Strasburg Road Extension
From North of Stauffer Drive
To New Dundee Road

Class Environmental Assessment

ENVIRONMENTAL STUDY REPORT

APRIL 2012
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GLOSSARY OF TERMS AND ACRONYMS

Following are definitions of the common terms and acronyms referred to when discussing the Strasburg Road Extension.

AAQC - Ambient Air Quality Criteria

ANSI – Area of Natural and Scientific Interest

BHR – Built Heritage Resource

CEAA – Canadian Environmental Assessment Act

CHL – Cultural Heritage Landscape

Class EA - Municipal Engineers Association Class Environmental Assessment

A planning process that must be applied to all municipal infrastructure projects. It is an evaluation of all environmental implications of a project and involves extensive public consultation to identify and mitigate any adverse impacts.

COS – Contaminated Overview Study

COSEWIC – Committee on the Status of Endangered Wildlife in Canada

COSSARO - Committee on the Status of Species at Risk in Ontario

dBA – A-weighted decibels

DFO – Department of Fisheries and Oceans

EA – Environmental Assessment

An Environmental Assessment (EA) is a process used in Ontario to determine the possible impacts that proposed infrastructure projects may have on the environment so that the best possible decisions can be made on if, where, when and how to construct such projects.

ELC - Ecological Land Classification

ESCP – Erosion and Sediment Control Plan

ESR – Environmental Study Report

GRCA – Grand River Conservation Authority

HADD – Harmful alteration, disruption or destruction of fish habitat, as defined in the federal Fisheries Act

MBCA – Migratory Birds Convention Act

MOE – Ontario Ministry of the Environment
MNR – Ontario Ministry of Natural Resources

MTCS – Ontario Ministry of Tourism and Culture and Sport (formerly Ministry of Tourism and Culture (MTC))

NAPS – National Ambient Pollution Surveillance

POR – Point of Reception (in the context of noise sensitive receptors)

PTTW – Permit to Take Water

ROW – Right-of-way

RTMP – Regional Transportation Master Plan

SARA – Species at Risk Act

SARO – Species at Risk in Ontario

TPA – Technically Preferred Alignment

WWR – Water Well Records
EXECUTIVE SUMMARY

ES.1 Introduction

In April 2010, the City of Kitchener initiated a Class Environmental Assessment (EA) study for the extension of Strasburg Road in the southwest section of the City, from approximately 500 m north of Stauffer Drive southerly to New Dundee Road, and retained SNC-Lavalin Inc. (SLI) to lead the study. The study process and results are documented in this Environmental Study Report (ESR).

The City deems the segment of the proposed Strasburg Road Extension from Rush Meadow Street to north of Stauffer Drive to be an established corridor, by virtue of approvals secured under the Planning Act, and has acquired lands to accommodate the extension over a portion of the corridor. This segment of the road extension is referred to as the North Section, and the City initiated Detail Design for it at the same time as initiating the Class EA study. The Class EA study area is referred to as the South Section of the road extension. Figure ES.1 shows the conceptual alignment of the established Strasburg Road corridor, for which Detail Design is in progress (North Section), and the limits of the Strasburg Road Extension Class EA Study (South Section) in relation to the adjacent Huron, Brigadoon and Doon South communities.

Figure ES.1: Strasburg Road Extension Project Area - Community Context and Scope

Source: Schedule “B” Amendment to the City of Kitchener Municipal Plan – Map 4: Transportation
ES.2 Project Need and Study Purpose

The approved alignment of Strasburg Road Extension from Rush Meadow Street to 500 m north of Stauffer Drive has been developed based on the recommendations from a number of community and transportation network planning studies that were completed between 1981 and 2008. The principal studies that established the alignment and form the basis for this environmental study are the 1982 Huron Industrial Development Transportation Planning and Engineering Study and the 1994 Doon South – Brigadoon Transportation Network and Corridor Study, which are summarized in the body of this ESR, are on file with the City of Kitchener and have been made available for public review on the City’s environmental assessment project website ([www.kitchener.ca/en/businessinkitchener/ Environmental_assessments.asp](http://www.kitchener.ca/en/businessinkitchener/ Environmental_assessments.asp)) during the course of this EA study.

The Doon South - Brigadoon Transportation Network and Corridor Study provided the need and justification for future transportation improvements in a study area bounded by Conestoga Parkway, Highway 8, Highway 401 and Trussler Road. The study concluded that the existing road network would not be able to support the increased traffic demand associated with projected growth without a number of network improvements, including the extension of Strasburg Road from Battler Road to New Dundee Road.

Additional need and justification for the project has been documented in the Regional Transportation Master Plan (RTMP) prepared by the Region of Waterloo, which states that the extension of Strasburg Road from Rush Meadow Street to New Dundee Road is required to relieve future demand on Homer Watson Boulevard, Huron Road and Fischer Hallman Road, as well as to support the future growth and approved development in the area at Doon South and other areas in southwest Kitchener. The RTMP indicates that the Strasburg Road Extension (Huron Road to New Dundee Road) has been recognized as an integral part of the Region's strategic road network improvement approach, with implementation required within 5-10 years (second highest level of priority).

The purpose of this EA study is to determine the most appropriate alignment for Strasburg Road from north of Stauffer Drive to New Dundee Road, and to identify potential future collector road intersection(s), in compliance with the planning and design process set out in the Municipal Engineers Association Municipal Class Environmental Assessment.

ES.3 Project Approach

This study was conducted as a Schedule C undertaking in accordance with the Municipal Engineers Association Municipal Class Environmental Assessment (October 2000, as amended in 2007) (“Municipal Class EA”). Schedule ‘C’ undertakings are projects that may have significant environmental effects on the environment and must proceed under the full planning and documentation procedures outlined in the Municipal Class EA Document, including preparation of an Environmental Study Report and filing of the ESR in the public record for public review.

The Class Environmental Assessment study included a comprehensive set of integrated environmental and engineering investigations (inventories; impact assessment; mitigation recommendations) conducted by specialist consultants, using established/approved methods and protocols, as well as consultation with technical staff of regulatory agencies and other stakeholders with knowledge of the study area. The City of Kitchener established a Project Team to provide technical input and direction on the project. The multi-agency, multi-disciplinary Project Team, representing a broad range of mandates and interests, included staff from the following groups:
• City of Kitchener
• Regional Municipality of Waterloo
• Grand River Conservation Authority
• Consultant Team management group

In addition to providing technical input and direction, the Project Team was responsible for selection of the Technically Preferred Alignment for the Strasburg Road Extension.

A comprehensive communications program was conducted by the City for engaging and consulting with known stakeholders and potentially interested parties at both mandatory and discretionary points in the environmental assessment process. Table ES.1 identifies the communication/consultation mechanisms employed in the study.

Table ES.1: Consultation Activities and Mechanisms Summary

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<th>Consultation Element</th>
<th>Municipal Class EA Study Phase</th>
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<td>Identify/Assess Planning Solutions</td>
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<td>Consultation</td>
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<td>Project Team Meeting</td>
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<td>Mayor/Senior Mgmt. Briefing</td>
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<td>Public Information Centre (PIC)</td>
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<td>Face-to-Face Meeting</td>
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<td>Property Owner Meeting</td>
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<td>Utility Coordination Liaison</td>
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<td>Agency Consultation</td>
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<td>Aboriginal Consultation</td>
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<tr>
<td>Online Consultation</td>
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<tr>
<td>City/Consultant One-Window Consultation/Response</td>
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<tr>
<td>Other Public Forum</td>
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Communications

| Notice of Commencement (newspaper ad; letters) | √ |                               |                               |
| Meeting Notification                          | √ | √                             | √                             |
| Public Information Centre (newspaper ad; letters; displays; handouts, Comment Sheets) | √ | √                             | √ |
The principal mechanism for gauging public interest and related questions and concerns was Public Information Centres (PIC). PIC dates and major comments received in relation to the alternative alignments study are summarized in Table ES.2. A detailed summary of comments received and responses provided is presented in the Consultation Record in Appendix A of this ESR.

Table ES.2: Summary of Public Information Centre Dates and Comments

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<th>Public Information Centre</th>
<th>Major Comments Received</th>
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| Public Information Centre No. 1 - Introduction and Background (June 10, 2010) | • Scope of the Environmental Assessment investigations.  
• Length of the study time frame.  
• Effects on property values.  
• Environmental impacts of noise, pollution and traffic on wildlife, wetlands, groundwater recharge areas, designated Environmentally Sensitive Policy Areas and the community. |
| Public Information Centre No. 2 Short-Listed Alignment Alternatives (June 1, 2011) | • Retain Countryside and select an East alternative; there should be an option east of Reidel Drive.  
• Preference for “No Road” option or W1.  
• Recognized service/cost advantages of East Series, but concern over potential impacts to natural and cultural heritage features; noise impacts to existing residents.  
• C1 and C2 represent best balance between East and West Series.  
• Safety (lack of sight distance) concern over existing Reidel Drive-Cameron Road/New Dundee intersection and potential traffic impacts on Cameron Road.  
• Protection of Stauffer Drive as a walking |
## Public Information Centre

### Major Comments Received

<table>
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<th>Public Information Centre No. 3 Technically Preferred Alignment (October 26, 2011)</th>
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<td>• There were expressions of interest in seeing the project proceed to construction as soon as possible.</td>
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<td>• About half of the comment sheets specified a preference for Alignment W1 either as the best option, or the best option, understanding that they prefer the road not be built at all.</td>
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<td>• There were a number of comments focusing on impacts to the property at 500 Stauffer Drive and protection of the farm pond and preservation of the bed and breakfast business on the property.</td>
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<td>• There were continued concerns expressed about the safety (lack of sight distance) concern over existing Reidel Drive-Cameron Road/New Dundee intersection and potential traffic impacts on Cameron Road.</td>
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Based on contacts on file with the City, and the information provided by government agencies with mandates related to constitutionally protected Aboriginal or treaty rights, the City also contacted selected First Nations communities/groups, but has not received any responses to date.

### ES.4 Existing Conditions

The study area is situated on in the southwest corner of the City of Kitchener, on the periphery of the urban envelope, and extending into the rural and agricultural lands designated by the City, and the Countryside area designated by the Region of Waterloo (including protected countryside, prime agricultural land and rural designations) (refer to Figure ES.2). The majority of the lands in the study area are owned by development interests and are used for agricultural purposes. There are three residences in the immediate study area.

The study area is bisected by the Upper Blair Creek corridor (headwater area), which includes deciduous forests, cultural communities and areas designated as Provincially Significant Wetland as part of the Roseville Swamp – Cedar Creek complex, but which has limited sensitivity from a fisheries perspective. Other vegetation communities within the general study area are characteristic of areas in southern Ontario that have been heavily influenced by historical clearing for agriculture and residential development. The study area is also located in an upland area associated with the Waterloo Moraine Complex, an important groundwater recharge source. An overarching constraint to the project in the study area is the regulated habitat for Jefferson Salamander, which is listed as endangered under Ontario Regulation 230/08. The species receives individual species protection and regulated habitat protection pursuant to Sections 9 (1) and 10 (1) of the Endangered Species Act.
From a cultural heritage perspective, the study area contains seven (7) cultural heritage landscapes, including the historic roadscapes along Stauffer Drive and Reidel Drive and two (2) farmscapes (500 Stauffer Drive; 271 Reidel Drive). The study area also exhibits potential for the identification of both Aboriginal and Euro-Canadian archaeological sites.

The existing road network in the study area is limited to New Dundee Road (a Region of Waterloo arterial roadway), and Reidel Drive and Stauffer Drive, which are local roads under the jurisdiction of the City of Kitchener.

**Figure ES.2: Strasburg Road Extension Study Area**
ES.5 Development and Evaluation of Alignment Alternatives

The development of the alignment alternatives was based on the designation of the Strasburg Road Extension as a 4-lane Secondary Arterial road with an urban (curb and gutter) cross-section and 30 m right-of-way platform.

Nine (9) alignment alternatives (referred to as the long list of alignment alternatives) were initially developed and were categorized under three series, based on the geographical location, as described below.

- **East Alignments (E1, E2, E3, E4)** – These alignments are based on the Strasburg Road Extension designated in the Kitchener Municipal Plan (which was retained as an option – Alignment E1). They reduce impacts to the B&B/agricultural operation to the east side of property (compared to the Municipal Plan alignment), avoid the Stauffer Woods ESPA; retain the Reidel Drive scenic-heritage route; and/or relocate the existing Reidel Drive-Cameron Road/New Dundee Road intersection to a location that may provide better sight distance.

- **Central Alignments (C1, C2)** – These alignments limit impacts to the B&B/agricultural operation to west side of the property; and/or relocate the existing Reidel Drive-Cameron Road/New Dundee Road intersection to a location that may provide better sight distance.

- **West Alignments (W1, W2, W3)** – These alignments minimize or avoid impacts to the B&B operation, most sensitive groundwater recharge area; the Roseville Swamp - Cedar Creek PSW and the large woodlot at the west end of the stream corridor; and/or relocate the existing Reidel Drive-Cameron Road/New Dundee Road intersection to a location that may provide better sight distance.

It is very important to note that there are two designated future east-west collector roads (Robert Ferrie Drive and Blair Creek Drive) that will intersect with the Strasburg Road Extension alignment and were accounted for in the development and assessment of the alignment alternatives.

The long list of alignment alternatives was evaluated against the following project objectives and a related set of evaluation criteria to arrive at the short-listed alignment alternatives:

**Primary Objective**
- Provide for approved development and future growth (Doon South and other areas in southwest Kitchener), including traffic service and municipal services.

**Secondary Objectives**
- Relieve future demand on Homer Watson Boulevard, Huron Road and Fischer Hallman Road.
- Achieve compatibility with City and Regional policies for future growth and development, and the location of any related road intersections.
- Minimize impacts to natural heritage features and other important environmental resources.

The following alignment alternatives were presented at PIC No. 2 as the options the Project Team recommended for more detailed assessment.

- Alignment E2
- Alignment E3
- Alignment E4
- Alignment C2
- Alignment W1

The long list and short-listed alignment alternatives are shown in Figure ES.3

**Figure ES.3: Long List and Short-Listed Alignment Alternatives**
Following a detailed assessment of the short-listed alignment alternatives, the Project Team concluded that a combination of Alignments E3 and E4 (Alignment E4 Modified – refer to Figure ES.4) represents an acceptable balance of advantages and disadvantages across the spectrum of evaluation criteria and should be adopted as the Technically Preferred Alignment.

**Figure ES.4: Technically Preferred Alignment (E4 Modified)**
The summary rationale for selection of Alignment E4 Modified is as follows:

- It is adequate for meeting traffic operations, transit, and servicing requirements.
- It represents the shortest crossing of the Blair Creek corridor, minimizing impacts to natural heritage features, including wetlands, streams and fish habitat, groundwater resources, and wildlife.
- It exhibits relatively high overall conformance with Region of Waterloo and City of Kitchener planning policies, including an acceptable level of intrusion on the Protected Countryside; and impacts to agricultural resources/operations. In this regard, it avoids the potential of more westerly alignments to result in a shift in the urban envelope, including the western boundary of the Brigadoon South and Doon South Phase 2 Community areas, if the Strasburg Road Extension is retained as the north-south limit of the Countryside Line. If this shift occurs, the natural heritage features in the Blair Creek corridor, as well as additional areas within the Regional Recharge Area initially avoided with the alignment may ultimately come under increased pressure from urban development, thereby compromising the rationale for developing Alignment W1 in the first place.
- It results in an acceptable balance of impacts to and preservation of cultural heritage resources and provides opportunity to enhance the scenic heritage road and trail network in the Doon South Community.
- It has the second lowest capital cost and private property requirements.

The disadvantages of the West and Central alignment alternatives are of particular concern to the Region of Waterloo (refer to September 6, 2011 and April 19, 2012 correspondence from the Region to the City of Kitchener in Appendix B of this ESR) and it will not support these options. The Region has indicated that, although it prefers Alignment E2, it is prepared to support Alignment E4 Modified.

Table ES.3 presents a graphic summary of how Alignment E4 Modified compares with the other alignments, exhibiting the preferred attributes of Alignments E3 and E4.
Table ES.3: Summary Comparison of Alignment Alternatives

<table>
<thead>
<tr>
<th>EVALUATION FACTOR</th>
<th>ALIGNMENT ALTERNATIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EAST</td>
</tr>
<tr>
<td>Natural Environment</td>
<td>E2</td>
</tr>
<tr>
<td>Socio-Economic Environment</td>
<td></td>
</tr>
<tr>
<td>Cultural Environment</td>
<td></td>
</tr>
<tr>
<td>Transportation/Utilities</td>
<td></td>
</tr>
<tr>
<td>Financial/Technical</td>
<td></td>
</tr>
</tbody>
</table>

ES.6 Environmental Impacts Associated with Proposed Alignment, Proposed Mitigation Measures and Other Requirements

The Technically Preferred Alignment has been developed to the Preliminary Design (30%) level of design. This includes design of the proposed Regional watermain that will be carried within the Strasburg Road Extension corridor from north of the study area into the Doon South Community Phase 2.

The proposed design has the potential to result in environmental condition changes within the project area and will require the implementation of mitigation treatments and additional environmental and engineering investigations. Commitments in these regards are described in Section 5.2 and summarized in Table 5.5 of this ESR. The principal mitigation treatments incorporated in the Preliminary Design scheme at this time include:

- A clear span structure over Blair Creek, to avoid relocation of the watercourse, and additional investigations to assess the feasibility of spanning the full width of the provincially significant wetland feature at the creek crossing.
- Provision for wildlife movement/protection within the Blair Creek corridor, including through the Blair Creek structure, and possibly a separate/dedicated ecopassage for Jefferson Salamander movement. Needs in this regard will be investigated further during the Detail Design phase.
- Provision for wildlife movement/control in proximity to the dug pond (candidate Significant Wildlife Habitat) at 500 Stauffer Drive, including dedicated ecopassage.
• Protection of vegetation communities not scheduled for removal, and ecological restoration of disturbed areas of the Blair Creek corridor using compatible vegetation species.

• Minimizing the potential impacts of the watermain construction by employing Horizontal Directional Drilling construction method, rather than open trench.

• Collection of roadway runoff by storm sewers and direction of runoff to stormwater treatment facilities (ponds, oil/grit separators, enhanced/grassed swales) prior to discharge to receiving watercourses.

• Maintenance of natural surface drainage and groundwater flow across the road corridor to retain downstream baseflow contributions.

• Introduction of vegetative screening adjacent to cultural heritage landscapes immediately adjacent to the road corridor (Stauffer Drive/Reidel Drive intersection; 500 Stauffer Drive; 271 Reidel Drive).

• Conducting Heritage Impact Assessments for directly affected cultural heritage landscapes/historic features (farmscapes, roadscapes) during Detail Design to determine the need for additional mitigation treatment.

• Maintenance of access to affected residential accesses (500 Stauffer Drive; 271 Reidel Drive) through reconfigured intersections (500 Stauffer Drive) or driveways (271 Reidel Drive).

• Maintenance of access for large agricultural vehicles to areas currently used for crop production through intersection and field entrance design.

• Conducting strategic pre-construction baseline surveys (e.g., potable water wells), construction phase environmental compliance monitoring (inspection), and appropriate post-construction environmental effects monitoring.

The project will also require various municipal, provincial and possibly federal approvals, permits or authorizations, some of which will present significant challenges to implementation of the proposed design.

Significant modifications to the project proposals or changes in the environmental setting that occur after the filing of the ESR will require preparation of an addendum to the ESR. A review of the project and changes to the project proposals may also be required if there is a significant lapse of time between the filing of the ESR and the start of construction (10 years). Where an ESR Addendum is issued, only the project elements in the Addendum (the proposed changes to the recommended undertaking) are open for review. The City intends to implement the project in accordance with MEA Class EA process in these regards.
1.0 INTRODUCTION
1.1 Background and Context

In April 2010, the City of Kitchener initiated a Class Environmental Assessment (EA) study for the extension of Strasburg Road from approximately 500 m north of Stauffer Drive southerly to New Dundee Road, and retained SNC-Lavalin Inc. (SLI) to lead the study.

The preferred alignment of Strasburg Road from its current terminus just west of Rush Meadow Street to a point north of Stauffer Drive was originally recommended through the Transportation Planning and Engineering Study for the Huron Industrial Development in 1982. This study identified and established the transportation infrastructure requirements for the Huron Industrial Development with a focus on the development of a secondary arterial road network and the provision of rail and public transit service to the area. The associated Huron Business Park Secondary Plan (1983) established the new Strasburg Road as a Secondary Arterial Road, and confirmed the preferred alignment to a point approximately 500m north of Stauffer Drive. Subsequent studies identified an alignment for the Strasburg Road Extension that is currently shown in a conceptual manner on Map 4 (Transportation) of the City’s Municipal Plan. Figure 1.1 is an extract from Map 4 and shows the Strasburg Road Extension area currently under consideration by the City in relation to other existing and proposed roads in the southwest section of the City. Additional historical context of the road extension is provided in Section 1.2.1.

![Figure 1.1: Strasburg Road Extension Project Area](source-url)
The City deems the segment of the proposed Strasburg Road Extension from Rush Meadow Street to north of Stauffer Drive to be an established corridor, by virtue of approvals secured under the Planning Act, and has acquired lands to accommodate the extension over a portion of the corridor. This segment of the road extension is referred to as the North Section, and the City initiated Detail Design for it at the same time as initiating the Class EA study. The Class EA study area is referred to as the South Section of the road extension.

Figure 1.2 shows the conceptual alignment of the established Strasburg Road corridor, for which Detail Design is in progress (North Section), and the limits of the Strasburg Road Extension Class EA Study (South Section) in relation to the adjacent Huron, Brigadoon and Doon South communities.

Figure 1.2: Strasburg Road Extension Project Area - Community Context and Scope

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1 The Ministry of Environment’s Environmental Assessment Branch (Environmental Assessment Services) has also advised the City that it is satisfied that the City’s planning process for the North Section of Strasburg Road under the Planning Act has met the intent of the Municipal Class Environmental Assessment with respect to consideration of potential environmental impacts of the project, assessed a reasonable range of alternatives through a public and transparent process, and involved various agencies and stakeholders. This acceptance is contingent upon the use of current best management practices to mitigate the potential environmental effects of the project, which the City has been incorporating in the Detail Design investigations.
1.2 Environmental Study Report

Municipal road projects in Ontario are subject to Ontario’s *Environmental Assessment Act* (EA Act). The Municipal Engineers Association’s *Municipal Class Environmental Assessment* (Municipal Class EA) process for planning, design and construction of municipal infrastructure was developed in accordance with the EA Act and is described in more detail in Section 2.1 of this document. This Environmental Study Report (ESR) documents the planning process conducted in accordance with the Municipal Class EA for the South Section of the Strasburg Road Extension (from north of Stauffer Drive to New Dundee Road).

The ESR is organized as follows:

**Section 1** introduces the study, including background and the context with other projects, and presents the rationale for the project and related study objectives.

**Section 2** summarizes the Municipal Class EA process and the overall approach to carrying out the study.

**Section 3** describes the existing conditions and planned development/projects in the study area within a multi-disciplinary framework to establish the baseline conditions against which project alternatives have been assessed.

**Section 4** presents the development and assessment of alternative planning and design solutions, including identification of the Technically Preferred Alignment for the Strasburg Road Extension.

**Section 5** describes the recommended design for the Technically Preferred Alignment in some detail, including how the alignment was refined to limit environmental impacts, the potential impacts, proposed mitigation measures, and commitments to additional environmental investigations and monitoring.

**Section 6** outlines the staging/timing of future phases of the project and the approvals required to implement the project.

The ESR Appendices provide supplementary and more detailed information on the Consultation Record, documentation of study decisions, the proposed design of the roadway, and supporting technical investigations.

1.3 Purpose of the Project

1.3.1 Historical Development of the Strasburg Road Extension

The approved alignment of Strasburg Road Extension from Rush Meadow Street to 500 m north of Stauffer Drive has been developed based on the recommendations from a number of community and transportation network planning studies that were completed between 1981 and 2008. The chronological summary is presented in Table 1.1.
## Table 1.1: Chronological Summary of Strasburg Road Extension

<table>
<thead>
<tr>
<th>Date</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 1981</td>
<td>Based on <em>Transportation Planning and Engineering Study – Huron Industrial Development</em> and related public consultation during January 1981, City Council resolved that the future extension of Strasburg Road should be subject to further study to determine an exact alignment through the transportation planning and Secondary Plan process.</td>
</tr>
<tr>
<td>June 1982</td>
<td>The “New” Strasburg Road alignment from Huron Road to a point approximately 1.6 km south, was established in the City’s Official Plan Amendment (OPA) No. 8 and the findings of the <em>Transportation Planning and Engineering Study – Huron Industrial Development</em> were subsequently approved by the Region of Waterloo.</td>
</tr>
<tr>
<td>December 1982</td>
<td>City Planning Committee approved the Huron Business Park Secondary Plan and related transportation engineering studies for Huron Road and Strasburg Road reconfirming the alignment of Strasburg Road from Huron Road, southerly to approximately 500 m north of Stauffer Drive.</td>
</tr>
<tr>
<td>February 1983</td>
<td>City Council approved the alignment of Strasburg Road, from Huron Road southerly to approximately 500 m north of Reidel Drive. Strasburg Road was classified as a ‘Secondary Arterial’ with a right-of-way width of 26 m.</td>
</tr>
<tr>
<td>September 1983</td>
<td>Regional Council approved the alignment of Strasburg Road alignment, from Huron Road, southerly to approximately 500 m north of Stauffer Drive including its classification and proposed right-of-way.</td>
</tr>
<tr>
<td>September 1989 - January 1990</td>
<td><em>Brigadoon Community Plan</em> (adopted through City OPA 98), established the collector road arrangement within the Brigadoon Community and reconfirmed the Strasburg Road Extension following the previously approved alignment, southerly to 500 m north of Stauffer Drive.</td>
</tr>
<tr>
<td>1992 - 1994</td>
<td><em>Doon South – Brigadoon Transportation Network and Corridor Study</em> confirmed the need for the new Strasburg Road corridor south of Huron Road in a process consistent with Phases 1 and 2 of the MEA Class EA, including government agency and public consultation. An addendum to the report recommended that Strasburg Road be extended within its planned alignment as a 4-lane roadway from south of Huron Road to New Dundee Road.</td>
</tr>
<tr>
<td>1999</td>
<td>Region of Waterloo <em>Transportation Master Plan</em> included the proposed alignment of the Strasburg Road Extension from Huron Road to north of Stauffer Drive.</td>
</tr>
<tr>
<td>January 2003</td>
<td><em>Doon South Community Plan</em> reconfirmed the proposed extension of Strasburg Road as a Secondary Arterial Road south of Huron Road to north of Stauffer Drive.</td>
</tr>
<tr>
<td>2004 - 2005</td>
<td>City Council approved the 2004 <em>Development Charges</em> study and the <em>Brigadoon Community Plan</em>, which reconfirmed the Strasburg Road alignment from Huron Road to approximately 500 m north of Stauffer Road.</td>
</tr>
<tr>
<td>2009-2010</td>
<td>Several parcels in Doon South Community - Phase 2 were subject to an Ontario Municipal Board hearing in 2009. Subsequent Plan of Subdivision</td>
</tr>
</tbody>
</table>
Draft Approval for these parcels included the condition that Strasburg Road must be extended from its current terminus at Rush Meadow Street to New Dundee Road and Robert Ferrie Drive must be extended from its current terminus at Tilt Drive to Strasburg Road prior to registration of development plans.

