West Road Corridor EA

Project No.: 60281533 Date: 2013-11-06

AECOM

Project Management Initials: Designer: Checked: Approved: ANSI B 279.4mm x 431.8mm
Last Plotted: Tue Sep 23, 2014
Last saved by: SCOTTS2 (2014-09-23)
Filename: I:\AECOM WORK\GIS MAPPING\3-GUELPH GIS WORK\60281533 - EAST GWILLIMBURY\DESIGN\60281533_FIG 2 AQUATIC FEATURES.MXD

Sharon Creek

Sharon Creek is a coldwater watercourse that flows through the eastern part of the study area. The creek flows north and discharges into the East Holland River at Rogers Reservoir (MMM, 2010). Fish species captured from historical electrofishing activities and minnow traps include: Brook Stickleback, Creek Chub, Bluntnose Minnow and Fathead Minnow, all common fish species in Southern Ontario.

The water quality within Sharon Creek ranges from poor to good (MMM, 2010). Through investigations pertaining to benthic macroinvertebrates the water quality ranges from poor to good (MMM, 2010). Stream characteristics include a high percentage of woody vegetation as well as coarse substrate materials such as cobble and gravel.

Although the system is classified as coldwater by Ministry of Natural Resources and Forestry (MNRF) none of the scientific survey records received from the MNRF and Lake Simcoe Region Conservation Authority or the 2011 survey show the presence of coldwater species in this system. Other factors limiting the presence of coldwater species may be in play, for example online structures (LSRCA – East Holland, 2010).

Sharon Creek is designated as Redside Dace occupied, with the last occurrence date being September 1994 (MNR Correspondence, Eva Bobak, September 27, 2011). Redside Dace have a Provincial Status of S2, and are listed as Endangered under Ontario's Endangered Species Act (ESA 2007).

With the exception of Redside Dace, all species found in Sharon Creek are Provincially Status S5 which indicates that a population is very common in Ontario and demonstrably secure.

Due to the sensitive nature of Sharon Creek, the SAR species and coldwater regime, AECOM ecologists completed a field assessment on October 17 2013 on the creek 260 m north of Green Lane East road and 100 m west of Leslie Street, in the vicinity of the proposed watercourse crossings for the East-West Road Corridor. In this location the creek runs through an agricultural field with less than 5 m buffer of meadow. This reach has been channelized and straightened, however there are a few riffle, run pool sequences present. The riparian vegetation was dominated by grasses with very few overhanging shrubs. The channel substrate was dominated by cobble and gravel.

The site visit indicates the portion of Sharon Creek may not be ideal habitat for Redside Dace however, this does provide fish habitat and may provide an important corridor not only for fish passage, but also for the flow of water and nutrients to downstream reaches.

East Holland River Tributary

This tributary originates south of Green Lane East in residential urban areas then flows through agricultural fields with a forest riparian buffer, ultimately feeding into the East Holland River. It is a permanent warm water system with several 1st order tributaries feeding into the main branch. The main channel is fed by the numerous contributing tributaries that originate in farms fields and although many of the tributaries are plowed through they still serve as conveyers of overland flow in times of high precipitation events or spring melts.

AECOM field investigations revealed the main channel to be a low gradient slow flowing system. The main channel meanders through the forest buffer and the system has a soft substrate. Beaver activity was noted throughout with multiple dams on the main channel tributary. Approximately 700 m north of Green Lane there is a marsh area followed by an open water pond online of the tributary. The main tributary has a poorly defined channel as it flows through the marsh area. Beyond the open water pond the tributary flows out in a wider deeper channel. It continues to meander as it flows towards the East

Holland River. Schools of cyprinids sp. fish were noted throughout the main channel, both upstream and downstream of the marsh and pond area indicating that this system directly supports fish.

Tributary A of the East Holland River

Tributary A is characterized as an intermittent tributary beginning south of Green Lane exhibiting cool water temperatures (MMM, 2010). This feature flows through the southwest corner of the study area, flowing into the East Holland River approximately 250 m north of Green Lane. Historical field investigations included fish community sampling focused on the area between Green Lane and Roger's Reservoir. No fish were captured. This is attributed to poor connectivity downstream, due to fish barriers in the watercourse.

It appears this tributary does not directly support fish habitat although contributes flow and nutrients to the East Holland River. Benthic macroinvertebrate sampling has concluded that this watercourse is of poor quality (CRA et al., 2013).

Tributary B of the East Holland River

Tributary B is located north of Green Lane, east of the East Holland River, west of Leslie Street. It is characterized as a straightened, poorly defined first order tributary which begins within the study area and flows northwest into Rogers Reservoir. This feature is not identified on Ontario Base Mapping (OBM) or from MNR habitat mapping. This feature not considered fish habitat (MMM, 2010).

Other Features of the East Holland River Subwatershed

Several small permanent and intermittent watercourses were identified within the study area through the Green Lane Secondary Plan Area completed by XCG Consultants (2013). Barriers to fish movement are identified in the East Holland River Subwatershed Study (LSRCA, 2010). One barrier is known to be within the Green Lane Secondary Plan Area, it is located at Green Lane and the East Holland River. This barrier is the remaining dam constructed as part of the East Holland Canal.

Ansnorvedlt Creek

Ansnorveldt Creek is one of the main watercourses that feeds into the West Holland River and is classified as a permanent warm water river. The headwaters flow through a mix of forest and agricultural lands before feeding into the main channel.

Within the East-West Road Corridor study area there are three headwater tributaries of Ansnorveldt Creek. The preliminary corridor alignments are proposed to cross the main headwater tributary. AECOM field investigations revealed that the tributary begins in a deciduous swamp area and flows in a poorly defined channel. As it reaches the agricultural crop fields it becomes buried. The buried watercourse can be considered a fish passage barrier, and it appears all proposed corridor crossings occur in the stretch the headwater is buried. The watercourse stays buried until it reaches the southwestern meadow marsh and mixed forest where it re-surfaces. The watercourse flows through a small forested valley and is a low gradient system with dense canopy cover. It is a highly meandering system with a mix of sand, gravel, silt and detritus as the substrate. There does not appear to be any fish barrier through the forest or as it crosses Bathurst Street.

4.5.1.2 Summary of Aquatic Existing Conditions

A total of 45 fish species were identified within the study area, based on historical data from LSRCA, MNR, and AECOM field surveys conducted for the Upper York Sanitary Sewer Project. With the exception of one species, all

fish species are considered common, or uncommon but not rare, in Ontario, with most populations being demonstrably secure, although there are some concerns for the long-term decline of nine fish species.

One aquatic Species at Risk (SAR) found within the study area (Sharon Creek) is the Redside Dace, which is currently listed as Endangered under Ontario's *Endangered Species Act* (ESA 2007). (see **Section 4.5.4** for additional detail on Species at Risk within the study area).

The majority of the creeks within study area are cool to warmwater thermal regime, with fish communities that typically respond well to changing environmental conditions, and whose habitat preferences are wide-ranging or common. Only one creek is identified as coldwater, Sharon Creek, and therefore may contain species less tolerant of disturbances and changing environmental conditions.

4.5.2 Terrestrial Conditions

Following secondary source review and terrestrial field investigations completed on October 17th and 18th, 2013, terrestrial features were subdivided into 10 vegetated patches (see **Figure 4-10 and 4-11)**.

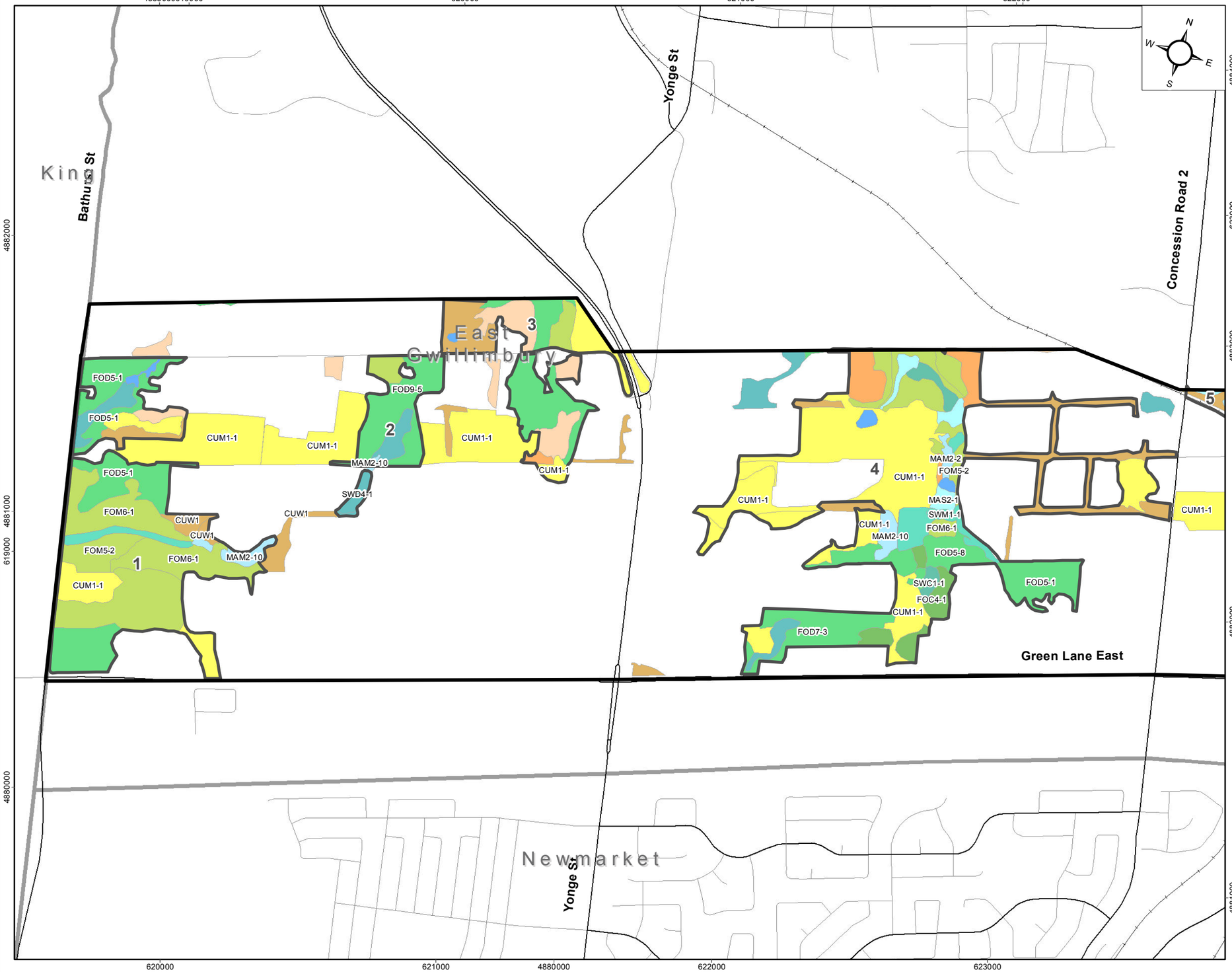
The Regional Municipality of York Official Plan identifies 8 potentially significant woodlands and two Conservation Area/Regional Forests occurring within the study area. The Town of East Gwillimbury's update of its Natural Heritage System in their Official Plan uses the *PPS* (2005), the Lake Simcoe Protection Plan, the Greenbelt Plan, and the Oak Ridges Moraine Plan to define the existing natural heritage features. The town's Natural Heritage System identifies three levels of features:

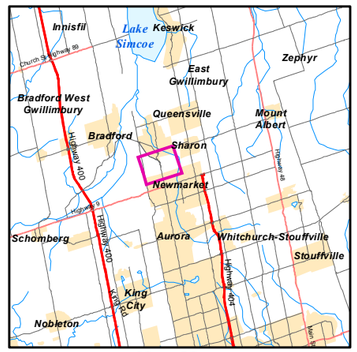
- Level A (NHS-A) features are considered to be Provincially Significant or significant at the municipal level. Features designated as NHS-A are to be retained and where development is proposed on adjacent lands, the completion of an Environmental Impact Study will be necessary to demonstrate that there will be no negative impacts;
- Level B (NHS-B) features are considered to be significant at the local or subwatershed level. It is intended that features be retained. However, there is flexibility on the manner in which these features are to be retained with consideration being given to creation, enhancement or restoration off-site as a form of compensation for loss;
- Level C (NHS-C) features are considered to support those areas identified as NHSA and NHS-B features. It is preferred that these features are retained however will not necessarily constitute a constraint to a land use change (Beacon, 2008).

Refer to **Appendix C – Natural Environment Existing Conditions Report** for a breakdown of all available background information pertaining to each of the 10 vegetation patches within each subwatershed.

Identified Natural Heritage Features occurring within the study area that should be considered during the selection of a preferred corridor alignment include:

- The Provincially Significant Ansnorveldt Wetland Complex – Vegetation Patch #1 and Vegetation Patch #2
- Rogers Reservoir Wetlands – Vegetation Patch #5
- Rogers Reservoir Conservation Area – Vegetation Patch #5
- 11 candidate significant woodlands – Vegetation Patch #1, 2, 3, 4, 5, 6, 9, and 10
- 2 Conservation Area/Regional Forests – Vegetation patch #4 and 5
- Several areas identified as Natural part of the Natural Heritage System (Level A, B, C) – Vegetation Patch #1, 2, 3, 4, 5, 6, 8, 9, and 10





Key Map

Legend

- Study Area
- Municipal Division
- Vegetated Patches
- Freeway
- Expressway / Highway
- Major Road
- Local Road
- Ramp
- Railway

ELC Community

- Coniferous Forest (FOC)
- Mixed Forest (FOM)
- Deciduous Forest (FOD)
- Coniferous Swamp (SWC)
- Mixed Swamp (SWM)
- Deciduous Swamp (SWD)
- Thicket Swamp (SWT)
- Cultural Meadow (CUM)
- Cultural Plantation (CUP)
- Cultural Thicket (CUT)
- Cultural Woodland (CUW)
- Meadow Marsh (MAM)
- Shallow Marsh (MAS)
- Open Bog (BOO)
- Shrub Bog (BOS)
- Treed Bog (BOT)
- Open Aquatic (OAO)
- Shallow Water (SA)
- Road/Residential/Railway (R/R/R)

Figure 4-10

1:15,000
NAD 1983 UTM Zone 17N

200 100 0 200 400 600
Metres

Basemap: Ontario Ministry of Natural Resources.
Additional Sources: York, 2013
Ortho-Imagery: York, 2011

Ecological Land use Classification - Western Study Area
East Gwillimbury East-West Road Corridor EA
Project No.: 60281533 Date: 2013-11-06

AECOM

Project Management Initials: Designer: Checked: Approved: ANSI B 279.4mm x 431.8mm
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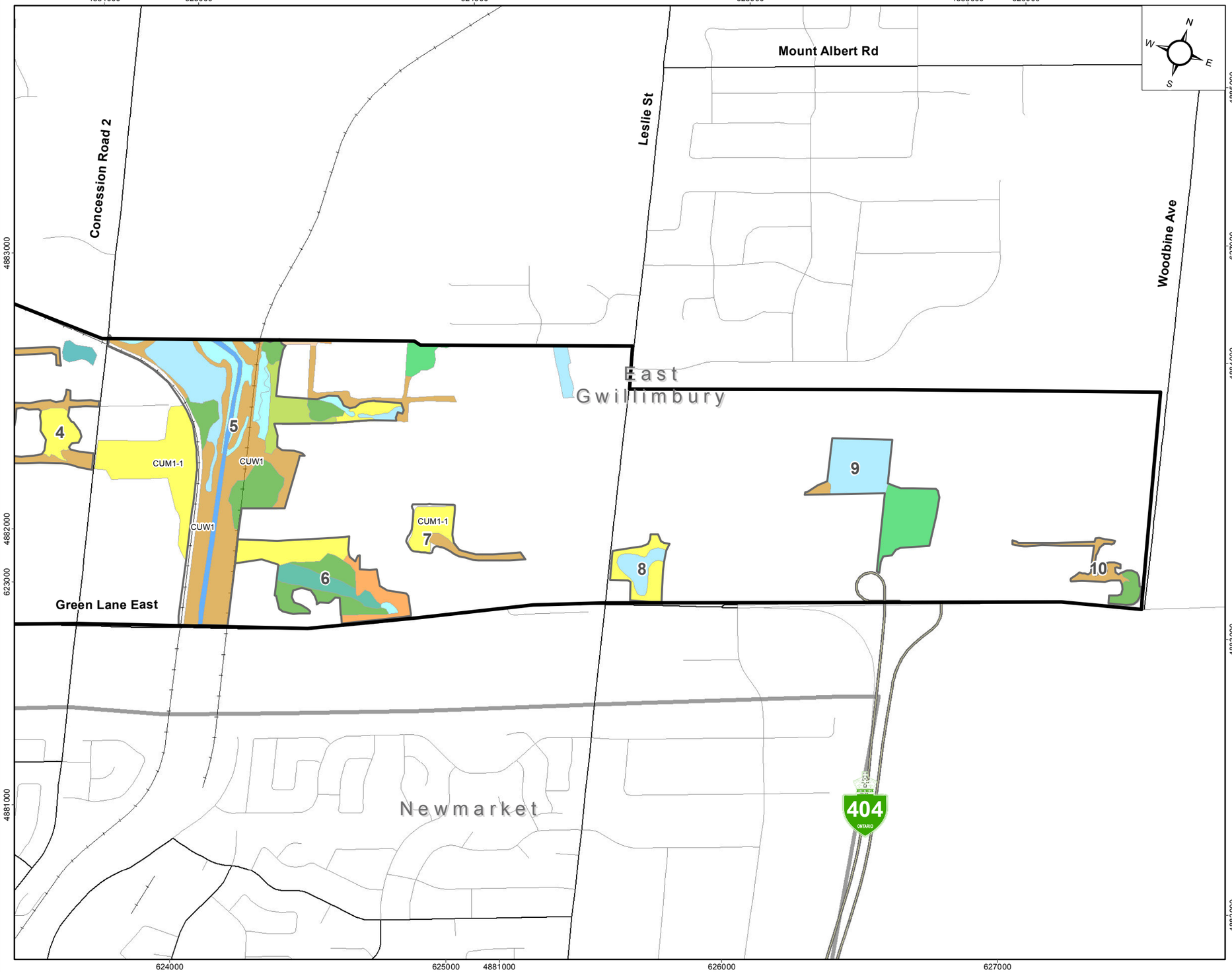
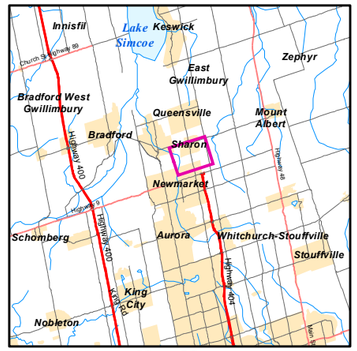
Filename: I:\AECOM WORK\GIS MAPPING\3-GUELPH GIS WORK\60281533 - EAST GWILLIMBURY\DESIGN\60281533_FIG 3 ELC - WESTERN STUDY AREA.MXD