City of Kitchener information package to MOE Environmental Assessment and Approvals Branch (EAAB) on chronology of North Section of Strasburg Road Extension, and subsequent determination by EAAB that the City complied with the intent of the Municipal Engineers Association Municipal Class Environmental Assessment in establishing the North Section alignment through decisions made under the Planning Act.

The principal studies that established the alignment and form the basis for this environmental study are the 1982 Huron Industrial Development Transportation Planning and Engineering Study and the 1994 Doon South – Brigadoon Transportation Network and Corridor Study, which are summarized below. These studies are on file with the City of Kitchener and have been made available for public review on the City’s environmental assessment project website (www.kitchener.ca/en/businessinkitchener/Environmental_assessments.asp) during the course of this EA study.

Huron Industrial Development Transportation Planning and Engineering Study (1981)

On June 22, 1981, the City of Kitchener, in accordance with the provision of Sections 13 and 17 of the Planning Act, adopted the official plan amendments for the Huron Industrial Park (Amendment No. 8.). The primary purpose of Amendment No. 8 was to expand the boundaries of the Plan for Land Use to incorporate the lands for future development.

As part of the official plan amendments, it was clearly identified that the City would develop a secondary plan for this area. The main components of the secondary plan were the servicing strategy and related staging plan; drainage policies; a comprehensive transportation planning study; identification and protection of residential, significant historic and archaeological features; wooded and floodplain areas; open space system; subwatershed studies, and a detailed land use plan. Further, as part of the official plan amendments, it was recognized that the location of Strasburg Road was general in nature, pending the determination of the exact alignment through the transportation study and secondary plan.

The Official Plan Amendment process included standard notification and meeting mechanisms to obtain public input. No parties appealed to the Ontario Municipal Board (OMB) at the time and the plan was approved.

During the official plan amendment process, it was recognized that certain works, such as construction and/or widening of roads in the area may be subject to the requirements of the provincial Environmental Assessment Act. This included identification of which elements will be subject to the requirements of the EA Act and which works will be exempt as part of the transportation planning study referred to above.

Pursuant to the Official Plan Amendment recommendations, the City initiated a Secondary Plan for the Huron Industrial Development, and the Transportation Planning and Engineering Study for Huron Road and the extension of Strasburg Road. The Transportation Planning and Engineering Study developed and analyzed seven (7) alternative alignments for the Strasburg Road Extension. These alternative alignments were inventoried for major environmental and other study area sensitivities and evaluated through various criteria that included impacts to...
environmental features, existing residential areas and potential development areas, as well as the potential for providing traffic and transit service, and potential road geometric design challenges.

From the detailed environmental screening and other analyses and input, including public and agency consultation, the City selected a preferred alignment for the Strasburg Road Extension and developed a preliminary design. In 1982 and 1983, City Council approved the Strasburg Road Extension alignment from Huron Road southerly to approximately 500 m north of Reidel Drive. These studies, Official Plan Amendments, or Secondary Plans, were not appealed to the OMB under the Planning Act. As such, the City and other government agencies accepted this as the final alignment and approved the subdivisions and zoning change applications. Further, subsequent development (including the Brigadoon Community and Huron Community) and road network improvements have proceeded on the basis of this Strasburg Road Extension alignment.

**Doon South – Brigadoon Transportation Network and Corridor Study (1994)**

In 1994, the City initiated the Doon South - Brigadoon Transportation Network and Corridor Study that is consistent with Phase 1 and Phase 2 of the Municipal Class EA process and provided the need and justification for, as well as the general location of a recommended transportation corridor network. Included in the report addendum is the recommendation that Strasburg Road be extended within its planned alignment as a 4-lane arterial roadway from Battler Road to New Dundee Road.

The main study objectives included:

- Assessment of the need for additional east-west access, including the feasibility of extending Doon South Drive from its current terminus to (former) Westmount Road;
- Assessment of the need for additional access to the study area from Highway 401;
- Assessment of the opportunity for realigning Strasburg Road south of Stauffer Drive so that Reidel Drive may be designated as a “Scenic Road”.

Other objectives that emerged during the study included:

- Minimize traffic impacts on the existing communities of Upper Doon, Doon South, Pioneer, Caryndale and Brigadoon;
- Minimizing impacts on identified significant environmental resource areas;
- Recognize the City’s desire to promote more compact urban development and accommodate changing travel characteristics (provide greater opportunities for non-vehicular travel);
- Recognize the City’s desire to develop a scenic/heritage road network within the study area
- Minimize the impacts on heritage areas; and
- Provide a cost-effective transportation network that allows traffic and transit planning flexibility, as well as staging potential.

The Doon South – Brigadoon Transportation Network and Corridor Study developed various road network alternatives, including the Do Nothing scenario, and assessed them under the following criteria:

- Natural Environment
• Heritage Area and Scenic Roads
• Social Environment
• Road Networks
• Planning and Development Implications
• Transportation Costs

Each of the above-noted factors was further refined to develop detailed criteria to assess the alternative alignments to identify the preferred alignment. The Do Nothing option was discarded because it “is not a viable alternative due to the fact that the road network within the study area cannot accommodate additional development related traffic without further improvements”.

There were two public information centres for this project to present the various alternatives and the preferred alternative. The final report was posted in the City’s website.

On June 20, 1994, the City adopted the Doon-South – Brigadoon Transportation Network and Corridor Study. Through this study, the alignment of Strasburg Road from its terminus south of Trillium Drive (at Battler Road) to a point just north of Stauffer Drive was reconfirmed in accordance with the following:

• Approved Huron Industrial Development Transportation Planning and Engineering Study;
• Approved Secondary Plan for Huron Business Park; and
• Approved Brigadoon Community Plan

With the approval by City Council of the 2004/2005 Development Charge Background Study and the Brigadoon Community Plan, the proposed alignment of the Strasburg Road Extension between Rush Meadow Street and 500 m north of Stauffer Drive was reconfirmed.

Approval of the Doon South Community Plan – Phase II in 2009 reconfirmed the alignment of the Strasburg Road Extension between Rush Meadow Street and Stauffer Drive.

Approval of the Regional Transportation Master Plan by the Region of Waterloo has confirmed the need for and prioritization of the extension of Strasburg Road from Rush Meadow Street to New Dundee Road. In 2009, the City’s Development Charges Background Study also reconfirmed the need for the extension of Strasburg Road.

Doon South Ontario Municipal Board Hearing (2009)

In 2009, several parcels within the Doon South Community – Phase 2 were subject to an Ontario Municipal Board hearing, which resulted in additional community planning efforts by the City, and Draft Approvals of subdivision plans. The conditions of Draft Approval include the stipulation that Strasburg Road be extended from its current terminus at Rush Meadow Street to New Dundee Road, and Robert Ferrie Drive be extended from its current terminus at Tilt Drive to Strasburg Road prior to registration of Stage 2, 3 and 4 development plans. In addition, prior to the final approval, the subdivider must dedicate to the City of Kitchener any required lands for the new Strasburg Road right-of-way in accordance with the Strasburg Road Environmental Assessment to be undertaken to establish the alignment of Strasburg Road from a point north of Stauffer Drive to New Dundee Road.

The purpose of this EA study is to determine the most appropriate alignment for Strasburg Road from north of Stauffer Drive to New Dundee Road, and to identify potential future collector road
intersection(s), in compliance with the planning and design process set out in the Municipal Engineers Association Municipal Class Environmental Assessment.

1.3.2 Project Rationale

The Doon South - Brigadoon Transportation Network and Corridor Study cited in Section 1.2.1 provided the need and justification for future transportation improvements in a study area bounded by Conestoga Parkway, Highway 8, Highway 401 and Trussler Road. The study was based on analyses using the Region of Waterloo’s Travel Demand Forecasting Model for a horizon year of 2011 and projections of 83,600 persons and 51,700 jobs. The forecast travel demand scenario suggested that a significant number of residents would continue to be employed outside the study area and would need additional road network capacity and connections to travel to and from work in order to avoid undue deterioration in traffic operation levels of service. The study concluded that the existing road network would not be able to support the increased traffic demand associated with projected growth without a number of network improvements, including the extension of Strasburg Road from Battler Road to New Dundee Road.

According to the Regional Transportation Master Plan\(^2\) (RTMP) prepared by the Region of Waterloo, the extension of Strasburg Road from Rush Meadow Street to New Dundee Road is required to relieve future demand on Homer Watson Boulevard, Huron Road and Fischer Hallman Road, as well as to support the future growth and approved development in the area at Doon South and other areas in southwest Kitchener. The RTMP indicates that the Strasburg Road Extension (Huron Road to New Dundee Road) has been recognized as an integral part of the Region’s strategic road network improvement approach, with implementation required within 5-10 years (second highest level of priority). The RTMP is available for review on the Region’s website: [http://www.regionofwaterloo.ca/en/regionalGovernment/resources/RTMP_FINAL_REPORT.PDF](http://www.regionofwaterloo.ca/en/regionalGovernment/resources/RTMP_FINAL_REPORT.PDF).

The Doon South and Broader Study Area – Traffic Impact Study\(^3\) report was assumed to reflect the latest development scenario in and around the Strasburg Road study area and indicated that the Regional transportation model forecasted a modest traffic diversion from the existing road network upon completion of the Strasburg Road Extension (i.e., diversion of traffic from Huron Road – Homer Watson Boulevard onto extended Strasburg Road). Thus, the existing traffic congestion/delays at intersections on Huron Road and Homer Watson Boulevard during the daily peak travel demand periods will be relieved upon the completion of the Strasburg Road Extension.

Several other traffic impact studies for the proposed developments in the Brigadoon and Doon South communities, and other developments within the vicinity of the Class EA study area, also indicated the need for the Strasburg Road Extension to support future growth and development in the area. The Doon South Community Road Network Review\(^4\) report, prepared by iTrans, indicated construction of approximately 7,000 houses in the Brigadoon and Doon South communities. For the current Class EA study, this development forecast was adjusted to reflect current development plans (September 2010), including the potential future developments, as

\(^{2}\) Region of Waterloo Regional Transportation Master Plan: Moving Forward 2031. Regional Municipality of Waterloo, January 2011.

\(^{3}\) Doon South and Broader Study Area – Traffic Impact Study. Paradigm Transportation Solutions Inc. for Hallman/Activa, November 2008.

\(^{4}\) Doon South Community Road Network Review. iTRANS for the Region of Waterloo. November 2008.
provided by the City of Kitchener. Based on the latest information provided by the City's Planning Division, approximately 8,450 houses will be built within the vicinity of the study area.

Additional details pertaining to the traffic service rationale for the extension of Strasburg Road are presented in Sections 3.2.1 (Transportation Network) and 3.2.2 (Traffic Analysis) and Appendix D.1 (a) (Traffic Report).

1.4 Problem and Opportunity Statement

Based on the identification of transportation needs in relation to planned development in southwest Kitchener, as well as study area sensitivities identified by the Project Team early in the study process, the following Problem and Opportunity Statement was developed for the project.

The southwest quadrant of the City of Kitchener is served primarily by two north-south major arterial roads - Homer Watson Boulevard and Fischer Hallman Road. Homer Watson Boulevard is congested during peak hours, due to its central location and connection with Highway 401. The primary connections between these two north-south arterials are two east-west major arterials - Huron Road and New Dundee Road.

Traffic operations and demand studies since the late 1970s demonstrated the requirement for an additional north-south route, establishing connection to the existing arterial road network, to relieve the future demand on Homer Watson Boulevard and Fischer Hallman Road, as well as to accommodate future growth in the southwest quadrant of the City. To accommodate this growth and increases in travel demand, several transportation studies stated the need to provide an alternate north-south arterial by extending Strasburg Road from its current terminus to New Dundee Road.

The current City of Kitchener Official Plan (OP) recognizes Strasburg Road as a 4-lane secondary arterial with controlled access, with the exception of some future intersections with major collector roads within the Brigadoon Community and Doon South Community. The proposed study area for this environmental assessment extends from approximately 500 m north of Stauffer Drive to New Dundee Road to accommodate further extension of Strasburg Road. The tentative alignment for the proposed extension of Strasburg Road was identified in previous studies. At this time, there is an opportunity to identify a suitable corridor for the proposed extension, which could:

- Provide for approved future growth and increased travel demand in the southwest quadrant of the City, including facilitation of future transit service;
- Define the limits of future development and the location of any related road intersections, while assisting in the management/stewardship of important natural heritage and other environmental resources;
- Take advantage of the opportunity to incorporate municipal services in the Strasburg Road corridor to serve new development; and
- Accommodate/enhance facilities for bicyclists and pedestrians through this part of the City.
2.0 STUDY APPROACH

This section of the report outlines the procedural approach followed in the study to comply with the Ontario Environmental Assessment Act ("EA Act"). In addition, the key study participants are identified and the conduct and results of the consultation program are summarized.

2.1 Class Environmental Assessment Process

This study is being conducted in accordance with the Municipal Engineers Association Municipal Class Environmental Assessment (October 2000, as amended in 2007) ("Municipal Class EA"). The Municipal Class EA process was developed in accordance with the EA Act for a “class” of projects, including municipal road, water, wastewater and transit projects, that are recurring, similar in nature, limited in scale, responsive to mitigation measures, and have a predictable range of environmental effects. The purpose of the Municipal Class EA is to provide for the protection, conservation, and wise management of the “environment”, which includes the natural, social, cultural, built and economic environment, through comprehensive planning and informed decision-making. It allows municipalities to meet the requirements of the EA Act, while following a streamlined, self-administered process.

2.1.1 Project Classification

The Municipal Class EA process recognizes that potential environmental impacts may vary, depending on the nature of the project, and classifies projects into four “schedules”, as follows:

- **Schedule ‘A’** municipal maintenance, operational and emergency activities. These projects are pre-approved and, therefore, allow the municipality to proceed without further approval under the EA Act.

- **Schedule ‘A+’** the environmental effects are usually minimal. However, the public is to be advised prior to implementation. These projects are also pre-approved.

- **Schedule ‘B’** projects that may have minimal environmental effects on the environment. These projects are approved subject to a screening process, including consultation with directly affected public and agencies.

- **Schedule ‘C’** projects that may have significant environmental effects on the environment and must proceed under the full planning and documentation procedures outlined in the Municipal Class EA Document.

In accordance with project classification criteria in the Municipal Class EA, this study is being conducted as a **Schedule ‘C’ undertaking** and involves completion of Phases 1 through 4 of the Municipal Class EA process:

- **Phase 1** Identification of problem or opportunity
- **Phase 2** Alternative planning solutions to address the problem or opportunity
- **Phase 3** Alternative design concepts for the preferred planning solution
- **Phase 4** Documentation of the study results (preparation of Environmental Study Report)
- **Phase 5** Prepare Detail Design, proceed to construction/operations, and monitoring of environmental provisions and commitments

---

5 Construction of new roads or other linear facilities costing more than $2.2 Million.
Since the Doon South – Brigadoon Transportation Network and Corridor Study (1994) provided the need and justification for the Strasburg Road Extension, as well as a multi-disciplinary assessment of various project alternatives and the general location of a recommended transportation corridor network (the planning solution) (refer to Section 1.3), Phases 1 and 2 of the Municipal Class EA process are deemed to have been completed.

Successful completion of Phase 4 of the Class EA process will permit the City of Kitchener to proceed to Phase 5 of the process, which is not included in the scope of this EA.

The step-wise Municipal Class EA process is illustrated in Figure 2.1. A simplified graphic showing the main study components for this EA study is presented in Figure 2.2.

The Strasburg Road Extension ESR will be filed with the Ontario Ministry of the Environment, and the City of Kitchener and Regional Municipality of Waterloo Clerks’ offices, and will be available for review at selected libraries in the City of Kitchener as well as the City’s project website for the mandatory 30 calendar day public review period. All parties previously expressing interest in this project through written comments have been notified directly regarding completion and filing of this ESR. An announcement of the ESR completion and filing will be placed in the Kitchener-Waterloo Record.

The City of Kitchener will address concerns and questions raised during the review period. Any significant changes to the project proposals presented in the ESR will be documented in an Addendum to the ESR, the process for which is described in Section 6.3.4 of this report.

The Municipal Class EA process also includes provisions for interested parties to request that the Minister of the Environment elevate the status of the project to an Individual environmental assessment. The individual environmental assessment process normally addresses large scale projects with the potential to result in very significant and unpredictable impacts, and includes provisions for invoking more formal mechanisms for addressing stakeholders’ concerns (i.e., tribunal hearing or mediation). If concerns arise regarding this project, which cannot be resolved in discussion with the City of Kitchener, a person or party may request that the Minister of the Environment make an order for the project to comply with Part II of the EA Act (referred to as a Part II Order), which addresses individual environmental assessments. Requests must be received by the Minister of the Environment within the 30-day period established for public review of the Environmental Study Report. A copy of the request must also be sent to the City of Kitchener.
Figure 2.2: Class Environmental Assessment Process

- **Phase 1**: Problem or Opportunity
- **Phase 2**: Alternative Solutions
- **Phase 3**: Alternative Design Concepts for Preferred Solution
- **Phase 4**: Environmental Study Report
- **Phase 5**: Detail Design, Construction, Monitoring

**Public Consultation to Date**
- PIC No. 1 (June 2010)
- Mayor/Ward Councillors, Property Owners
  - PIC No. 2 (June 2011)
- Mayor/Ward Councillors, Property Owners
  - PIC No. 3 (Oct 2011)
  - Heritage Committee (Nov 2011)
- Environ Committee (Dec 2011)
- Project Team/MNR/MOE
  - PSI (May 2012)
2.1.2 Scope of Environmental Assessment

The Class Environmental Assessment study included a comprehensive set of integrated environmental and engineering investigations (inventories; impact assessment; mitigation recommendations) conducted by specialist consultants, using established/approved methods and protocols, as well as consultation with technical staff of regulatory agencies and other stakeholders with knowledge of the study area. Table 2.1 presents the general scope of the Class EA investigations.

Table 2.1: Class EA Scope of Investigations

<table>
<thead>
<tr>
<th>Terrestrial Ecosystems</th>
<th>Heritage Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Wildlife surveys</td>
<td>• Stage 1 Archaeological Assessment</td>
</tr>
<tr>
<td>o amphibians/reptiles search/monitoring</td>
<td>• Provision for Stage 2 Archaeological Assessment</td>
</tr>
<tr>
<td>o breeding bird and other wildlife</td>
<td>• Heritage Resource Assessment (man-made Built Heritage Resources; Cultural Landscapes)</td>
</tr>
<tr>
<td>habitat/communities</td>
<td>• Recommendations for further archaeological investigations; heritage resource preservation</td>
</tr>
<tr>
<td>• Vegetation inventories (Ecological Land Classification; wetland delineation)</td>
<td></td>
</tr>
<tr>
<td>• Establish appropriate reference habitats/communities and targets/objectives for preparation of mitigation</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Aquatic Ecosystems</th>
<th>Noise</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Aquatic habitat and fish community assessment</td>
<td>• Identify noise sensitive areas</td>
</tr>
<tr>
<td>o watercourse physical attributes, flow, thermal regime</td>
<td>• Noise modeling; impact assessment</td>
</tr>
<tr>
<td>o fish community supported; sensitivity</td>
<td>• Operations and construction phase impact assessment</td>
</tr>
<tr>
<td>• Fish habitat mitigation/compensation</td>
<td>• Noise mitigation recommendations</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Drainage, Hydrology, Stormwater Management</th>
<th>Air Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Confirm watershed drainage regime</td>
<td>• Establish base case (historical meteorological air quality monitoring data)</td>
</tr>
<tr>
<td>• Establish hydraulic requirements for drainage/watercourse conveyance</td>
<td>• High level assessment of design alternatives</td>
</tr>
<tr>
<td>• Develop stormwater management strategy to achieve Blair-Bechtel-Bauman/Strasburg Creek watershed protection targets</td>
<td>• Future exhaust emissions for preferred design option (nine contaminants)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hydrogeology, Contaminated Property</th>
<th>Socio-Economic</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Groundwater regime (recharge/discharge; stream baseflow)</td>
<td>• Designated and approved land uses</td>
</tr>
<tr>
<td>• Potential for encountering contaminated property</td>
<td>• Agricultural and other business operations</td>
</tr>
<tr>
<td></td>
<td>• Community amenities and social/cultural linkages</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transportation Planning</th>
<th>Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Roadway capacity analyses; traffic counts (intersection/link volumes; Level of Service)</td>
<td>• Roadway structural deficiencies (Reidel Drive)</td>
</tr>
<tr>
<td>• Safety analyses</td>
<td>• Soil conditions; road and structural foundation requirements</td>
</tr>
<tr>
<td>• Geometric improvement recommendations</td>
<td>• Roadway geometric design (cross-section; horizontal/vertical alignment; grading, drainage; lighting)</td>
</tr>
<tr>
<td>• Roundabout feasibility study</td>
<td>• Drainage structure design</td>
</tr>
</tbody>
</table>


2.2 Project Organization

The City of Kitchener established a Project Team to provide technical input and direction on the project. The multi-agency, multi-disciplinary Project Team, representing a broad range of mandates and interests, included staff from the following groups:

City of Kitchener

- Community Services - Planning
  - i. Long Range & Policy Planning (Environmental, Cultural Heritage)
  - ii. Development Review
- Infrastructure Services - Engineering
  - iii. Development Engineering
  - iv. Transportation Planning
- Infrastructure Services - Operations

This group provided input on departmental matters. It was supported by and reported regularly to the City’s Corporate Leadership Team, local councillors and the mayor.

Regional Municipality of Waterloo (RMOW)

- Transportation and Environmental Services
- Planning, Housing and Community Services
- Water Services
- Ontario Works

Regional staff provided input on matters of regional interest, such as the provision of regional water supply services in the Strasburg Road Extension corridor, and long range transportation and land use planning policies and plans, including environmental resource protection, impacts on regional road operations, and roundabout initiatives at new intersections.

Grand River Conservation Authority (GRCA)

- Resource Planning
- Ecology
- Aquatic Biology
- Water Resources Engineering

A proportion of the study area lies within areas regulated by GRCA under the Ontario Conservation Authorities Act. GRCA staff provided information on and assisted in the delineation of environmental sensitivities within the Blair Creek watershed, and identified future permitting requirements within their mandate.

SNC-Lavalin Inc. (SLI) was retained to lead the Class EA study and assembled a multi-disciplinary team to conduct the technical investigations required to develop and assess the project alternatives, including specialists in the following disciplines:

- Terrestrial Biology
- Aquatic Biology
• Drainage, Hydrology and Stormwater Management
• Hydrogeology
• Soil and Groundwater Contamination
• Heritage Resources (Archaeology, Built Heritage, Cultural Heritage Landscapes)
• Noise
• Air Quality
• Land Use/Socio-economics
• Transportation Planning
• Traffic Engineering
• Civil Engineering

The management group of the Consultant Team was also represented on the Project Team.

In addition to providing technical input and direction, the Project Team was responsible for selection of the Technically Preferred Alignment for the Strasburg Road Extension.

2.3 Communications Program

This section of the ESR describes the communications program conducted by the City for engaging and consulting with known stakeholders and potentially interested parties at both mandatory and discretionary points in the environmental assessment process.

Public, regulatory agency and other stakeholder consultation has been recognized as an important component of the Strasburg Road Extension Class EA study. The Communications Plan established by the City was designed to capture a full range of opinions and perspectives at regular intervals and at milestone junctures throughout the study. In this regard, it provided multiple and ongoing opportunities for feedback during the planning and design process. It not only met the requirements for mandatory contact prescribed by the Municipal Class EA, but went beyond this protocol based on the complexity of the project, the range and degree of environmental sensitivities involved, the associated number of stakeholders potentially affected by the project, and their level of interest and concern.

2.3.1 Guiding Principles

To address the needs inherent in the study scope of work, the guiding principles for the Consultation Plan included:

• The consultation program was highly inclusive and balanced, engaging the broadest range of audiences reasonably deemed to be potentially affected by the project.

• The program provided early and ongoing opportunities for stakeholders to provide constructive input, the timing of which was commensurate with the need to incorporate such input in the decision-making process, as appropriate.

• The program was transparent (utilizing multiple communication mechanisms) and traceable (documenting the comments, how they have been addressed, the results of any conflict resolution efforts, and the effects of the program on the decision-making process).
The program was **adaptive**, incorporating the **flexibility** to be modified to meet the needs of participating stakeholders and the Project Team.

### 2.3.2 Consultation Mechanisms and Tools

The principal consultation mechanisms that employed to implement the Communications Plan included:

**Notice of Commencement**

- Prospective EA study participants were formally notified of the study commencement through published advertisements in the Kitchener-Waterloo Record on two separate dates. This is a mandatory contact point in the Municipal Class Environmental Assessment process. The notification included information on the study background, purpose, location, EA process, and opportunities/contacts for obtaining information and providing input.

**City/Consultant One-Window Consultation**

- To facilitate public access to the Project Team, project notifications identified the City of Kitchener and Consultant Team representatives through which public “one-window” contact was established and maintained. This included mail, phone, fax and email information.

**Project Team Meetings**

- Municipal technical representatives from the City of Kitchener, Region of Waterloo and the Grand River Conservation Authority, as well as the Consultant, formed the Project Team (refer to Section 2.2 for Study Organization), which met at regular intervals with the Consultant Team to receive information on study progress and provide direction on technical matters. The Consultant Team also met with separate factions of the Project Team off line from the regular Project Team meetings, as required, to convey information and discuss various technical matters in additional detail. Examples include presentations to Grand River Conservation Authority staff at the outset of the project, and meetings with Region of Waterloo Transportation Planning staff to discuss matters related to municipal servicing needs and the New Dundee Road/Reidel Drive-Cameron Road intersection. During the EA study, the City’s Project Manager and the Consultant’s Environmental Lead acted as the public and agency conduit to the Project Team.

**Public Information Centres (PIC)**

- Milestone PICs, also mandatory points of contact, were formally announced through advertisements in the Kitchener-Waterloo Record on two separate dates for each of the three PIC phases. The notification provided information on the PIC purpose, date, time, location and Project Team contacts for obtaining information and providing input. In addition, letter and/or flyer invitations were distributed to participating government agencies, elected representatives, aboriginal communities, interest groups and individuals. The PICs disseminated information through the use of one-on-one discussion; text and graphic display boards, including interactive displays at the alignment screening stage; reference to background resource materials brought to the PIC venue; handouts of selected display material; and comment sheets that were to be left at the PIC or returned to the Project Team via mail, fax or email. Three (3) PICs in the form of drop-in open house forums were
held at strategic milestones in the study (refer to Section 2.3.2) to present the project findings/recommendations and provide an opportunity for public feedback.

**Mayor/Ward Councillors and Senior Management Briefings**

- The City’s Project Manager, assisted by the Consultant, provided progress and proposed action briefings to the Mayor, Ward Councillors and City Senior Management prior to the second and third Public Information Centre in preparation for possible direct contact with this group from project stakeholders.

**Property Owner Meetings**

- A meeting forum was established to provide information to and receive feedback from major property owners that may be directly affected by the road alignments developed as part of the Municipal Class EA study. The milestone presentations to the Mayor/Ward Councillors were followed by presentations to the property owners.

**Face-to-Face Individual Meetings**

- The PICs, providing information to a broad-based public, served to identify individuals that have significant concerns. Where appropriate, focus group or “kitchen table” meetings were held with such groups to provide information and receive feedback. These sessions included interpretive field visits.

**Utility Coordination Meetings**

- Utility companies that may be affected by the road alignments developed during the Municipal Class EA study were identified and met with either as a group or individually, as deemed appropriate.

**Agency Consultation**

- Federal, Provincial and Municipal agencies with policy or regulatory mandates that may affect the project development or implementation were identified and contacted with respect to obtaining technical information, and their desire to participate in the studies. A Government Review Team (GRT) was identified for distribution and review of the Environmental Study Report.