Key Map

Legend

- Study Area
- Municipal Division
- 1 Vegetated Patches
- Freeway
- Expressway / Highway
- Major Road
- Local Road
- Ramp
- Railway

ELC Community

- Coniferous Forest (FOC)
- Mixed Forest (FOM)
- Deciduous Forest (FOD)
- Coniferous Swamp (SWC)
- Mixed Swamp (SWM)
- Deciduous Swamp (SWD)
- Thicket Swamp (SWT)
- Cultural Meadow (CUM)
- Cultural Plantation (CUP)
- Cultural Thicket (CUT)
- Cultural Woodland (CUW)
- Meadow Marsh (MAM)
- Shallow Marsh (MAS)
- Open Bog (BOO)
- Shrub Bog (BOS)
- Treed Bog (BOT)
- Open Aquatic (OAO)
- Shallow Water (SA)
- Road/Residential/Railway (R/R/R)

Figure 4-11

1:15,000

NAD 1983 UTM Zone 17N

200 100 0 200 400 600

Metres

Basemap: Ontario Ministry of Natural Resources.
Additional Sources: York, 2013
Ortho-Imagery: York, 2011

Ecological Land use Classification - Eastern Study Area

East Gwillimbury East-West Road Corridor EA

Project No.: 60281533 Date: 2013-11-06

AECOM

Project Management Initials:
Designer:
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Approved:
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4.5.3 Wildlife Habitat

In addition to the data collected from the background materials, incidental wildlife observations were recorded during the site investigations that took place on October 17 and 18, 2013.

Overall, wildlife within the study area is limited to the areas associated with the East Holland River, Sharon Creek, Rogers Reservoir and the Tributary to the East Holland River.

Most of the recorded species observations from secondary source materials were all common and found within the region, including amphibian, dragonflies and damselflies, mammal and breeding bird observations.

Several area sensitive bird species have been reported as occurring within the study area, including Red eyed Vireo, American Crow, White-breasted Nuthatch, Black and White Warbler, American Redstart, Mourning Warble, and Rose-breasted Grosbeak. Also, a number of bird species that have been listed under the ESA or SARA or by the COSEWIC have also been identified in this area in the Atlas of Breeding Birds of Ontario (see **Section 4.5.4** for further detail on Species at Risk).

A single Bald Eagle, which is listed as Special Concern under the ESA, was observed flying over the study area during the field investigations. Although no other wildlife SAR were identified in the study area during the field investigations, this does not necessarily indicate that these species are not present. The field investigations were completed in October, which is well outside of the active breeding season for breeding birds and the majority of other wildlife that could potentially occur in the study area. See **Section 4.5.4** below for further detail on Species at Risk.

4.5.4 Species at Risk and Species of Conservation Concern

4.5.4.1 Methodology

A comprehensive Species at Risk Screening for the study area was completed through review of the following:

- Federal *Species at Risk Act* (SARA);
- *Endangered Species Act* (ESA), Ontario (2007);
- Natural Heritage Information Centre Database (NHIC), 2012;
- Committee on the Status of Endangered Wildlife in Canada (COSEWIC) database;
- Department of Fisheries and Oceans (DFO) SAR Mapping;
- Atlas of Breeding Birds of Ontario

Correspondence with the MNRF was also used to identify Species at Risk that may be present in the study area.

The list of SAR that are known to occur within the Town of East Gwillimbury obtained from the NHIC database using the Spatial Boundary Tool was supplemented with the records obtained from the NHIC 1 km search, correspondence with MNR, DFO SAR mapping and the records obtained from the Atlas of Breeding Birds of Ontario.

The intention of the exercise was to use all available resources to create a comprehensive list of all potential SAR species located within the study area. The habitat preferences of these species were then screened against the habitat conditions that were documented at the site to determine which of these species may be present at the site.

Species at Risk Screening

Table 4-3 presents a list of species which could potentially occur and/or have been confirmed in the study area, based on the screening methodology outlined in **Section 4.5.4.1** above.

Table 4-3 Potential Species at Risk Present within Study Area

English Name	Scientific Name	ESA	SARA	COSEWIC	Comments
Butternut	*Juglans cinerea*	Endangered	Endangered – Schedule 1	Endangered	Species observed at various locations in vegetation patches 1 and 4. Suitable habitat present throughout these patches and in vegetation patches 3, 4 and 5,
Little Brown Myotis (Bat)	*Myotis lucifugus*	Endangered	No Status	Endangered	Potentially suitable habitat in cavity trees in vegetation patches 1, 2, 3, 4 5 and 6. Could also roost in abandoned structures or old farm houses which are present at site.
Northern Myotis (Bat)	*Myotis septentrionalis*	Endangered	No Status	Endangered	Potentially suitable habitat in cavity trees in vegetation patches 1, 2, 3, 4 5 and 6.
Barn Swallow	*Hirundo rustica*	Threatened	No Status	Threatened	Potentially suitable habitat in old/abandoned barns and buildings and underneath culverts/bridges in study area.
Bobolink	*Dolichonyx oryzivorus*	Threatened	No Status	Threatened	Potentially suitable habitat in cultural meadows and hayfields in study area.
Chimney Swift	*Chaetura pelagica*	Threatened	Threatened – Schedule 1	Threatened	Potentially suitable habitat in old farmhouses with chimneys in study area/
Eastern Meadowlark	*Sturnella magna*	Threatened	No Status	Threatened	Potentially suitable habitat in cultural meadows and hayfields in study area.
Common Nighthawk	*Chordeiles minor*	Special Concern	Threatened – Schedule 1	Threatened	Potentially suitable habitat in and adjacent feature #.
Milksnake	*Lampropeltis triangulum*	Special Concern	Special Concern – Schedule 1	Special Concern	Potentially suitable habitat in study area.
Monarch	*Danaus plexippus*	Special Concern	No Status	Special Concern	Potentially suitable habitat in study area.
Olive-sided Flycatcher	*Contopus cooperi*	Special Concern	Threatened – Schedule 1	Threatened	Potentially suitable habitat at site in vegetation patch 1.
Redside Dace	*Clinostomus elongatus*	Endangered	Special Concern	Endangered	Confirmed Habitat within Sharon Creek
Snapping Turtle	*Chelydra serpentina*	Special Concern	Special Concern – Schedule 1	Special Concern	Potentially suitable habitat in the East Holland River.
Wood Thrush	*Hylocichla mustelina*	No Status	No Status	Threatened	Potentially suitable habitat in features 1, 2, 3 and 4.
Eastern Wood-Pewee	*Contopus virens*	No Status	No Status	Special Concern	Potentially suitable habitat in features 1, 2, 3 and 4.

A full list of the SAR which are known to occur, have historically occurred or could potentially occur in the study area, along with their habitat preferences, can be viewed in **Appendix C – Natural Environment Existing Conditions Report**.

4.5.5 Summary of Natural Environment Existing Conditions

Key hydrologic features found within the study area include:

- East Holland River, and its tributaries
- Sharon Creek
- East Holland Tributary
- Tributary A and B of the East Holland River;
- Ansnorveldt Creek

Several smaller tributaries are also located throughout the study area that function as headwater tributaries to downstream key hydrologic features.

With the exception of one species, all fish species are considered common, or uncommon but not rare, in Ontario. Most populations are demonstrably secure, although there are some concerns for the long-term decline of nine fish species.

Redside Dace is a confirmed aquatic Species at Risk within Sharon Creek. Redside Dace is listed as Endangered under Ontario's Endangered Species Act (ESA 2007). Section 9 of the *ESA* prohibits harmful actions such as killing, harming, harassment, and possession of this species and Section 10 of the *ESA* prohibits the damage or destruction of the habitat of Redside Dace.

Further consultation with the local regulatory agencies, LSRCA, MNR, DFO should be conducted during the detail design phase to determine potential permitting requirements for SAR and watercourse crossings.

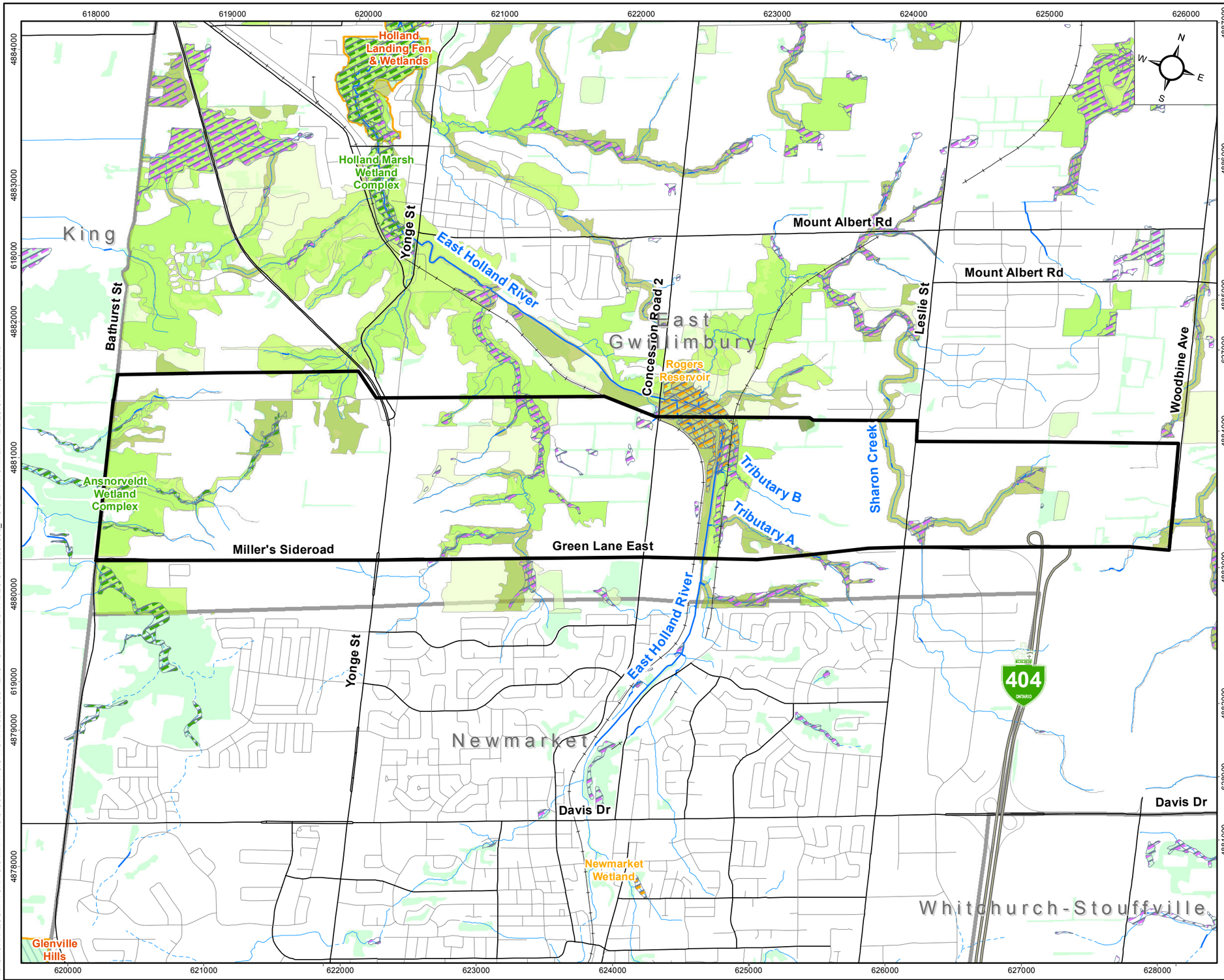
Identified Natural Heritage Features occurring within the study area include:

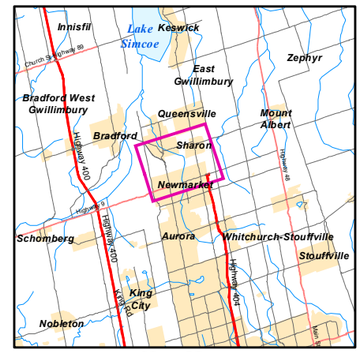
- The Provincially Significant Ansnorveldt Wetland Complex;
- Rogers Reservoir Wetlands;
- Rogers Reservoir Conservation Area;
- 11 candidate significant woodlands (Region of York Official Plan);
- 2 Conservation Area/Regional Forests (Region of York Official Plan);
- 5 areas identified as Natural part of the Natural Heritage System (Level A, B, C) (Town of East Gwillimbury Official Plan).

All terrestrial communities observed during field investigations were consistent with the information gathered from background reports. It was determined that a total of 24 terrestrial SAR are known to occur, have historically occurred, or could potentially occur in the study area. The presence or absence of SAR should be confirmed through further field investigations during detail design (see **Section 7**).

Pursuant to the above, the following methodology should be used in the evaluation of the alternative corridor alignments during the EA study:

1. Avoidance of the features where feasible;
2. A reduction of crossing of features where feasible (i.e., reducing the total number of water crossings)
3. A reduction of the area of impact for a feature (i.e., where bisection of a feature is required it should be at the feature's narrowest point); and
4. Maintenance of corridors and linkages (i.e., efforts should be made to reduce the impacts on existing natural corridors).





Key Map

Legend

- Study Area
- Municipal Division
- Freeway
- Expressway / Highway
- Major Road
- Local Road
- Ramp
- Railway
- River
- Permanent Stream
- Intermittent Stream

Evaluated Wetlands

- Provincially Significant Wetland
- Locally Significant Wetland
- Unevaluated Wetland
- Wooded Area

Natural Heritage Components

- Unknown
- Level A
- Level B
- Level C

ANSI's

- Provincially Signficant Candidate Life Science ANSI
- Regionally Signficant Candidate Life Science ANSI
- Provincially Signficant Candidate Earth Science ANSI
- Regionally Signficant Candidate Earth Science ANSI

Figure 4-12

1:30,000
NAD 1983 UTM Zone 17N

400 200 0 400 800 1,200
Metres

Basemap: Ontario Ministry of Natural Resources.
Additional Sources: York, 2013
Ortho-Imagery: York, 2011

Environmental Designations
East Gwillimbury East-West Road Corridor EA
Project No.: 60281533 Date: 2013-11-06

AECOM

ANSI B 279.4mm x 431.8mm
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Filename: I:\AECOM WORK\GIS MAPPING\3-GUELPH GIS WORK\60281533 - EAST GWILLIMBURY\DESIGN\60281533_FIG 5 ENVIRONMENTAL DESIGNATIONS.MXD

4.6 Socio-Economic Environment

4.6.1 Political Jurisdiction

The study area is located completely within the Town of East Gwillimbury, part of the Regional Municipality of York. The Region of York constitutes the northern portion of the Greater Toronto Area, with the City of Toronto lying to its south.

East Gwillimbury shares borders with the Township of King (west), Town of Newmarket (south), Town of Whitchurch-Stouffville (southeast), Town of Uxbridge (east), Town of Georgina (north) in York Region, and the Town of Bradford-West Gwillimbury (northwest) in Simcoe County.

The main population centres in East Gwillimbury are the villages of Holland Landing, Queensville, Sharon, and Mount Albert. Of these population centres, a portion of the village of Sharon extends to fall within the northeast portion of the study area.

The study area also borders the Township of King at its western edge, west of Bathurst Street.

4.6.2 Existing Land Uses

Agricultural properties and natural areas dominate most of the study area landscape, however there is some recent urban-type commercial development occurring in the vicinity of Green Lane and Yonge Street. The development of this corridor is underway to accommodate mixed-use medium density development through the implementation of the Green Lane Secondary Plan (see **Section 4.6.3**). Some of the existing commercial uses along Yonge Street include:

- A large commercial property including Lowes and other various retail establishments;
- Shell gas station
- Northern Greens Golf and Family Fun Centre;
- Hillcrest Garage Service Centre;
- Brooklin Concrete Products Limited;
- Newmarket Inn

A row of residential properties with some agricultural uses are present along Morning Sideroad, west of Yonge Street. There is also a cluster of residential properties on Rogers Road, at the north end of the study area, off of Second Concession.

An existing railway accommodating GO Transit train service runs generally north-south through the study area, east of Second Concession. East of the railway is the Rogers Reservoir Conservation Area and, within its boundaries, the East Holland River. This area consists of a shallow reservoir and marsh, supporting a variety of flora and fauna (see **Section 4.5**). Rogers Reservoir Conservation Area is part of the Nokiidaa Trail System, which links the Towns of Aurora, Newmarket, and East Gwillimbury. The trail runs along the western edge of the East Holland River within the study area and is suitable for hiking, cross country skiing and snow shoeing. Public access to the trail is gained via a small parking lot/driveway access on the north side of Green Lane, in the vicinity of the historic Joe Kelley Swing Bridge (see **Section 4.7**). A Golf Driving Range is also located in this area.

As mentioned, the village of Sharon is located at the northeastern edge of the study area. The village includes the Sharon Temple, low density residential and commercial land uses, and a number of other heritage buildings and

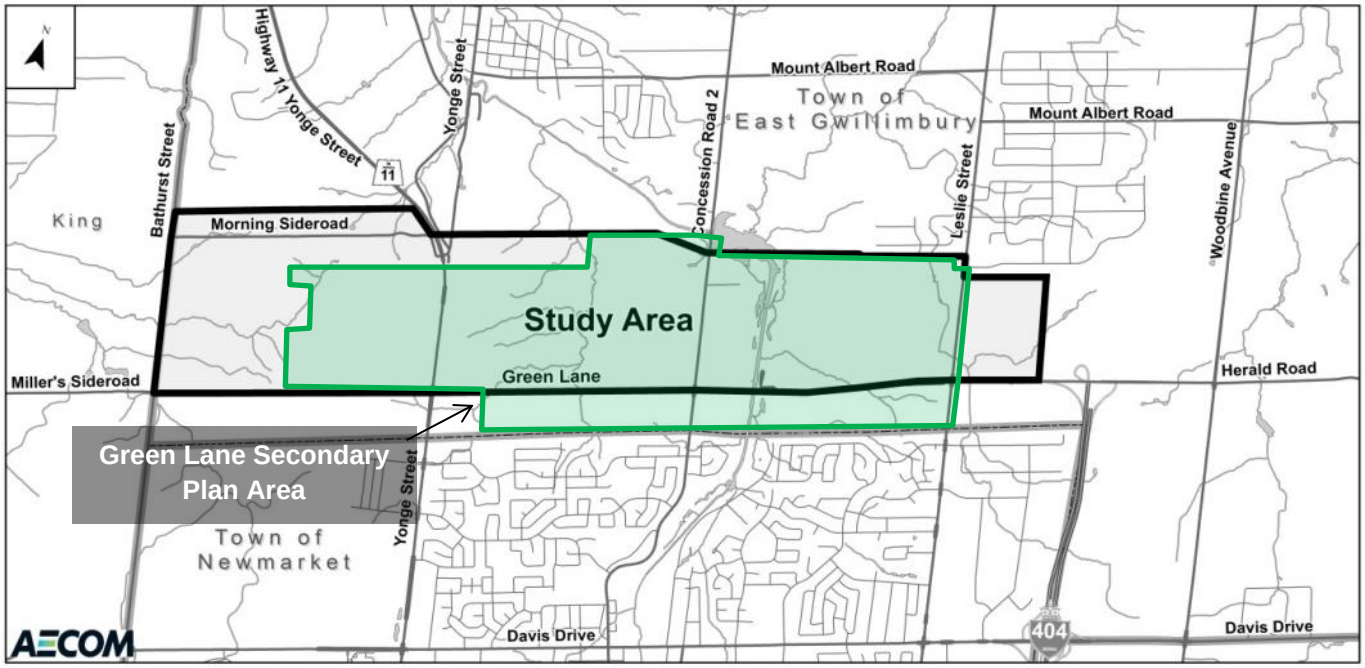
structures. Sharon Public School and the Sharon Burying Ground are located on Leslie Street at the south end of the village. The village has a population of approximately 3,000; however, this population is expected to grow significantly during future area development.

The right-of way for the Highway 404 extension is present near the western boundary of the study area. The 13 km extension from Green Lane to Ravenshoe Road opened to traffic in September 2014.

4.6.3 Future Development

Planning within the study area is guided by the Green Lane Secondary Plan (currently in draft), and will be focused on a series of Centres and Corridors that will provide for medium and higher density development, accommodating a mix of uses. **Figure 4-13** illustrates EA study area with the approximate extent of the Green Lane Secondary Plan Area.

Figure 4-13 Significant Future Planned Development Area – Green Lane Secondary Plan



The Secondary Plan Area is planned to accommodate new housing and population-related employment in an attractive mixed use and transit-supportive built form that encourages pedestrian movement and active transportation. The long term vision for the Green Lane Secondary Plan is to accommodate approximately 21,000 residents by 2031, and ultimately 30,000 to 38,000 residents at full build-out.

According to the draft Green Lane Secondary Plan, mainly low-medium density residential dwellings are planned in areas directly adjacent to the East-West Road Corridor. There is no significant land development anticipated for the far western portion of the study area not covered by the Green Lane Secondary Plan. The portion of the study area east of Leslie Street will be subject to a future Secondary Plan Study (Secondary Plan Study Area B-4 (Town of East Gwillimbury Official Plan, 2010).

Other major north-south roadways (Bathurst Street, Yonge Street, Second Concession, future North-South Collector Road, and Leslie Street) are in various stages of planning, design, and construction to accommodate the planned future growth in the study area. As noted earlier, the Highway 404 extension is completed, comprising a 4 lane-controlled access cross-section.

4.6.4 Noise

The principal sources of noise in the study area include traffic on the following existing roadways: Green Lane, Bathurst Street, Morning Sideroad, Yonge Street, Second Concession, Leslie Street, and Woodbine Avenue – with Green Lane and Yonge Street comprising the most significant sources. Considerable existing temporary construction noise from area development is prevalent in the vicinity of Leslie Street and Yonge Street.

A total of 38 existing noise-sensitive receptors were identified within the study area. Identified sensitive receptors are concentrated in the areas west of Yonge Street along Morning Sideroad, along Rogers Road, and along Leslie Street. Refer to **Appendix I** for the location of existing noise sensitive receptors.

Proposed mitigation for identified noise sensitive receptors in the vicinity of the preferred corridor alignment is documented in **Section 7,** and will be further refined during detail design.

4.6.5 Air Quality

The air quality assessment of existing conditions (2013) focused on the regional level of air quality representing the study area. Baseline ambient air quality was assessed based on publicly available background data collected by monitoring stations of the MOE and Environment Canada. Existing air quality review was conducted in accordance with the following applicable standards and guidelines:

- Ontario Regulation 419/05 Air Pollution – Local Air Quality Regulation, Schedule 3
- MOE Ambient Air Quality Criteria (AAQC)
- Proposed Canada Wide Standards (CCME)
- World Health Organization Guideline

The wind rose information provided by the MOE shows that the predominant wind is blowing from northwest, which may result in greater future air quality impacts to the subdivision south to the corridor during construction and operation. 14 existing sensitive receptors and 4 (representative) future sensitive receptors were found and assessed within the study area.

For all contaminants, with the exception of benzene (annual), the existing (2013) maximum cumulative concentrations are below their respective standard, guideline or interim reference levels. Benzene was found to be within the maximum concentrations in the 24-Hour average period (2013).

See **Appendix H** for the Existing Conditions Air Quality Study.

The recommended mitigation based on the modelling and assessment of the existing (2013) vs. future build scenario (2031) is documented within **Section 7**.

4.7 Cultural Environment

4.7.1 Archaeological Resources

AECOM retained Archeoworks Inc.to conduct a Stage 1 Archaeological Assessment (AA) of the study area. The Stage 1 AA determined that ten registered archaeological sites are located within the study area; three sites are located within 50 m of the study area; and 5 sites are located within 300 m of the study area.

The Stage 1 AA found that a number of previous archaeological assessments/field work were completed within portions of the study area, and the MTCS has cleared these areas of further archaeological concern. It is therefore recommended that these areas be exempt from further archaeological assessment.

Areas identified as having been subjected to deep and extensive disturbance include the existing paved roads, a rail line, and the footprints of commercial and residential structures within the study area. The construction and paving activities for these developments would have caused extensive and deep disturbance to any archaeological resources that could have been present, thus resulting in the removal of archaeological potential. However, given a property inspection was not undertaken, as well as the established archaeological potential within the study area, following the selection of a preferred corridor, it is recommended that these disturbed areas and their limits should be evaluated through a Stage 2 AA.

Apart from areas that have been subjected to extensive disturbance, and those areas cleared of further archaeological concern by the MTCS, the study area is considered to have high archaeological potential.

Following the selection of the preferred corridor alignment and creation of a detail design, these undisturbed and un-assessed areas that fall within the right-of way limits, construction and/or staging areas should be subjected to Stage 2 field assessment, under the field direction of a licensed archaeologist (see **Figure 4-14** for portions of the study area requiring a Stage 2 AA) The Stage 2 AA should commence with a property survey to assess current land conditions, identify areas of low archaeological potential and determine appropriate field work strategies.

Following Stage 2 AA, further Stage 3 AA investigations will also be necessary for any land-disturbing occurring within 10 m of the Sharon Burying Ground. No excavation activities shall take place within the study area prior to the MTCS (Heritage Operations Unit) confirming in writing that all archaeological licensing and technical review requirements have been satisfied.

A Letter of Compliance for the Stage 1 AA was received from the Ministry of Tourism, Culture and Sport on October 31, 2013.

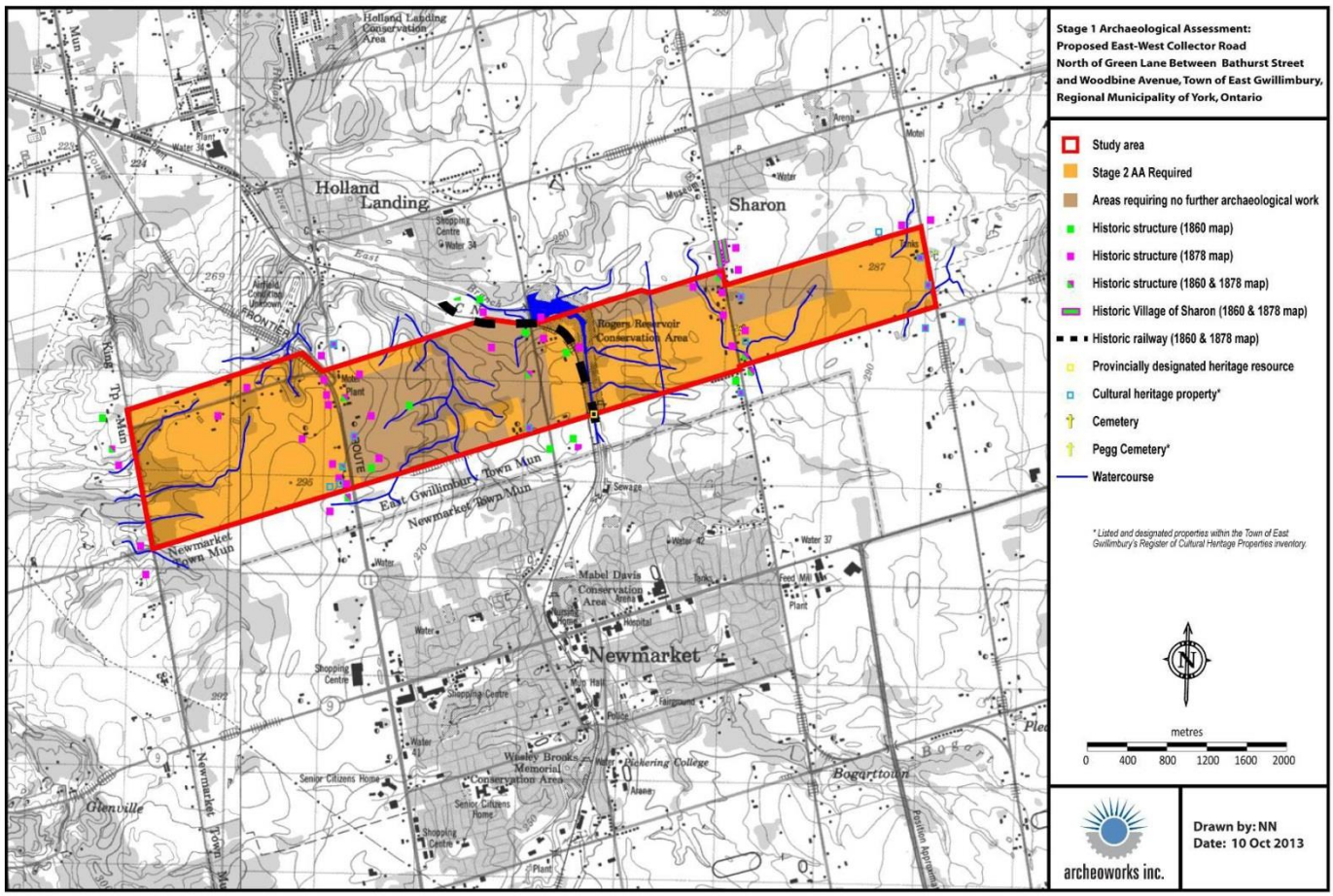
Refer to **Appendix F** for a copy of the Stage 1 AA Report and MTCS Stage 1 AA Compliance Letter.

4.7.2 Cultural Heritage Resources

Unterman McPhail and Associates was retained by AECOM to conduct a cultural heritage resource assessment of the built heritage resources and cultural heritage landscapes of 40 years and older in age within the study area.

The Municipal Class EA Document, Part B – Municipal Road Projects, Section B.1.1 (4), refers to the consideration of the cultural environment and cultural heritage in the environment for municipal road projects. The definition of cultural heritage resources includes built heritage and cultural heritage landscapes. MTCS is responsible for the administration of the *Ontario Heritage Act (OHA)* and is responsible for determining policies, priorities and programs for the conservation, protection and preservation of Ontario's heritage, which includes cultural heritage landscapes and built heritage.

Figure 4-14 Results of Stage 1 Archaeological Assessment



As well, Section B.1.1 (4), states significant cultural heritage features should be avoided, where possible. Where they cannot be avoided, then effects should be minimized where possible, and every effort made to mitigate adverse impacts, in accordance with provincial and municipal policies and procedures. Cultural heritage features should be identified early in the process in order to determine significant features and potential impacts. Section B.1.1 (4) defines built heritage resources and cultural heritage landscapes as follows.

Built Heritage Resources (BHR) is defined as one or more significant buildings, structures, monuments, installations or remains associated with architectural, cultural, social, political, economic military history and identified as being important to a community. These resources may be identified through designation or heritage conservation easements under the *OHA*, or listed by local, provincial or federal jurisdictions.

Cultural Heritage Landscapes (CHL) are defined as geographical areas of heritage significance, which have been modified by human activities and is valued by a community. It involves grouping(s) of individual heritage features such as structures, spaces, archaeological sites, and natural elements, which together form a significant type of heritage form, distinctive from that of its constituent elements of parts. Examples may include, but are not limited to, neighbourhoods, cemeteries, trailways, and industrial complexes of cultural heritage value.

The *OHA* requires the Town to keep a current register of properties of cultural heritage value or interest. In 2012, East Gwillimbury Council technically approved this register, entitled the *Town of East Gwillimbury: A Comprehensive Listing*

of Heritage and Historically Significant Properties. This heritage register includes properties formally designated under Part IV of the *OHA* and those non-designated properties, commonly referred to as "listed" properties, identified as having potential cultural heritage value or interest within the municipality.

Generally, the most significant cultural heritage resources are those that have been designated under the *OHA* and accordingly should receive the highest level of protection in planning.

Table 4-4 provides a summary of the type and significance of each cultural heritage resource found within the study area.

Table 4-4 Summary of Cultural Heritage Resources within the Study Area

Resource Address/Feature	Resource Type	Municipally Listed?	Designated under *OHA* Part IV?
14 Green Lane West	BHR	Yes	No
22 Green Lane West	BHR	Yes	No
542 Green Lane East	BHR	No	No
576 Green Lane East	CHL	Yes	No
Joe Kelley's Swing Bridge, Old Green Lane	BHR	Yes	Yes
18574 Woodbine Avenue	CHL	Yes	No
18442 Woodbine Avenue	CHL	Yes	No
18532 Leslie Street, Sharon School	BHR	Yes	No
18508 Leslie Street	BHR	No	No
18499 Leslie Street	CHL	Yes	No
18490 Leslie Street	BHR	Yes	No
18460 Leslie Street	CHL	Yes	No
18391 Leslie Street (Sharon Burying Ground)	CHL	Yes	Yes
18335 Leslie Street	BHR	Yes	No
18328 Yonge Street	CHL	No	No
18474 Yonge Street	BHR	Yes	Yes
18558 Yonge Street	BHR	No	No
18581 Yonge Street	BHR	Yes	No
356 Morning Sideroad	CHL	Yes	No
457 Morning Sideroad	CHL	Yes	No
GO Transit Barrie Line	CHL	No	No
East Holland River/Newmarket Canal	CHL	No	No
Existing and former agricultural lands within the study area;	CHL	No	No
Second Concession, Rogers Road, Bathurst Street, and Morning Sideroad Roadscapes	CHL	No	No
Village of Sharon	CHL	Yes/No*	Yes/No*

*Note: * The Village of Sharon (CHL) is included as a Historical Settlement, encompassing land within and outside of the study area; many properties within the village are included Town of East Gwillimbury: A Comprehensive Listing of Heritage and Historically Significant Properties (2012). Additionally, the Sharon Temple, a National Historic Site, is located within the Village, albeit outside of the study area. The Ontario Heritage Trust holds a heritage easement on the property and has installed a commemorative plaque onsite. The property is designated under the OHA.*

There are no known federally or provincially recognized or protected properties within the study area.