**Aboriginal Consultation**

- At a minimum, each of the aboriginal communities that may have an interest in the project were identified and were included in the notification process for milestone PIC No. 3 and the filing of the ESR. As deemed appropriate, individual meetings/briefings will be provided to participating communities.

**On-line Consultation**

- An internet portal was established by the City to provide on-line public access to information and provide opportunities for input throughout the Municipal Class EA study ([www.kitchener.ca/en/businessinkitchener/Environmental_assessments.asp](http://www.kitchener.ca/en/businessinkitchener/Environmental_assessments.asp)). These web-based opportunities were provided to mirror the information and documentation provided through milestone notifications and the PICs.

**Other Public Forum**

- In addition to the public information sessions described above, the Project Team provided information and received comments in other public forums, principally in
relation to the selection of the Technically Preferred Alignment. These included a presentation to the City of Kitchener Heritage Committee (November 4, 2011) and the City of Kitchener Environmental Committee (December 15, 2011). These meetings included provision for members of the public to make deputations to the committees and for committee members to question the Project Team on the study process.

- The Environmental Study Report was presented to the City’s Planning and Strategic Initiatives Committee (May 7, 2012), with a request to make the Draft ESR available for public review for an extended period prior to formal filing of the ESR in the public record. This meeting also included provision for public deputations and inquiries to the Project Team.

**Notice of Completion**

- The final Class EA mandatory contact point was the Notice of Completion, which was also published in the Kitchener-Waterloo Record on two separate dates. This notice advised that the EA study documentation (Environmental Study Report) has been prepared and placed in the Public Record for a review period of 30 calendar days. It provided information on the location(s) where the Environmental Study Report is available for review, the period within which the document will be available for review and comments must be submitted, the Project Team contacts for obtaining information and providing input, and the Ministry of the Environment contact for submitting objections to the project.

A summary of the manner in which the Communications Plan mechanisms and tools were used to facilitate and support activities in the Municipal Class EA process phases applicable to this study is presented in Table 2.2.

**Table 2.2: Consultation Activities and Mechanisms Summary**

<table>
<thead>
<tr>
<th>Consultation Element</th>
<th>Municipal Class EA Study Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Identify/Assess Planning Solutions</td>
</tr>
<tr>
<td>Project Team Meeting</td>
<td>√</td>
</tr>
<tr>
<td>Mayor/Senior Mgmt. Briefing</td>
<td>√</td>
</tr>
<tr>
<td>Public Information Centre (PIC)</td>
<td>√</td>
</tr>
<tr>
<td>Face-to-Face Meeting</td>
<td>√</td>
</tr>
<tr>
<td>Property Owner Meeting</td>
<td>√</td>
</tr>
<tr>
<td>Utility Coordination Liaison</td>
<td>√</td>
</tr>
<tr>
<td>Agency Consultation</td>
<td>√</td>
</tr>
<tr>
<td>Aboriginal Consultation</td>
<td>√</td>
</tr>
<tr>
<td>Online Consultation</td>
<td>√</td>
</tr>
</tbody>
</table>
2.3.3 Consultation with Government Agencies and Other Stakeholders

In addition to the Project Team described in Section 2.2, the study involved participation by multi-disciplinary teams from several levels of government. Appendix A includes a detailed listing of principal agency staff and other stakeholders that were engaged during the study. Table 2.3 presents a summary of the agencies/stakeholders contacted for technical information.

### Table 2.3: List of Government Agencies and Other Stakeholders Contacted

**Federal**
- Aboriginal Affairs and Northern Development Canada
- Environment Canada
- Fisheries and Oceans Canada
- Transport Canada

**Provincial**
- Ministry of Aboriginal Affairs
- Ministry of the Environment (Regional and District Offices)
- Ministry of Municipal Affairs and Housing
- Ministry of Natural Resources (Guelph District Office)
- Ministry of Tourism and Culture
- Ministry of Transportation
- Ontario Heritage Trust
Letters of notification were sent to these groups at the following study junctures with invitations:

- Notice of Commencement (refer to sample letter in Appendix A.1)
- Public Information Centre No. 1 (refer to sample letter in Appendix A.2)
- Public Information Centre No. 2 (refer to sample letter in Appendix A.3)
- Public Information Centre No. 3 (refer to sample letter in Appendix A.4)
- Notice of Completion (refer to sample letter in Appendix A.6)

Technical input was sought from these groups to assist in the identification of study area sensitivities, constraints, existing and planned infrastructure and potential impacts associated with the candidate alignments for the Strasburg Road Extension. Specific technical input in these regards is cited in Sections 3 (Existing Conditions) and 4 (Conceptual Design Alternatives) of this ESR.

In addition to the information conveyed and received through written correspondence and Project Team meetings, the Project Team met with government agencies, as required, to provide supplementary information and seek direction on regulatory matters. Table 2.4 provides a summary of these meetings.
### Table 2.4: Meetings with Regulatory Agencies

<table>
<thead>
<tr>
<th>Agency</th>
<th>Date</th>
<th>Meeting Purpose/Discussion/Outcome</th>
</tr>
</thead>
</table>
| Grand River Conservation Authority (GRCA)            | May 7, 2010     | - Provide project background and overview  
- Introduce key GRCA and SLI staff  
- Outline proposed work scope in relation to permitting requirements  
- Identify GRCA information requirements  
- Identify information available from GRCA                                                                                                                                                                                                                                                                                                                                                     |
| Ministry of Natural Resources (MNR)                 | September 22, 2010 | - Provide project background and overview, including alignment options developed to date  
- Introduce key MNR and SLI staff  
- Outline investigations completed to date and proposed work scope in relation to permitting requirements  
- Identify MNR information requirements  
- Identify information available from MNR  
- Seek initial comments on Evaluation Criteria and candidate alignments  
- Determine best course forward to establish permitting requirements for Species at Risk under Endangered Species Act, including additional surveys  
- Received September 2010 Draft Jefferson Salamander Regulated Habitat Mapping and MNR’s approach to applying the regulation (meet with and advise property owners by end of 2010). MNR requested mapping not be shown publicly                                                                                                                                                                                                 |
|                                                      | February 22, 2011 | - Update the requirements for the project area inventories and information to date, and to obtain an update on the status of the Species at Risk regulation lines pertaining to project area  
- MNR has not completed property owner notification for the Jefferson Salamander regulation process and would prefer that the lines not be used in any mapping that would be shown publicly  
- MNR will provide updated draft Jefferson Salamander habitat regulation lines based on new information provided by others in the project area  
- MNR will review files to determine if there is documented information on Species at Risk presence/absence surveys on west side of Reidel Drive, at and south of Stauffer Drive  
- City committed to conduct new/additional seasonal Species at Risk (Chimney swift, Whip-poor-whil,
<table>
<thead>
<tr>
<th>Agency</th>
<th>Date</th>
<th>Meeting Purpose/Discussion/Outcome</th>
</tr>
</thead>
</table>
| Regional Municipality of Waterloo / City of Kitchener | September 24, 2010 | - Reconciliation of past and current traffic forecasts for future Strasburg Road Extension based on differences in modelling parameters  
- Agreement on buildout rates for development and their influence on traffic forecasting  
- City to confirm the timing of the developments and provide development volume estimates for the 2016 and 2031 horizon years |
| August 16, 2011                         |                  | - Regional staff concerns with Strasburg Road intersection at New Dundee Road that is offset from existing Reidel Drive-Cameron Road intersection (Alignment E3), especially if roundabouts are being considered  
- Regional staff concerns with Strasburg Road alignment further west from a traffic/transit service perspective (Alignment W1)  
- Initial discussion on operational requirements at existing New Dundee/Reidel Drive-Cameron Road intersection to address safety concerns. Region has no plans to widen New Dundee here, but intersection may require urbanization |
| December 5, 2011, December 19, 2011     |                  | - Additional discussion on alternative solutions to address safety concerns at existing New Dundee Reidel Drive-Cameron Road intersection                                                                                     |
| January 25, 2012                        |                  | - Decision to adopt roundabouts for Strasburg Road Extension intersections with Robert Ferrie Drive, Blair Creek Drive, New Dundee Road                                                                                 |
2.3.4 Public Consultation

This section summarizes the conduct and results of the public consultation program of the study, including the information presented and the principal concerns and questions received at the public information centres. A more detailed Consultation Record is presented in Appendix A.

Table 2.5 summarizes the dates on which the mandatory public notices for the consultation mechanisms described above were placed in the Kitchener-Waterloo Record.

Table 2.5: Summary of Mandatory Study Notification Dates

<table>
<thead>
<tr>
<th>Notification</th>
<th>Date of Placement in Kitchener-Waterloo Record</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notice of Commencement</td>
<td>Friday, April 23, 2010 and Friday, April 30, 2010</td>
</tr>
<tr>
<td>Public Information Centre No. 1</td>
<td></td>
</tr>
<tr>
<td>Introduction and Background (June 10, 2010)</td>
<td></td>
</tr>
<tr>
<td>Public Information Centre No. 2</td>
<td></td>
</tr>
<tr>
<td>Short-Listed Alignment Alternatives (June 1, 2011)</td>
<td></td>
</tr>
<tr>
<td>Public Information Centre No. 3</td>
<td></td>
</tr>
<tr>
<td>Technically Preferred Alignment (October 26, 2011)</td>
<td></td>
</tr>
<tr>
<td>Roundabout Proposals Open House</td>
<td>TBD</td>
</tr>
<tr>
<td>Notice of Completion</td>
<td>TBD</td>
</tr>
</tbody>
</table>

Public Information Centre No. 1

Public Information Centre No. 1 was held on Thursday, June 10, 2010. The purpose of the information centre was to present the study scope and objectives in relation to a draft Problem Statement, outline the technical investigations that will be conducted, provide information on the proposed communications plan, identify preliminary criteria for assessing the project alternatives, and provide an opportunity for public and government agency review and comment.

The information presented at the PIC included:

- Welcome, requesting that attendees sign the register for future notification purposes; informing attendees that Project Team members were available to answer questions and receive comments/concerns; and requesting attendees to complete a comment sheet (provided at the PIC or available on the City’s project website);
- Study Background and Purpose, including study area limits;
- MEA Class EA Process;
- Proposed Consultation Mechanisms (from Communications Plan);
- City of Kitchener Municipal Plan – Transportation/Roads Schedule;
- City of Kitchener Municipal Plan – Land Use Schedule;
• Kitchener Growth Management Plan – Development Blocks (Brigadoon; Doon South);
• Future Traffic in Strasburg Road Extension Corridor;
• Draft Problem/Opportunity Statement;
• Aerial Photo of Existing Conditions/Sensitivities within Study Area;
• Scope of Multi-Disciplinary Investigations to be Conducted for the Class EA Study
• Preliminary List of Project Evaluation Criteria;
• Approved Brigadoon Community Plan;
• Next Steps and Consultation Opportunities

Following is a summary of participation and comments emanating from PIC No. 1:

• 78 people attended the PIC. Written comments were received from 61 people via comment sheets or email.
• Comments and questions were received regarding:
  o scope of the Environmental Assessment investigations;
  o length of the study time frame;
  o effects on property values; and
  o environmental impacts of noise, pollution and traffic on wildlife, wetlands, groundwater recharge areas, designated Environmentally Sensitive Policy Areas and the community.

At the June 2010 PIC, the Project Team also received comments on the segment of the Strasburg Road Extension between Rush Meadow Street and north of Stauffer Drive (North Section). These comments have been considered as part of the Detail Design work for that segment of the roadway extension, and the proposed plan for the North Section was presented at a separate PIC.

The project team addressed these comments and questions verbally, provided a written response to all written comments received and posted information on the City’s Environmental Assessments website: www.kitchener.ca/en/businessinkitchener/Environmental_assessments.asp.

Public input was used to refine the Evaluation Criteria and the scope of investigations and to develop and screen the initial set of alignment alternatives.

A more detailed summary of comments received and responses provided is presented in the Consultation Record in Appendix A.2.

Public Information Centre No. 2

Public Information Centre No. 2 was held on Wednesday, June 1, 2011. The purpose of the information centre was to report on study progress, present the route alignment alternatives that have been developed and the short list of alignment options proposed for more detailed study, and provide an opportunity for public and government agency review and comment.

The information presented at the PIC included:

• Welcome, requesting that attendees sign the register for future notification purposes; informing attendees that Project Team members were available to answer questions
and receive comments/concerns; and requesting attendees to complete a comment sheet (provided at the PIC or available on the City’s project website);

- Key Plan (South Section vs North Section);
- Results of PIC No. 1;
- MEA Class EA Process;
- Project Objectives;
- Development of Alignment Alternatives;
- Long List of Alignment Alternatives;
- Natural Heritage Features and Sensitivities with Alignment Alternatives;
- Cultural Heritage Features and Sensitivities with Alignment Alternatives;
- Socio-Economic Features and Sensitivities with Alignment Alternatives;
- Doon South Community Plan (Intended Land Use Based on Approved Subdivisions);
- Results of Traffic Investigations;
- Strasburg Road Typical Cross-Section(s);
- Evaluation Criteria;
- Screening of Long List of Alignment Alternatives (summary matrix);
- Short List of Alignment Alternatives to be Carried Forward;
- Scope of Investigations to be Completed for Short-Listed Alternatives;
- Next Steps and Consultation Opportunities

Following is a summary of participation and comments emanating from PIC No. 2:

- Approximately 70 people attended the PIC. Written comments were received from 20 people via comment sheets or email;
- Retain Countryside and select an East alternative; there should be an option east of Reidel Drive;
- Preference for “No Road” option or W1;
- Recognized service/cost advantages of East Series, but concern over potential impacts to natural and cultural heritage features; noise impacts to existing residents;
- C1 and C2 represent best balance between East and West Series;
- Safety (lack of sight distance) concern over existing Reidel Drive-Cameron Road/New Dundee intersection and potential traffic impacts on Cameron Road;
- Protection of Stauffer Drive as walking trail.

The project team addressed these comments and questions verbally, provided a written response to all written comments received and posted information on the City’s Environmental Assessments website: www.kitchener.ca/en/businessinkitchener/Environmental_assessments.asp.

Public input was considered by the Project Team in its detailed assessment of the short-listed alignments.
At the June 2011 PIC, the Project Team again received some comments on the segment of the Strasburg Road Extension between Rush Meadow Street and north of Stauffer Drive (North Section). These comments have been considered as part of the Detail Design work for that segment of the roadway extension.

A more detailed summary of comments received and responses provided is presented in the Consultation Record in Appendix A.3.

Public Information Centre No. 3

Public Information Centre No. 3 was held on Wednesday, October 26, 2011. The purpose of the information centre was to report on study progress, present the assessment of the short-listed alignment alternatives, identify the Technically Preferred Alignment, and provide an opportunity for public and government agency review and comment.

The information presented at the PIC included:

- Welcome, requesting that attendees sign the register for future notification purposes; informing attendees that Project Team members were available to answer questions and receive comments/concerns; and requesting attendees to complete a comment sheet (provided at the PIC or available on the City’s project website);
- Key Plan (South Section vs North Section);
- Results of PIC No. 2;
- MEA Class EA Process;
- Project Objectives;
- Natural Heritage Features and Sensitivities with Alignment Alternatives
- Cultural Heritage Features and Sensitivities with Alignment Alternatives
- Socio-Economic Features and Sensitivities with Alignment Alternatives
- Doon South Community Plan
- Results of Traffic Investigations
- Strasburg Road Typical Cross-Section(s)
- Evaluation Criteria
- Evaluation of Short-Listed Alignment Alternatives
- Summary/Rationale for the Technically Preferred Alternative
- Next Steps and Consultation Opportunities

Following is a summary of participation and comments emanating from PIC No. 2:

- Approximately 125 people attended the PIC. Written comments were received from 35 people via comment sheets or email;
- There were expressions of interest in seeing the project proceed to construction as soon as possible;
- About half of the comment sheets specified a preference for Alignment W1 either as the best option, or the best option, understanding that they prefer the road not be built at all;
• There were a number of comments focusing on impacts to the property at 500 Stauffer Drive and protection of the farm pond and preservation of the bed and breakfast business on the property;

• There were continued concerns expressed about the safety (lack of sight distance) concern over existing Reidel Drive-Cameron Road/New Dundee intersection and potential traffic impacts on Cameron Road.

The project team addressed these comments and questions verbally, provided a written response to all written comments received and posted information on the City’s Environmental Assessments website: www.kitchener.ca/en/businessinkitchener/Environmental_assessments.asp.

Public input was used to refine the Technically Preferred Alignment and develop it to the Preliminary Design level of detail, including development of mitigation strategies and treatments.

A more detailed summary of comments received and responses provided is presented in the Consultation Record in Appendix A.4.

2.3.5 First Nations Consultation

The City contacted the Ontario Ministry of Aboriginal Affairs and the federal Department of Aboriginal Affairs and Northern Development (AANDC) with respect to information on established or potential Aboriginal and treaty rights in the vicinity of the project, and advice on consultation with First Nations communities and groups representing First Nations.

AANDC’s Consultation and Accommodation provided information regarding potentially affected Aboriginal communities within 100 km of the project site from its Aboriginal and Treaty Rights Information System (ATRIS), which brings together information regarding Aboriginal groups, such as their location, related treaty information, claims (specific, comprehensive and special) and litigation (refer to Appendix A.5 in this ESR).

Based on the information provided, the City contacted the following First Nations groups (refer to letters in Appendix A.5):

• Six Nations of the Grand River
• Caldwell First Nation
• Mississauga of the Credit
• Oneida Nation of the Thames
• Métis Consultation Unit
• Métis National Council

The City has also followed up the initial contacts with phone calls and/or email contact.

To date, the City has not received any responses from the cited First Nations groups.
3.0 EXISTING CONDITIONS

This chapter of the ESR describes the project study area in the context of the foregoing EA scope described in Section 2.1.2, including transportation infrastructure and the natural, socio-economic and cultural environments. It provides the baseline, including approved infrastructure and land use plans, against which the project alternatives and the effects of the project have been measured.

Information on the following components is presented here and, for selected components, is supplemented with detailed technical reports supporting the ESR in Appendix D:

a) Transportation Network  
b) Traffic Analysis  
c) Municipal Services and Utilities  
d) Surface/Stormwater Drainage  
e) Geotechnical  
f) Designated Environmentally Sensitive Areas  
g) Land Use and Community Features  
h) Fish and Fish Habitat  
i) Terrestrial Ecosystems  
j) Groundwater  
k) Contaminated Property  
l) Noise  
m) Air Quality  
n) Built Heritage and Cultural Landscapes  
o) Archaeology

3.1 Study Area

The general study area for the Class EA (South Section) of the Strasburg Road Extension is shown in relation to the overall proposed extension of the roadway between Rush Meadow Street and New Dundee Road in Figure 1.2, and is shown more detail in Figure 3.1 below. Figure 3.1 shows the study area in the context of the current schematic alignment for the Strasburg Road Extension presented in the Kitchener Municipal Plan. The study area is generally bounded by the Region of Waterloo’s proposed Countryside Line, Reidel Drive and the Doon South Community to the east; New Dundee Road to the south; Lot 6 Beasley’s New Survey and Lot 4 Biehn’s Tract to the west; and Lots 10 and 11 Biehn’s Tract to the north.

The study area was initially more limited in extent and based on expansion of the corridor within which Strasburg Road Extension options might be located, as shown in the June 2009 Kitchener Growth Management Plan (KGMP) (refer to KGMP Parcel Detail graphic in Appendix D.3). Based on the need to expand the area under consideration to provide the additional flexibility to develop reasonable alignment alternatives (refer to Section 4.3 of this ESR), the study area was adjusted accordingly.
Figure 3.1: Study Area
3.2 Engineering

3.2.1 Transportation Network

This Class EA study assumes that the extension of Robert Ferrie Drive and the Blair Creek Drive (also referred to as the East-West Collector in the Doon South Community Plan) up to Strasburg Road will be completed and both the intersections (i.e., Robert Ferrie Drive/Strasburg Road and Blair Creek Drive/Strasburg Road) will be operational under the future traffic conditions. This report also assumes that traffic using the Stauffer Drive and Riedel Drive intersection will be turning at the Robert Ferrie Drive and Strasburg Road intersection under the future traffic conditions. Refer to Appendix D.1 (a) – Traffic Report for additional details on traffic network assumptions.

Figure 3.2 illustrates the transportation network in the area, which consists of the following major arterial roads:

**Huron Road** – A secondary arterial road, with a basic 4-lane urban cross-section within the study area. The posted speed on Huron Road is 60 km/h within the vicinity of the study area. The current intersection of Huron Road and Strasburg Road is a multi-lane roundabout. Huron Road terminates at Homer Watson Boulevard, forming an interchange. The eastbound left movement on Huron Road at Homer Watson Boulevard operates under ‘Stop’ control; all other movements at this intersection operate under free flow conditions.

**Homer Watson Boulevard** - is another 4-lane divided urban arterial within the City. Homer Watson Boulevard interchanges with Highway 401 and becomes Fountain Street to the south of the interchange.

**New Dundee Road** - is a basic 2-lane road, varying from a semi-urban to a rural cross-section as it travels west, and Fischer Hallman Road is also a basic 2-lane rural arterial with a posted speed of 80 km/h. The Region has long term plans to widen New Dundee Road, but have not yet initiated an Environmental Assessment.

**Strasburg Road** – a secondary arterial with a basic 4-lane urban cross-section, and a posted speed of 50 km/h. The City plans to implement the Strasburg Road Extension as a major 4-lane urban collector with a posted speed of 60 km/h.

**Reidel Drive and Stauffer Drive** – are local 2-lane roads with rural cross-sections that currently connect the existing built-up sections of the Brigadoon Community to New Dundee Road and provide access to two existing residential properties in the study area.

**Caryndale Drive** – is designated as a minor collector road and currently serves as major north-south spine in the Brigadoon Community immediately east of the Class EA study area, connecting the community to the Stauffer Drive/Reidel Drive corridor.
Figure 3.2: Transportation Network

City of Kitchener
Municipal Plan

MAP 4
TRANSPORTATION
### 3.2.2 Traffic Analysis

This study assumes two specific horizon years for the proposed developments around the Brigadoon and Doon South communities, as well as areas to the west of proposed Strasburg Road and south of Huron Road. The specific horizon years were 2016 (i.e., an interim year of developments) and 2031 (as the full build-out horizon year).

**2016 Horizon Year:** A total of 3,508 single detached homes are assumed to be constructed and occupied by the horizon year of 2016. This assumption is based on the horizon year forecasts given in the 2008 Paradigm report, adjusted to reflect current development plans (September 2010), as provided by the City of Kitchener.

**2031 Horizon Year:** Based on the steady progression of home building, this report assumes construction of further 4,941 residential units by the horizon year of 2031. This assumption is based on the horizon year forecasts given in the 2008 Paradigm report, adjusted to reflect current development plans (September 2010), as provided by the City of Kitchener.

Table 3.1 presents the net new trips that would be added onto the future area road network under the future traffic conditions due to all the developments in the Brigadoon and Doon South communities and the Conestoga College Boulevard area.

<table>
<thead>
<tr>
<th>Horizon</th>
<th>Development Site</th>
<th>Land Use</th>
<th>Weekday AM Peak Hour</th>
<th>Weekday PM Peak Hour</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>In</td>
<td>Out</td>
</tr>
<tr>
<td>2010 to 2016</td>
<td>East of Strasburg Road</td>
<td>Residential</td>
<td>420</td>
<td>1,240</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Commercial</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sub-total</td>
<td>420</td>
<td>1,240</td>
</tr>
<tr>
<td></td>
<td>West of Strasburg Road</td>
<td>Residential</td>
<td>180</td>
<td>540</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Commercial</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sub-total</td>
<td>180</td>
<td>540</td>
</tr>
<tr>
<td></td>
<td>East + West Total</td>
<td>Total</td>
<td>600</td>
<td>1,780</td>
</tr>
<tr>
<td>2016 to 2031</td>
<td>East of Strasburg Road</td>
<td>Residential</td>
<td>521</td>
<td>1,533</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Commercial</td>
<td>406</td>
<td>291</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sub-total</td>
<td>927</td>
<td>1,824</td>
</tr>
<tr>
<td></td>
<td>West of Strasburg Road</td>
<td>Residential</td>
<td>370</td>
<td>1,105</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Commercial</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sub-total</td>
<td>370</td>
<td>1,105</td>
</tr>
<tr>
<td></td>
<td>East + West Total</td>
<td>Total</td>
<td>1,297</td>
<td>2,929</td>
</tr>
<tr>
<td>2010 to 2031</td>
<td>East + West Overall</td>
<td>Overall Total</td>
<td>1,897</td>
<td>4,709</td>
</tr>
</tbody>
</table>
The 2008 traffic volumes during the weekday morning and afternoon peak hours at the existing study area intersections were extracted from the turning volumes reported in the ‘Doon South Community and Broader Study Area – Traffic Impact Study’ November 2008 (the Paradigm report). The 2008 traffic volumes were applied with a growth rate of 1% per annum to update the turning movement volumes to 2010. Based on the current land use around Strasburg Road, south of Huron Road, no significant change in the traffic turning volumes is anticipated, other than the background corridor growth.

Figure 3.3 illustrates the existing traffic volumes (2010) during the weekday morning and afternoon peak hours, respectively at all the intersections within the vicinity of the study area.
Figure 3.3: Estimated 2010 Traffic Volumes
The same traffic growth rate of 1% per annum was also applied to estimate the background traffic volumes during the weekday peak hours under the future background traffic conditions in 2016 and 2031. The forecast future total traffic volumes under the 2016 and 2031 horizon years were estimated by adding the future background volumes and the net additional development volumes for all the intersections on Strasburg Road (i.e., from Rush Meadow Street to New Dundee Road). Figures 3.4 and 3.5 illustrate the future total traffic volumes with the Kitchener Municipal Plan alignment scenario by 2016 and 2031.

Figure 3.4: Estimated 2016 Traffic Volumes
The predicted intersection turning volumes translate to AADT two-way volumes in the Strasburg Road corridor within the study area ranging from 11,800 to 12,400 in 2016 and from 18,400 to 21,200 in 2031 with the current Kitchener Municipal Official Plan alignment.

A signal warrant analysis has been conducted for all the new intersections, as summarized in Table 3.2, based on the Ontario Traffic Manual warrant methodology (included in Appendix D.1 (a). For intersections that warranted signal control, it was assumed that roundabouts would be
preferred, unless roundabouts are not feasible to implement due to topography/sightline constraints.

**Table 3.2: Summary of Intersection Analysis**

<table>
<thead>
<tr>
<th>Intersections</th>
<th>Signal Warranted?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rockcliffe Drive/Strasburg Road</td>
<td>Not warranted up to year 2031</td>
</tr>
<tr>
<td>Biehn Drive/Strasburg Road</td>
<td>Not warranted up to year 2031</td>
</tr>
<tr>
<td>Robert Ferrie Drive/Strasburg Road</td>
<td>Upon extension of Robert Ferrie Drive and connection to Strasburg Road</td>
</tr>
<tr>
<td>Blair Creek Drive/Strasburg Road</td>
<td>Upon extension of Blair Creek Drive and connection to Strasburg Road</td>
</tr>
<tr>
<td>New Dundee Road/Strasburg Road</td>
<td>Warranted as soon as Strasburg Road is opened</td>
</tr>
</tbody>
</table>

Table 3.2 indicates that three of the new intersections: Robert Ferrie Drive/Strasburg Road, Blair Creek Drive/Strasburg Road and New Dundee Road/Strasburg Road would warrant a signal control by the opening of the Strasburg Road Extension and extension of the new side roads connections to Strasburg Road. Details as to the type of intersection control selected for new intersections with the Strasburg Road Extension are presented in Section 5.1 and the intersection design analysis documentation is included in Appendix D.1 (a) and Appendix D.1 (b).