The above information was utilized in the selection of the preferred alignment, avoiding direct impacts (i.e., demolition or removal of, BHR and CHL). Indirect impacts (i.e., the introduction new physical, visual, audible or atmospheric elements that are not in keeping with resource character and/or setting.) were also considered in the evaluation of the corridor alignment alternatives presented in **Section 5** of this ESR.

The Impact Assessment and proposed mitigation for any cultural heritage resources in the vicinity of the preferred corridor alignment is documented in **Section 7** of this ESR.

Refer to **Appendix E** for a copy of the Cultural Heritage Assessment Report (CHAR).

5. Corridor Alignment Alternatives

5.1 Generation of Alternatives

Corridor alignment alternatives represent different ways of carrying out the preferred solution (East-West Road Corridor) established in Phases 1 and 2 of the Municipal Class EA process through the Town's TMP.

In this case, a long list of (22) corridor alignment alternatives were generated from early stakeholder and public input based on the preliminary evaluation criteria for the East-West Road Corridor (see **Figure 3-2**), and the following constraints noted during early consultation with stakeholders:

- Relatively fixed location of the Bridge over the East Holland River/GO Rail Tracks;
- Relatively fixed location of the intersection with Second Concession; and,
- Relatively fixed location of the future intersection with the North South Collector Road.

Refer to **Figure 4-8** for the long list of corridor alignment alternatives.

5.2 Evaluation of the Corridor Alignment Alternatives

5.2.1 Evaluation Criteria

An evaluation framework was developed and is presented in **Table 5-1**, including technical considerations and environmental components that address the broad definition of the environment as described in the *Environmental Assessment Act* in addition to considering comments received from review agencies. The factor groups for evaluation criteria were confirmed through consultation with project team members, agencies, stakeholders, and by public attendees of PIC #1.

Table 5-1 Evaluation Criteria

Category	Final Evaluation Criteria
Technical	• Ability to maximize roadway capacity • Ability to accommodate future demand • Ability to minimize construction constraints and complexity • Effect on traffic safety • Effect on stormwater quality and quantity • Effect on utility infrastructure • Effect on rail line
Natural Environment	• Effect on terrestrial habitat and species • Effect on aquatic habitat and fisheries, including the Holland River and other watercourses
Socio-economic Environment	• Conformity with Places to Grow Act, Oak Ridges Moraine Conservation Plan, Greenbelt Plan, Lake Simcoe Protection Plan • Ability to accommodate future development (Green Lane Secondary Plan) • Ability to provide active transportation facilities • Effect on existing sensitive receptors • Effect on local air quality due to vehicle emissions • Amount and type of property required • Effect on property access to adjacent properties • Effect on adjacent business operations
Cultural Environment	• Potential for disruption of archaeological resources • Potential for disruption of built heritage resources and cultural landscape features
Cost	• Cost of construction and operations

5.2.2 Development of the Short List of Corridor Alignment Alternatives

With the long list of corridor alignment alternatives established and evaluation criteria confirmed, the Project Team reviewed the existing environmental conditions and engaged in further consultation with agencies and stakeholders in order to refine the options and proceed to a detailed evaluation process. The following summarizes the key considerations used in the refinement of the long list of corridor alignment alternatives to a short list of corridor alignment alternatives:

- Avoidance of natural environment features, where feasible;
- A reduction of total number of watercourse crossings;
- A reduction of the area of impact for a natural feature (i.e., where bisection of a feature is required it should be at the feature's narrowest point);
- Maintenance of natural corridors and linkages (i.e., efforts should be made to reduce the impacts on existing natural corridors);
- Limit impacts to properties required for the roadway;
- Avoid impacts to existing institutions (Church) and businesses, where possible; and,
- Preserve the future utility of the roadway by limiting proximity to Green Lane at Yonge Street.

Figure 5-1 illustrates the short list of corridor alignment alternatives that were subsequently carried forward to detailed evaluation.

5.2.3 Evaluation of the Short List of Corridor Alignment Alternatives

The short list of corridor alignment alternatives were assessed using the reasoned argument method of evaluation. This method identifies and highlights the differences in net impacts associated with the various alternatives. The relative significance of the impacts is examined to provide a clear rationale for the selection of a preferred alternative. As noted, the Evaluation Criteria were put forward based on their ability to identify the potential environmental effects of each alternative and distinguish the advantages and disadvantages between them.

Table 5-2 presents the assessment table used to evaluate the eight (8) short-listed Corridor Alignments. Through this table, appropriate technical, natural, socio-economic, cultural and cost criteria are used to evaluate and compare impacts of each alignment. A recommendation was made for the Preferred Corridor Alignment based on the results presented in this table.

Figure 5-1 Short List of Corridor Alignment Alternatives

Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8
•B2 •Y1 •C1 •L1	•B2 •Y1 •C1 •L2	•B2 •Y2 •C2 •L1	•B2 •Y2 •C2 •L2	•B2 •Y3 •C2 •L1	•B2 •Y3 •C2 •L2	•B2 •Y1 •C2 •L1	•B2 •Y1 •C2 •L2

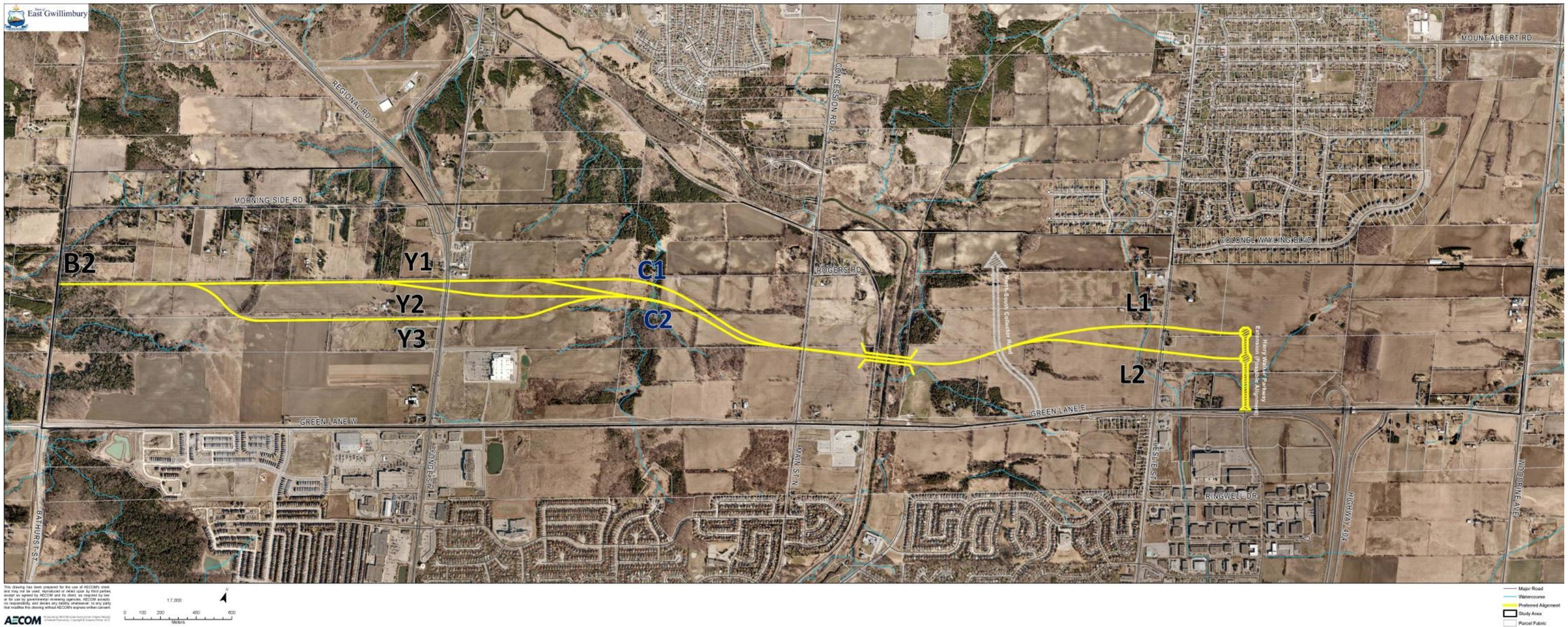


Table 5-2 Comparative Evaluation of the Alternative Alignments

Category	Criteria	Option 1 •B2 •Y1 •C1•L1	Option 2 •B2 •Y1 •C1 •L2	Option 3 •B2 •Y2 •C2 •L1	Option 4 •B2 •Y2 •C2 •L2	Option 5 •B2 •Y3 •C2 •L1	Option 6 •B2 •Y3 •C2 •L2	Option 7 •B2 •Y1 •C2 •L1	Option 8 •B2 •Y1 •C2 •L2
Technical	Ability to maximize roadway capacity	• Close proximity to existing signalized intersection (Morning Sideroad) at Yonge Street.		• Intersection spacing is adequate to maximize roadway capacity.		• Intersection spacing is adequate to maximize roadway capacity.		• Close proximity to existing signalized intersection (Morning Sideroad) at Yonge Street.	
	Ability to accommodate future demand	• Limited spacing between major intersections on Yonge Street may negatively impact traffic flow.		• Intersection spacing is adequate to accommodate future demand.		• Intersection spacing is adequate to accommodate future demand.		• Limited spacing between major intersections on Yonge Street may negatively impact traffic flow.	
	Ability to minimize construction constraints and complexity	• Least curvature in roadway geometry west of Holland River.		• Less curvature in roadway geometry west of Holland River.		• Greatest curvature in roadway geometry west of Holland River.		• Less curvature in roadway geometry west of Holland River.	
	Effect on traffic safety	• Proximity to existing signalized intersection (Morning Sideroad) along Yonge Street may create signal timing and associated traffic safety issues.		• Intersection spacing is adequate to maximize traffic safety.		• Proximity to existing signalized intersection (Lowe's Access Road) along Yonge Street may create signal timing and associated traffic safety issues.		• Proximity to existing signalized intersection (Morning Sideroad) along Yonge Street may create signal timing and associated traffic safety issues.	
	Effect on stormwater quality and quantity	• No significant difference between alignments. Alignments to adhere to pertinent Stormwater Management Policies (MOE, LSPP, and SWMMP) during detail design.		• No significant difference between alignments. Alignments to adhere to pertinent Stormwater Management Policies (MOE, LSPP, and SWMMP) during detail design.		• No significant difference between alignments. Alignments to adhere to pertinent Stormwater Management Policies (MOE, LSPP, and SWMMP) during detail design.		• No significant difference between alignments. Alignments to adhere to pertinent Stormwater Management Policies (MOE, LSPP, and SWMMP) during detail design.	
	Effect on utility infrastructure	• 5 span bridge accommodates 44 kV hydro corridor crossing. • Existing utilities to be confirmed during detail design.		• 5 span bridge accommodates 44 kV hydro corridor crossing. • Existing utilities to be confirmed during detail design.		• 5 span bridge accommodates 44 kV hydro corridor crossing. • Existing utilities to be confirmed during detail design.		• 5 span bridge accommodates 44 kV hydro corridor crossing. • Existing utilities to be confirmed during detail design.	
	Effect on rail line	• Accommodates 5-span arrangement, allowing sufficient headroom to allow for potential future electrification of the railway line and provides for a future 2nd track west of the existing track.		• Accommodates 5-span arrangement, allowing sufficient headroom to allow for potential future electrification of the railway line and provides for a future 2nd track west of the existing track.		• Accommodates 5-span arrangement, allowing sufficient headroom to allow for potential future electrification of the railway line and provides for a future 2nd track west of the existing track.		• Accommodates 5-span arrangement, allowing sufficient headroom to allow for potential future electrification of the railway line and provides for a future 2nd track west of the existing track.	
Technical Category Screening		**MORE PREFERRED** • **Least curvature in roadway geometry, provides good horizontal alignment.** • **Proximity to existing signalized intersection on Yonge Street at Morning Side Road may impact traffic flow.**		**MOST PREFERRED** • **Provides optimal intersection spacing on Yonge Street and opportunity to maximize roadway capacity and traffic safety.** • **Less curvature in horizontal roadway geometry.**		**LESS PREFERRED** • **Increased curvature in roadway geometry.** • **Proximity to existing intersection on Yonge Street at Lowes Access Road may potentially impact signal timing.**		**MORE PREFERRED** • **Less curvature in roadway geometry.** • **Proximity to existing signalized intersection on Yonge Street at Morning Side Road may impact traffic flow.**	

Table 5-2 Comparative Evaluation of the Alternative Alignments

Category	Criteria	Option 1 •B2 •Y1 •C1•L1	Option 2 •B2 •Y1 •C1 •L2	Option 3 •B2 •Y2 •C2 •L1	Option 4 •B2 •Y2 •C2 •L2	Option 5 •B2 •Y3 •C2 •L1	Option 6 •B2 •Y3 •C2 •L2	Option 7 •B2 •Y1 •C2 •L1	Option 8 •B2 •Y1 •C2 •L2
Natural Environment	Effect on terrestrial habitat and species	**Potential effects would include:** • The removal of approximately **0.12** ha of unevaluated wetland. Wetland could potentially be complexed with Provincially Significant Holland Marsh Wetland Complex. • The removal of approximately **0.19 ha** of Provincially Significant Ansnorveldt Wetland Complex; and • The removal of approximately **12.73 ha** of natural heritage areas. **Potential effects to Species at Risk Potentially Suitable Habitat could include**: • Disturbance to potentially suitable bobolink (THR) and eastern meadowlark (THR) habitat; • Disturbance to suitable habitat for butternut (END); and • Disturbance to potentially suitable habitat for little brown myotis (END) and northern myotis (END) in cavity trees. **Potential effects to Potential Suitable Significant Wildlife Habitat could include**: • Disturbance to potentially suitable habitat for common nighthawk (SC), milksnake (SC), monarch (SC), olive-sided flycatcher (SC), and snapping turtle (SC); • Disturbance to potential animal movement corridors. **Potential effects to Potentially Suitable Habitat for species listed under COSEWIC could include**: • Disturbance to potentially suitable habitat for wood thrush (THR) and Eastern wood-pewee (SC)	**Potential effects would include:** • The removal of approximately **0.44 ha** of unevaluated wetland. Wetland could potentially be complexed with Provincially Significant Holland Marsh Wetland Complex. • The removal of approximately **0.19 ha** of Provincially Significant Ansnorveldt Wetland Complex; and • The removal of approximately **11.62 ha** of natural heritage areas. **Potential effects to Species at Risk Potentially Suitable Habitat could include**: • Disturbance to potentially suitable bobolink (THR) and eastern meadowlark (THR) habitat; • Disturbance to suitable habitat for butternut (END); and • Disturbance to potentially suitable habitat for little brown myotis (END) and northern myotis (END) in cavity trees. **Potential effects to Potential Suitable Significant Wildlife Habitat could include**: • Disturbance to potentially suitable habitat for common nighthawk (SC), milksnake (SC), monarch (SC), olive-sided flycatcher (SC), and snapping turtle (SC); • Disturbance to potential animal movement corridors. **Potential effects to Potentially Suitable Habitat for species listed under COSEWIC could include**: • Disturbance to potentially suitable habitat for wood thrush (THR) and Eastern wood-pewee (SC)	**Potential effects would include:** • The removal of approximately **0.44 ha** of unevaluated wetland. Wetland could potentially be complexed with Provincially Significant Holland Marsh Wetland Complex. • The removal of approximately **0.19 ha** of Provincially Significant Ansnorveldt Wetland Complex; and • The removal of approximately **11.62 ha** of natural heritage areas. **Potential effects to Species at Risk Potentially Suitable Habitat could include**: • Disturbance to potentially suitable bobolink (THR) and eastern meadowlark (THR) habitat; • Disturbance to suitable habitat for butternut (END); and • Disturbance to potentially suitable habitat for little brown myotis (END) and northern myotis (END) in cavity trees. **Potential effects to Potential Suitable Significant Wildlife Habitat could include**: • Disturbance to potentially suitable habitat for common nighthawk (SC), milksnake (SC), monarch (SC), olive-sided flycatcher (SC), and snapping turtle (SC); • Disturbance to potential animal movement corridors. **Potential effects to Potentially Suitable Habitat for species listed under COSEWIC could include**: • Disturbance to potentially suitable habitat for wood thrush (THR) and Eastern wood-pewee (SC)	**Potential effects would include:** • The removal of approximately **0.44 ha** of unevaluated wetland. Wetland could potentially be complexed with Provincially Significant Holland Marsh Wetland Complex. • Crossing within 30 m of the Provincially Significant Ansnorveldt Wetland Complex; and • The removal of approximately **9.92 ha** of natural heritage areas. **Potential effects to Species at Risk Potentially Suitable Habitat could include**: • Disturbance to potentially suitable habitat for Chimney Swift (THR) and little brown myotis (END) in farm house at 18474 Yonge Street; • Disturbance to potentially suitable bobolink (THR) and eastern meadowlark (THR) habitat; • Disturbance to suitable habitat for butternut (END); and • Disturbance to potentially suitable habitat for little brown myotis (END) and northern myotis (END) in cavity trees. **Potential effects to Potential Suitable Significant Wildlife Habitat could include**: • Disturbance to potentially suitable habitat for common nighthawk (SC), milksnake (SC), monarch (SC), olive-sided flycatcher (SC), and snapping turtle (SC); • Disturbance to potential animal movement corridors. **Potential effects to Potentially Suitable Habitat for species listed under COSEWIC could include**: • Disturbance to potentially suitable habitat for wood thrush (THR) and Eastern wood-pewee (SC)	**Potential effects would include:** • The removal of approximately **0.44 ha** of unevaluated wetland. Wetland could potentially be complexed with Provincially Significant Holland Marsh Wetland Complex. • The removal of approximately **0.19 ha** of Provincially Significant Ansnorveldt Wetland Complex; and • The removal of approximately **11.93 ha** of natural heritage areas. **Potential effects to Species at Risk Potentially Suitable Habitat could include**: • Disturbance to potentially suitable bobolink (THR) and eastern meadowlark (THR) habitat; • Disturbance to suitable habitat for butternut (END); and • Disturbance to potentially suitable habitat for little brown myotis (END) and northern myotis (END) in cavity trees. **Potential effects to Potential Suitable Significant Wildlife Habitat could include**: • Disturbance to potentially suitable habitat for common nighthawk (SC), milksnake (SC), monarch (SC), olive-sided flycatcher (SC), and snapping turtle (SC); • Disturbance to potential animal movement corridors. **Potential effects to Potentially Suitable Habitat for species listed under COSEWIC could include**: • Disturbance to potentially suitable habitat for wood thrush (THR) and Eastern wood-pewee (SC)