### 3.2.3 Municipal Services and Utilities

**Existing Condition**

There are currently no municipal services within the study area, and existing residents are serviced by private wells and septic systems on their lands. Utilities within the study area include Kitchener-Wilmot Hydro poles along the Reidel Drive/Cameron Road corridor, and along New Dundee Road.

**Proposed Condition**

It is expected that, with future growth, the local utility companies will require a corridor to provide services to new developments (Doon South Community). The City of Kitchener’s standard 30 m secondary arterial urban cross-section is proposed for the Strasburg Road Extension, matching into the same cross-section proposed for Strasburg Road north of the study area, and will provide a standard location within the new road corridor for each utility, including Kitchener-Wilmot Hydro, Kitchener Gas, Bell, and Rogers Cable.

In addition, the City provides sanitary sewer services, and may install a sewer along the new road corridor along the standard offset, if required.

The Region of Waterloo also plans to extend their Regional watermain to provide additional water supply from Pressure Zone 4 to Pressure Zone 2W, to the Doon South Community as identified in the Kitchener Zone 2 and 4 Optimization Study (Stantec, May 2009), and to facilitate a condition as identified in the OMB’s judgment dated March 25, 2009 Section 3. Regional Municipality of Waterloo Conditions Item #25 and as per OMB Approved plan 30T-08203.
The 600 mm diameter watermain will extend from the terminus of the future 600 mm watermain proposed north of the study area, southerly to the intersection of future Blair Creek Drive and Strasburg Road, and will continue east along future Blair Creek Drive as a 450 mm diameter Regional watermain, also as per OMB Approved plan 30T-08203. The watermain will be provided within the proposed road corridor along the standard offset location. Connections will be required at all proposed intersections.

3.2.4 Surface Water/Stormwater Drainage

The available background information and previous studies pertaining to surface water and stormwater drainage were reviewed. This included the following:

- Upper Blair Creek (Kitchener) – Functional Drainage Study (FDS), March 2009, Stantec Consulting Ltd.
- Environmental Study Report – Doon South Phase 2, Official Plan Amendment Area, City of Kitchener, Collector Road – Municipal Class Environmental Assessment, November 2008, Ecoplans Ltd and MTE.

Hydraulic modelling and floodplain mapping for Upper Blair Creek at the Reidel Drive crossing have also been reviewed.

Detailed supporting information for this component of the study is presented in Appendix D.8 Drainage and Stormwater Management.

Existing Surface/Stormwater Drainage Conditions

The general existing drainage scheme and topography of the Upper Blair Creek sub-catchment is sloping from west to east. The catchment area located west of the existing Reidel Drive includes a large number of depression areas (wetlands). Figure 3.6 illustrates general surface drainage flow, and the location and storage volumes of depression areas.

The total catchment area contributing to the Upper Blair Creek crossing under Reidel Drive (crossing culvert C4) is approximately 210.5 ha. According to the Upper Blair Creek FDS, the estimated peak flow rates at this creek crossing resulting from the continuous model (GAWSER Model) are 0.51 m³/sec and 0.94 m³/sec for the 5- and 100-year storm events respectively.

According to the Upper Blair Creek FDS, the subject catchment area is part of the West Study Area, which represents the lands located to the west of existing Reidel Drive. This area is outside the current urban development boundary.

As indicated in the Environmental Study Report – Doon South Phase 2, Official Plan Amendment Area, the predominant land use of the Upper Blair Creek watershed is active agricultural fields and natural features, with a small amount of rural residential developments.

GENIVAR staff completed a site reconnaissance of existing Reidel Drive between New Dundee Road and Stauffer Drive. Reidel Drive has a rural cross-section with ditches located on both sides of the road. The road consists of two travelled lanes, one lane for each direction. In general the runoff from road side ditches, as well as from external areas, is conveyed across Reidel Drive through a number of crossing culverts. Based on the field observations, five (5) crossing culverts were identified and inspected along Reidel Drive. Table 3.3 summarizes the findings from the site visit.
Figure 3.6: Depression Storage Volumes
Table 3.3: Reidel Drive Crossing Culverts

<table>
<thead>
<tr>
<th>Culvert ID</th>
<th>Approximate Distance North of New Dundee Road (m)</th>
<th>Approximate Diameter (mm) /Material</th>
<th>Approximate Cover (m)</th>
<th>Observations/ Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>400</td>
<td>500 CSP</td>
<td>0.50</td>
<td>Inlet: fair condition, rusted with 40% siltation Outlet: not located – under heavy vegetation</td>
</tr>
<tr>
<td>C2</td>
<td>480</td>
<td>700 PVC</td>
<td>1.0</td>
<td>Inlet: good condition, Outlet: good condition,</td>
</tr>
<tr>
<td>C3</td>
<td>800</td>
<td>600 CSP</td>
<td>0.4</td>
<td>Inlet: fair condition, with 20% siltation Outlet: not assessed - 80% siltation</td>
</tr>
<tr>
<td>C4</td>
<td>900</td>
<td>600 CSP</td>
<td>0.8</td>
<td>Inlet: fair condition, with some corrosion Outlet: fair condition, With some corrosion</td>
</tr>
<tr>
<td>C5</td>
<td>1120</td>
<td>400 CSP</td>
<td>0.5</td>
<td>Inlet: fair condition, heavy rusted at bottom. Outlet: not assessed – heavy vegetation</td>
</tr>
</tbody>
</table>

Future Surface/Stormwater Drainage Conditions

The middle and lower reaches of Blair Creek have been characterized as a sensitive coldwater fishery. Based on previous studies, it was demonstrated that increasing the watershed imperviousness would result in degradation of watercourses and aquatic habitat, especially in coldwater fisheries.

According to the Upper Blair Creek FDS, stormwater quantity control is required to ensure that downstream peak flow/flood risks are not increased due to the proposed development. Also, stormwater quality control is required in accordance with the Ontario Ministry of the Environment (MOE) Design Guidelines to the latest applicable standard. In addition, City of Kitchener Design Standards, which requires naturalization of stormwater management facilities, will also apply to any proposed design.

The Grand River Conservation Authority (GRCA) was contacted to obtain the required stormwater management design criteria. According to GRCA, post-development peak flows
should be controlled to match the pre-development peak flows. As for the quality control, it is required to achieve Level 1 (enhanced level) water treatment, as specified by MOE Design Criteria. In addition, water temperature should not increase, in order to protect the Blair Creek coldwater fishery.

The following SWM alternatives were considered to be applicable for this study:

r) Enhanced grassed swales
s) Wet ponds/wetlands
t) Oil/grit separator

The new storm sewer system along the proposed Strasburg Road Extension will be designed to convey the minor system flow, while overland flow from the major system runoff will be assessed and conveyed in a safe manner without flooding the travelled lanes or any adjacent properties. New crossing culverts/bridges will be designed as required to convey flow from watercourses within the proposed road extension limits.

3.2.5 Geotechnical

Site Geology

The subject site is located in the physiographic region known as the “Waterloo Hills” according to Chapman and Putnam. The area is characterized by rolling sandy hills formed by numerous glacial events during the Wisconsinan Ice Age, approximately 15,000 to 25,000 years ago. Thick glacial ice sheets advanced several times into the Kitchener area from various directions and then receded and created sandy hills and ridges of sandy till, with outwash sands and gravel occupying the intervening hollows.

The topography of the site is best described as “rolling” with intermittent ditches/creeks and wet swampy areas.

Additional quaternary information is presented in Section 3.9 of this ESR and Appendix D.2 Natural Environment in relation to groundwater conditions.

3.3 Natural Environment

3.3.1 Designated Environmentally Sensitive Areas

A number of Regionally designated environmentally sensitive areas are found both within and proximal to the study area (refer to Figure 3.7). These are the Stauffer Woods Environmentally Sensitive Policy Area (ESPA 33), Doon South Woods (ESPA 34), and Roseville Swamp (ESPA 39), and the Strasburg Floodplain Forest (ESPA 30).

According to policy 7.C.5 of the Regional Official Plan, Environmentally Sensitive Policy Areas are regionally significant natural areas that comprise:

- a) Provincially or regionally significant Life Science Areas of Natural and Scientific Interest (ANSI), or provincially significant Earth Science ANSI; or

- b) Meet at least two of the following criteria:
  - i. comprise ecological communities deemed unusual, of outstanding quality or particularly representative regionally, provincially or nationally;
  - ii. contain critical habitats which are uncommon or remnants of once extensive habitats such as old growth forest, forest interior habitat, Carolinian forest, prairie-savanna, alvars, cliffs, bogs, fens, marl meadows, and cold water streams;
iii. provide a large area of natural habitat of at least 20 hectares which affords habitat to species intolerant of human intrusion; or

iv. provide habitat for organisms native to the region recognized as regionally, provincially or nationally significant; or

c) Fulfill one of the criteria in Policy 7.C.5 (b), and any two of the following:

i. contain an unusual diversity of native life forms due to varied topography, microclimates, soils and/or drainage regimes;

ii. perform a vital ecological function such as maintaining the hydrological balance over a widespread area by acting as a natural water storage, discharge or recharge area;

iii. provide a linking system of relatively undisturbed forest or other natural habitat for the movement of wildlife over a considerable distance;

iv. serve as major migratory stop-over or significant over-wintering habitat; or

v. contain landforms deemed unusual or particularly representative at the regional scale.

A brief description of each ESPA and its location in relation to the project study is presented in the following section. Additional information is provided in Appendix D.2 Natural Environment.
Figure 3.7: Existing Natural Heritage Sensitivities

Legend
- Established Strasburg Rd. Corridor
- Study Area
- Jefferson Salamander Regulated Habitat within Class EA Study Area
- Rare Species Occurrence Block
- Watercourse
- GRCA Wetland Boundaries
- Transmission Line
- Land Parcel

Jefferson Salamander Habitat Notes
- Jefferson Salamander Regulated Habitat within Class EA Study Area
- Rare Species Occurrence Block

Figure 3.7: Existing Natural Heritage Sensitivities

Legend
- Established Strasburg Rd. Corridor
- Study Area
- Jefferson Salamander Regulated Habitat within Class EA Study Area
- Rare Species Occurrence Block
- Watercourse
- GRCA Wetland Boundaries
- Transmission Line
- Land Parcel

Jefferson Salamander Habitat Notes
- Jefferson Salamander Regulated Habitat within Class EA Study Area
- Rare Species Occurrence Block
Stauffer Woods (ESPA 33)

Stauffer Woods is located at the southeast corner of the intersection of Reidel Drive and Stauffer Drive. It is approximately 26.2 hectares in size and is predominantly a Sugar Maple-Beech forest on hilly ground surrounding swamp depressions which provides significant amphibian breeding habitat. Numerous springs from the surrounding slopes sustain its wetland features. It is a locally significant life science area and is designated as an ecologically significant Open Space Area by the City of Kitchener.

Doon South Woods (ESPA 34)

Located approximately 1.0 km to the east of the study area, Doon South Woods is a low-lying mixed forest along a small tributary of Doon South Creek flanked by low ridges of maple-beech forest. A hydro corridor severs this ESPA. It is considered a local life science site and is designated as an ecologically significant Open Space Area by the City of Kitchener.

Roseville Swamp (ESPA 39)

This is the largest and one of the best wetland forest complexes and breeding bird areas in the Region. Although parts of it were lumbered some decades ago, it still contains many interesting plant and animal species.

The extensive swamp forest, mainly Silver Maple-Yellow Birch-Black Ash, is impressive for its large trees, especially White Pine, and its lush growth of ferns and mosses. This swamp is an excellent breeding area for deer and is important for migrating and breeding bird species, including warblers. The northern part of the ESPA in the City of Kitchener is traversed by Blair Creek which becomes a coldwater stream in this area. Numerous springs in the southern part in North Dumfries Township serve as headwaters for Cedar Creek, the Region’s largest coldwater stream. The area is an International Biological Programme site. It is mapped by the Ministry of Natural Resources as a significant biological area for wildlife and a regionally significant life science area.

Strasburg Floodplain Forest (ESPA 30)

This large complex of swamp forest and adjoining wooded uplands occupies the Strasburg Creek floodplain and is located approximately 500 metres northeast of the northern portion of the study area.

Adjacent to the east is an extensive swamp forest which contains a notable hemlock stand. Mixed Sugar Maple-Beech forest occupies the slopes away from the floodplain. The floodplain is a complex and diverse mixture of trees and shrubs interspersed with rank herbaceous growth, mainly of grasses and asters. The area is designated as an ecologically significant Open Space Area by the City of Kitchener’s Municipal Plan.

3.3.2 Fish and Fish Habitat

The study area includes the upper reach and headwaters of Blair Creek, which is a productive and healthy coldwater stream that supports brook trout and other coldwater species throughout its length. The presence of groundwater, a reasonable baseflow and gravel substrates provide ideal habitat for brook trout.

The entire length of Blair Creek is considered to be a natural channel with little anthropogenic disturbance noted. There are a couple of known barriers to the upstream passage of fish.

---

6 Grand River Conservation Authority. 1991. Blair Creek Habitat Assessment and Fishery Inventory.
including the v-notch weir at the Reidel Road culvert and a residential driveway culvert that is perched, presenting a seasonal barrier to fish passage.\\(^7\)

Existing fish habitat information for Blair Creek suggests that the watercourse supports a diverse assemblage of cold, cool and warmwater fish species and that there is suitable habitat to support highly sensitive coldwater species, such as brook trout. The review of the Grand River Watershed Management Plan identified that Blair Creek is managed as a coldwater system by MNR and GRCA, with suitable thermal and habitat conditions to support a self-sustaining population of brook trout.

Designated Aquatic Species at Risk

The designation of aquatic species of national significance is given by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), which may then qualify for legal protection and recovery under the federal Species at Risk Act (SARA). Endangered, Threatened or Extirpated species on Schedule 1 of the SARA are afforded protection under the Act. The designation of species of provincial significance is based on recommendations made by the Committee on the Status of Species at Risk in Ontario (COSSARO). Species classified as "at risk" (i.e., Extirpated, Endangered, Threatened or Special Concern) by COSSARO are placed on the Species at Risk List in Ontario (SARO List) and are afforded protection under the Ontario Endangered Species Act, with the exception of species of "special concern".

From the review of background information, there are no designated aquatic species at risk present in Blair Creek within the study area.

3.3.3 Biophysical Characteristics of Blair Creek

Main Branch of Blair Creek

Blair Creek is a tributary of the Grand River located on the outskirts of the cities of Kitchener and Cambridge. Blair Creek is a coldwater stream that is 10 km in length with a catchment area of 1,800 ha.\\(^8\) Land use surrounding Blair Creek is mainly agricultural in the upper parts of the watercourse and residential in the downstream reaches. Wooded buffers are present throughout much of the length of the watercourse, except for the headwaters, where agricultural lands predominate and cover consists of grassed banks.\\(^9\)

Downstream of Reidel Drive

Downstream of Reidel Drive, the stream flows are permanent through lowland/wetland areas and are conveyed in a defined channel. There is a V-notch weir located at the outlet of the culvert conveying Blair Creek at Reidel Drive, which is a barrier to the upstream passage of fish. The stream was flowing, albeit slowly, through the culvert during SLI field investigations in May, August and October, 2010.

The average wetted width of the watercourse downstream of Reidel Drive is 0.6 – 0.7 m, with depths of 0.06 - 0.08 m. Observation of the stream morphology was restricted by the thick overhead vegetation cover and in-stream watercress, but it is dominated mainly by flats due to the low gradient. There were also a few pools noted and a

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\\(^7\) Stantec, 2009.
\\(^8\) Grand River Conservation Authority. 1991.
\\(^9\) Ibid.
small riffle reach. The substrate is composed predominantly of muck and detritus, which is consistent with observations by GRCA during the habitat assessment in 1991.\textsuperscript{10}

**Upstream of Reidel Drive**

Upstream of Reidel Drive, assumed diffuse groundwater contribution in combination with the lack of a defined channel, obscure the stream flow to the extent that flow is not discernable through the wetland.

Standing water was observed in the wetland during the SLI field investigations in May 2010; however, flow was not evident. This reach does not provide permanent fish habitat, but could provide seasonal fish habitat, except for the V-notch weir located at the Reidel Drive culvert that is currently considered to be a barrier to the upstream passage of fish. Further upstream in the study area, Blair Creek is characterized as a shallow intermittent swale feature through forest and agricultural lands.\textsuperscript{11} A smaller ephemeral tributary of Blair Creek joins the main branch from the southwest approximately 200 m upstream from Reidel Drive. There is no permanent fish habitat through these upstream reaches as they contribute only seasonal flows to the downstream reaches.

There is an un-named pond located approximately 50 m north of the terminus of Reidel Drive on the north side of Stauffer Drive, on the property at 500 Stauffer Drive. Origins of the pond are unknown, but it appears that it is an old agricultural pond that was dug some years ago. Twentieth century topographic maps of the area confirm that a pond was not there until sometime after 1951. In the 1964 and 1974 maps, the pond is labelled as "dugout" beside the feature. There is no inlet or outlet stream, which is a distinguishing characteristic of dug ponds. Active agricultural fields are located on the east side of the pond and the remaining edges are a combination of manicured lawn with some small shrubs and scattered trees. Extensive fish community investigations were not conducted at the pond; however, some minnow traps were set and a single brown bullhead (\textit{Ameiurus nebulosus}) was sampled in the spring of 2010. The pond is considered to support a fish community and typical of dug agricultural ponds; the fish have likely been stocked purposely or introduced accidentally.

### 3.3.4 Fish Community

Fish community sampling and inventory was not conducted by SLI in 2010, as it was determined there was sufficient background information from within the study area available from the Ministry of Natural Resources, GRCA and background reports prepared in support of development applications for the Doon South Community. Refer to the aquatic resources report in Appendix D.2 Natural Environment for additional information in this regard.

The fish community sampling stations (conducted by others) were located between Reidel Drive and Dodge Drive and are detailed on Figure 3.8.

In general, the fish community sampling was conducted in the headwaters area in the vicinity of Dodge Drive, as reaches upstream of this location have characteristic thick growth of overhead vegetation, which make sampling very difficult and the heavy growth of watercress and lower

\textsuperscript{10} Grand River Conservation Authority. 1991. Blair Creek Habitat Assessment and Fishery Inventory.
\textsuperscript{11} Stantec. 2009. Upper Blair Creek (Kitchener) Functional Drainage Study.
baseflow contributions contribute to poor visibility and low water levels that restrict the effectiveness of the sampling effort and also restrict the visual observations.\textsuperscript{12}

While the majority of the fish sampling stations were located outside of the study corridor, there was one exploratory electrofishing survey conducted by GRCA in 1991 at Reidel Drive.\textsuperscript{13} The GRCA survey of Blair Creek at Reidel Drive found only fathead minnows.

During the SLI investigations of May and August 2010, no fish were observed at Blair Creek for the reaches in the study area that had either ponding water or minimal flow.

\textsuperscript{12}Grand River Conservation Authority. 1991. Blair Creek Habitat Assessment and Fishery Inventory.

\textsuperscript{13}GRCA, November 1991.
3.3.5 Spawning Surveys
Spawning surveys were not conducted by SLI during the fall of 2010, as spawning surveys had been previously conducted during the fall of 2008 by others and these surveys were deemed sufficient. As well, the sand and muck substrate and sections with poor channel form likely limits fish movement within and immediately downstream of the study area and therefore does not meet the basic requirements for brook trout spawning.14

The spawning surveys conducted by GRCA in 1991 took place from Dodge Drive downstream to the outlet at the Grand River, which is a considerable distance downstream of the study area for the Strasburg Road Extension. No spawning surveys were conducted upstream of Dodge Drive due to extensive overhead cover and poor substrate conditions. Spawning surveys conducted by others in 2008 noted 3 confirmed redds at Dodge Drive and no confirmed spawning upstream of Dodge Drive which is consistent with past spawning surveys conducted by GRCA.

3.3.6 Wetlands
There are several wetland complexes in or near the study area, these are: the Roseville Swamp – Cedar Creek Wetland Complex and PSW; and the Strasburg Creek Wetland Complex and PSW. The terrestrial vegetation report in Appendix D.2 Natural Environment provides additional detail on these resource areas. A brief description of each is presented below and the general extent of the features is shown in Figure 3.7.

Roseville Swamp – Cedar Creek Complex (PSW)
The upper reaches of the Roseville Swamp - Cedar Creek complex PSW runs directly through the study area, crossing Reidel Drive approximately 200 m south of the intersection with Stauffer Drive and continuing to the east. The majority of this feature is located east of the study area (west of Highway 401, south of the Homer Watson Boulevard interchange in the City of Kitchener/Township of North Dumfries) and covers an area of 338.7 hectares. This is one of the best wetland forest complexes and breeding bird areas in the Region, as it contains many interesting plant and animal species and is one of the largest swamp forest complexes in the Region. Many of the significant species listed for this area are concentrated around Rainbow Lake, in a small marl meadow close by, or are within the hydro corridor, which severs this feature.

The swamp forest, mainly Silver Maple-Yellow Birch-Black Ash, is impressive for its large trees, especially White Pine, and its lush growth of ferns and mosses. This swamp is an excellent breeding area for deer and is important for migrating and breeding bird species, including warblers. Numerous springs serve as headwaters for Cedar Creek. The area is an International Biological Program site. It is mapped by the Ministry of Natural Resources as a significant biological area for wildlife and a regionally significant life science area. The feature includes the Grand River Conservation Authority Regulated Area. Specific portions of the Roseville Swamp – Cedar Creek Wetland Complex and PSW potentially affected by the proposed extension of Strasburg Road are described in Section 3.3.7 Vegetation Communities.

Strasburg Creek Wetland Complex (PSW)
Strasburg Creek Wetland complex is located approximately 200 m from the northwestern border of the study area. It is a Provincially Significant Wetland, composed of two wetland types (77% swamp and 23% marsh) (Coulson et al., 1986), which occupies the Strasburg Creek valley

14Stantec, 2009.
system, forming a complex of marshes, deciduous, mixed, coniferous, and thicket swamps. This area is one of the more significant wetland forest complexes in the Region, as it contains many diverse habitats, along with interesting plant and animal species. It provides nesting for colonial waterbirds, as well as active feeding areas (Coulson et al., 1986). It also provides winter cover for wildlife and is of local significance for deer (MNR, Cambridge), (Coulson et al., 1986).

3.3.7 Vegetation Communities

Terrestrial vegetation field investigations were designed to confirm/update the literature review/investigations conducted during the initial phase of the study, delineate habitat and vegetation assemblages, determine the presence and/or potential of rare, endangered or threatened species within the study area boundaries and confirm the delineation of known sensitive areas in close proximity to the study area.

The field program consisted of detailed site investigations of vegetation units delineated from the 2009 Ortho-imagery provided by the City of Kitchener. These investigations were conducted during the spring (May 19 and 27) of 2010 for spring emergents, and the summer (August 4 and 17) of 2010 when vegetation is in leaf to confirm and refine habitat delineations and develop a vegetative composition profile for each habitat unit identified within the study area. The Ecological Land Classification (ELC) system, for Southern Ontario, was also applied to develop the ELC designations for the study area. A full ELC assessment was applied to units directly affected by the alignment alternatives.

Field visits were also conducted in the fall of 2010 to capture late season vascular plants. The late season flowering plants survey was completed on October 1.

The study area was defined as all vegetated areas that may be affected by the proposed alignment alternatives. For those communities east of Reidel Drive, the study area was limited to approximately 100 m from the existing road.

Vegetation communities within the general study area are characteristic of areas in southern Ontario that have been heavily influenced by historical clearing for agriculture and residential development. That said, a significant portion of the study area traverses or encroaches on relatively untouched natural areas associated with portions of Blair Creek and its tributaries. The most important of these is the wetland associated with the headwaters of Blair Creek, which form part of a Provincially Significant Wetland, but the associated woodlots surrounding the wetland are also of high quality and have significant ecological, aesthetic and recreational value. Refer to Appendix D.2 for additional detail in the full terrestrial vegetation report.

Twenty (20) vegetation units, not including hedgerows are delineated on Figure 3.9. A detailed map of the vegetation communities associated with the Blair Creek system is presented in Figure 3.10.
Figure 3.10: Vegetation Communities Associated with Blair Creek
Deciduous Forest Communities

Natural deciduous forests within the study area are primarily concentrated in two areas, a large woodlot to the west of the end of Stauffer Drive (“western woodlot”), and a portion of the Stauffer Woods ESPA at the southeast corner of the intersection of Stauffer Drive and Reidel Drive.

At the west end of Stauffer Drive, the woodlot is dominated by a dry-fresh sugar maple-beech community (FOD 5-2) over rolling uplands and valleys. This mature woodlot is dominated by sugar maple, with other common tree species consisting of American beech, white ash, and black cherry.

The woodlot at the southeast corner of the intersection of Stauffer drive and Reidel Drive is part of the larger Stauffer Woods ESPA, which continues to the east of the study area. It contains a fresh-moist sugar maple hardwood community (FOD 6-5) with other common species including American beech, and white ash along with rarer red oak and bitternut hickory.

Both of these woodlots are mature communities and contain many large trees, especially the portion of the Stauffer Woods ESPA under consideration. The species within these woodlots are expected to continue replacing themselves over time and they will continue to provide similar habitat function in the future. Subcanopy and shrub layers are typically well developed with smaller individuals of the same species. Ground cover varies within the woodlots and is typically sparse in upland areas, and fairly dense in low lying portions. There is also a small woodlot consisting of a dry-fresh sugar maple-black cherry community (FOD 5-7) approximately 500 m north of Stauffer Drive.

Other forest communities within the project limits are mostly early successional forest communities dominated by poplar or aspens (FOD 3-1, FOD 8-1). These are principally associated with the margins of mature woodlots, or the slopes of the Roseville Swamp - Cedar Creek PSW corridor. These are regenerating forests that have likely been cleared at some point to allow for agricultural activities, or access to fields. The subcanopy and shrub layers in these communities show evidence of establishment by species from adjacent vegetation units, which will likely replace the existing tree community over time.

Cultural Communities

There are several vegetation communities within the study area that have been altered by human activity. There are several cultural plantations (CUP 3-1, CUP 3-2), including a remnant of a larger red pine plantation at the south end of the large woodlot at the west end of Stauffer Drive, and two pine plantations along the east side of Reidel Drive. The plantations along Reidel Drive consist of red or white pine and have little in the way of subcanopy or ground cover. At the south end of the large western woodlot there is substantial evidence of infiltration by species such as sugar maple and white ash.
A small cultural woodlot (CUW 1) is located north of the residence located at 271 Reidel Drive (west side). It consists of a stand of trees, mostly black walnut and black locust, which is likely the result of plantings. At the centre of this unit is a small cattail shallow marsh inclusion.

Cultural thicket communities (CUT 1-5, CUT 1-7) are also found within the study area. A red raspberry cultural thicket has grown up adjacent to the red pine plantation adjacent to the western woodlot in areas where logging has removed most of the pines. Within the Blair Creek corridor there is a section of hawthorn-buckthorn thicket, which has replaced the thicket swamp found on either side. This is likely the result of clearing for an access between agricultural fields at some point in the past.

There are also several patches of cultural meadow (CUM 1-1) within the study area. These are mostly associated with old agricultural areas or homesteads that have been left unmanaged, and are dominated by typical old field type vegetation.

**Hedgerows**

There are numerous hedgerows (HROW) found throughout the study area. Those located within the agricultural fields are mature, with numerous large trees such as a black cherry (98 cm dbh), white ash (73 cm dbh), sugar maple (102 cm dbh), and basswood (144 cm dbh). Dominant tree species include sugar maple, white ash, basswood, black walnut and black cherry, with some bitternut hickory, red oak, green ash, Manitoba maple, trembling aspen, and apple present. Shrub species are numerous, with species such as common buckthorn, hawthorn, riverbank grape, Virginia creeper, red raspberry, staghorn sumac, and nannyberry. Red osier dogwood, and willow were observed in the wetter pockets. Herbaceous vegetation was found to be similar to that described in the cultural meadow areas.

**Wetlands**

There are a variety of wetland vegetation communities within the study area. The majority of these wetlands are part of MNR's Blair Creek Provincially Significant Wetland; however, there are also several unevaluated wetlands. Some of these wetlands are hydrologically connected to the Blair Swamp, while others are not. Overall, this wetland complex is a mosaic of treed swamp, thicket swamp, and meadow marsh.

The only treed swamp is a yellow birch mixed swamp community (SWD 6-1), which is found within the western woodlot. Tree species consist of yellow birch, red maple, white pine, and black ash. Shrub and herbaceous vegetation is dense throughout, but varies, as this unit contains several open areas and ponded water.

Much of the Blair Creek corridor is willow thicket swamp consisting of two types (SWT 3-2, SWT 2-2) as the depth of organic soils changes. This thicket contains scattered trees, mostly red maple, poplar, tamarack and black ash, but is dominated by dense shrub vegetation consisting of abundant willow, spicebush, nannyberry,
and swamp red current, as well as red osier dogwood, gray dogwood, Virginia creeper. While there is some watercourse channelization through parts of the Blair Creek corridor, this was noted to be dry during the SLI 2010 and 2011 summer investigations.

Meadow marsh wetland types are found as inclusions within the treed and thicket wetland communities, as well as on their own. There are two principle types of meadow marsh within the study area. The first is a broad leaved sedge meadow marsh community (MAM 3-6), located just north of the road closure at the west of Stauffer Drive, which consists of broad-leaved sedges with some goldenrod and aster species at the edges of the depression. Trees can be found adjacent to the old road adjacent to this pond, including big tooth aspen, Scots pine and weeping willow. This unit has a hydrologic connection to the Blair Swamp via a culvert under the old farm road. A similar wetland is located approximately 500m north of the Stauffer Drive/Reidel Drive intersection.

The other meadow marsh type consists of cattail shallow marsh features, which also occur within the other wetland types, but can be found as a discrete unit located south of a cultural plantation on the east side of Reidel Drive. At this location, it is an open herbaceous community dominated by cattails. Along the edges where the land rises to north, south and west, other vegetation, including sedges, water hemlock, goldenrod and shrubs such as willow and buckthorn can be found.

Vegetation Species at Risk

One species at risk was found within the study area. A single butternut (Juglans cinerea) was found on the south facing slope of the Blair Creek valley, just west of Riedel Drive in Unit 4. The butternut is considered Endangered under COSEWIC, SARA (Species at Risk Act), and SARO (Species at Risk in Ontario). It is also has a SRank of S3\(^{15}\) under the NHIC (Natural Heritage Information Centre) listing. Its location is shown on Figure 3.10.

3.3.8 Wildlife

LGL Limited conducted a review of background information and conducted field surveys to characterize the wildlife habitat and communities within the EA portion of the project area as detailed in the Strasburg Road Extension Part A Draft Interim Report – Wildlife (LGL Ltd., June 2011), contained in Appendix A.2 Natural Environment.

Potential wildlife habitat identified within the study area through a review of background information and further field studies conducted by LGL Limited included remnant natural features, watercourses, wetlands, woodlands and agricultural fields. These habitats were screened for significant wildlife habitat (SWH) as measured against the MNR criteria outlined in the Significant Wildlife Habitat Technical Guide (MNR, 2000) and Ecoregion Criteria Schedules (MNR, June

\(^{15}\) S? - Not Ranked Yet; or if following a ranking, Rank Uncertain (e.g., S3?). S? species have not had a rank assigned. NHIC Glossary.
2011) to identify the following four types of SWH:

- Woodland breeding amphibian habitat;
- Wetland breeding amphibian habitat;
- Movement corridors associated with the above;
- Habitat for Species of Conservation Concern; and
- Turtle overwintering habitat.

Numerous common and secure species were also identified, including: 4 reptile; 16 mammal; 27 invertebrate; 15 amphibian; and, 92 bird species. Field studies conducted by LGL Limited between April 2010 and June 2011 included detailed surveys for salamanders, frogs, breeding birds, whip-poor-will/nighthawk, and reptiles; as well as incidental observations of mammals and species at risk (SAR) screening within the project area. Field observations verified the presence of 2 reptile, 6 amphibian, 20 invertebrate, 44 bird, and 5 mammal species within the study area, most of which were common and secure species.

SAR screening within the project area resulted in the documentation of monarch (Danaus plexippus), and the confirmation of snapping turtle (Chelydra serpentina) within the project area; both are listed as species of special concern provincially and federally. Although milksnake (Lampropeltis triangulum triangulum) was not confirmed within the study area limits for the Class EA, it was documented further north, and potential habitat for this species does exist within the Class EA study area. Although whip-poor-will (Caprimulgus vociferus) was observed as a spring migrant in April 2010 just outside the limits of the study area, this species was not documented in subsequent breeding bird surveys in June 2011. Of the species noted here, Candidate SWH was only identified for snapping turtle.

The overarching constraint to the project area from a wildlife perspective remains the regulated habitat for Jefferson Salamander (Ambystoma jeffersonianum); a species listed as endangered, both provincially and federally. MNR has mapped regulated habitat in the area and would determine if any of the ponds identified within the current study area merit inclusion into the regulated habitat limits. Alignment with the potential to impact the salamander and regulated habitat would trigger a Section 17(2)(c) permit under the Endangered Species Act, 2007.

3.3.9 Groundwater

The following is a summary of the current understanding of the hydrogeology and geology of the Strasburg Road Extension Class EA study area. More detailed information on groundwater conditions in the study area are presented in the hydrogeology report contained in Appendix A.2 Natural Environment.

Much of the information provided herein has been distilled from larger area studies, including the Blair, Bechtel and Bauman Creeks Subwatershed Plan (CH2M Gore & Storrie et al., 1997),

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16 MNR updated the Jefferson Salamander Regulated Habitat Mapping in the vicinity of the Class EA study area several times during this study (most recently on January 9, 2012). Over most of the course of the study, the ministry advised the City of Kitchener that it was not in a position to grant permission to include the mapping in this ESR or any other study documentation that may be presented in a public forum. After further requests by the City at a meeting on January 18, 2012, MNR prepared Jefferson Salamander Regulated Habitat Mapping for only the study area, including disclaimers and explanatory notes, and granted the City permission to show this mapping in the ESR (refer to January 24, 2012 correspondence from MNR in Appendix B).
hereafter referred to as the BBB Study, and the Upper Blair Creek (Kitchener) Functional Drainage Study (Stantec, 2009), referred to in this section as the UBC study. It is understood that the geotechnical/hydrogeological fieldwork and analysis for the UBC study was provided to Stantec by Naylor Engineering Associates Ltd. (NEAL).

The study area is located in an upland area associated with the Waterloo Moraine Complex, within the physiographic region of southern Ontario known also known as the Waterloo Sand Hills.

The Quaternary Geology map of the Cambridge Area (Karrow, 1987) identifies soils in the general study area as composed mainly of sands of an ice contact origin, as well as lower quantities of Port Stanley sandy silt till, isolated pockets of ice-contact gravel, and stream deposits of mixed lithology, although investigation of the subsurface stratigraphy of the study area through borehole drilling by NEAL has revealed a more heterogeneous assemblage of soil types than the Quaternary Geology mapping suggests.

Water Well Records (WWR) from the MOE indicate that overburden soils in the study area are composed of quaternary deposits approximately 50 m to 60 m in depth. Beneath the overburden soils lies sedimentary bedrock of the Salina and Guelph Formations. The Salina Formation is composed of deposits of shale and dolostone, while the Guelph Formation is typically a massive fine to medium crystalline dolostone. Bedrock has a gentle regional slope to the southwest.

Northwest of Reidel Drive and Stauffer Drive, test pits by NEAL typically encountered subsurface deposits of sand or silt, with occasional occurrences of silt till and sand and gravel. Two boreholes were advanced in this area, and they encountered approximately 3.5 to 6 m of sand deposits overlying silt or silt till up to approximately 5 m or more in thickness. West of Reidel Drive, test pits encountered a variety of soils types, with silty deposits being more common close to New Dundee Road, and sand/silt and sand deposits being more common further from New Dundee Road.

The hydraulic conductivity of the various subsurface soil types encountered across the study area varies widely. Typically, conductivity ranges are $10^{-6}$ to $10^{-4}$ m/sec for sandy and silty sand soils, $10^{-7}$ to $10^{-5}$ m/sec for silty and sandy silt soils, and $10^{-8}$ m/sec for clayey fine grained till soils, which were only sporadically indicated in the majority of the investigated area.

As described in the BBB Report, groundwater in the area occurs in two overburden deposits of sand and gravel, which are separated by Catfish Creek till; a low permeability confining layer. The shallow and deep overburden aquifers provide water for residential and municipal wells, in addition to contributing flow to Blair Creek, Roseville Swamp, and the Grand River.

The Region of Waterloo operates four water supply wells in the general vicinity of the study area; production wells K34 and K36 to the north and Roseville production wells R5 and R6 to the southwest. In addition, the Ayr production wells A1, A2, and A3 are found to the south of the study area. Wellhead Protection Sensitivity Areas (WPSAs) 2, 3, and 4 for the Strasburg wells extend into the northwestern corner of the Upper Blair Creek drainage system, and a very small area at the intersection of Reidel Drive and New Dundee Road, representing the edge of the lowest sensitivity (Category 8) area (i.e., the area is outside of the ten-year time of travel to the limit of the total land area contributing water to a municipal drinking-water supply well).

In addition to the existing supply wells, a target area for potential future groundwater supply was identified to the east of the study area, in the eastern part of the subwatershed as part of the Region’s Long Term Water Strategy (RMOW, 2003 and Golder, 2007). In the immediate vicinity
of the study area, only one residential well was identified (at 500 Stauffer Drive), and it was noted to draw water from the shallow overburden aquifers, as well as being potentially tied into a surface pond.

Historic water level measurements, as summarized in the UBC report, have identified shallow groundwater flow to be in a south to southeasterly direction, towards Blair Creek. Specific contours for the area of concern are reproduced from the UBC report in Figure 3.11 below.

Figure 3.11: Water Table Contours (from UBC, 2009)

From Figure 3.11, it can be seen that the headwater area of Blair Creek is a shallow groundwater destination, and that flow is focused there from the south, west and north. The BBB study had concluded that, while Blair Creek originates in the ice-contact sands and gravels of the Waterloo Moraine, it is primarily an intermittent and losing stream fed by surface water runoff. However, consistent with the water table contours indicated in Figure 3.11, the UBC
report noted that measurements of surface water and groundwater elevations in and beside the creek indicate that at some times during the year, groundwater discharge to Blair Creek does occur even west of Reidel Drive, supporting wetlands and marshes in the area. The intermittent nature of the headwaters area has been confirmed via site inspections and ecological investigations as part of this study.

As is documented in the UBC report, monitoring wells with multiple well screens exhibit a downwards hydraulic gradient in the area of the study. Therefore, in addition to some shallow discharge to surface, a portion of shallow groundwater also continues to percolate through the stratigraphic sequence to the deeper overburden aquifer, providing recharge to the more regional deep aquifer.

The shallow groundwater table generally occurs at a depth of less than 7 m below ground surface across the study area. Topographic influences, such as kettle depressions, hummocky topography, and the Blair Creek valley, all cause variation in the depth at which groundwater is encountered.

The lands west of Reidel Drive were identified as regionally significant in terms of providing high rates of recharge to the Strasburg and Ayr wells and contributing base flow to Blair Creek. Accordingly, these lands were identified in the BBB Plan and in Report PC-97-008/E-97-009 as Regional Recharge Areas. Additional hydrogeologic work in support of the FDS confirmed the presence of higher recharge rates on the West Side.

Although the Region has no immediate plans to develop additional groundwater supplies in this area, it remains a target area for future water supply with respect to the Long Term Water Strategy, and, therefore, the groundwater resources in the subwatershed should be protected accordingly.

SLE understands that the existing farm pond at 500 Stauffer Drive is a dug pond that is spring-fed and is likely hydraulically connected to the potable supply well via the shallow aquifer. This is consistent with MOE water well records that identify a shallow overburden well in the area.

3.3.10 Contaminated Property

SLI conducted a Contaminated Overview Study (COS) for the study area – refer to Appendix D.2 Natural Environment for full details. The objective of the COS was to provide a general overview of the area and identify properties or areas with the potential for site contamination, either within the road corridor, or in adjacent areas with the potential to migrate onto the proposed work area.

The following activities were conducted in order to collect information on the potential for contamination in the study area:

d) Description of the Study Area: The location and limit of the work, the current land use, topography and drainage, physiography, geology and hydrogeology of the project area have been described.

e) Review of Records: Historical information was reviewed to identify any past, actual or potential environmental issues within the project area. This included the identification of activities that have the potential to result in environmental impact, as well as occurrences such as spills. An EcoLog Environmental Risk Information Services (ERIS) database search was commissioned for the study area to obtain information from federal, provincial and private databases that may be relevant to the project area.
f) **Review of Historical Aerial Photographs:** Historical aerial photographs were requested from the Ministry of Natural Resources and reviewed in order to identify any potential sources of contamination or disturbances that may have existed in the study area in the past.

g) **Review of Historical Fire Insurance Plans:** Fire insurance plans for the City of Kitchener were reviewed to identify potential sources of contamination that may have existed in the study area.

h) **Study Area Reconnaissance:** A reconnaissance of the study area was performed by an SLI investigator experienced in the assessment of environmental issues related to the area of concern. The investigator observed the area by a windshield survey. Actual or potential sources of contamination were recorded.

The findings of the activities outlined above were analysed to determine the potential for contamination to soil and/or groundwater in the study area.

The reconnaissance survey was conducted on March 7, 2010 by an SLI Site inspector. Key observations made during the field visit include:

i) The land use within and adjacent to the study area is predominantly agricultural, with three farms located on Stauffer Drive, Reidel Drive and New Dundee Road.

j) Various litter, tires and scrap metals were noted on the property west of the Stauffer Drive terminus.

k) Scrap metals and tires were noted on two farms located on Reidel Drive and New Dundee Road, respectively.

It should be noted that snow cover prevented full inspection of the ground surface.

### 3.4 Socio-Economic Environment

#### 3.4.1 Land Use

**Designated Land Use**

The majority of the study area is situated within an area in the southwest segment of the City of Kitchener that is designated for agricultural and/or rural uses by both the City and the Region of Waterloo. The Region’s Countryside Line represents the long-term boundary between the existing Urban Area/Township Urban Areas and the Countryside. It is currently defined, in part, by the Strasburg Road Extension alignment shown in the City’s Municipal Plan. The north end of the study area (approximately 15%) is situated within an urban area designated for low density residential uses in the southwest corner of the Brigadoon Community. The other designated land uses in the study area are Open Space (by the City) and Core Environmental Features (by the Region), principally within the Blair Creek corridor.

The City of Kitchener’s Growth Management Plan (KGMP)\(^{17}\) outlines growth management goals and a related strategy for achieving those goals. Within the KGMP, lands in the Strasburg Road Extension study area in the 2009 - 2010+ KGMP were assigned a lower level of development priority (Priority C) than other areas of the City, based on growth management criteria, including the need to complete additional planning and development-related investigations, or based on the need and timing of the delivery of necessary infrastructure to support development.

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including the Strasburg Road Extension EA (refer to Appendix D.3 for KGMP excerpts). The Fall 2011 - Fall 2013+ KGMP\textsuperscript{18} has given many of the properties in Doon South north of New Dundee Road a Priority B status and this is reflected in the new KGMP. This further reinforces the need for the Strasburg Road Extension, as the timing of the registration of the subdivisions will now be a higher priority.

Land uses defined in the City’s Municipal Plan are shown in Figure 3.12. The Region of Waterloo’s land use designations for the Countryside area are shown in Figure 3.13.

\textsuperscript{18} Kitchener Growth Management Plan (KGMP) Fall 2011- Fall 2013+. City of Kitchener, November 14, 2011.
Figure 3.12: Study Area Land Uses Designated by the City of Kitchener
The Countryside area includes Rural Area and Prime Agricultural Area designations, overlain by a Protected Countryside designation, where urban uses are generally not permitted. Future expansions to the boundaries of the Urban Area are only permitted onto lands within the Countryside Line under certain conditions, including that the existing or planned infrastructure required to accommodate the proposed expansion can be provided in a financially and environmentally sustainable manner and is consistent with any applicable Regional and/or Area Municipal infrastructure master plan.

Where the Countryside Line coincides with the Protected Countryside designation, as shown on ROP Map 7 (refer to Figure 3.13), the Countryside Line is considered a permanent boundary. The Region of Waterloo has vigorously asserted and applied its policy positions on the Countryside Line in southwest Kitchener taken in its June 2009 recommendations to Regional Council and its June 2010 Report to Council in relation to protection of the Countryside Area and Regional Recharge Area from development, particularly in light of the potential additional impacts/costs associated with infrastructure needed to support urban development in this part of the City. However, these policies are currently the subject of objections to the Regional

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Official Plan by some study area land owners and are currently before the Ontario Municipal Board for consideration.

Existing Land Use

The study area is approximately 425 ha in size. Approximately 80% of the study area lands are owned by non-resident development interests; 10% is owned by the resident owner at 500 Stauffer Drive; and the remaining 10% is owned by the City of Kitchener and the Region of Waterloo in the form of opened and unopened road allowances. The latter category includes the designated Strasburg Road Extension corridor, which extends into the study area from the north.

Lands in the study area are used primarily for agricultural activities and rural residential uses (one owner-occupied (500 Stauffer Drive) and one tenant occupied (271 Reidel Drive)).

The study area comprises soils with high capability to support agriculture. Over half (54.4%) of the area is considered prime agricultural land (Capability for Agricultural Rating of Class 1 to Class 3 soils) and 42.1% are Class 4 soils, the remainder (3.5%) being low capability (organic) soils within the Blair Creek corridor. Cultivated land is used primarily for cash crops (corn, soybeans, wheat), with most of the custom planting and harvesting being contracted to two operators from the Cambridge area. The woodlot on the property at 500 Stauffer Drive is used by the owner to provide firewood for the house and business; and the farm pond is used to water the grounds immediately surrounding the house.

Apart from farming, the primary economic activity in the study area is the bed and breakfast operation run by the owner of the 40 ha property at 500 Stauffer Drive since 1997. The business is run out of the 140 year old farmhouse, which serves as the sleeping and eating quarters, with the outdoor amenity area situated principally on the grounds to the east of the house, overlooking the pond and the lands to the east. The business reportedly caters to local, regional and international clientele, and has also served as a venue for seminars, meetings, weddings and other special events.

The Countryside Line, land parcel configurations and agricultural capability are shown in Figure 3.14, Figure 3.15, and Figure 3.16.
Figure 3.14: Countryside Line and Noise Points of Reception (POR)
Figure 3.16: Study Area Land Parcel Configurations

Parcel Ownership
1. City of Kitchener (including designated allowance for Strasburg Road Extension)
2. Freune Developments
3. Hallinan Construction
4. Sunvest Real
5. 500 Stauffer Drive
6, 8. Arivé Holdings
7. Stonfield Development

Strasburg Road - Property Fabric

- Property Boundaries
- Study Area
3.4.2 Communities

Defined communities within the study area are limited to the western periphery of the Doon South Community - Phase 2 and the southwest corner of the Brigadoon Community (refer to Appendix D.3), which are areas that the Strasburg Road Extension is intended to serve, through the provision of additional road network connections and as a conduit for municipal services.

The Doon South Community Plan (1997) identified two separate phases, based on what were thought to be servicing constraints associated with lands within the Blair Creek Subwatershed, given information that was available at the time. Development within Phase 2 was deferred pending the completion of a functional drainage plan for the Blair, Bechtel and Bauman Creeks Subwatershed Plan and adoption of a Municipal Plan Amendment which considers the subwatershed plan. The City of Kitchener formally initiated the Upper Blair Creek (Kitchener) Functional Drainage Study in October of 2003. At the same time, the City of Kitchener initiated a Community Plan and Transportation Study intended to establish land use and a collector road network for Phase 2. Detailed planning, environmental, engineering and traffic studies were also completed on behalf of major property owners as input to the City-initiated planning process and Functional Drainage Study. The studies concluded that the Phase 2 lands can develop with complete municipal services, at residential densities consistent with servicing and other priorities detailed by Provincial Policy and the Regional Official Policies Plan.

Planning for Phase 2 included the development of a collector road network for a fully serviced Doon South Community, with road and transit connections internal to the Community and to the broader area, recognizing what was deemed to be inefficient traffic movement to/from areas west of the Doon South Community. The recommended network, derived through an environmental assessment process that evaluated social, economic, environmental and planning considerations, included an additional east-west connection (now referred to as Blair Creek Drive) that extends westerly from Robert Ferrie Drive across Blair Creek to the future extension of Strasburg Road. Blair Creek Drive will connect the Doon South Community to the broader area and enhance connections (including transit service) between all parts of the community. Transportation network development policies in the community plan also recognize the need to consider all forms of transportation, including walking, cycling, public transit and automobile, including minimizing walking distances to transit stops (e.g., 95% of development to be within 450 m of transit service). With the possible conversion of Phase 2 Limited Service Residential areas to Low Rise Residential, it is expected that this policy will be extended to Phase 2 areas.

The Doon South Phase 2 plan also recognizes the desire to close certain Scenic-Heritage roads and incorporate them into the community trail network. Based on the Doon South Scenic Roads Study (1995), the plan calls for closure of the north end of existing Reidel Drive and the section of Stauffer Drive within the Class EA study area and their incorporation in the Scenic Roads Community Trail Network. It is intended that roads designated as part of the Scenic Roads Community Trail Network may be used to access new subdivision development until such time as the permanent collector and local road network is in place to access such development.

The land uses designated in Brigadoon and Doon south in proximity to the study area are shown in Figure 3.12, and include Open Space (in the Blair Creek corridor (with the decision relating to the redesignation from Limited Service Residential to Low Rise Residential proposed for lands identified as Deferral 1 in Figure 3.12 deferred until such time as environmental analysis has been finalized, environmental setbacks established and the potential movement of endangered and threatened species assessed relative to environmental features to the north and south of the deferral area); Low Rise Residential; and Neighbourhood Mixed Use Centre.
Within Doon South Phase 2, the development proposal of most interest to this study is the Stauffer Woods Subdivision (Activa Holdings Inc. - Plans 30T-08203 and 30T-06203), which is bounded on the west by existing Reidel Drive, north and south of the Blair Creek corridor. The subdivision will be developed in a staged manner as part of a multi-use community comprising a mix of single family, street fronting townhouses and multi-family residential uses, open space, minor retail/commercial and future institutional (school) blocks. There are also stormwater management facilities planned within the subdivision, including one (SWM Facility - 5) south of Blair Creek immediately east of Reidel Drive.

Plan 30T-08203 (presented in Appendix D.3) has Draft Approved status. The conditions of Draft Approval include the stipulation that Strasburg Road must be extended from its current terminus at Rush Meadow Street to New Dundee Road, and Robert Ferrie Drive must be extended from its current terminus at Tilt Drive to Strasburg Road prior to registration of Stage 2, 3 and 4 development plans. In addition, prior to the final approval, the subdivider must dedicate to the City of Kitchener any required lands for the new Strasburg Road right-of-way in accordance with the Strasburg Road Environmental Assessment to be undertaken to determine the alignment of Strasburg Road from a point north of Stauffer Drive to New Dundee Road.

There are no development plans for the southwest corner of the Brigadoon Community currently under review by the City of Kitchener. The community land use plan is presented in Appendix D.3.

3.4.3 Noise

The noise impact assessment for this study was conducted by J. E. Coulter Associates Limited. Full details for the study are presented in Appendix D.4 Noise. The noise impacts of the proposed Strasburg Road Extension have been evaluated using the Ministry of Transportation’s “Environmental Guide for Noise” (the protocol). This protocol compares the future daytime (0700h – 2300h) equivalent sound levels (16hr Leq) under two different scenarios at a point 10 years after the hypothetical completion of the project. The comparison is between the sound levels that would be present with the project in place (the “with project” scenario) and the sound levels that would be present assuming the project did not proceed (the “no project” scenario). If the difference between these two scenarios is 5 dB or greater, the economic, technical, and administrative feasibility of noise control needs to be investigated. In some areas, there may not be an existing dominant noise source, which can sometimes be the case for green-field projects such as this. Where there is no dominant noise source, the protocol requires that the receptors be classified as Class 1 (urban), Class 2 (suburban) or Class 3 (rural). For these areas, the ambient sound limits used for comparison purposes are 55 dB Leq, 50 dB Leq, and 45 dB Leq for Class 1, Class 2, and Class 3 areas, respectively.

A total of five (5) points of reception (PORs), alternatively referred to as noise sensitive areas, have been identified in the study area, as shown in Figure 3.14. The point of evaluation at each receptor is typically an outdoor living area (OLA). For a well developed area (Class 1 or Class 2), the OLA is normally a point 3 m from the rear façade of a house, or a balcony more than 4 m deep for an apartment. For a rural area (Class 3), the OLA is less clearly defined and can usually be a point within 30 m of the dwelling on all sides.

The five PORs are:

POR1 Residence located on Hearthwood Drive (considered rural; ambient sound level of 45 dB Leq without Strasburg Road in place);

POR2 Residence located at 500 Stauffer Drive (future ambient sound level of 45 dB Leq without Strasburg Road in place);
POR3 Residence at 271 Reidel Drive (future ambient sound level of 45 dB Leq without Strasburg Road in place);

POR4 Residence on New Dundee Road, east of Cameron Road and east of all proposed Strasburg Road alternatives (future ambient sound level of 50 dB Leq without Strasburg Road in place); and

POR5 Residence on New Dundee Road, west of Cameron Road and west of all proposed Strasburg Road alternatives (future ambient sound level of 57 dB Leq without Strasburg Road in place).

3.4.4 Air Quality

Relevant Thresholds

The air quality impact assessment for this study was conducted by RWDI AIR Inc. Full details for the study are presented in Appendix D.5 Air Quality. The air contaminants of interest in this study are:

- Carbon Monoxide (CO)
- Nitrogen Dioxide (NO₂)
- Respirable Particulate Matter (PM₂.₅)
- Inhalable Particulate Matter (PM₁₀)
- Benzene (C₆H₆)
- 1,3-Butadiene (C₄H₆)
- Formaldehyde (CH₂O)
- Acetaldehyde (CH₃CHO)
- Acrolein (C₃H₄O)

The Province of Ontario has established both criteria and standards for concentrations of airborne contaminants. The Ambient Air Quality Criteria (AAQC’s) are effects-based levels in air, based on health and/or other effects. They are used in environmental assessments, special air monitoring studies and assessments of general air quality to determine the potential for adverse effects. The standards, on the other hand, are established by Ontario Regulation 419/05, and are legal requirements that emitters in Ontario must meet. Most of the standards are based on the AAQC’s but, in some cases, the standard and AAQC for a contaminant differ from each other. Since Ontario Regulation 419/05 does not apply to discharges of contaminants from motor vehicles, only the AAQC’s apply to the present assessment.

In addition to provincial AAQC’s, the Federal Government and the Canadian Council of Ministers of the Environment have established National Ambient Air Quality Objectives and Canada-Wide standards (CWS) for some contaminants. These levels are effects-based levels in air, based on health and other effects, depending on the pollutant. Of particular relevance is the CWS for PM₂.₅ (respirable particulate matter), since PM₂.₅ currently does not have a provincial AAQC in Ontario.