Table 5-2 Comparative Evaluation of the Alternative Alignments

Category	Criteria	Option 1 •B2 •Y1 •C1•L1	Option 2 •B2 •Y1 •C1 •L2	Option 3 •B2 •Y2 •C2 •L1	Option 4 •B2 •Y2 •C2 •L2	Option 5 •B2 •Y3 •C2 •L1	Option 6 •B2 •Y3 •C2 •L2	Option 7 •B2 •Y1 •C2 •L1	Option 8 •B2 •Y1 •C2 •L2
Natural Environment *(continued)*	Effect on aquatic habitat and fisheries, including the Holland River and other watercourses	**Potential effects to 7 watercourse crossings, including:** • 1 permanent cold water watercourse: ▪ Sharon Creek • 1 permanent cold water watercourse: ▪ Sharon Creek as part of the Harry Walker Parkway Extension • 3 permanent warm water watercourses: ▪ Ansnorveldt Creek, East Holland River, tributary of the East Holland River • 1 intermittent warm water watercourse: ▪ Tributary of the East Holland River • 1 unevaluated intermittent watercourse ▪ Tributary B of the East Holland River • Crosses confirmed Redside Dace habitat in Sharon Creek. • Narrower crossing of tributary of the East Holland River in area of (transient) beaver activity.	**Potential effects to 7 watercourse crossings, including:** • 1 permanent cold water watercourse: ▪ Sharon Creek • 1 permanent cold water watercourse: ▪ Sharon Creek as part of the Harry Walker Parkway Extension • 3 permanent warm water watercourses: ▪ Ansnorveldt Creek, East Holland River, a tributary of the East Holland River • 1 intermittent warm water watercourses: ▪ Tributary of the East Holland River • 1 unevaluated intermittent watercourse: ▪ Tributary B of the East Holland River • Crosses confirmed Redside Dace habitat in Sharon Creek. • Wider crossing of tributary of the East Holland River in area of (transient) beaver activity.	**Potential effects to 6 watercourse crossings, including**: • 1 permanent cold water watercourse: ▪ Sharon Creek • 1 permanent cold water watercourse: ▪ Sharon Creek as part of the Harry Walker Parkway Extension • 2 permanent warm water watercourses: ▪ East Holland River, a tributary of the East Holland River • 1 unevaluated intermittent watercourse: ▪ Tributary B of the East Holland River • 1 buried warm water stream in farm field: ▪ Tributary of Ansnorveldt Creek • Adjacent to intermittent tributary of East Holland River tributary. • Crosses confirmed Redside Dace habitat in Sharon Creek. • Wider crossing of tributary of the East Holland River in area of (transient) beaver activity.	**Potential effects to 7 watercourse crossings, including:** • 1 permanent cold water watercourse: ▪ Sharon Creek • 1 permanent cold water watercourse: ▪ Sharon Creek as part of the Harry Walker Parkway Extension • 3 permanent warm water watercourses: ▪ Ansnorveldt Creek, East Holland River, a tributary of the East Holland River • 1 intermittent warm water watercourse: ▪ Tributary of the East Holland River • 1 unevaluated intermittent watercourse: ▪ Tributary B of the East Holland River • Crosses confirmed Redside Dace habitat in Sharon Creek. • Wider crossing of tributary of the East Holland River in area of (transient) beaver activity.	
Natural Environment Category Screening		**MOST PREFERRED** • **Less potential impacts to East Holland River Tributary and adjacent wetland crossing.**	**LESS PREFERRED** • **Greater potential impacts to East Holland River Tributary and adjacent wetland crossing.**	**LEAST PREFERRED** • **Impacts to East Holland River Tributary and adjacent wetland crossing.** • **Potential impact to historic farm house that may provide habitat for Species at Risk (chimney swift and little brown myotis).**	**LESS PREFERRED** • **Greater potential impacts to East Holland River Tributary and adjacent wetland crossing.**				

Table 5-2 Comparative Evaluation of the Alternative Alignments

Category	Criteria	Option 1 •B2 •Y1 •C1•L1	Option 2 •B2 •Y1 •C1 •L2	Option 3 •B2 •Y2 •C2 •L1	Option 4 •B2 •Y2 •C2 •L2	Option 5 •B2 •Y3 •C2 •L1	Option 6 •B2 •Y3 •C2 •L2	Option 7 •B2 •Y1 •C2 •L1	Option 8 •B2 •Y1 •C2 •L2
Socio-Economic Environment	Conformity with Places to Grow Act, Oak Ridges Moraine Conservation Plan, Greenbelt Plan, Lake Simcoe Protection Plan	• Conforms to relevant policy. • Minimizes impact to the Greenbelt Plans' Protected Countryside Area and Natural Heritage System. • Minimizes impact to Lake Simcoe Protection Plan 30 m Vegetation Protection Zones • Avoids the Oak Ridges Moraine.		• Conforms to relevant policy. • Minimizes impact to the Greenbelt Plans' Protected Countryside Area and Natural Heritage System. • Minimizes impact to Lake Simcoe Protection Plan 30 m Vegetation Protection Zones • Avoids the Oak Ridges Moraine		• Conforms to relevant policy. • Minimizes impact to the Greenbelt Plans' Protected Countryside Area and Natural Heritage System. • Minimizes impact to Lake Simcoe Protection Plan 30 m Vegetation Protection Zones • Avoids the Oak Ridges Moraine.		• Conforms to relevant policy. • Minimizes impact to the Greenbelt Plans' Protected Countryside Area and Natural Heritage System. • Minimizes impact to Lake Simcoe Protection Plan 30 m Vegetation Protection Zones • Avoids the Oak Ridges Moraine.	
	Ability to accommodate future development (Green Lane Secondary Plan)	• Linear roadway geometry and alignment along property boundaries provides greatest accommodation for future development.		• Potential complexities for future development due to increased curvature in roadway geometry.		• Potential complexities for future development due to increased curvature in roadway geometry.		• Linear roadway geometry and alignment along property boundaries provides greatest accommodation for future development.	
	Ability to provide active transportation facilities	• Opportunity to incorporate multi-use trail into future proposed Town Wide Active Transportation and Trail Route Network as identified in the *Active Transportation and Trails Master Plan* (East Gwillimbury, 2012). • Accommodates connectivity to Nokiidaa Trail along the East Holland River and future north-south trails within study area.		• Opportunity to incorporate multi-use trail into future proposed Town Wide Active Transportation and Trail Route Network as identified in the *Active Transportation and Trails Master Plan* (East Gwillimbury, 2012). • Accommodates connectivity to Nokiidaa Trail along the East Holland River and future north-south trails within study area.		• Opportunity to incorporate multi-use trail into future proposed Town Wide Active Transportation and Trail Route Network as identified in the *Active Transportation and Trails Master Plan (East Gwillimbury, 2012)*. • Accommodates connectivity to Nokiidaa Trail along the East Holland River and future north-south trails within study area.		• Opportunity to incorporate multi-use trail into future proposed Town Wide Active Transportation and Trail Route Network as identified in the Active Transportation and Trails Master Plan (East Gwillimbury, 2012). • Accommodates connectivity to Nokiidaa Trail along the East Holland River and future north-south trails within study area.	
	Effect on existing sensitive receptors	• Approx. 5 existing sensitive receptors within 100 m.	• Approx. 6 existing sensitive receptors within 100 m.	• Approx. 2 existing sensitive receptors within 100 m.	• Approx. 3 existing sensitive receptors within 100 m.	• Approx. 3 existing sensitive receptors within 100 m.	• Approx. 4 existing sensitive receptors within 100 m.	• Approx. 5 existing sensitive receptors within 100 m	• Approx. 6 existing sensitive receptors within 100 m.
	Effect on local air quality due to vehicle emissions	• No exceedances of applicable air quality standards predicted for the contaminants of concern for the future roadway operation. Emissions generated during construction activities will result in the creation of vapours and particulate matter.		• No exceedances of applicable air quality standards predicted for the contaminants of concern for the future roadway operation. Emissions generated during construction activities will result in the creation of vapours and particulate matter.		• No exceedances of applicable air quality standards predicted for the contaminants of concern for the future roadway operation. Emissions generated during construction activities will result in the creation of vapours and particulate matter.		• No exceedances of applicable air quality standards predicted for the contaminants of concern for the future roadway operation. Emissions generated during construction activities will result in the creation of vapours and particulate matter.	
	Amount and type of property required	• Right-of-way within 12 private properties • Right-of-way within Rogers Reservoir Conservation Area (LSRCA property)	• Right-of-way within 10 private properties • Right-of-way within Rogers Reservoir Conservation Area (LSRCA property)	• Right-of-way within 12 private properties • Right-of-way within Rogers Reservoir Conservation Area (LSRCA property)	• Right-of-way within 10 private properties • Right-of-way within Rogers Reservoir Conservation Area (LSRCA property)	• Right-of-way within 14 private properties • Right-of-way within Rogers Reservoir Conservation Area (LSRCA property)	• Right-of-way within 12 private properties • Right-of-way within Rogers Reservoir Conservation Area (LSRCA property)	• Right-of-way within 12 private properties • Right-of-way within Rogers Reservoir Conservation Area (LSRCA property)	• Right-of-way within 10 private properties • Right-of-way within Rogers Reservoir Conservation Area (LSRCA property)
	Effect on property access to adjacent properties	• Potential effects on access to properties around intersection with Yonge Street.		• No potential effects on property access to adjacent properties is anticipated.		• No potential effects on property access to adjacent properties is anticipated.		• Potential effects on access to properties around intersection with Yonge Street.	
	Effect on adjacent business operations	• No potential effects to adjacent business operations are anticipated.		• No potential effects to adjacent business operations are anticipated.		• Effects on one existing business: ▪ Northern Greens Golf and Family Fun Centre, 18444 Yonge Street		• No potential effects to adjacent business operations are anticipated.	
Socio-Economic Environment Category Screening		**MORE PREFERRED** • **Greater potential impacts to existing sensitive receptors.** • **Property access issues in vicinity of Yonge Street intersection.** • **Greater alignment along property boundaries facilitates accommodation for future development.**		**MOST PREFERRED** • **Less potential impacts to existing sensitive receptors.** • **Fewer number of private properties impacted.** • **No impact on existing property access and business operations.**		**LEAST PREFERRED** • **Significant impact on existing business operation.** • **Greater number of private properties impacted.**		**LESS PREFERRED** • **Greater potential impacts to existing sensitive receptors.** • **Property access issues in vicinity of Yonge Street intersection.**	

Table 5-2 Comparative Evaluation of the Alternative Alignments

Category	Criteria	Option 1 •B2 •Y1 •C1•L1	Option 2 •B2 •Y1 •C1 •L2	Option 3 •B2 •Y2 •C2 •L1	Option 4 •B2 •Y2 •C2 •L2	Option 5 •B2 •Y3 •C2 •L1	Option 6 •B2 •Y3 •C2 •L2	Option 7 •B2 •Y1 •C2 •L1	Option 8 •B2 •Y1 •C2 •L2
Cultural Environment	Potential for disruption of archaeological resources	Areas of Archaeological Potential identified. • Stage 2 Archaeological Assessment required for majority of alignment.		Areas of Archaeological Potential identified. • Stage 2 Archaeological Assessment required for majority of alignment.		Areas of Archaeological Potential identified. • Stage 2 Archaeological Assessment required for majority of alignment.		Areas of Archaeological Potential identified. • Stage 2 Archaeological Assessment required for majority of alignment.	
	Potential for disruption of built heritage resources and cultural landscape features	**Potential effects to cultural heritage resources, including:** • 1 municipally designated heritage resource under the Ontario Heritage Act: ▪ Sharon Burying Ground at 18391 Leslie Street • 2 listed built heritage resources: ▪ Residence at 18581 Yonge Street ▪ Farm Complex at 18499 Leslie Street • Bisects agricultural-related cultural heritage landscape features.	**Potential effects to cultural heritage resources, including:** • 1 municipally designated heritage resource under the Ontario Heritage Act: ▪ Sharon Burying Ground at 18391 Leslie Street • 2 listed built heritage resources: ▪ Residence at 18581 Yonge Street ▪ Residence at 18335 Leslie Street • Bisects agricultural-related cultural heritage landscape features.	**Potential effects to cultural heritage resources, including:** • 2 municipally designated heritage resources under the Ontario Heritage Act: ▪ Sharon Burying Ground at 18391 Leslie Street. ▪ Residence at 18474 Yonge Street • 1 listed built heritage resource: ▪ Farm Complex at 18499 Leslie Street • Bisects agricultural-related cultural heritage landscape features.	**Potential effects to cultural heritage resources, including:** • 2 municipally designated heritage resources under the Ontario Heritage Act: ▪ Sharon Burying Ground at 18391 Leslie Street. ▪ Residence at 18474 Yonge Street • 1 listed built heritage resource: ▪ Residence at 18335 Leslie Street • Bisects agricultural-related cultural heritage landscape features.	**Potential effects to cultural heritage resources, including:** • 2 municipally designated heritage resources under the Ontario Heritage Act: ▪ Sharon Burying Ground at 18391 Leslie Street. ▪ Residence at 18474 Yonge Street • 1 listed built heritage resource: ▪ Farm Complex at 18499 Leslie Street • Bisects agricultural-related cultural heritage landscape features.	**Potential effects to cultural heritage resources, including:** • 2 municipally designated heritage resources under the Ontario Heritage Act: ▪ Sharon Burying Ground at 18391 Leslie Street. ▪ Residence at 18474 Yonge Street • 1 listed built heritage resource: ▪ Residence at 18335 Leslie Street • Bisects agricultural-related cultural heritage landscape features.	**Potential effects to cultural heritage resources, including:** • 1 municipally designated heritage resource under the Ontario Heritage Act: ▪ Sharon Burying Ground at 18391 Leslie Street. • 2 listed built heritage resources: ▪ Residence at 18581 Yonge Street ▪ Farm Complex at 18499 Leslie Street • Bisects agricultural-related cultural heritage landscape features.	**Potential effects to cultural heritage resources, including:** • 1 municipally designated heritage resource under the Ontario Heritage Act: ▪ Sharon Burying Ground at 18391 Leslie Street • 2 listed built heritage resources: ▪ Residence at 18581 Yonge Street ▪ Residence at 18335 Leslie Street • Bisects agricultural-related cultural heritage landscape features.
Cultural Environment Category Screening		**LESS PREFERRED** • **Alignment situated away from *OHA* designated historic farmhouse and entrance drive (John S. Millard House, 18474 Yonge Street).** • **Potentially significant property impact to listed Farm Complex (18499 Leslie Street).** • **Separates the Historical Village of Sharon from burial ground.**	**MOST PREFERRED** • **Alignment situated away from *OHA* designated historic farmhouse and entrance drive (John S. Millard House, 18474 Yonge Street).**	**LESS PREFERRED** • **Alignment situated away from *OHA* designated historic farmhouse and entrance drive (John S. Millard House, 18474 Yonge Street).** • **Potentially significant property impact to listed Farm Complex (18499 Leslie Street).** • **Separates the Historical Village of Sharon from burial ground.**	**MOST PREFERRED** • **Alignment situated away from *OHA* designated historic farmhouse and entrance drive (John S. Millard House, 18474 Yonge Street).**	**LEAST PREFERRED** • **Potential for significant impact to *OHA* designated historic farmhouse (John S. Millard House, 18474 Yonge Street).** • **Potentially significant property impact to listed Farm Complex (18499 Leslie Street).** • **Separates the Historical Village of Sharon from burial ground.**	**LESS PREFERRED** • **Potential for significant impact to *OHA* designated historic farmhouse (John S. Millard House, 18474 Yonge Street).**	**LESS PREFERRED** • **Alignment situated away from *OHA* designated historic farmhouse and entrance drive (John S. Millard House, 18474 Yonge Street).** • **Potentially significant property impact to listed Farm Complex (18499 Leslie Street).** • **Separates the Historical Village of Sharon from burial ground.**	**MOST PREFERRED** • **Alignment situated away from *OHA* designated historic farmhouse and entrance drive (John S. Millard House, 18474 Yonge Street).**