The aforementioned air quality criteria, objectives and standards are collectively referred to as air quality thresholds in this report. The thresholds used to assess potential project impacts are summarized in Table 3.4. In general, if the concentration or deposition level of an airborne pollutant can be maintained below its threshold, then either no health effect is observed or the effect is small enough that it presents an acceptably low risk to the population and the environment.
It should also be noted that these thresholds represent target levels and are not specifically enforceable for motor vehicle emissions.

Table 3.4: Summary of Relevant Air Quality Thresholds (µg/m³)

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Criterion (µg/m³)</th>
<th>Averaging Period</th>
<th>Source</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM$_{2.5}$</td>
<td>30</td>
<td>24-hour</td>
<td>CWS</td>
<td>[3]</td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>24-hour</td>
<td>AAQC</td>
<td>[1]</td>
</tr>
<tr>
<td>PM$_{10}$</td>
<td>50</td>
<td>24-hour</td>
<td>AAQC</td>
<td>[1]</td>
</tr>
<tr>
<td>CO</td>
<td>36,200</td>
<td>1-hour</td>
<td>AAQC</td>
<td>[1]</td>
</tr>
<tr>
<td></td>
<td>15,700</td>
<td>8-hour</td>
<td>AAQC</td>
<td>[1]</td>
</tr>
<tr>
<td>NO$_2$</td>
<td>400</td>
<td>1-hour</td>
<td>AAQC</td>
<td>[1]</td>
</tr>
<tr>
<td></td>
<td>200</td>
<td>24-hour</td>
<td>AAQC</td>
<td>[1]</td>
</tr>
<tr>
<td>Benzene</td>
<td>2.3</td>
<td>24-hour</td>
<td>AAQC</td>
<td>[4]</td>
</tr>
<tr>
<td></td>
<td>0.45</td>
<td>Annual</td>
<td>AAQC</td>
<td>[4]</td>
</tr>
<tr>
<td>1,3-Butadiene</td>
<td>10</td>
<td>24-hour</td>
<td>AAQC</td>
<td>[5]</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Annual</td>
<td>AAQC</td>
<td>[5]</td>
</tr>
<tr>
<td>Acrolein</td>
<td>4.5</td>
<td>1-hour</td>
<td>AAQC</td>
<td>[6]</td>
</tr>
<tr>
<td></td>
<td>0.4</td>
<td>24-hour</td>
<td>AAQC</td>
<td>[6]</td>
</tr>
<tr>
<td>Acetaldehyde</td>
<td>500</td>
<td>30-minute</td>
<td>AAQC</td>
<td>[1]</td>
</tr>
<tr>
<td></td>
<td>500</td>
<td>24-hour</td>
<td>AAQC</td>
<td>[1]</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>65</td>
<td>24-hour</td>
<td>AAQC</td>
<td>[1]</td>
</tr>
</tbody>
</table>

**Background Air Quality Conditions**

Background concentrations (i.e., concentrations due to non-project emission sources in the surrounding area) are an important part of the total air quality concentration. The dispersion model will predict the incremental impact of the project. An estimate of the maximum coincident background level will be added to the maximum modelled concentration for each contaminant, to determine the worst-case combined impact of the project, together with background. The results will then be compared to the relevant thresholds.

The current background air quality conditions in the study area can be generally characterized with air quality monitoring data. There is an air quality monitoring station located at West Avenue and Homewood Avenue in Kitchener. CO is no longer monitored in Kitchener; therefore, data were taken from the monitoring station located at 900 Highbury Avenue North in London. The stations are operated by the MOE and are part of the National Ambient Pollution Surveillance (NAPS) network. These locations are not exactly representative of the study area, but provide the best estimates available of general background air quality. Since they are both
located in more built-up environments, they are likely to overestimate background levels somewhat.

Table 3.5 summarizes the five most recent years of ambient air quality monitoring data for NO$_2$, CO, PM$_{10}$ and PM$_{2.5}$. All concentrations in the tables are hourly except PM$_{2.5}$ and PM$_{10}$, which are presented as 24-hour concentrations.

Neither the MOE nor NAPS currently reports PM$_{10}$ data in Ontario. Lall et al. (2004), however, determined that the nationwide PM$_{2.5}$/PM$_{10}$ ratios for the USA are normally distributed with a mean of 0.54, a median of 0.53, a minimum of 0.16, and a maximum of 0.94. This result was based on an analysis of a large amount of data and stations. Therefore, 90th percentile PM$_{10}$ concentrations are calculated using the mean PM$_{2.5}$/PM$_{10}$ ratio of 0.54.

**Table 3.5: Summary of Ambient Monitoring Data**

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Statistic</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO$_2$ (μg/m$^3$)</td>
<td>1-hr Max</td>
<td>134</td>
<td>128</td>
<td>117</td>
<td>98</td>
<td>132</td>
<td>134</td>
</tr>
<tr>
<td></td>
<td>24-hr Max</td>
<td>89</td>
<td>94</td>
<td>68</td>
<td>60</td>
<td>60</td>
<td>94</td>
</tr>
<tr>
<td></td>
<td>Annual Mean</td>
<td>25</td>
<td>24</td>
<td>20</td>
<td>19</td>
<td>17</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>1hr-90th Percentile</td>
<td>49</td>
<td>51</td>
<td>42</td>
<td>38</td>
<td>36</td>
<td>51</td>
</tr>
<tr>
<td></td>
<td>Times &gt; 1-hr AAQC (400 μg/m$^3$)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Times &gt; 24-hr AAQC (200 μg/m$^3$)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>CO (μg/m$^3$)</td>
<td>1-hr Max</td>
<td>2654</td>
<td>2769</td>
<td>2077</td>
<td>1385</td>
<td>1385</td>
<td>2769</td>
</tr>
<tr>
<td></td>
<td>8-hr Max</td>
<td>1673</td>
<td>1431</td>
<td>1431</td>
<td>750</td>
<td>750</td>
<td>1673</td>
</tr>
<tr>
<td></td>
<td>Annual Mean</td>
<td>519</td>
<td>196</td>
<td>219</td>
<td>185</td>
<td>185</td>
<td>519</td>
</tr>
<tr>
<td></td>
<td>1hr-90th Percentile</td>
<td>773</td>
<td>369</td>
<td>358</td>
<td>335</td>
<td>335</td>
<td>773</td>
</tr>
<tr>
<td></td>
<td>Times &gt; 1-hr AAQC (36,200 μg/m$^3$)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Times &gt; 8-hr AAQC (15,700 μg/m$^3$)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>PM$_{2.5}$ TEOM (μg/m$^3$)</td>
<td>1-hr Max</td>
<td>64</td>
<td>73</td>
<td>52</td>
<td>62</td>
<td>54</td>
<td>73</td>
</tr>
<tr>
<td></td>
<td>24-hr Max</td>
<td>41</td>
<td>48</td>
<td>35</td>
<td>41</td>
<td>37</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>Annual Mean</td>
<td>8.1</td>
<td>9.5</td>
<td>7.7</td>
<td>8.0</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>1hr-90th Percentile</td>
<td>19</td>
<td>24</td>
<td>18</td>
<td>18</td>
<td>16</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>24hr-90th Percentile</td>
<td>17</td>
<td>22</td>
<td>16</td>
<td>16</td>
<td>15</td>
<td>22</td>
</tr>
</tbody>
</table>
Table 3.6 summarizes the ambient monitoring data from the four most recent years of available data for benzene and 1,3-butadiene from the Kitchener ambient monitoring station.

**Table 3.6: Summary of Ambient Monitoring Data for Benzene and 1,3-Butadiene (NAPS Network Data) in µg/m³**

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Statistic</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Benzene</strong></td>
<td>24-hr Max</td>
<td>3.7</td>
<td>2.2</td>
<td>2.4</td>
<td>3.3</td>
<td>3.7</td>
</tr>
<tr>
<td></td>
<td>Annual Mean</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td></td>
<td>24-hr-90th Percentile</td>
<td>1.6</td>
<td>1.4</td>
<td>1.2</td>
<td>1.2</td>
<td>1.6</td>
</tr>
<tr>
<td><strong>1,3-Butadiene</strong></td>
<td>24-hr Max</td>
<td>0.5</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>Annual Mean</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td></td>
<td>24-hr 90th Percentile</td>
<td>0.2</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.2</td>
</tr>
</tbody>
</table>

Notes:

[1] n/a = not available
Table 3.7 presents a summary of the five most recent years of 90th percentile concentrations for aldehydes and acrolein. Recent multiple years of data for aldehydes and acrolein are readily available for only two stations: Simcoe and Windsor. Data from Simcoe were selected as more representative of the Strasburg Road Extension area, given its relatively rural nature.

Table 3.7: Summary of 90th Percentile Ambient Monitoring Data for Acrolein, Acetaldehyde, and Formaldehyde in µg/m³

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acrolein</td>
<td>0.096</td>
<td>0.193</td>
<td>0.109</td>
<td>0.077</td>
<td>--</td>
<td>0.193</td>
</tr>
<tr>
<td>Acetaldehyde</td>
<td>4.88</td>
<td>2.64</td>
<td>2.27</td>
<td>1.49</td>
<td>1.47</td>
<td>4.88</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>8.59</td>
<td>5.56</td>
<td>5.22</td>
<td>4.35</td>
<td>2.30</td>
<td>8.59</td>
</tr>
</tbody>
</table>

Conclusions

The review of historical ambient air quality measurements indicates that existing levels of CO, NO₂, 1,3-butadiene, acrolein, acetaldehyde and formaldehyde are well below their respective thresholds at the representative monitoring sites. The 90th percentile PM₂.₅, PM₁₀ and benzene concentrations are below their respective thresholds; however, the maximum concentrations are above their respective thresholds.

3.5 Cultural Environment

3.5.1 Built Heritage and Cultural Landscapes

A cultural heritage resource assessment was undertaken by Archaeological Services Inc. (ASI) to provide: an existing conditions inventory of above-ground cultural heritage resources in the study area for the proposed Strasburg Road Extension; an assessment and evaluation of the impacts of the proposed road extension; and appropriate conservation measures and/or additional investigations that may be required to mitigate potential impacts of the proposed project on above ground cultural heritage resources. This section of the ESR presents the inventory of above-ground cultural heritage resources. Additional details are presented in the cultural heritage assessment report in Appendix D.6 Built Heritage and Cultural Heritage Landscapes.

In order to make a preliminary identification of existing built heritage resources and cultural heritage landscapes within the study area, a number of sources were consulted, including the following reports and indexes: Kitchener Scenic Roads Study (LACAC, 1994); Doon South Community Plan: Scenic Roads Study (City of Kitchener, 1995); Doon South Community Plan (Consolidated, 2003; City of Kitchener Municipal Plan (City of Kitchener, 2005); Index of Non-designated Properties of Heritage Value or Interest (City of Kitchener, 2010); Index of Properties Designated Under Part IV of the Ontario Heritage Act (City of Kitchener, 2009); and Index of Properties Designated Under Part V of the Ontario Heritage Act (City of Kitchener, 2007).

Both Reidel Drive and Stauffer Drive were identified in the Scenic Roads Study (LACAC, 1994) as having high scenic qualities and they were recommended to be considered for designation. In 1995, the Doon South Community Plan: Scenic Roads Study further investigated scenic roads within Doon South and recommended that Stauffer Drive and the northern most portion of Reidel Drive (from Stauffer Drive south to the Blair Creek System) be designated as scenic roads. According to the City of Kitchener Municipal Plan, Stauffer Drive, from Reidel Drive to
Tilt Drive was designated as a Scenic-Heritage Road. According to the Doon South Community Plan (2003), the north end of Reidel Drive is to be incorporated in the community’s Scenic Roads Community Trail Network. The City of Kitchener’s Municipal Plan also states that Reidel Drive is presently under study for designation as a Scenic-Heritage Road.

Scenic-Heritage Roads include roads that meet all or some of the following criteria:

- They have unique structural, topographic and visual features compared to most other roads in the municipality;
- They have unique abutting vegetation, including mature tree cover or enclosure;
- They are located within or abut a quality woodlot or significant environmental area;
- They function as a wildlife corridor;
- The abutting built environment and cultural landscape or road segment itself is of heritage or historical significance; and
- They are located within an approved or proposed Heritage Conservation District.

A field review was undertaken by ASI in July 2010 to document the existing conditions of the study area. An additional field review was undertaken in August 2011 to complete detailed assessments of the short-listed alignment alternatives. Field review confirmed that this area retains many elements evocative of its early agricultural roots, mainly in the form of farmscapes and scenic/historic roadscapes along both Reidel Drive and Stauffer Drive. The area features rolling topography, easily experienced while travelling along Reidel Drive, and which contributes to the scenic, rural views from the Reidel Drive and Stauffer Drive roadscapes.

The results of historical research confirmed that the study area features historically surveyed thoroughfares located in an agricultural setting that dates back to the early- to mid-nineteenth century. The field review confirmed that this area retains elements evocative of its early agricultural beginnings. A total of seven (7) cultural heritage landscapes were identified within the study area. The following provides a summary of field review and data collection findings (refer to Table 3.8 and Figure 3.17).

A total of three cultural heritage resources identified in the study area were previously identified by the municipality: CHL 1 in the Municipal Heritage Register, and CHL 3 and CHL 4 in the Municipal Plan (City of Kitchener 2009) and Doon South Community Plan (City of Kitchener 2003). Field review confirmed that the Scenic-Heritage Road attributes for CHL 3 and CHL 4, as cited in the Doon South Scenic Road Study, remain intact.

Four additional resources were identified during the field review (CHL 2, CHL 5, CHL 6 and CHL 7). There are no cultural heritage resources designated under the Ontario Heritage Act; and of the total identified cultural heritage resources, two are farm complexes (CHL 1 and CHL 2), one is a remnant farm complex (CHL 7), one is a roadscape that is designated as a Scenic-Heritage Road (CHL 4), one is a roadscape that is a candidate for designation as a Scenic-Heritage Road (CHL 3), and two are scenic/historic roadscapes that were identified during field review (CHL 5 and CHL 6).
# Table 3.8: Summary of Cultural Heritage Landscapes

<table>
<thead>
<tr>
<th>CHL 1</th>
<th>Farm Complex (271 West Drive)</th>
<th>Historic farm complex located at the north end of West Drive and features a 15 acre Ontario College estate, a barn, and a location on a hill. The farm complex has been described as having a high degree of cultural heritage and historical significance. The property contains a number of buildings and landscape features, including a barn, a house with a large roof, and a driveway. It is identified as a field under review.</th>
<th>Listed as a Visual Heritage Resource in the COCP.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHL 2</td>
<td>Farm Complex (550 Stauffer Drive)</td>
<td>Historic farm complex located at the north end of West Drive and features a 15 acre Ontario College estate, a barn, and a location on a hill. The farm complex has been described as having a high degree of cultural heritage and historical significance. The property contains a number of buildings and landscape features, including a barn, a house with a large roof, and a driveway. It is identified as a field under review.</td>
<td>Listed as a Visual Heritage Resource in the COCP.</td>
</tr>
<tr>
<td>CHL 3</td>
<td>Roadside (Keele Creek - Bobbitt Creek)</td>
<td>Historic farm complex located on the north end of West Drive and features a 15 acre Ontario College estate, a barn, and a location on a hill. The farm complex has been described as having a high degree of cultural heritage and historical significance. The property contains a number of buildings and landscape features, including a barn, a house with a large roof, and a driveway. It is identified as a field under review.</td>
<td>Listed as a Visual Heritage Resource in the COCP.</td>
</tr>
<tr>
<td>CHL 4</td>
<td>Roadside (Stauffer Drive - West Drive)</td>
<td>Historic farm complex located on the north end of West Drive and features a 15 acre Ontario College estate, a barn, and a location on a hill. The farm complex has been described as having a high degree of cultural heritage and historical significance. The property contains a number of buildings and landscape features, including a barn, a house with a large roof, and a driveway. It is identified as a field under review.</td>
<td>Listed as a Visual Heritage Resource in the COCP.</td>
</tr>
<tr>
<td>CHL 5</td>
<td>Roadside (Stauffer Drive - West Drive)</td>
<td>Historic farm complex located on the north end of West Drive and features a 15 acre Ontario College estate, a barn, and a location on a hill. The farm complex has been described as having a high degree of cultural heritage and historical significance. The property contains a number of buildings and landscape features, including a barn, a house with a large roof, and a driveway. It is identified as a field under review.</td>
<td>Listed as a Visual Heritage Resource in the COCP.</td>
</tr>
<tr>
<td>CHL 6</td>
<td>Roadside (New Dundee Road)</td>
<td>Historic farm complex located on the north end of West Drive and features a 15 acre Ontario College estate, a barn, and a location on a hill. The farm complex has been described as having a high degree of cultural heritage and historical significance. The property contains a number of buildings and landscape features, including a barn, a house with a large roof, and a driveway. It is identified as a field under review.</td>
<td>Listed as a Visual Heritage Resource in the COCP.</td>
</tr>
<tr>
<td>CHL 7</td>
<td>Remnant Farm Complex (West of the western terminus of Stauffer Drive)</td>
<td>Historic farm complex located on the north end of West Drive and features a 15 acre Ontario College estate, a barn, and a location on a hill. The farm complex has been described as having a high degree of cultural heritage and historical significance. The property contains a number of buildings and landscape features, including a barn, a house with a large roof, and a driveway. It is identified as a field under review.</td>
<td>Listed as a Visual Heritage Resource in the COCP.</td>
</tr>
</tbody>
</table>
Figure 3.17: Cultural Heritage Features
3.5.2 Archaeological Resources

A Stage 1 Archaeological Assessment was undertaken by ASI to provide information about the geography, history, previous archaeological fieldwork and current land condition of the proposed Strasburg Road Extension study area and to evaluate in detail the archaeological potential of the study area that can be used, if necessary, to support recommendations for a Stage 2 Archaeological Assessment for all or parts of the study area.

A Stage 1 Archaeological Assessment involves a background study to provide detailed documentary research on the archaeological and land use history and present conditions of the study area. Specifically, the background study provides information about previous archaeological fieldwork within and around the study area, its geography and history, and current land conditions.

In order for an inventory of archaeological resources to be compiled for the study area, three sources of information were consulted: the site record forms for registered sites housed at the Ministry of Tourism and Culture and Sport (MTCS; formerly Ministry of Tourism and Culture (MTC)); published and unpublished documentary sources; and the files of ASI.

In Ontario, information concerning archaeological sites is stored in the Ontario Archaeological Sites Database (OASD) maintained by the MTCS. According to the OASD a single archaeological site, AiHc-22, has been registered within the Strasburg Road Extension study area. Six additional archaeological sites have been registered within 1 km of the study area. AiHc-22 was discovered during the Museum of Indian Archaeology’s archaeological assessment for the proposed Huron Road and Strasburg Road alignments associated with the Huron Industrial Park (LMA 1982). The site was located while surveying a cornfield, adjacent to the proposed corridor. A single artifact of unknown Aboriginal affiliation was recovered. No further work was recommended, and the site was cleared of further archaeological concern.

A review of the general physiography and local nineteenth century land use of the study area suggested that it has potential for the identification of both Aboriginal and Euro-Canadian archaeological sites.

The Standards and Guidelines for Consultant Archaeologists list characteristics that indicate where archaeological resources are most likely to be found (2009: 5-6). Archaeological potential is confirmed when one or more features of archaeological potential are present. Per Section 1.3.1 of the standards and guidelines, the study area meets four of the criteria used for determining archaeological potential:

- Previously registered archaeological sites (i.e. AiHc-22);
- Water sources: primary, secondary, or ancient water sources (i.e., Blair Creek);
- Early Euro-Canadian settlement (i.e., pioneer homestead); and
- Early historical transportation route (i.e., New Dundee Road, Reidel Drive, and Stauffer Drive).

These criteria characterize the study area as having potential for the identification of Aboriginal and Euro-Canadian archaeological sites, the extent of which is illustrated in Figure 3.17.
4.0 CONCEPTUAL DESIGN ALTERNATIVES

As stated in Section 1.2.1 of this ESR, the principal purpose of this study is to determine the most appropriate alignment for Strasburg Road from north of Stauffer Drive to New Dundee Road. The chapter of the report documents the development and assessment of alignment alternatives, leading to selection of the Technically Preferred Alignment.

4.1 Design Criteria

The development of the alignment alternatives was based on the designation of the Strasburg Road Extension as a 4-lane Secondary Arterial road with an urban (curb and gutter) cross-section and 30 m right-of-way platform. The engineering Design Criteria template used for the development of the alignment alternatives is presented in Table 4.1.

Table 4.1: Engineering Design Criteria for Development of Strasburg Road Extension

<table>
<thead>
<tr>
<th>DESIGN PARAMETERS</th>
<th>PRESENT CONDITIONS (NORTH OF EXTENSION)</th>
<th>DESIGN STANDARDS (KITCHENER DEVELOPMENT MANUAL – APRIL 2010)</th>
<th>TAC GEOMETRIC DESIGN MANUAL</th>
<th>PROPOSED STANDARDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROW Width</td>
<td>26 m</td>
<td>30 m – 35 m</td>
<td>N/A</td>
<td>30 m</td>
</tr>
<tr>
<td>Posted Speed</td>
<td>50 km/h</td>
<td>N/A</td>
<td>60 km/h</td>
<td>60 km/h</td>
</tr>
<tr>
<td>Design Speed</td>
<td>N/A</td>
<td>60 - 80 km/h</td>
<td>70 km/h</td>
<td>70 km/h</td>
</tr>
<tr>
<td>Minimum Stopping Sight Distance</td>
<td>N/A</td>
<td>85 - 140 m</td>
<td>95 - 110 m</td>
<td>110 m</td>
</tr>
<tr>
<td>Equivalent Minimum ‘K’ Factor</td>
<td>N/A</td>
<td>9 or 16 Sag 13 or 36 Crest</td>
<td>20 - 25 Sag 16 - 23 Crest</td>
<td>25 Sag 25 Crest</td>
</tr>
<tr>
<td>Grade Range</td>
<td>N/A</td>
<td>0.5 % - 5.0 %</td>
<td>0.5 % - 5.0 %</td>
<td>0.5 % - 5.0 %</td>
</tr>
<tr>
<td>Minimum Radius</td>
<td>N/A</td>
<td>130 m</td>
<td>200 m</td>
<td>200 m</td>
</tr>
<tr>
<td>Pavement Width</td>
<td>4 Lanes @ 3.5 m</td>
<td>10.0 m – 18.0 m</td>
<td>3.5 m - 3.7 m lane width</td>
<td>14.0 m pavement width (4 Lanes @ 3.5 m)</td>
</tr>
<tr>
<td>Boulevard Width</td>
<td>5.5 m (1.5 m conc. sidewalk on east side)</td>
<td>5.5 – 9.5 m (1.5 m conc. sidewalk on both sides)</td>
<td>3.0 m min. (1.5m min. sidewalk)</td>
<td>7.5 m (3.0 m asphalt multi-use path on both sides)</td>
</tr>
<tr>
<td>DESIGN PARAMETERS</td>
<td>PRESENT CONDITIONS (NORTH OF EXTENSION)</td>
<td>DESIGN STANDARDS (KITCHENER DEVELOPMENT MANUAL – APRIL 2010)</td>
<td>TAC GEOMETRIC DESIGN MANUAL</td>
<td>PROPOSED STANDARDS</td>
</tr>
<tr>
<td>-------------------</td>
<td>----------------------------------------</td>
<td>-----------------------------------------------------------</td>
<td>----------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Curb</td>
<td>Curb and Gutter (OPSD 600.040)</td>
<td>Curb and Gutter (OPSD 600.040)</td>
<td>Curb and Gutter</td>
<td>Curb and Gutter (OPSD 600.040)</td>
</tr>
<tr>
<td>Median Width</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Intersection Geometrics</td>
<td>N/A</td>
<td>Intersection Angle 90°</td>
<td>Intersection Angle 70° to 110°</td>
<td>Intersection Angle 70° - 110°</td>
</tr>
<tr>
<td>Maximum Grade for Through Roads at Intersection</td>
<td>N/A</td>
<td>3.0 %</td>
<td>N/A</td>
<td>3.0 %</td>
</tr>
<tr>
<td>Maximum Grade for Stop Roads at Intersection</td>
<td>N/A</td>
<td>1.5 %</td>
<td>N/A</td>
<td>1.5 %</td>
</tr>
<tr>
<td>Minimum Curb Radius at Intersection with Arterial Road</td>
<td>N/A</td>
<td>15.0 m</td>
<td>10.7 m (WB-20 - Outside Front Wheel)</td>
<td>15.0 m</td>
</tr>
<tr>
<td>Minimum Curb Radius at Intersection with Collector Road</td>
<td>15.0 m (Strasburg Rd / Huron Rd intersection)</td>
<td>15.0 m</td>
<td>10.7 m (WB-20 - Outside Front Wheel)</td>
<td>15.0 m</td>
</tr>
<tr>
<td>Minimum Curb Grade</td>
<td>N/A</td>
<td>0.5 %</td>
<td>N/A</td>
<td>0.5 %</td>
</tr>
<tr>
<td>Minimum Curb Grade at Radius of Intersections</td>
<td>N/A</td>
<td>0.8 %</td>
<td>N/A</td>
<td>0.8 %</td>
</tr>
<tr>
<td>Maximum Superelevation</td>
<td>N/A</td>
<td>As Required</td>
<td>0.04 m/m</td>
<td>0.04 m/m</td>
</tr>
<tr>
<td>Minimum Intersection Spacing Between Adjacent Intersections (measured from centerline to centerline of the intersections)</td>
<td>N/A</td>
<td>200.0 m</td>
<td>680 m</td>
<td>200.0 m</td>
</tr>
<tr>
<td>Roundabout Inscribed Circle Diameter</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>55 m – 60 m (45 m – 55 m urban double lane - FHWA Roundabout Guide)</td>
</tr>
</tbody>
</table>
Figure 4.1 illustrates the typical cross-section of the Strasburg Road Extension (refer to Appendix E Design Plates for engineering details) and an example of the road’s appearance.

**Figure 4.1: Typical Cross-Section of Strasburg Road Extension**

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4.2 Evaluation Criteria

Based on identified study area sensitivities, and the approved scope of the EA investigations for this project (refer to Table 2.1), in addition to the Design Criteria presented in Table 4.1, the criteria presented in Table 4.2 were adopted by the Project Team for the purposes of development and assessment of the Strasburg Road Extension alignment alternatives.
### Table 4.2: Alignment Alternatives Evaluation Criteria

<table>
<thead>
<tr>
<th>FACTOR GROUP/FACTOR</th>
<th>INDICATOR/MEASURE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NATURAL ENVIRONMENT</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Terrestrial Ecosystems (Including Species at Risk)</strong></td>
<td></td>
</tr>
<tr>
<td>▪ Wetlands</td>
<td>- Encroachment on PSWs or other wetlands (area; classification/quality, relative extent in relation to entire complex)</td>
</tr>
<tr>
<td>▪ Designated Environmentally Sensitive Policy Areas / Areas of Natural and Scientific Interest</td>
<td>- Encroachment on ESPAs/ANSIs, including Core Environmental Features (area; relative extent in relation to entire designated area)</td>
</tr>
<tr>
<td>▪ Vegetation communities</td>
<td>- Encroachment on vegetation communities (area, type, quality, composition, relative extent; and potential for mortality, stress, composition change)</td>
</tr>
<tr>
<td>▪ Significant vegetation species (including Species at Risk)</td>
<td>- Effects on vegetation SAR or species of local/regional significance</td>
</tr>
<tr>
<td>▪ Wildlife habitat</td>
<td>- Encroachment on and/or reduction of interior habitat (area; fragmentation) - Effects on wildlife movement corridors or corridors between critical habitat features (e.g., upland/breeding ponds) (number of crossings) - Degree of potential increases in animal-vehicle conflicts</td>
</tr>
<tr>
<td>▪ Significant wildlife species (including Species at Risk)</td>
<td>- Effects on terrestrial SAR, species of local/regional significance (critical habitat; breeding timing windows)</td>
</tr>
<tr>
<td><strong>Aquatic Ecosystems (Including Species at Risk)</strong></td>
<td></td>
</tr>
<tr>
<td>▪ Watercourses providing fish habitat (including food/shelter)</td>
<td>- Number of watercourse crossings, sensitivity of fish/fish habitat and thermal regime (warm, cool or cold water) - Extent (area) and function of riparian habitat removed - Extent and type of fish habitat (in-stream) altered/displaced at watercourse, including importance to aquatic ecosystem (e.g., spawning, nursery areas)</td>
</tr>
<tr>
<td>▪ Aquatic Species at Risk</td>
<td>- Effects on aquatic SAR</td>
</tr>
<tr>
<td>▪ Water quality, thermal regime or baseflow</td>
<td>- Encroachment on headwater areas (1st or 2nd Order Streams) (area) - Degree of interference with known groundwater discharge areas that contribute to creek baseflow - Effects on surface drainage/flood plain contributions to fish habitat</td>
</tr>
<tr>
<td><strong>Groundwater Resources</strong></td>
<td></td>
</tr>
<tr>
<td>▪ Groundwater recharge areas</td>
<td>- Encroachment on significant groundwater recharge areas (removal/disruption of function - area; depth)</td>
</tr>
<tr>
<td>▪ Groundwater quality</td>
<td>- Potential for impacts to vulnerable areas (area)</td>
</tr>
<tr>
<td>▪ Shallow groundwater movement</td>
<td>- Potential for interference with existing flow patterns (baseflow) relative to proximity to surface water and significant groundwater discharge areas</td>
</tr>
<tr>
<td><strong>Surface Drainage</strong></td>
<td></td>
</tr>
<tr>
<td>▪ Watercourses; drainage catchments</td>
<td>- Need for diversion/channelization of Blair Creek (length and catchment area impacts (area))</td>
</tr>
<tr>
<td>▪ Flood plain function</td>
<td>- Changes (+/-) to Blair Creek flood plain hydrologic function</td>
</tr>
<tr>
<td>▪ Stormwater management</td>
<td>- Opportunities to enhance roadway stormwater management measures, including coordination with/use of adjacent development facilities</td>
</tr>
<tr>
<td>FACTOR GROUP/FACTOR</td>
<td>INDICATOR/MEASURE</td>
</tr>
<tr>
<td>---------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>SOCIO-ECONOMIC ENVIRONMENT</strong></td>
<td></td>
</tr>
<tr>
<td>Land Use</td>
<td></td>
</tr>
<tr>
<td>- Land use/resource designations and policies</td>
<td>- Degree of compatibility with provincial and municipal growth/development goals/objectives (high, moderate, low)</td>
</tr>
<tr>
<td>- Approved private development proposals</td>
<td>- Encroachment on development lands (area)</td>
</tr>
<tr>
<td>- Agricultural operations (physical resource consumption; facility resource consumption; operational impacts)</td>
<td>- Prime agricultural land out of production (Class 1-3; specialty crop) (area)</td>
</tr>
<tr>
<td>- Total farm properties affected (number; type; area; severances)</td>
<td>- Farm infrastructure displaced (type, number, area)</td>
</tr>
<tr>
<td>- Other business operations</td>
<td>- Business infrastructure/employees displaced (type; number)</td>
</tr>
<tr>
<td>- Changes (+/-) in business exposure/viability</td>
<td></td>
</tr>
<tr>
<td>Communities</td>
<td></td>
</tr>
<tr>
<td>- Encroachment on communities/individual properties</td>
<td>- Encroachment on individual properties (number/area)</td>
</tr>
<tr>
<td>- Influence in defining proposed community areas (high, moderate, low)</td>
<td></td>
</tr>
<tr>
<td>- Community connectivity (cultural/social linkages)</td>
<td>- Physical changes (+/-) to established community connectors (trails/roads)</td>
</tr>
<tr>
<td>- Changes to delivery of community services (emergency; school transportation)</td>
<td></td>
</tr>
<tr>
<td>- Community amenities</td>
<td>- Changes (+/-) in community access to recreational/interpretive areas</td>
</tr>
<tr>
<td>Noise</td>
<td></td>
</tr>
<tr>
<td>- Noise sensitive areas</td>
<td>- Noise sensitive receivers experiencing resultant absolute noise levels over 55 dBA</td>
</tr>
<tr>
<td>- Noise sensitive receivers experiencing increases (5 dB ranges) in sound levels over pre-existing conditions</td>
<td></td>
</tr>
<tr>
<td>Air Quality*</td>
<td></td>
</tr>
<tr>
<td>- Sensitive receptors</td>
<td>- Number of nearby receptors and proximity to the alignment</td>
</tr>
<tr>
<td>- Proximity of sensitive receptors to roadway intersections</td>
<td></td>
</tr>
<tr>
<td>- Airshed burden</td>
<td>- Degree of increase (exceedance) in critical AQ parameters in local airshed</td>
</tr>
<tr>
<td><strong>CULTURAL ENVIRONMENT</strong></td>
<td></td>
</tr>
<tr>
<td>Archaeological Resources</td>
<td></td>
</tr>
<tr>
<td>- Known archaeological sites</td>
<td>- Number/type/significance of direct/indirect impacts to registered archaeological sites</td>
</tr>
<tr>
<td>Heritage Resources</td>
<td></td>
</tr>
<tr>
<td>- Built heritage features</td>
<td>- Number/type/significance of direct/indirect impacts to above ground heritage resources (based on presence of above ground cultural heritage features identified or designated, by the City of Kitchener, as having heritage value or interest, or identified during EA field studies)</td>
</tr>
<tr>
<td>- Cultural heritage landscapes (historic; scenic-heritage roads, farm complexes, etc.)</td>
<td>- Number/type/significance of direct/indirect impacts to cultural heritage landscapes</td>
</tr>
<tr>
<td>FACTOR GROUP/FACTOR</td>
<td>INDICATOR/MEASURE</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td><strong>TRANSPORTATION/UTILITIES</strong></td>
<td></td>
</tr>
<tr>
<td>Transportation Network/Infrastructure</td>
<td></td>
</tr>
</tbody>
</table>
| ▪ Transportation network | - Provision of Doon South Community access (Robert Ferrie Drive; E-W Collector) 
                             - Compatibility with RMOW New Dundee Road proposals |
| ▪ Traffic operations | - Road safety and accessibility (sight distance; turning movements) |
| ▪ Transportation policy initiatives | - Capability to support municipal policy initiatives (transit, active transportation, roundabouts) |
| Municipal Services and Utilities | |
| ▪ Municipal services | - Opportunities for connections to existing services 
                         - Provision of standard cross-section location for services 
                         - Provision of continuous services |
| ▪ Utilities (existing and proposed plant) | - Degree of exposure of utilities and/or utility conflicts with road design |
| **FINANCIAL/TECHNICAL** | |
| Financial | |
| ▪ Cost | - Estimated capital cost ($) 
               - Property requirements (number, area) 
               - Extraordinary operations and maintenance requirements/costs |
| Technical | |
| ▪ Roadway geometric design requirements | - Conformance to TAC and City of Kitchener/RMOW standards |
| ▪ Structural/foundation/pavement design requirements | - Conformance to TAC and City of Kitchener standards 
                                                           - Requirements for pavement depth and/or foundation footprint, based on soil conditions 
                                                           - Structural requirements relative to capital cost and long term maintenance requirements |
| ▪ Topographic; earth balance | - Potential for excessive borrow quantity or excessive off-site disposal of earth material (volume) 
                                 - Requirements for excessive (steep) grades (length) |
| ▪ Constructability | - Adequate access to corridor 
                        - Potential conflicts with existing infrastructure (other than utilities) 
                        - Provision of standard horizontal and vertical clearance requirements 
                        - Extraordinary staging requirements |

* Air Quality criteria were applied only to the Technically Preferred Alignment, due to the inability to distinguish between differences between alignment alternatives in close proximity to each other.

These Evaluation Criteria include refinements made on the basis of input by stakeholders during the spring of 2010, including comments received at Public Information Centre No. 1.

It should also be noted that there was consensus at the Project Team level that there would be no advantage to weighting the Evaluation Criteria during the assessment process. There was general agreement that graphic scoring (i.e., pie charts) can be used initially to score the degree to which alternatives meet project objectives/criteria, and that the most significant factors would emerge through further discussion and gauging of stakeholder values.
4.3 Development of Alignment Alternatives

The development of alignment alternatives for the Strasburg Road Extension was based on the following major considerations:

- The alignment of the Strasburg Road Extension from Rush Meadow Street to north of Stauffer Drive, established through the community planning process under the Planning Act, as described in Section 1.1 of this ESR, and the lands acquired by the City of Kitchener to accommodate the established alignment;
- The Strasburg Road Extension alignment between Rush Meadow Street and New Dundee Road shown on Map 4 Transportation in the City of Kitchener’s approved Municipal Plan;
- Study area sensitivities identified by the Consultant Team during the spring and summer of 2010; and
- Input received at Public Information Centre No. 1.

At its May 18, 2010 meeting, the Project Team agreed to modify the starting (origin) point for the alignment alternatives, away from the location of the south end of the established corridor for the Strasburg Road Extension, in order to provide additional flexibility to develop the alignment alternatives from north of Stauffer Drive to New Dundee Road. This involved pulling the point of origin for the alignment alternatives northerly to approximately 855 m north of the location of the future Strasburg Road/Robert Ferrie Drive shown in the city’s Municipal Plan. This adjustment resulted in the opportunity to develop alignment alternatives to the west of the property at 500 Stauffer Drive and some of the sensitivities identified in the Blair Creek corridor, which may not otherwise have been possible if the south end of the city-owned corridor (as shown in Figure 3.16) had been retained as the origin point for the alignment alternatives.

Nine (9) alignment alternatives were initially developed by the Consultant Team and were categorized under three series, based on the geographical location, as described below and shown in Figures 4.2a, 4.2b and 4.2c:

- **East Alignments (E1, E2, E3, E4)** – These alignments are based on the Strasburg Road Extension designated in the Kitchener Municipal Plan (which was retained as an option – Alignment E1). They reduce impacts to the B&B/agricultural operation to the east side of the property (compared to the Municipal Plan alignment), avoid the Stauffer Woods ESPA; retain the Reidel Drive scenic-heritage route; and/or relocate the existing Reidel Drive-Cameron Road/New Dundee Road intersection to a location that may provide better sight distance.

- **Central Alignments (C1, C2)** – These alignments limit impacts to the B&B/agricultural operation to the west side of the property; and/or relocate the existing Reidel Drive-Cameron Road/New Dundee Road intersection to a location that may provide better sight distance.

- **West Alignments (W1, W2, W3)** – These alignments minimize or avoid impacts to the B&B operation, the most sensitive groundwater recharge area; the Roseville Swamp - Cedar Creek PSW and large woodlot at the west end of the stream corridor; and/or relocate the existing Reidel Drive-Cameron Road/New Dundee Road intersection to a location that may provide better sight distance.

It is very important to note that there are two future east-west collector roads (Robert Ferrie Drive and Blair Creek Drive), as shown in the designated road network presented in Figure
3.12, that will intersect with the Strasburg Road Extension alignment and must be accounted for in the development and assessment of the alignment alternatives. It is expected that the exact alignment of future Robert Ferrie Drive and Blair Creek Drive will be determined through the plan of subdivision process. The alignments of these roads adopted for this Class EA, shown as dashed grey lines on the alignment figures below, reflect the best current information available to the Project Team and were deemed to represent reasonable assumptions.
Figure 4.2a: Long List of Alignment Alternatives (East Series)

**East 1 [E1]**
- Skirts west side of Stauffer Woods (ESPA 33) and connects to Reidel Drive 250 m south of Stauffer Drive to preserve Scenic-Heritage section of Reidel Drive designated as part of Doon South trail system.
- Uses existing Reidel Drive crossing point of Blair Creek
- Coincident with Regional Countryside Line
- Generally avoids direct new impacts to agricultural operation at 271 Reidel Drive and uses existing New Dundee/Reidel intersection

**East 2 [E2]**
- Diverges from Official Plan alignment at north end of farm/B&B operation
- Skirts east side of farm/B&B operation pond and west side of Stauffer Woods (ESPA 33)
- Connects to Reidel Drive 325 m south of Stauffer Drive to preserve Scenic-Heritage section of Reidel Drive designated as part of Doon South trail system
- Generally avoids direct new impacts to agricultural operation at 271 Reidel Drive and uses existing New Dundee/Reidel Drive intersection

**East 3 [E3]**
- Diverges from Official Plan alignment at north end of farm/B&B operation
- Skirts east side of farm/B&B operation pond and west side of Stauffer Woods (ESPA 33)
- Crosses narrow point of Blair Swamp PSW
- Connects to Central 1 500 m north of New Dundee Road and to New Dundee Road 260 m west of Reidel Drive to improve intersection sight distances compared to existing New Dundee/Reidel intersection

**East 4 [E4]**
- Diverges from Official Plan alignment at north end of farm/B&B operation
- Skirts east side of farm/B&B operation pond and west side of Stauffer Woods (ESPA 33)
- Crosses narrowest point of Blair Swamp PSW
- Swings east behind farm buildings at 271 Reidel Drive
- Intersects New Dundee Road at an angle compatible with opposing Cameron Road leg
Central 1 [C1]
• Diverges from Official Plan alignment at north end of farm/B&B operation
• Coincident with Lot 9/Lot 14 Concession BT property line to south limit of farm/B&B operation
• Crosses Blair Creek outside designated PSW
• Connects to New Dundee Road 260 m west of Reidel Drive to improve intersection sight distances compared to existing New Dundee/Reidel intersection

Central 2 [C2]
• Diverges from Official Plan alignment at north end of farm/B&B operation
• Coincident with Lot 9/Lot 14 Concession BT property line to south limit of farm/B&B operation
• Connects to Reidel Drive corridor 625 m south of Stauffer Drive, avoids direct new impacts to agricultural operation at 271 Reidel Drive and uses existing New Dundee/Reidel Drive intersection
At its August 26, 2010 meeting, the Project Team adopted these alignment alternatives for assessment.

4.4 Comparative Assessment and Evaluation of Alternatives

This section of the ESR describes the comparative assessment of the alignment alternatives for the Strasburg Road Extension.

The assessment process was completed in two stages, which were subject to stakeholder review through the consultation process described in Section 2.3 of this report:

- Stage 1 - Screening of the long list of alignment alternatives to a more manageable number for the purpose of conducting a detailed assessment (Spring 2011);

- Stage 2 - Detailed assessment of the short-listed alignment alternatives (Summer 2011).
At each stage, the advantages and disadvantages of the alternatives were evaluated against the ability of the options to fulfill the following set of project objectives derived from the problem and opportunity statement:

Primary Objective

- Provide for approved development and future growth (Doon South and other areas in southwest Kitchener), including traffic service and municipal services.

Secondary Objectives

- Relieve future demand on Homer Watson Boulevard, Huron Road and Fischer Hallman Road.
- Achieve compatibility with City and Regional policies for future growth and development, and the location of any related road intersections.
- Minimize impacts to natural heritage features and other important environmental resources.

The comparative assessment of alignment options included the use of “pie charts” as indicators of the degree to which technical discipline groups preferred an option (i.e., “Most Preferred” to “Least Preferred”). The adoption of pie charts, including the associated scale of preference indicators as a means for presenting the summary assessment of the project alternatives is widely used and accepted by the Ministry of the Environment. As was the case in this study, the use of the pie charts need not be accompanied by numerical scores. The pie charts are simply a means of helping the discipline specialists think about and summarize their comparative assessment, and convey this to the other members of the Project Team in a “snap shot” graphic. The pie charts have been accompanied by text in the summary matrices describing the most salient points of the assessment.

Similarly, since no numerical scoring is associated with the pie charts, no numerical weighting of the Evaluation Criteria or Factor Groups was attempted. Further, with a large multi-disciplinary Project Team (15-25 members at any given time) comprising such varied stakeholder interests, it was deemed impractical to attempt to achieve consensus on a numerical weighting of the evaluation criteria.

Rather, the most significant criteria were identified through Project Team discussions during the two-stage alignment assessment process. The most significant considerations emerging from the alignment assessment discussions included:

- Ability to provide highest level of transportation and municipal services to proposed/approved new development (Primary Objective);
- Compatibility with existing and proposed regional and municipal long range planning land use policies;
- Optimum crossing point of the Blair Creek corridor; and
- Balance of impacts to cultural heritage resources.

4.4.1 Screening of Long List of Alignment Alternatives

Figures 4.3a, 4.3b and 4.3c show the long list of alignment alternatives (9 options) in a consolidated manner in relation to study area features and sensitivities, including natural heritage, land use and cultural heritage components.
Figure 4.3a: Long List of Alignment Alternatives in Relation to Principal Natural Heritage Features

Jefferson Salamander Habitat Notes

Legend

Long List Alignment Alternatives

- E1
- E2
- E3
- E4
- C1
- C2
- W1
- W2
- W3
- S1
- S2

Significant Tree

MNR Wetland Designations

- SWT 2-2 (Willow Mineral Swamp Thicket)
- MAS 3-1 (Cattail Organic Shallow Marsh)
- MAM 3-6 (Broad-leaved Sedge Organic Meadow Marsh)
- SAM 1-4 (Pondweed Mixed Shallow Aquatic)
- FOD 3-1 (Dry Fresh Poplar Deciduous Forest)
- FOD 4-1 (Fresh Moist-Poplar Deciduous Forest)
- CUP 3-1 (Red Pine Coniferous Plantation)
- CUP 3-2 (White Pine Coniferous Plantation)
- CUT 1-7 (Hawthorn Buckthorn Cultural Thicket)

Jefferson Salamander Regulated Habitat

- SWD 2-2 (Yellow Birch Conifer Mixed Swamp)
- FOD 5-2 (Dry Fresh Sugar Maple-Beech Forest)
- FOD 6-5 (Fresh Moist Sugar Maple-Hardwood Forest)
- SWT 3-2 (Willow Organic Swamp Thicket)

Legend

Long List Alignment Alternatives

- E1
- E2
- E3
- E4
- C1
- C2
- W1
- W2
- W3
- S1
- S2

Significant Tree

MNR Wetland Designations

- SWT 2-2 (Willow Mineral Swamp Thicket)
- MAS 3-1 (Cattail Organic Shallow Marsh)
- MAM 3-6 (Broad-leaved Sedge Organic Meadow Marsh)
- SAM 1-4 (Pondweed Mixed Shallow Aquatic)
- FOD 3-1 (Dry Fresh Poplar Deciduous Forest)
- FOD 4-1 (Fresh Moist-Poplar Deciduous Forest)
- CUP 3-1 (Red Pine Coniferous Plantation)
- CUP 3-2 (White Pine Coniferous Plantation)
- CUT 1-7 (Hawthorn Buckthorn Cultural Thicket)

Jefferson Salamander Regulated Habitat

- SWD 2-2 (Yellow Birch Conifer Mixed Swamp)
- FOD 5-2 (Dry Fresh Sugar Maple-Beech Forest)
- FOD 6-5 (Fresh Moist Sugar Maple-Hardwood Forest)
- SWT 3-2 (Willow Organic Swamp Thicket)

Legend

Long List Alignment Alternatives

- E1
- E2
- E3
- E4
- C1
- C2
- W1
- W2
- W3
- S1
- S2

Significant Tree

MNR Wetland Designations

- SWT 2-2 (Willow Mineral Swamp Thicket)
- MAS 3-1 (Cattail Organic Shallow Marsh)
- MAM 3-6 (Broad-leaved Sedge Organic Meadow Marsh)
- SAM 1-4 (Pondweed Mixed Shallow Aquatic)
- FOD 3-1 (Dry Fresh Poplar Deciduous Forest)
- FOD 4-1 (Fresh Moist-Poplar Deciduous Forest)
- CUP 3-1 (Red Pine Coniferous Plantation)
- CUP 3-2 (White Pine Coniferous Plantation)
- CUT 1-7 (Hawthorn Buckthorn Cultural Thicket)

Jefferson Salamander Regulated Habitat

- SWD 2-2 (Yellow Birch Conifer Mixed Swamp)
- FOD 5-2 (Dry Fresh Sugar Maple-Beech Forest)
- FOD 6-5 (Fresh Moist Sugar Maple-Hardwood Forest)
- SWT 3-2 (Willow Organic Swamp Thicket)
Jefferson Salamander Habitat Notes

- Regulated Habitat within Class EA Study Area
- Recharge Areas

Legend

Long List Alignment Alternatives

- E1
- E2
- E3
- E4
- C1
- C2
- W1
- W2
- M1

MNR Wetland Designations

- C1 - Provincially Significant Wetland (PSW)
- E2 - Un-Evaluated Wetland
- E3 - Significant Tree

Figure 4.3a: Long List of Alignment Alternatives in Relation to Principal Natural Heritage Features (continued)

- Intermittent Reach
- Provides some indirect fish habitat
- May provide some seasonal fish habitat immediately upstream of Reidel Drive but is limited due to lack of channel definition

- Ephemeral Tributary
- Provides indirect fish habitat
- Permanent Coldwater Watercourse
- Provides direct fish habitat
- Barrier to fish passage (perched culvert) at Reidel Drive
Figure 4.3b: Long List of Alignment Alternatives in Relation to Land Use

Legend

- Long List Alignment Alternatives
- E1
- E2
- E3
- E4
- W1
- W2
- W3
- C1
- C2
- Land Parcel
- Countryside Line
- Noise Sensitive Area
- Future Collector Roads
- Required Extension of Proposed Collector Roads
Figure 4.3c: Long List of Alignment Alternatives in Relation to Principal Cultural Heritage Resources

Legend

Long List Alignment Alternatives

- E1  W1
- E2  W2
- E3  W3
- E4
- C1
- C2

- Historic Feature
- Historic Road
- Archaeological Potential
- Future Collector Roads
- Required Extension of Proposed Collector Roads
The nine alignment alternatives were screened against the evaluation criteria presented in Table 4.2, assuming a basic 30 m wide footprint, and the project objectives:

**Primary Objective**
- Provide for approved development and future growth (Doon South and other areas in southwest Kitchener), including traffic service and municipal services.

**Secondary Objectives**
- Relieve future demand on Homer Watson Boulevard, Huron Road and Fischer Hallman Road.
- Achieve compatibility with City and Regional policies for future growth and development, and the location of any related road intersections.
- Minimize impacts to natural heritage features and other important environmental resources.

The results were documented in summary matrices, which were presented to and reviewed by the Project Team at its May 10, 2011 meeting.

The full screening matrices are presented in Appendix C.1. The summary matrices are presented in Table 4.3.
### Table 4.3: Summary Screening of Long List of Alignment Alternatives

<table>
<thead>
<tr>
<th>EVALUATION FACTOR</th>
<th>ALIGNMENT ALTERNATIVE</th>
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<tbody>
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<td></td>
<td>WEST</td>
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<tr>
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<td>W1</td>
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<tr>
<td><strong>NATURAL ENVIRONMENT</strong></td>
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<tr>
<td>Terrestrial Ecosystems</td>
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<td>Aquatic Ecosystems</td>
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<tr>
<td>Surface Drainage</td>
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**SUMMARY**
- W1 is the preferred option with respect to potential impacts to natural heritage features because it avoids crossings of the Blair Creek corridor (including the major Dry Fresh Sugar Maple-Beech Forest (FOD 5-2) at the west end, the Roseville Swamp - Cedar Creek Provincially Significant Wetland (PSW) and Species at Risk habitat regulated area) and the most sensitive groundwater recharge area. It would also create less of a barrier to wildlife movement because it does not cross contiguous natural features associated with the creek corridor.
- Central and West alternatives that involve new crossings of the Blair Creek corridor are slightly preferred to more easterly ones with respect to potential impacts to aquatic resources because the creek is more ephemeral/intermittent in that area. E1 is the only alternative that would displace the pond north of Stauffer Drive.
- Alternatives with alignments close to and parallel with the creek corridor (W3 and C2) may be more problematic with respect to potential impacts to the groundwater regime and flood plain.
### EVALUATION FACTOR

<table>
<thead>
<tr>
<th>EVALUATION FACTOR</th>
<th>ALIGNMENT ALTERNATIVE</th>
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<td>WEST</td>
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<td>W1</td>
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#### SOCI-ECONOMIC ENVIRONMENT

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<thead>
<tr>
<th>Land Use</th>
<th>W1</th>
<th>W2</th>
<th>W3</th>
<th>C1</th>
<th>C2</th>
<th>E1</th>
<th>E2</th>
<th>E3</th>
<th>E4</th>
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**SUMMARY**

- Alternative W1 is the least compatible with City of Kitchener and Region of Waterloo land use policy initiatives with respect to protection of agricultural land and rural areas. The further west of the designated Countryside Line (Reidel Drive) an alignment is, the more pressure there would be for expansion of the urban area into designated Protected Countryside in the Prime Agricultural Area and the Rural Area. E1 exhibits a high degree of compatibility because it is the alignment identified in the existing City of Kitchener Official Plan and appears to have been used to define the north-south segment of the Countryside Line in this area.

- W1 would take the most land with highest capability to support agricultural uses (Class 1-3; Specialty Crop) out of production. Alignments that utilize the existing Reidel Drive corridor to the largest degree (E1 and E2) would displace the least agricultural land. Other East alignments (E3 and E4) would affect only a nominal amount of prime agricultural land (mostly Class 4-7 land).

- Impacts to the agricultural community are generally similar for all alternatives, based on the number of severances, with E1 creating only one severance. Alternative C2 makes good use of existing property lines and existing Reidel Drive to minimize severances. E1 represents the highest potential for displacement of the existing bed and breakfast/farm operation north of Stauffer Drive due to proximity to the buildings and encroachment on the associated outdoor living areas.

- The roadway represents a new/ altered noise source in close proximity to the two homes on Stauffer Drive and Reidel Drive. Alignments W1 and W2 would result in the least impact based on distance from the homes. Alignments C1/C2, E2 and E4 have the potential to create the highest degree of change in sound levels due to the introduction of a new roadway adjacent to the homes and their outdoor living areas (assuming E1 displaces the home on Stauffer Drive).
### CULTURAL ENVIRONMENT

#### Archaeological Resources

- W1
- W2
- W3
- C1
- C2
- E1
- E2
- E3
- E4

#### Heritage Resources

- W1
- W2
- W3
- C1
- C2
- E1
- E2
- E3
- E4

**SUMMARY**

- Alignments W1 and W2 exhibit the least potential for disturbance of heritage resources due to their distance from existing/former historic transportation corridors and limited impact to the Blair Creek corridor.
- Alignments that will significantly alter the existing Reidel Drive cultural heritage landscape/scenic heritage resource (W3, C2, E1, E2) are less preferable than the more westerly options.
- Alignment E1 is least preferred due to its potential to displace the century farm on Stauffer Drive, combined with its impacts on Reidel Drive.
### TRANSPORTATION/UTILITIES

#### Transportation Network/Infrastructure

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<tr>
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<tbody>
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<td>E1</td>
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<tr>
<td>W2</td>
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<td>E4</td>
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#### Municipal Services/Utilities

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### SUMMARY

- Alignment W1 is least preferred because it has the least potential to meet traffic service objectives and will result in the greatest impacts to existing local roads. Traffic from new development in Doon South will not use the new roadway to the intended level and traffic from that area will infiltrate existing neighbourhoods to the north.
- Alternatives E1 and E2 are the most likely to meet traffic service objectives, including diverting traffic from Homer Watson Boulevard and Huron Road.
- Similarly, the West alignments are least compatible with City of Kitchener and Region of Waterloo municipal servicing objectives and plans, requiring extension and additional infrastructure to properly serve the Doon South Community, whereas Alignments E1 and E2 would best meet City and Regional objectives.
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<tr>
<th>EVALUATION FACTOR</th>
<th>ALIGNMENT ALTERNATIVE</th>
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**SUMMARY**
- Alignments W1 and W2 are the least preferred alternatives with respect to construction cost, primarily because of the greater length of east-west collector roads (Robert Ferrie Drive and Blair Creek Drive in Doon South) and the associated services carried in the those corridors. W1 would also have the highest operations/maintenance costs.
- Alignment E1 has the least construction cost, but the City would likely incur significant costs associated with a full buy-out of the bed and breakfast/farm operation on Stauffer Drive (not estimated here).
- The construction costs of the remaining alternatives would be relatively similar.
- The technical aspects of the alternatives are generally similar, but E1 may be the least complex to construct with respect to accessibility (greatest use of an existing road allowance - Reidel Drive).