Table 5-2 Comparative Evaluation of the Alternative Alignments

Category	Criteria	Option 1 •B2 •Y1 •C1•L1	Option 2 •B2 •Y1 •C1 •L2	Option 3 •B2 •Y2 •C2 •L1	Option 4 •B2 •Y2 •C2 •L2	Option 5 •B2 •Y3 •C2 •L1	Option 6 •B2 •Y3 •C2 •L2	Option 7 •B2 •Y1 •C2 •L1	Option 8 •B2 •Y1 •C2 •L2
Cost	Cost of construction and operations	• Lowest approximate east-west roadway distance. • Additional distance for Harry Walker Parkway Extension.	• Lowest approximate east-west roadway distance.	• Lowest approximate east-west roadway distance. • Additional distance for Harry Walker Parkway Extension.	• Lowest approximate east-west roadway distance.	• Highest approximate east-west roadway distance. • Additional distance for Harry Walker Parkway Extension.	• Highest approximate east-west roadway distance.	• Lowest approximate east-west roadway distance. • Additional distance for Harry Walker Parkway Extension.	• Lowest approximate east-west roadway distance.
Cost Category Screening		**LESS PREFERRED** • **Alignment distance approximately 7,195 m.**	**MOST PREFERRED** • **Alignment distance approximately 7,070 m.**	**LESS PREFERRED** • **Alignment distance approximately 7,165 m.**	**MOST PREFERRED** • **Alignment distance approximately 7,020 m.**	**LEAST PREFERRED** • **Alignment distance approximately 7,240 m.**	**MORE PREFERRED** • **Alignment distance approximately 7,095 m.**	**LESS PREFERRED** • **Alignment distance approximately 7,170 m.**	**MOST PREFERRED** • **Alignment distance approximately 7,025 m.**
OVERALL SCREENING SUMMARY		**LESS PREFERRED** • Potentially Greater Cultural Heritage Impact.	**MOST PREFERRED** **RECOMMENDED TO BE CARRIED FORWARD TO DETAIL DESIGN** • Lower Technical impacts. • Least potential impacts to Natural Environment (East Holland River Tributary and adjacent wetland crossing). • Lower Socio-Economic impacts. • Least impacts to Cultural Heritage Resources (Alignment situated away from OHA designated historic farmhouse and entrance drive and Sharon Burial Ground is not separated from Sharon Community). • Lowest potential cost(s).	**LESS PREFERRED** • Potentially Greater Natural Environment Impact (impacts to unevaluated wetland).					

5.2.4 Preferred Corridor Alignment

Based on the detailed comparative evaluation, Option 2 is recommended to be carried forward as the Preferred Corridor Alignment (East West Collector Road and Harry Walker Parkway Extension). This option involves the least potential impacts to the natural environment, specifically at the East Holland River Tributary and the adjacent wetland area. Option 2 also involves the least impact to existing cultural heritage resources, due to its situation away from the OHA-designated farmhouse at 18474 Yonge Street and facilitating the continued connection between the Sharon Burial Ground and the community of Sharon. Generally, Option 2 involves lower technical and socio economic impacts over the majority of the other options, however, some minor impacts to traffic and existing sensitive receptors are anticipated. Mitigation measures for these potential impacts are documented in **Section 7**.

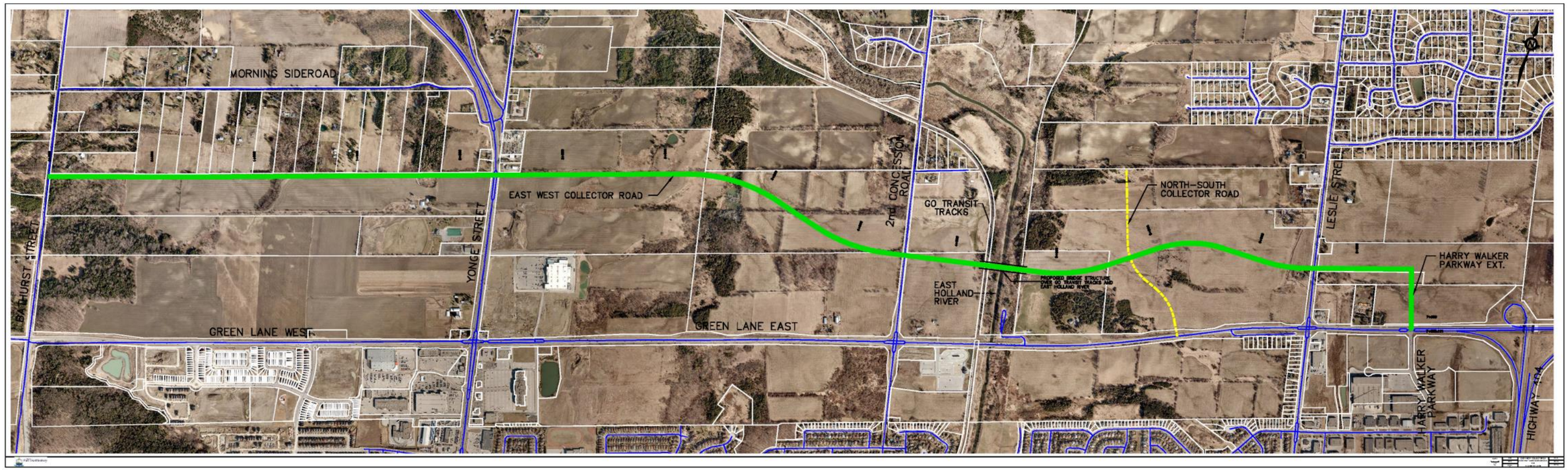
Option 1 was not recommended as it would encroach on a listed Heritage property at 18499 Yonge Street and act as a barrier between the Community of Sharon and the Sharon Burial Ground. Generally, Options 3 through 8 were not recommended due to the potentially greater impact on the Holland River tributary and adjacent wetland area. Each Option also involves other potentially greater and/or significant environmental impacts over Option 2.

The Preferred Corridor Alignment will provide direct access to future development in Green Lane West and to businesses in Sharon and Queensville, minimize the impact to the environment, and alleviate traffic congestion emanating from areas within East Gwillimbury and outside the Towns boundaries through a connection to Green Lane.

The Preferred Corridor Alignment was slightly refined in response to property owner concerns following PIC #2 (provide linearity within the alignment) in the vicinity of Leslie Street and to potentially accommodate an alternative intersection geometry (traffic circle) proposed for the intersection with the North-South Collector Road.

Figure 5-2 illustrates the Preferred Corridor Alignment. Preliminary design drawings for corridor segments can be found in **Appendix B**.

Figure 5-2 Preferred Corridor Alignment (East West Collector Road and Harry Walker Parkway Extension)



6. Project Description

6.1 Road Design

The Preferred Corridor Alignment (East West Collector Road and Harry Walker Parkway Extension) will include a basic 4 lane urban cross-section with a 5 m median for continuous left turn lane or streetscape median where opportunity exists in relation to proposed road connections under area development. Auxiliary lanes for turning movements will be provided at warranted intersections. The plan and profile for the Preferred Corridor Alignment is contained in **Appendix B.** The vertical alignment will be refined during the detail design stage in conjunction with area development and roadway drainage requirements.

It is recognized that the exact location and alignment of the east-west road and bridge crossing that traverses and abuts lands municipally described as 842 Green Lane East, as shown in **Appendix B** may be modified as part of the detailed design phase (Phase 5) of the Municipal Class Environmental Assessment or, alternatively, through the completion and approval of a detailed functional servicing plan and environmental impact assessment/natural heritage evaluation, to the satisfaction of the Town of East Gwillimbury and LSRCA.

The need for an easterly extension from the planned terminus of the East-West Road Corridor to include a Highway 404 crossing, as identified in the York Region Transportation Master Plan and East Gwillimbury Transportation Master Plan, will be addressed in future planning. This EA does not preclude a future EA for a Highway 404 crossing. Protection for the easterly extension of the East-West Road Corridor and Highway 404 crossing will be included in development approvals for the Green Lane Secondary Plan Area.

6.1.1 Design Criteria

Table 6-1 below outlines the design criteria applied to the preliminary design of the Preferred Corridor Alignment.

Table 6-1 Design Criteria for the Preferred Alternative

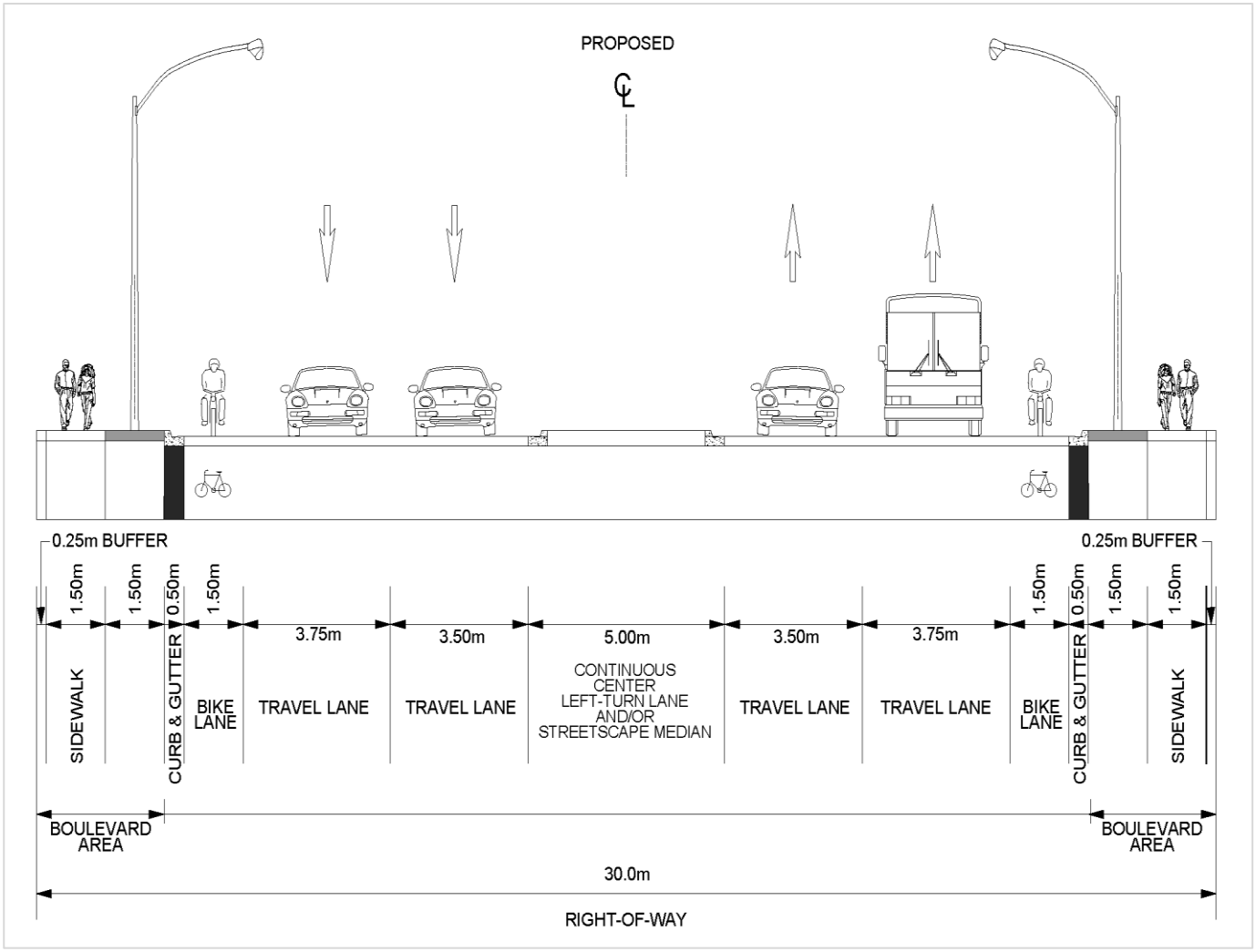
Feature		Description
Proposed Road Classification		Urban Road Collector (UCU 80)
Designated right-of-way width		30.0 m Right-of-Way (minimum)
Design Speed		80 km per hour
Posted Speed		60 to 70 km per hour
Number of Lanes		4/5 plus left and right turning lanes at major intersections
Lane Width	• *Curb* • *Center* • *Left Turn* • *Right Turn*	3.75 m 3. 5 m 3.25 m 3.5 m
Boulevard		4.0 m (Typ.)
Minimum Median Width		4.0 m
Minimum Intersection Radius		15.0 m
Minimum Stopping Sight Distance		200 m
Minimum Sight Triangles	• *Arterial to collector* • *Arterial to arterial*	12 m X 12 m 15 m X 15 m
Road Gradient	• *Maximum* • *Minimum*	5.0 % 0.5 %
Road Crossfall – Normal crown		2 %
Minimum Vertical Curves	• *Sag Curve K* • *Crest Curve K*	12 24
Sidewalk and On-Street Bike Lane		1.5 bike lane 1.5 m concrete sidewalk

Feature	Description
Stormwater Management	Use of storm sewers, culverts, catchbasins, StormCeptors and enhanced swales. Flow management within right-of way to be provided under area development
Bridge Structure	Proposed bridge for CN Railway crossing and Holland River
Grading	Will be provided in conjunction with area development

6.1.2 Typical Cross-Section

A Typical cross-section for the Preferred Corridor Alignment is shown in **Figure 6-1**.

Figure 6-1 Typical Section, East West Collector Road and Harry Walker Parkway Extension



The method of stormwater management and treatment will be applied under area development and during detail design to suit agency requirements and may include LID opportunities and enhanced swales.

6.1.3 Pavement Structure

The pavement structure for the Preferred Alternative is proposed to be a flexible pavement designed to Town of East Gwillimbury standards.

Subdrains will be provided to outlet at catchbasins to assist the performance of the pavement structure.

The final pavement structure will be determined during the detail design phase of the project based on geotechnical investigation, vehicular traffic and truck volumes and Town standards for a collector roadway.

6.2 Property Requirements and Grading Easements

Property will be required for the implementation of the Preferred Corridor Alignment and construction of the grade separation (Bridge over the East Holland River). Additional property beyond the 30.0 m right-of-way will be required to accommodate the fill embankments and slope grading at the grade separation and locations along the full length of the project limits. Property acquisition will be completed through the development approvals process and refined through detail design.

6.3 Active Transportation, Sidewalk and Multi Use Trail

Sidewalks, Multi-Use-Path and facilities for cycling to support active transportation will be an integral component of the project. These facilities will be constructed as per Town Standards and Policy directives and will interface with bus stop and passenger standing areas and will connect with other pedestrian and cycling facilities provided through development or existing facilities. The location of facilities for active transportation will be reviewed and implemented during the future development review process.

On-road buffer features for bike lanes will be determined during detail design and subject to applicable design standards.

6.4 Transit

The East West Collector Road and Harry Walker Parkway Extension will include 3.75 m outside curb lanes to accommodate potential future transit route(s) along the corridor (see **Figure 6-1**).

6.5 Stormwater Management

The East West Collector Road and Harry Walker Parkway Extension will be designed to adhere to pertinent Stormwater Management policies (MOECC Stormwater Management Planning and Design Manual, LSPP, and East Gwillimbury Stormwater Management Master Plan). SWM measures for the East West Road Corridor will be implemented in conjunction with area development during detail design, as per MOECC Standards and subject to approval by LSRCA and MNRF.

The roadway will be serviced by storm sewers outletting to either a treatment train consisting of oil/grit separators and enhanced swales or stormwater management pond(s). As per the MOECC's Stormwater Management Planning and Design Manual, 2003, specific SWM facilities that are to be implemented for the project will be designed to meet Enhanced Level Protection for water quality treatment, and will provide water quantity control for the 2-100 year storm event for all areas, unless a lower level of treatment of control can be justified.

Drainage areas and outlets will be evaluated for impacts and benefits as part of the development of the lands through the respective draft site plan and subdivision approval processes in each sub-watershed. The following receiving watercourses may be included in the SWM design for the study, pending additional evaluation and confirmation during detail design:

East Holland Subwatershed

- Sharon Creek
- East Holland River
- Tributaries of the East Holland River

West Holland Subwatershed

- Ansnorveldt Creek

Storm sewers along the East West Road Corridor will be designed to Town of East Gwillimbury standards. Further detail was not able to be provided at this time as the stormwater management design will greatly depend on the proposed planning of the surrounding future developments, and as such SWM should be addressed in tandem.

6.6 Streetscaping

Opportunities for streetscaping within center median and boulevard locations will be determined during the detail design stage. These plans will include but not be limited to:

- Street trees as per Town of East Gwillimbury Policy
- Collaboration with area development for Open Space Design
- Consideration of overhead and underground utilities and Hydro easement
- Assessment of existing vegetation removed as part of this project for potential replacement

6.7 Utilities

A hydro design plan will be carried out during detail design with area development requirements, with provision and consideration at the grade separation within the hydro existing hydro easement along the railway corridor through the road right-of-way.

6.7.1 Street Lighting and Traffic Signals

Roadway illumination will be provided for the length of the project. The standard used for the lighting will be in compliance with Town requirements during detail design.

New traffic signals will be provided at future warranted intersections. New traffic signals are proposed at Bathurst Street, Yonge Street, 2nd Concession and at the Leslie Street intersections.

Provisions for future traffic signals (underground works) will be considered during detail design for local intersections. Locations identified for new or future traffic signals are to be monitored to determine the final scheduling for installation of the traffic signals as traffic warrants are satisfied.

6.7.2 Wastewater Infrastructure

Area development may require construction of local or trunk sanitary sewer services within the right-of-way. This requirement will be identified through the development review process in advance of the roadway detail design.

6.7.3 Local Services

Local services (watermain distribution) will be reviewed during detail design to determine any required installation. As necessary, plans for local services will be addressed during detail design.

6.7.4 Enbridge Gas

Enbridge Gas services may be locating future gas lines within the road right-of way. Service requirements will be assessed during detail design as area development emerges.

6.7.5 Bell

Bell Canada plant located within the Preferred Alternative corridor will assessed during detail design as area development emerges.

6.8 East Holland River/ GO Rail Bridge Design

6.8.1 Plan and Profile

The structure is proposed to be a 5 span bridge, and will be approximately 190 m in length between abutments. This span arrangement will accommodate the existing railway track and an additional track in the future.

Within the railway right-of-way, sufficient lateral clearance is provided to accommodate CN off track equipment for service and maintenance purposes.

Standard vertical clearance requirements of 7.01 m from top of rail, as per Transport Canada TC E-05, will be provided to underside of structure, including for future tracks. To protect for any future opportunities for electrification of GO services, GO Transit has indicated that consideration be given to increase the vertical clearance to 7.4 m. This aspect will be discussed during detail design in the context of need and justification for future electrification and additional track requirements for future service.

Roadway approaches to the grade separation are proposed at 5%. The location and number of piers required to facilitate spanning the valley will be examined during detail design to minimize impacts to the valleyland and the natural heritage features within it.

The preliminary design arrangement for the East-West Road Corridor bridge crossing the East Holland River and GO Transit Railway tracks is contained within **Appendix B.**

It is recognized that the exact location and alignment of the east-west road and bridge crossing that traverses and abuts lands municipally described as 842 Green Lane East, as shown in **Appendix B** may be modified as part of the detailed design phase (Phase 5) of the Municipal Class Environmental Assessment or, alternatively, through the completion and approval of a detailed functional servicing plan and environmental impact assessment/natural heritage evaluation, to the satisfaction of the Town of East Gwillimbury and LSRCA.

6.8.2 Design Criteria

The grade separation will be designed in accordance with the requirements of the Canadian Highway Bridge Design Code (CHBDC). In addition, vertical and lateral clearance requirements to abutments and for off track equipment will be provided as per CN guidelines and railway requirements.

6.8.3 Typical Cross-Section

The bridge deck on the structure will provide for 2 lanes of traffic in each direction with a raised centre concrete median between the two opposing travel directions. The cross-section provides for an on-street bile lane on each side of the bridge. 2 m wide sidewalks are proposed on either side of the structure. Concrete parapet walls with top metal railing will be provided at the outer edges of the structure.

6.8.4 Property Requirements and Grading Easements

The roadway approaches to the structure will be fill embankments with 2:1 grading and benching. Where grading extends beyond the right-of-way, additional property will be required for the extended grading.

The hydro easement is planned to remain, however, the overhead lines within this easements will require to be relocated overhead at the east abutment for the bridge structure.

Property rights for the right-of-way (ROW) within Rogers Reservoir Conservation Area (from the LSRCA) will be required through fee simple purchase or easement (to be determined).

6.8.5 Bridge Cost Estimate

The construction cost for the grade separation is estimated at $18 M and includes flagging protection during construction.

The cost for the roadway approach storm sewer, pavement structure, curbs, sidewalk and street lighting within the limits of the grade separation are not included in this estimate, but carried within the project cost estimate (see **Section 6.11**).

6.9 Construction Phasing

The East West Road and Harry Walker Parkway Extension will be implemented in phases to follow adjacent land development, expected to begin as early as 2018.

6.10 Property Requirements

The right of way for the roadway is within 10 private properties and crosses LSRCA property at the East Holland River. Property taking agreements with affected landowners will be finalized during the detail design phase(s).

6.11 Cost Estimate

The total estimated cost is based on the preliminary design and includes all roadworks and mitigation measures noted in this Environmental Study Report, with the following exclusions; grading (earthworks), watermain, sanitary sewer and property acquisition costs.

The total cost is estimated at $50.98 Million, based on 2013 unit prices (excluding HST).

The above estimate includes:

- Roadwork
- Storm Sewers
- Intersection Tie-ins
- Streetlighting
- Traffic Signals
- 5 span bridge Grade Separation
- Sidewalks, Bike lane and Streetscaping
- An Allowance for Construction Adjustments and Contingency

7. Anticipated Impacts and Proposed Mitigation Measures

It is recognized that the proposed construction of the East West Road Corridor and Harry Walker Parkway Extension will result in minor impacts on the existing environment. In order to address the effects, the following approach was taken:

1. **Avoidance**
   The first priority is to prevent the occurrence of negative effects (i.e., adverse environmental effects) associated with the implementation of an alternative;
2. **Mitigation**
   Where adverse environmental effects cannot be avoided, it will be necessary to develop the appropriate mitigation measures to eliminate or reduce to some degree, the negative effects associated with implementing the alternative; and,
3. **Enhancement/Compensation**
   In situations where appropriate mitigation measures are not available, or significant net adverse effects will remain following the application of mitigation, enhancement or compensation measures may be required to counterbalance the negative effect through replacement in kind, or provision of a substitute or reimbursement.

The following mitigation measures are recommended to ensure that any disturbances are managed by the best available methods. These measures will be further confirmed and developed during detail design of the respective segments and associated construction phases. **Table 7-1** provides a detailed assessment of the potential impacts associated with the project and the recommended mitigation measures required to reduce these effects.

This section provides a detailed list of specific commitments to be carried forward to Phase 5 of the Municipal Class EA process - Implementation. It is recommended these mitigation measures be further refined during the detail design phases of implementation for the roadway and, become part of the respective phase contract packages so that contractors are aware of the requirements prior to tendering. The Town of East Gwillimbury and land developers will work with the Ministry of the Environment and Climate Change, Lake Simcoe Region Conservation Authority, and other authorities, during detail design and prior to the start of construction to ensure that the proposed works are acceptable and to obtain required permits. Further to the commitments outlined in **Table 7-1**, it is recommended that the construction footprint of the Preferred Alignment be minimized, if possible, in areas where impacts to natural hazards (e.g., steep slopes), natural heritage features and hydrologic features can be avoided and/or minimized. It is also recommended that the regional scale impacts to fragmentation of natural heritage features and ecological connectivity/corridors with consideration of eco-passage, including appropriate mitigation strategies such as span bridges, be considered at detail design. A decision planning tool prepared by a qualified professional should be used to create road ecology solutions to avoid wildlife/vehicle collisions, habitat fragmentation, and degradation.

Recommended environmental monitoring will be combined with construction supervision to include periodic site visits and inspections throughout the course of the work (e.g., confirm the proper placement and maintenance of all erosion and sediment control measures and effects monitoring instruments).

Table 7-1 Recommended Mitigation Measures

Factor	Potential Impacts	Recommended Mitigation
Traffic Management	During construction there may be temporary disruptions to traffic on: • Bathurst Street • Woodspring Avenue • Yonge Street • Future North South Collector Road • Second Concession • Leslie Street • Green Lane at the Harry Walker Parkway Extension During construction there may be temporary disruption to trail traffic (pedestrian, cycling, etc.) through the Rogers Reservoir Conservation Area. Alterations to traffic patterns post-construction.	**During Detail Design:** • Develop requirements for potential traffic disruption signing to be in place during construction. • Implement future intersection improvements with existing roadways as recommended in **Appendix D**. • Review and optimize signal timing phasing splits at intersections along the East West Road Corridor. ▪ Protective left-turn phases should be implemented for the proposed double left-turn lane at the East-West Road/Harry Walker Parkway Extension/Green Lane intersection. • Review need for traffic calming measures. • Develop a trail traffic management plan to address the impacts of the roadway construction on the trail users through the Rogers Reservoir Conservation Area. A Trail closure plan will be required and will include, but not be limited to the following: identifying restricted areas, proposed signage, and implementing an appropriate communications plan **Prior to Construction:** • Undertake notification to area residents and businesses. • Erect signs advising of vehicular and active transportation traffic disruptions. **During Construction:** • Relocate heavy equipment travel routes away from residential roads, if possible. **During Operation:** • Monitor traffic patterns and compare against EA estimates.
Noise and Vibration	Noise disruption to existing residences and businesses during construction and operation in the following key areas: • Properties adjacent to the alignment with access off Morning Sideroad • Properties adjacent to the alignment with access off Yonge Street • Properties adjacent to the alignment with access off Leslie Street Vibration disruption during construction to Heritage Structures adjacent to the proposed alignment. Disruption to future residences and businesses during construction and operation	**During Detail Design:** • Develop vegetated buffers and/or noise barriers to mitigate effects to existing sensitive receivers, where appropriate. Noise attenuation features in relation to existing sensitive receivers are recommended in the vicinity of Bathurst St (See **Appendix I**), subject to further refinement/review during detail design. • As the roadway is implemented through area secondary plan (land use designation) and development approvals, property developers will conduct noise assessments in accordance with MOE Publication NPC-300, Part C, and implement recommended noise attenuation as conditions of approval within their respective future residential developments. • Construction noise constraints will be incorporated into contract documents. • Where appropriate, future noise barrier designs should consider the use of transparent panels at the top of the wall to promote light through the noise barrier into rear yards and outdoor living areas. **Prior to Construction:** • Develop reactive complaint resolution procedure for responding to complaints resulting from construction. **During Construction:** • Comply with MOECC noise limits, and local noise control by-laws. • Construction activities throughout the project will conform to current local municipal noise by-laws giving due consideration to such factors as the time of day, proximity and size of equipment and type of operation. • Use construction equipment that meets the requirements of the MOECC Construction Equipment Publication (NPC 115). • Prevent unnecessary noise and vibration by maintaining equipment in proper operating condition, including but not limited to non-defective muffler systems, properly secured components, and the lubrication of moving parts. • Restrict use of equipment to the minimum necessary to perform the specified work. Do not allow excessive idling. • Monitor complaints resulting from construction. **During Operation** • Where implemented, noise barriers and vegetated buffers shall be maintained as continuous and free of gaps. • Arrange for post construction building condition surveys to be undertaken for sensitive structures (i.e., heritage structures in the vicinity of the alignment).

Table 7-1 Recommended Mitigation Measures

Factor	Potential Impacts	Recommended Mitigation
Air Quality	Potential for decrease in localized air quality due to construction dust. Potential air emission generating activities during construction include, but are not limited to: • material removal (cutting, chiseling, grinding, etc.) • materials processing and handling • transportation operation and maintenance • construction machinery operation and maintenance • material replacement (concrete pouring and patching, paving, etc.) • soil excavation • soil transport and stockpiling Based on the modelling results for operation of the roadway, specific local mitigation measures are not warranted as there were no exceedances of applicable standards predicted for the contaminants of concern for the future build scenarios evaluated.	**During Detail Design:** • Develop Dust Control Plan to minimize the generation of dust via materials handling, vehicle movement, and wind erosion • Develop vegetation restoration plan(s) to reduce potential cumulative particulate impacts. ▪ Special consideration should be given to Environmentally Protected areas ▪ Consider vegetating the area adjacent the roadway between the North South Collector Road and future Harry Walker Parkway Extension to further reduce potential cumulative particulate impacts. Coniferous trees plantings should be prioritized in this area. • Consider developing staging plans to avoid overlapping construction activities in any one area **During Construction:** • Apply water and dust suppressants during construction to protect air quality due to dust, in accordance with Dust Control Plan developed during detailed design • Construction vehicles/machinery and equipment should be in good repair, equipped with emission controls, as applicable, properly maintained and operated within regulatory requirements and manufacturer specifications. • The number of machines operating in one area should be minimized at any given point in time. • Idling time should be minimized and signage should be posted to this effect around construction site(s) • Stationary equipment (e.g., generators, compressors etc.) should be located as far away from sensitive receptors as practical
Erosion and Sedimentation	Potential for erosion and sedimentation at the following watercourses: • 1 permanent cold water watercourse: ▪ Sharon Creek • 1 permanent cold water watercourse: ▪ Sharon Creek as part of the Harry Walker Parkway Extension • 3 permanent warm water watercourses: ▪ Ansnorveldt Creek, East Holland River, tributary of the East Holland River • 1 intermittent warm water watercourse: ▪ Tributary of the East Holland River • 1 unevaluated intermittent watercourse ▪ Tributary B of the East Holland River	**During Detail Design:** • Develop erosion and sedimentation control strategy in accordance with LSPP/SWM guidelines and policies. • Develop detail bridge design over the East Holland River in consultation with LSCRA. This will include development of a sedimentation control plan for the area within and adjacent to the road corridor under the bridge crossing. **During Construction:** • Implement and monitor the erosion and sedimentation control strategy, including appropriate phasing to avoid impacts to watercourses within the study area. • Install silt fencing to prevent sediment runoff to adjacent wetland features. • Restore and stabilize any areas disturbed by construction as soon as practically possible.

Table 7-1 Recommended Mitigation Measures

Factor	Potential Impacts	Recommended Mitigation
Groundwater and Hydrogeology	Potential for groundwater discharge at Sharon Creek, East Holland River, and wetlands. Potential for localized decreases in groundwater levels due to construction dewatering activities. Potential for introduction of pollutants to the groundwater system, either during construction, or as part of regular road maintenance activities following project completion (e.g., road salting). Potential effects on wells. The introduction of permeable bedding for buried services such as storm sewers could permanently lower the water table and by extension, water levels in the wells.	**During Detail Design:** • Conduct further investigations on groundwater occurrence, movement, and water well use. Mitigation proposed as a result of further groundwater investigations will be incorporated into contract documents during the detail design phase(s). • Conduct construction dewatering assessment(s) to determine the need for a MOECC Permit To Take Water (PTTW) based on the results of further detailed groundwater investigations. **During Construction:** • Store all oils, lubricants, fuels and chemicals in secure areas. • Contractors to develop and institute a Spills Prevention and Response Plan. • Contact appropriate regulatory agencies in event of a spill to the environment. • Monitor the preconstruction well network throughout the construction period to confirm changes in water levels. After construction is completed, both grading and underground services, further monitoring should only be extended to confirm levels in well network are as expected. **During Operation:** • An appropriate monitoring well network should be installed and routine monitoring linked to surface water monitoring in local tributaries and wetlands to assess the effects of development during construction and post-development phases. In addition, a private water well monitoring program should be implemented.
Aquatic Habitat and Surface Water	Potential effects to aquatic habitat in Sharon Creek Potential effects to aquatic habitat in the East Holland River Potential effects to aquatic habitat in intermittent and unnamed tributaries	**During Detail Design:** • Complete Species at Risk surveys, as appropriate, including for Redside Dace within Sharon Creek (subject to approval from MNRF). • Initiate baseline monitoring in Sharon Creek and the East Holland River prior to construction to provide reference conditions for monitoring potential changes to the aquatic habitat and communities (fish community where permitted by the MNRF and benthic macro invertebrate community). ▪ A long-term post-construction effects Monitoring Plan will be developed once detail design specifications are determined. Updated information determined in surveys during detail design will be made available to LSRCA. The Monitoring Plan will be submitted to LSRCA and outlined in relevant detail design drawings. A qualified fisheries biologist should be available during the duration of construction to monitor the area to ensure no negative impacts to aquatic habitat have occurred. • Fish sampling in Sharon Creek and the East Holland River should be undertaken in the summer to minimize effects to spring spawning fish while sampling in the unnamed tributaries should occur in the spring as these systems are typically intermittent and will not have flow during the summer months. Benthic invertebrate sampling should be conducted between late November and late March. • Span crossings are recommended where the Preferred Alignment crosses watercourses within the West Holland watershed, East Holland watershed, and Sharon Creek subwatershed. Watercourse crossings should be designed to: ▪ Avoid negative impacts to natural landform and corridor function ▪ Enhance and restore aquatic habitats ▪ Cause no upstream or downstream impacts to habitat due to flooding and erosion ▪ Maintain valley or stream corridor function • As the Preferred Alignment is adjacent to the riparian zone of Tributary A east of Rogers Reservoir, improvements to this channel in the vicinity of the alignment should be included in detail design. • Valley span bridges should be considered across all areas of natural heritage system with multiple features (watercourse, wetland, and forest) • Review natural heritage studies completed as part of the Green Lane Secondary Plan and LSRCA subwatershed plans and refine mitigation proposed for existing natural heritage features, if necessary

Table 7-1 Recommended Mitigation Measures

Factor	Potential Impacts	Recommended Mitigation
		During Construction: • Monitoring during construction will be undertaken annually during the summer for Sharon Creek and East Holland River and spring in the unnamed tributaries to ensure that all mitigation (i.e., sediment and erosion control, fish removals, etc.) and enhancement measures (i.e., plantings) are being implemented, maintained and assessed for improvement as well as enforced to assure compliance with all approvals and Authorizations. Aquatic community and habitat monitoring should also be undertaken following site grading and should continue each year thereafter until construction is completed. Monitoring should take place at each of the monitoring stations established for baseline monitoring using the same protocol (and version) used in baseline monitoring to evaluate whether construction mitigation measures are effective and identify short term and potentially long term impacts that may be addressed during the construction phase. • Sediment and erosion control measures should be installed prior to construction and monitored regularly during construction. • Store all oils, lubricants, fuels and chemicals in secure areas. • Contractors to develop and institute a Spills Prevention and Response Plan. • Contact appropriate regulatory agencies in event of a spill to the environment. **During Operation:** • Effects monitoring should be continued following construction to document potential changes to aquatic communities and habitats. The effects monitoring should take place at each of the monitoring stations established for baseline monitoring using the same protocol (and version) used in baseline monitoring.
Wildlife and Migratory Birds	Disruption to wild life habitat, including Species at Risk Disruption to wildlife migration patterns.	**During Detail Design:** • Complete Species at Risk surveys along the alignment for those Species at Risk confirmed as potentially present within the study area (see **Table 4-3**). • Confirm Migratory Bird Nesting season. • Culverts and bridges are recommended to be designed to encourage wildlife crossing, and may include the following considerations: ▪ Wildlife species are more likely to enter a culvert if they can see the light at the other end. ▪ To encourage wildlife movement at watercourse/wetland crossings, the surface layer of substrates at culvert structures should consist of fine material, creating a solid, stable platform and covering any underlying rock. • Valley span bridges should be considered across all areas of natural heritage system with multiple features (watercourse, wetland, and forest). • Impacts to wildlife due to traffic noise, air quality, street lighting, road salt/brine, and resultant shade from the bridge crossing the East Holland River should be further assessed to ensure appropriate mitigation. **During Construction:** • Require contractor to avoid disturbance of any migratory birds found nesting in the project area during the peak breeding season (April 15th to August 15th); ▪ Removal of trees to be performed outside this period. ▪ Prevent bird nesting on bridge(s) during construction with the installation of exclusionary netting, and remove any nests after this period.
Waste Management and Control of Inadvertent Spills	Potential inadvertent spill of hazardous materials during construction.	**During Construction:** • Re-fueling of vehicles and equipment should only be conducted in a contained fueling bund to be situated, at a minimum, 30 m from any watercourse. • Store all oils, lubricants, fuels and chemicals in secure areas. • Contractors to develop and institute a Spills Prevention and Response Plan. • Contact appropriate regulatory agencies in event of a spill to the environment.

Table 7-1 Recommended Mitigation Measures

Factor	Potential Impacts	Recommended Mitigation
Landscaping and Vegetation Protection	Physical damage and loss of vegetation/trees for material management and construction activities	**During Detail Design:** • Complete Butternut surveys along the alignment • Develop Vegetation Restoration Plan to address possible tree removals and streetscape enhancement. ▪ The Plan should identify appropriate locations for vegetation restoration and compensation within the study area, or appropriate alternatives, if required. Vegetation compensation ratios will be in accordance with LSRCA standard wetland and woodland ratios of 3:1 and 2:1 respectively. • Valley span bridges should be considered across all areas of natural heritage system with multiple features (watercourse, wetland, and forest) • Ensure construction staging areas are planned as distant as possible from LSPP Natural Vegetation Protection Zones (NVPZ). • Site specific field investigations, including 3 season surveys that assess the impacts at the regional and local scale should be completed, as deemed necessary, and may include field surveys of: ▪ Breeding Birds ▪ Breeding Amphibians ▪ Ecological Land Classification ▪ Inventory of vascular plants during appropriate season ▪ Significant wildlife habitat and function ▪ Species at Risk Inventory ▪ Geomorphic surveys to correctly identify the size of watercourse crossing structures • Construction restrictions and maintenance practices such as the following should be considered for tree protection during development of the contract specifications: ▪ Tree protection fencing shall be erected and maintained to protect the tree and root zone. Tree protection fencing requirements shall be illustrated in construction drawings and should be in place and approved by the consultant prior to any construction activity on site. ▪ No activity shall be allowed within the tree protection fence area. Equipment shall not be driven over root zones, no materials shall be stockpiled near trees, and foot traffic shall be limited especially during rainy periods when soil is more prone to compaction. ▪ A construction work plan will be developed which designates locations for stockpiling of soils and other materials including fuel. Prior to commencement of construction, the limits of protection areas will be delineated and fenced to avoid inadvertent intrusion of machinery or other activities such as stockpiling of excess material • Review natural heritage studies completed as part of the Green Lane Secondary Plan and LSRCA subwatershed plans and refine mitigation proposed for existing natural heritage features, as necessary • Impacts to vegetation/trees due to air quality, road salt/brine, and resultant shade from the bridge crossing the East Holland River on LSRCA property and adjacent lands should be further assessed to ensure appropriate mitigation. ▪ Where features are removed or are projected to be negatively impacted, mitigation should include replacement/enhancement of vegetative units or tree replacement. If full mitigation cannot be accommodated on-site, alternative restoration areas should be identified. • An Environmental Monitoring Program for implementation during construction and operation of the roadway will be developed once detailed impacts to the terrestrial environment have been determined, as per surveys completed during detailed design. The intent of this program will be to monitor the success of the implementation of protection and mitigation measures of this ESR. The programs should include vegetation monitoring, streambank monitoring and identified corrective measures for negative impacts or failures and any additional information collected from the additional surveys.

Table 7-1 Recommended Mitigation Measures

Factor	Potential Impacts	Recommended Mitigation
		During Construction: • Following survey and documentation, Butternut trees not designated for removal adjacent to the ROW should be protected with fencing to restrict construction access to these sites. • Butternut trees of suitable size within the ROW will be salvaged and transplanted to suitable sites on the Project Lands, where feasible, in consultation with the MNR. If undocumented Butternut trees are detected during construction activities in any location not listed in the ESA, works occurring in those areas will stop immediately and the MNR SAR Biologist will be contacted. • Restrict removal of trees to work areas specified in construction contract. • Where tree roots are encountered during excavations, roots should be properly pruned to avoid damage and disease to remaining roots. • Maintain all construction activity, including construction staging areas outside of Natural Vegetation Protection Zones (NVPZ). • Fence areas of retained trees prior to construction commencement, and prohibit entry of equipment and materials within fenced areas until final grading and landscaping is completed. • Any exposed soils should be seeded with an appropriate native seed mix.
Archaeology	Loss or disruption to archaeological resources.	**During Detail Design:** • Conduct Stage 2 Archaeological Assessments for those required portions of the study area (see **Figure 4-13**)**,** as required. ▪ Parts of the study area that are agriculturally active land should be ploughed, weathered, and then subjected to pedestrian survey at 5-metre intervals, in accordance with Section 2.1.1 in the 2011 S&G. ▪ Portions of the study area that have not been agriculturally active land in the recent past, or cannot be subjected to ploughing, should be subjected to a shovel test pit form of survey at 5-metre intervals, in accordance with Section 2.1.2 in the 2011 S&G. • Conduct Stage 3 Archaeological Assessment for any potential disturbance to ground within 10 m of Sharon Buying Ground, **During Construction:** • No excavations shall take place within the study area prior to the Ministry of Tourism, Culture and Sport (Heritage Operations Unit) confirming in writing that all archaeological licensing and technical review requirements have been satisfied. • Should previously unknown or unassessed deeply buried archaeological remains be uncovered during construction; ▪ Cease alteration of the site immediately and engage a licensed archaeologist to carry out archaeological field work, in compliance with Section 48 (1) of the Ontario *Heritage Act*. The office of the Heritage Operations Unit, Ministry of Tourism and Culture (416-314-7146) should be contacted immediately. ▪ Any person discovering human remains must immediately notify the office of the Heritage Operations Unit, Ministry of Tourism and Culture (416-314-7146), the police or coroner, and the Registrar of Cemeteries, Cemeteries Regulation Unit, Ministry of Government Services (416-326-8404).
Cultural Heritage	Disruption to Cultural Heritage Resources due to the introduction of new physical, visual, audible or atmospheric elements.	**During Detail Design:** • Develop landscaping plans in the vicinity of identified heritage resources to soften the effect of the new roadway in the landscape. • Complete a Heritage Impact Assessment (HIA) for the East Holland River/ Newmarket Canal and its associated landscape ▪ The new bridge design over the East Holland River/Newmarket Canal should complement the existing character and setting of the canal to lessen the physical and visual impact of the new road on the existing character and setting of the area. This should include appropriate landscaping treatments and provision of access to the canal and trail from both east and west sides of the bridge. The existing Rogers Reservoir Conservation interpretive trail should be addressed as part of the HIA. ▪ The isolation of approximately 10 ha of the lower part of the Rogers Reservoir Conservation Area due to the new roadway implementation should be considered in future heritage evaluation and impact assessment. • Complete Heritage Impact Assessments (HIA) for the following properties:

Table 7-1 Recommended Mitigation Measures

Factor	Potential Impacts	Recommended Mitigation
		▪ Sharon Burial Ground (18391 Leslie Street) ▪ Residence at 18335 Leslie Street ▪ Agricultural Complex at 18474 Yonge Street • The Town of East Gwillimbury may consider cultural heritage assessment process(es) for additional properties in the study area, if deemed appropriate. **During Construction:** • Limit construction noise and vibration in the vicinity of identified built heritage resources. Mitigation and/or monitoring to be specified through the completion of HIA for individual cultural heritage resources.

7.1 Permits and Approvals

The East West Road Corridor is subject to various regulatory approvals including EA requirements under Ontario's *Environmental Assessment Act.* The *Canadian Environmental Assessment Act* (CEAA) was not triggered for this project.

Following successful completion of the Class EA process documented in this ESR prepared under the Municipal Class EA, all requirements will have been met. Other approval requirements will be addressed for the project during detail design which will include:

- *Ontario Heritage Act* requirements for Archaeological Clearance;
- *Ontario Heritage Act* requirements for Cultural Heritage, including Heritage Impact Assessments, where appropriate;
- Health and safety requirements during construction under Ontario's *Occupational Health and Safety Act*;
- Permits from the LSRCA, including within areas subject to Ontario Regulation 179/06 under the *Conservation Authorities Act*;
- Permits under the *Species at Risk Act and/*or *Endangered Species Act*, if deemed appropriate;
- Transportation related permits, including signal timing modifications and entrance permits for additional roadway access;
- Property acquisition agreements for land, where appropriate;
- GO Transit Railway crossing agreement;
- Municipal approvals, as applicable; and
- Potential notification/permissions from respective utilities with facilities in the area, including;
  - Hydro One crossing agreement(s).

It should also be noted that water takings in Ontario are governed by the Ontario *Water Resources Act* (OWRA) and the Water Taking Regulation (O.Reg. 387/04). A Permit to Take Water (PTTW) is required for construction dewatering, if needed for water volumes greater than 50,000 L per day. Based on the current regulation, a Category 2 application requiring a technical review of the proposed water taking by a qualified person would be needed if volumes exceed the above amount.

Additional permitting requirements and specific details to those permits identified above will be determined during detail design for each phase of the roadway.

8. References

AECOM Canada Ltd. (AECOM), Conestoga-Rovers & Associates (CRA) and Black and Veatch, 2012:
Upper York Sewage Solutions Environmental Assessment – Natural Environment Baseline Conditions Report – DRAFT. Prepared for The Regional Municipality of York. Ref. No. 050278, York Region No. 74270. October, 2012.

Armstrong, D.K. and J.E.P. Dodge, 2007:
Paleozoic geology of southern Ontario; Ontario Geological Survey, Miscellaneous Release--Data 219. ISBN 978-1-4249-4526-9.

Armstrong, D.K. and T.R. Carter, 2010:
The subsurface Paleozoic stratigraphy of southern Ontario. Ontario Geological Survey, Special Volume 7, 301p.

Barnett, P.J. and Q.H. Gwyn, 1997:
Surficial Geology of the Newmarket area NTS 31D/3, Southern Ontario, Geological Survey of Canada, Open File 3329, scale 1:50 000

Barnett, P.J., 1990:
Stratigraphic drilling of Quaternary sediments in the Barrie area, Simcoe County. Geological Survey Ontario Ministry of Northern Development and Mines, Ontario Geological Survey, Miscellaneous Paper.

Barnett, P.J., D.R. Sharpe, H.A.J. Russell, G. Gorrell, S.E. Pullan, T.A. Brennand and F.M. Kenny, 1998:
On the origin of the Oak Ridges Moraine. Canadian Journal of Earth Sciences 35: 1152-1167.

Barnett, P.J., J.E.P. Dodge, M.K. McCrae and A. Stuart, 1999:
Quaternary geology, Newmarket area Ontario; Ontario Geological Survey, Map 2562, scale 1:50 000.

Chapman, L.J. and D.F. Putnam, 1984:
The Physiography of Southern Ontario, Third Edition. Ontario Geological Survey, Special Volume 2, 270 pp.

Conservation Authorities Moraine Coalition (CAMC), 2007:
Geological Model and Interpretation. CAMC-YPDT Technical Document 02-2007, Oak Ridges Moraine Hydrogeology Program. Dated May 15, 2007

Conservation Authorities Moraine Coalition (CAMC), 2009:
Groundwater Model of the Regional Municipality of Durham. CAMC-YPDT Technical Report Number 03-09. Prepared by Earthfx Inc. (Earthfx), 2009.

Conservation Authority Moraine Coalition (CAMC), 2006:
Groundwater Modelling of the Oak Ridges Moraine Area: CAMC-YPDT Technical Report #01-06. Prepared by Kassenaar, J.D.C. and E.J. Wexler. Available at http://www.ypdt-camc.ca.

Dreimanis, A. and P.F. Karrow, 1972:
Glacial History of the Great Lakes-St. Lawrence region, the classification of the Wisconsin(an) stage, and its correlatives; 24th International Geological Congress, Quaternary Geology, Section 12, p. 5-15.

Eyles, N., 1997:
Chapter 2. Environmental Geology of a Supercity: The Greater Toronto Area: in Eyles, N. (Ed), Environmental Geology of Urban Areas, Geological Association of Canada, Geotext #3, 7-80.

Gerber Geoscience Inc. and Earthfx Inc. (Earthfx), 2005:
Holland River, Maskinonge River and Black River Watersheds Water Budget Study.

Hewitt, D.F., 1972:
Paleozoic Geology of Southern Ontario. Ontario Geological Survey; Geological Report 105.

Lake Simcoe Region Conservation Authority (LSRCA), 2010a:
Black River Subwatershed Plan. Lake Simcoe Region Conservation Authority, 274 p.

Lake Simcoe Region Conservation Authority (LSRCA), 2010b:
West Holland River Subwatershed Plan. Lake Simcoe Region Conservation Authority, 280 p.

Lake Simcoe Region Conservation Authority (LSRCA), 2010c:
East Holland River Subwatershed Plan. Lake Simcoe Region Conservation Authority, 281 p.

Liberty, B.A., 1969:
Paleozoic geology of the Lake Simcoe area, Ontario; Geological Survey of Canada, Memoir 335, 201p.

Ontario Geological Survey (OGS), 2000:
Quaternary geology, seamless coverage of the Province of Ontario; Ontario Geological Survey, Data Set 14--Revised.

Ontario Geological Survey (OGS), 2010:
Surficial geology of Southern Ontario; Ontario Geological Survey, Miscellaneous Release--Data 128-REV ISBN 978-1-4435-2483-4 [DVD] ISBN 978-1-4435-2482-7 [zip file]

Ontario Ministry of the Environment (MOE), 2013:
Water Well Information System (WWIS) – Well Record data 1899 – 2013. [Online] http://www.ene.gov.on.ca/environment/en/resources/collection/data_downloads/index.htm#Well Records

Ontario Ministry of the Environment, 2003:
Stormwater Management (SWM) Planning and Design Manual. MOE Document: 4329e

Parish Geomorphic Ltd., 2007:
Basin scale fluvial geomorphology assessment for the York Region watersheds: East Holland – Reach EH23-2B, Report No. 2004-71, 20 p.

Russell, H.A.J., D.R. Sharpe, T.A. Brennand, P.J. Barnett and C. Logan, 2003:
Tunnel Channels of the Greater Toronto and Oak Ridges Moraine Areas, Southern Ontario: Geological Survey of Canada, Open File 4485, scale 1:250,000.

Sharpe, D.R. and P.J. Barnett, 1997:
Where is the water? Regional geological / hydrological framework, Oak Ridges Moraine area, southern Ontario. Geological Association of Canada – Mineralogical Association of Canada, Field Trip Guidebook 1997, A1, 49pp.

Sharpe, D.R., P.J. Barnett, H.A.J. Russell, T.A. Brennand and G. Gorrell, 1999:
Regional geological mapping of the Oak Ridges Moraine, Greater Toronto Area, southern Ontario; in Current Research 1999-E; Geological Survey of Canada, P.123-136

Sharpe, D.R., P.J. Barnett, L.D. Dyke, K.W.F. Howard, G.T. Hunter, R.E. Gerber, J. Paterson and S.E. Pullan, 1994:
Quaternary geology and hydrogeology of the Oak Ridges Moraine area. Geological Association of Canada – Mineralogical Association of Canada, Field Trip Manual 1994, A7, 32 pp.

Singer, S.N., C.K. Cheng and M.G. Scafe, 2003:
The Hydrogeology of Southern Ontario, Second Addition, Ministry of the Environment.

South Georgian Bay-Lake Simcoe (SGBLS) Source Protection Committee (SPC), 2011:
Approved Assessment Report: Lakes Simcoe and Couchiching- Black River Source Protection Area Part 1, November 2011.

Strahler, A.N., 1957:
Quantitative analysis of watershed geomorphology. Transactions of the American Geophysical Union, 38, 913-920. York Region Planning and Economic Development Committee. 2012. *Employment and Industry Report, 2011.*