**SHORT LIST: ALIGNMENTS RECOMMENDED FOR FURTHER DETAILED ANALYSIS**

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<tr>
<th>WEST</th>
<th>CENTRAL</th>
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<tr>
<td>W1</td>
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<tr>
<td>W2</td>
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It was deemed appropriate to retain at least one option from each of the East, Central and West series of alignments. The initial recommendations emerging from the May 2011 Project Team meeting were that the following three (3) alignment alternatives be retained:

- Alignment E2 - based on a balance of transportation service and environmental considerations;
- Alignment C2 - based on a balance of transportation service and environmental considerations; and
- Alignment W1 – based on the potential to reduce or eliminate most direct short term environmental impacts.

The following key considerations and actions should be noted:

### West Series

- **Alignment W1** - Retention of Alignment W1 was not favoured by some of the Project Team members (Region of Waterloo) based on potential traffic service deficiencies and the significant encroachment on the Region's Countryside designation. On a consensus level, these shortcomings were acknowledged by the team, as was the expectation that these factors would come to the fore during the detailed assessment. The potential pressure to retain an option that would eliminate most of the potential direct short term environmental impacts created by other options (the primary advantage of Alignment W1) was also considered. There was some discussion on retaining one of the other West options that may exhibit better servicing attributes, rather than W1, but it was agreed that W1 should be retained.

- **Alignments W2** – Alignment W2 was discarded based on the combination of the following major considerations:
  
  - vi. Inability to provide transportation and municipal services to Doon South Community in an efficient and cost-effective manner (distance from users; relatively high capital and operations/maintenance costs associated with extension of future Blair Creek Drive and municipal services in this road corridor);
  
  - vii. Degree of incompatibility with long range land use planning policies (encroachment on Countryside area);
  
  - viii. Crossing of Blair Creek corridor at a relatively sensitive point (sugar maple-beach forest and meadow marsh inclusion that extend to the east from the mixed swamp in the woodlot at the western end of the creek corridor);
  
  - ix. Impacts to traffic operations in New Dundee Road corridor as a result of introducing an additional intersection leg from the north, and the introduction of staggered intersection with for motorists travelling south to Cameron Road.

- **Alignment W3** - Alignment W3 was discarded based on the combination of the following major considerations:

  - x. Inability to provide transportation and municipal services to Doon South Community in an efficient and cost-effective manner (distance from users; relatively high capital and operations/maintenance costs associated with extension of future Blair Creek Drive and municipal services in this road corridor);
xi. Degree of incompatibility with long range land use planning policies (encroachment on Countryside area);

xii. Crossing of Blair Creek corridor at a relatively sensitive point (sugar maple-beach forest that extends to the east from the woodlot at the western end of the creek corridor).

In summary, Alignment W1 was retained based solely on its advantages in avoiding most the major natural heritage sensitivities in the study area, while Alignments W2 and W3 could not match these advantages and exhibited disadvantages associated with level of service and incompatibility with long range planning policy directions.

Central Series

- **Alignment C1** – Although it has the advantage of distributing property impacts equitably between 500 Stauffer Drive and Activa lands north of Stauffer Drive (this is the basis on which it was originally developed), Alignment C1 was discarded based on the combination of the following disadvantages, which are associated principally with the segment south of Stauffer Drive, where it is different from Alignment C2 (carried forward):

  xiii. Inability to provide transportation and municipal services to Doon South Community in an efficient and cost-effective manner (distance from users; relatively high capital and operations/maintenance costs associated with extension of future Blair Creek Drive and municipal services in this road corridor);

  xiv. Degree of incompatibility with long range land use planning policies (encroachment on Countryside area);

  xv. Relatively long crossing of Blair Creek corridor;

  xvi. Impacts to traffic operations in New Dundee Road corridor as a result of introducing an additional intersection leg from the north, and the introduction of staggered intersection with for motorists travelling south to Cameron Road.

- **Alignment C2** – Although this alignment has essentially the same length of crossing as Alignment C1 over the Blair Creek corridor, it does not exhibit the same disadvantages with respect to encroachment on the Countryside area, level of service and traffic operations in the New Dundee Road corridor as C1. Therefore, this alignment was retained from the Central Series.

East Series

- **Alignment E1** – although Alignment E1 is shown as the Strasburg Road Alignment corridor in the current City of Kitchener Municipal Plan, it was discarded due to the severity of impacts to (virtual displacement of) the pond, house and B&B business at 500 Stauffer Drive, and the added cost of full buyout of this property.

- **Alignment E2** – Alignment E2 was initially selected as the option to be retained from the East Series of alignments based primarily on its ability to satisfy the primary project objective and its degree of compatibility with long range planning policy directions.

- **Alignments E3 and E4** – Based on the level of information available at the time of the initial screening of alignment options, Alignments 3 and 4 were ranked below Alignment E2 key Socio-Economic and Transportation criteria, but showed more
promise with respect to key Natural Environment criteria, including crossing the Blair Creek corridor at potentially less sensitive areas. To finalize opinions on which East alignment(s) should be retained, a site visit of the Blair Creek corridor was conducted by SLI primarily for City, GRCA and RMOW staff to view sensitivities and potential impacts associated with Alignments E3 and E4 prior to PIC No. 2 (presentation of short-listed alignment alternatives). Ultimately, it was agreed that both Alignment E3 and Alignment E4 should be added to the short list of options to be carried forward for more detailed assessment, based on their potential to minimize the impacts of a Blair Creek crossing.

Therefore, the following alignment alternatives (shown in Figure 4.4) were presented at PIC No. 2 as the options the Project Team recommended for more detailed assessment.

- Alignment E2
- Alignment E3
- Alignment E4
- Alignment C2
- Alignment W1
Figure 4.4: Short-Listed Alignment Alternatives
4.4.2 Detailed Comparative Assessment of Short List of Alignment Alternatives

Whereas the initial nine (9) alignment alternatives were screened using the basic 30 m right-of-way for the roadway, the five (5) short-listed alignment alternatives were developed further to define their footprint based on their respective earthworks requirements, including nominal working easements (i.e., placing the basic 30 m right-of-way within the topographic relief, and the associated grading required to meet the geometric criteria presented in Table 4.1).

Figures 4.5a, 4.5b and 4.5c illustrate the short-listed alignment footprints, used for the detailed assessment in relation to study area features and sensitivities, including natural heritage, land use and cultural heritage components.
Jefferson Salamander Habitat Notes

Legend

<table>
<thead>
<tr>
<th>Short-Listed Alignment Alternatives</th>
<th>MNR Wetland Designations</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>SWT 2-2 (Willow Swamp Thicket)</td>
</tr>
<tr>
<td>C2</td>
<td>MAS 3-1 (Cattail Marsh)</td>
</tr>
<tr>
<td>E2</td>
<td>MAS 3-6 (Broad-leaved Sedge Marsh)</td>
</tr>
<tr>
<td>E3</td>
<td>SAM 1-4 (Pontic Sedge Marsh)</td>
</tr>
<tr>
<td>E4</td>
<td>FOD 3-1 (Dry Fresh Poplar Deciduous Forest)</td>
</tr>
<tr>
<td>W1</td>
<td>FOD 6-1 (Fresh Moist Poplar Deciduous Forest)</td>
</tr>
</tbody>
</table>

Jefferson Salamander Regulated Area within Class EA Study Area

Recharge Areas

Figure 4.5a: Footprints of Short-Listed Alignment Alternatives in Relation to Principal Natural Heritage Features

---

Jefferson Salamander Habitat Notes

MNR Wetland Designations

- SWT 2-2 (Willow Swamp Thicket)
- MAS 3-1 (Cattail Marsh)
- MAS 3-6 (Broad-leaved Sedge Marsh)
- SAM 1-4 (Pontic Sedge Marsh)
- FOD 3-1 (Dry Fresh Poplar Deciduous Forest)
- FOD 6-1 (Fresh Moist Poplar Deciduous Forest)
- FOD 5-2 (Dry Fresh Sugar Maple-Beech Forest)
- FOD 6-5 (Fresh Moist Sugar Maple-Beech Forest)
- SWT 3-2 (Willow Organic Swamp Thicket)

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Additional Notes

For specific details on the Jefferson Salamander Habitat Notes, please refer to the Jefferson Salamander Habitat Notes document. For more information on the Short-Listed Alignment Alternatives, please refer to the Short-Listed Alignment Alternatives document.
Jefferson Salamander Habitat Notes

Regulated Habitat within Class EA Study Area

Recharge Areas

Jefferson Salamander

Short-Listed Alignment Alternatives

C2
E2
E3
E4
W1

Legend

MNR Wetland Designations

Provincially Significant Wetland (PSW)

Un Evaluated Wetland

Significant Tree

Jefferson Salamander Regulated Habitat

Figure 4.5a: Footprints of Short-Listed Alignment Alternatives in Relation to Principal Natural Heritage Features (continued)

Permanent Coldwater Watercourse
Provides direct fish habitat
Barrier to fish passage (perched culvert) at Reidel Drive

Intermittent Reach
Provides some indirect fish habitat
May provide some seasonal fish habitat immediately upstream of Reidel Drive but is limited due to lack of channel definition

Ephemeral Tributary
Provides indirect fish habitat
Figure 4.5b: Footprints of Short-Listed Alignment Alternatives in Relation to Land Use, Agricultural Capability and Property Fabric

Parcel Ownership
1 City of Kitchener (including designated allowance for Strasburg Road Extension)
2 Freure Developments
3 Hallman Construction
4 Sunvest Reid
5 500 Stauffer Drive
6, 8 Activa Holdings
7 Stonefield Development
Figure 4.5c: Footprints of Short-Listed Alignment Alternatives in Relation to Cultural Heritage Features
The short-listed alignment alternatives were subjected to a detailed assessment by the Consultant Team during the summer of 2011, using the evaluation criteria presented in Table 4.2. The results were documented in a summary brief, which was provided to the Project Team for review, and presented to the Project Team at its September 26, 2011 meeting.

The full assessment matrices are presented in Appendix C.2. The summary matrices are presented in Table 4.4.
Table 4.4: Summary Assessment of Short-Listed Alignment Alternatives

<table>
<thead>
<tr>
<th>EVALUATION FACTOR</th>
<th>ALIGNMENT ALTERNATIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>WEST</td>
</tr>
<tr>
<td>Natural Environment</td>
<td></td>
</tr>
<tr>
<td>Terrestrial Ecosystems (Vegetation)</td>
<td></td>
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<tr>
<td>Terrestrial Ecosystems (Wildlife)</td>
<td></td>
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<tr>
<td>Aquatic Ecosystems</td>
<td></td>
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<tr>
<td>Groundwater Resources</td>
<td></td>
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<tr>
<td>Surface Drainage</td>
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</table>

Least Preferred | Most Preferred
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<thead>
<tr>
<th>EVALUATION FACTOR</th>
<th>ALIGNMENT ALTERNATIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>WEST</td>
</tr>
<tr>
<td>Natural Environment Summary</td>
<td></td>
</tr>
<tr>
<td>• W1 is the preferred option with respect to minimizing or eliminating potential direct short term impacts to natural heritage features because it avoids crossings of the Blair Creek corridor (including the significant woodlot at the west end, the Roseville Swamp - Cedar Creek Provincially Significant Wetland (PSW), Species at Risk (SAR) habitat regulated area, and regulated floodplain area) and the most sensitive groundwater recharge area. It would also create less of a barrier to wildlife movement because it does not cross contiguous natural features associated with the creek corridor. However, Alignment W1 has the potential to create the greatest shift in the urban envelope, including the western boundary of the Brigadoon South and Doon South Phase 2 Community areas, if the Countryside Line is relocated to coincide with this alignment. If this shift occurs, the natural heritage features in the Blair Creek corridor, as well as additional areas within the Regional Recharge Area initially avoided with the alignment may ultimately come under increased pressure from urban development (refer to Section 4.5).</td>
<td></td>
</tr>
<tr>
<td>• E2 and C2 are the least preferred due to large (E2), or multiple crossings (C2) which result in higher impacts to wetlands, aquatic habitat, wildlife passage, SAR habitat, and groundwater resources. E2 is good from a surface drainage perspective because it minimizes the number of new drainage outlets required.</td>
<td></td>
</tr>
<tr>
<td>• E3 and E4 have lower impacts to natural heritage features than E2 and C2 due to narrower crossings of the Blair Creek Corridor. E3 is preferred to E4 in this regard.</td>
<td></td>
</tr>
<tr>
<td>Socio-Economic Environment Summary</td>
<td></td>
</tr>
<tr>
<td>• With respect to land use, significant weight was attached to compatibility with the Region of Waterloo’s Countryside Line and the City of Kitchener’s urban-rural boundary, in association with the approved limits of the</td>
<td></td>
</tr>
</tbody>
</table>
Doon South Community. Alignment E2 exhibits the highest degree of compatibility with land use policies, imposes the least impacts to prime agricultural lands and agricultural operations, and is the preferred option. However, E2 imposes the most impacts to the B&B business at 500 Stauffer Drive. Alignments E3, E4 and C2 exhibit different degrees of compatibility, but are considered equal in the overall assessment (moderate degree of compatibility). Although W1 imposes the least impacts to the B&B business at 500 Stauffer Drive, it exhibits the lowest degree of compatibility with policy directions (including the potential for increased pressure on, or loss of prime agricultural land, if the Countryside Line is relocated to coincide with this alignment and the urban envelope is expanded). It also exhibits the most direct impacts to agricultural resources and operations and is the least preferred option.

- Alignment E2 is preferred with respect to community impacts based on its potential to minimize property takings and define the limits of the Doon South Phase 2 Community. However, E3 or E4 represent the best opportunities for maintaining or enhancing community connectivity, when considering retaining the existing Reidel Drive corridor as part of the future Doon South trail system to enhance connectivity. See also Cultural Environment Summary.

- Background noise will increase in the study area due to natural growth in traffic. W1 is the preferred option acoustically (only one sensitive receptor would experience significant noise increases), but there are few receptors in the study area (key receptors are 500 Stauffer Drive and 271 Reidel Drive).

### EVALUATION FACTOR

<table>
<thead>
<tr>
<th>EVALUATION FACTOR</th>
<th>ALIGNMENT ALTERNATIVE</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>WEST</td>
</tr>
<tr>
<td>Archaeological Resources</td>
<td>W1</td>
</tr>
<tr>
<td>Heritage Resources</td>
<td>W1</td>
</tr>
<tr>
<td>Cultural Environment Summary</td>
<td>W1</td>
</tr>
</tbody>
</table>

- W1 is the preferred option with respect to potential impacts to cultural heritage features because it avoids all cultural heritage units (homesteads and roadscapes) along the existing Reidel Drive corridor, minimizes impacts to those north of Stauffer Drive, and avoids areas with higher archaeological potential near the Blair Creek corridor.

- E2 and C2 are the least preferred options, given that both alignments will result in the displacement of CHL 6, as well as the farmhouse at CHL 1, given its close proximity to Reidel Drive. E2 would also impact CHL 2, CHL
### EVALUATION FACTOR

<table>
<thead>
<tr>
<th>WEST</th>
<th>CENTRAL</th>
<th>EAST</th>
</tr>
</thead>
<tbody>
<tr>
<td>W1</td>
<td>C2</td>
<td>E2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>E3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>E4</td>
</tr>
</tbody>
</table>

3, CHL 4 and CHL 5 through disruption. C2 will also impact CHL 7 through disruption.

- E3 and E4 have lower impacts to cultural heritage features compared to E2 and C2 due to avoiding scenic roadscapes along Reidel Drive (CHL-3, CHL-6).

---

### TRANSPORTATION/UTILITIES

#### Transportation Network/Infrastructure

- E2 is the preferred option with respect to compliance with transportation/municipal services policies, and also shows the highest projected use for passenger vehicle and public transit usage. The use of existing Reidel Drive makes this preferred from a servicing perspective as well.

- E4 and C2 are moderate options in these regards due to partial use of the existing Reidel Drive corridor with E4 being slightly higher than C2 because its alignment north of Stauffer Drive is more consistent with transportation/municipal services policy.

- E3 and W1 are the least preferred options since their distance from existing infrastructure reduces projected usage by passenger vehicles and transit users and reduces demand/connectivity for services/utilities, while increasing new infrastructure requirements. They also create the need for a staggered (E3), or additional (W1) intersection with New Dundee Road which are not desirable in terms of achieving efficient traffic operations in the New Dundee Road corridor.
### Financial/Technical Summary

- E2 is the preferred option from a financial perspective, with the lowest capital and operational costs. E3, E4, and C2 have similar capital and operational costs. W1 has the highest capital and operational costs, making it the least preferred option financially. W1 also requires longer road and service extensions for the side roads which further increase both the capital cost and operating costs.
- W1 is the easiest to construct from a technical perspective due to the avoidance of large crossing structures and the need to clear/grub vegetation, while C2 is the least preferred option due to requirement for two watercourse crossing structures.
- It should be noted that technical considerations are relative only, and all options are technically feasible.
The Consultant Team did not offer a recommendation on the Technically Preferred Alignment to the Project Team. Rather, the September 26, 2011 Project Team was organized as a workshop, wherein the detailed assessment was presented to the Project Team by various Consultant Team discipline specialists to ensure that all Project Team members gained a full appreciation of the potential advantages and disadvantages associated with the alignment alternatives, and that there was open discussion in this regard. The identified advantages and disadvantages were then enumerated by the full Project Team and round table discussion ensued to select the Technically Preferred Alignment.

The advantages and disadvantages of the alignments, as identified by the Project Team, are summarized in Table 4.5. Note that the advantages and disadvantages of Alignments E2, E3 and E4 are common north of Stauffer Drive, since the alignments are coincidental.

**Table 4.5: Summary of Advantages and Disadvantages of Short-Listed Alignments**

<table>
<thead>
<tr>
<th>W1</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avoids Natural Features in Blair Creek corridor; groundwater recharge areas.</td>
<td>Does not meet traffic operation, transit, or servicing objectives.</td>
<td></td>
</tr>
<tr>
<td>Avoids most direct impacts to Cultural Heritage Landscape features.</td>
<td>Highest amount of prime agricultural lands out of production.</td>
<td></td>
</tr>
<tr>
<td>Lowest noise impacts.</td>
<td>Requires highest amount of private property.</td>
<td></td>
</tr>
<tr>
<td>Least impacts to B&amp;B business.</td>
<td>Most expensive from a capital cost, maintenance, and servicing perspective.</td>
<td></td>
</tr>
<tr>
<td>Most constructible.</td>
<td>Does not meet land use policy objectives. Most intrusive to Protected Countryside, with the potential to create the greatest shift in the urban envelope.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C2</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most equitable property impacts north of Stauffer Drive.</td>
<td>Does not fully meet traffic operations, transit or servicing objectives.</td>
<td></td>
</tr>
<tr>
<td>Reduces proximity impacts to B&amp;B business compared to East alignments.</td>
<td>Largest impact to Natural Heritage Features including wetlands, regulated SAR habitat, streams and fish habitat (2 crossings), wildlife passage, groundwater recharge areas (including surface/groundwater interactions).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>B&amp;B business still affected to some degree by both Strasburg Road and Robert Ferrie Drive.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Impacts on one Cultural Heritage Landscape and a scenic roadscape.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Two directly impacted sensitive noise receptors.</td>
<td></td>
</tr>
<tr>
<td>E2 (E2/E3/E4 North of Stauffer Drive)</td>
<td>Advantages</td>
<td>Disadvantages</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>------------</td>
<td>---------------</td>
</tr>
<tr>
<td><strong>Advantages</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Best from a traffic operation, transit, and servicing perspective..</td>
<td></td>
<td>Most challenging to construct.</td>
</tr>
<tr>
<td>Least impacts to existing agricultural operations.</td>
<td></td>
<td>Intrusive to Protected Countryside (north of Stauffer Drive).</td>
</tr>
<tr>
<td>Least expensive from a capital cost, maintenance, and servicing perspective.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Least intrusion on Protected Countryside, and highest overall conformance with Official Plan and policies.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Disadvantages</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impacts to Natural Features in Blair Creek corridor, farm pond.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highest impact to Cultural Heritage Landscapes (houses and scenic roadscapes).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highest impacts to B&amp;B business.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two directly impacted sensitive noise receptors.</td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>E3</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advantages</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short crossing of Blair Creek minimizes impacts to Natural Heritage features including wetland, streams and fish habitat, groundwater resources, wildlife. Best among E alignments.</td>
<td></td>
<td>Does not meet traffic operations objectives (creates an additional intersection on New Dundee Road close to Cameron), or transit and servicing objectives.</td>
</tr>
<tr>
<td>Provides best opportunity to enhance scenic trail network in Reidel Drive corridor.</td>
<td></td>
<td>Intrusive to the Protected Countryside south of Stauffer Drive.</td>
</tr>
<tr>
<td><strong>Disadvantages</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Highest impacts to B&amp;B/Conference Centre business (common to all East alignments)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Two directly impacted sensitive noise receptors.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Highest property impacts among East alignments.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>E4</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advantages</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adequate for traffic, transit, and servicing objectives.</td>
<td></td>
<td>Impacts to Natural Environmental features slightly worse than E3 due to a poorer crossing of Blair Creek.</td>
</tr>
<tr>
<td>Less intrusive to Protected Countryside than all alignments, except E2.</td>
<td></td>
<td>Highest impacts to B&amp;B/Conference Centre business (common to all East alignments)</td>
</tr>
<tr>
<td><strong>Disadvantages</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Two directly impacted sensitive noise receptors.</td>
</tr>
</tbody>
</table>
4.5 **Technically Preferred Alignment**

Following is the rationale for selection of the Technically Preferred Alignment by the Project Team, which was determined through a process of elimination.

### 4.5.1 Selection of Technically Preferred Alignment

**West Alignment (W1)**

While Alignment W1 exhibits distinct initial advantages with respect to avoiding direct impacts to the natural heritage features in the Blair Creek corridor (and would, therefore, likely be the easiest to construct); and would impose the least impacts to cultural heritage resources and the B&B business at 500 Stauffer Drive (670 m removed from house; least proximity (noise) impacts) it has the following disadvantages:

- It has the least potential to meet the primary project objectives of serving traffic and transit demand in approved and future development in southwest Kitchener, specifically the Doon South Community. Average daily traffic volumes using this alignment would be in the order of 10% lower than those using the most easterly alignments. This has the potential for increasing traffic infiltration through existing local Brigadoon and Doon South neighbourhoods north and east of Doon South Phase 2, where some streets are already under pressure during peak travel periods (e.g., Caryndale Drive, Robert Ferrie Drive, Doon South Drive, Doon Mills Drive and Doon Village Road), which may, in turn, adversely affect the level of service at a number of local road intersections;

- It has the least potential to meet other transportation objectives, including minimizing cycling and walking distances to enhance attractiveness for transit ridership (more walking distance from OMB-approved subdivisions for transit riders). Further, it is expected that bus routes in the area would have to travel entirely on local.

- It does not meet Region of Waterloo of City of Kitchener objectives related to providing and maintaining municipal services in southwest Kitchener, specifically the Doon South Community. This includes additional capital, operations and maintenance costs associated with the extra length of services carried in the future Robert Ferrie Drive and Blair Creek Drive corridors;

- It is the least compatible with Regional and City land use policy direction related to protection of agricultural and rural resources. Its encroachment well into the Protected Countryside area is almost exclusively within the Prime Agricultural Land designation;

- It will have the most impacts to existing agricultural lands and farming operations. It will result in taking the largest amount (9.98 ha) of prime agricultural land out of production, since it traverses primarily Class 2 and Class 3 lands. This is almost ten times the amount of prime agricultural land occupied by the option with least impact on Class 1-3 lands. It will also create the most severances on land parcels that are currently being farmed (8);

- An additional intersection will be formed at Strasburg Road and New Dundee Road about 730 m west of the existing intersection at Reidel Drive/Cameron Road and New Dundee Road. This is not conducive to the Region of Waterloo’s aspirations for New Dundee Road to function as a regional arterial road (an additional traffic flow impediment is introduced);
- This alignment requires the most private property (requires land from 7 individual private properties; 19.99 Ha, including 3.34 Ha for future Robert Ferrie Drive and 3.36 Ha for future Blair Creek Drive); and
- This alignment would cost the most to build ($20.1 Million), operate and maintain.

As an over-arching concern, given the property ownership in the study area (the vast majority of the lands are held by development interests) and the fact that the future Strasburg Road corridor has historically been used to define both the Regional Countryside Line and the City’s urban-rural boundary, the Project Team feels that it is not unreasonable to suggest that Alignment W1 has the potential to create the greatest shift in the urban envelope, including the western boundary of the Brigadoon South and Doon South Phase 2 Community areas. If this shift occurs, the natural heritage features in the Blair Creek corridor, as well as additional areas within the Regional Recharge Area initially avoided with the alignment may ultimately come under increased pressure from urban development, thereby compromising the rationale for developing this alignment in the first place. This potential is illustrated in Figure 4.6.

These disadvantages are of particular concern to the Region of Waterloo (refer to September 6, 2011 and April 19, 2012 correspondence from the Region to the City of Kitchener in Appendix B) and the City’s long range planning staff.

**Figure 4.6: Potential Shift in Urban Envelope Associated with Alignment W1**
In the foregoing regard, reviewers may also refer to the Region of Waterloo’s report entitled Regional Transportation Master Plan: Implications of Southwest Kitchener Development Beyond Countryside Line (DOCS #803593). The document presents a review of the transportation implications of potential development in southwest Kitchener beyond the Countryside Line, based on assumptions related to the use of lands for residential and employment purposes. The area under consideration, as shown in Figure 3.13 of this ESR, is bounded by Reidel Drive on the east, New Dundee Road on the south, Trussler Road on the west and an irregular boundary to the north, and includes approximately 85% of the Strasburg Road Extension Class EA study area. The report concludes that there would be significant challenges in providing new and expanded transportation/transit infrastructure and services needed to support such development, including additional capacity on the Strasburg Road Extension, which is considered to be “environmentally constrained”. The report clearly identifies the Region’s concerns over any potential expansion of the current limit of development identified in the Regional Official Plan from a transportation perspective.

Based on the foregoing disadvantages, the Project Team recommends that **Alignment W1 not be adopted as the Technically Preferred Alignment**.

Central Alignment (C2)

Alignment C2 would impose the most equitable distribution of property impacts north of Stauffer Drive by virtue of the fact that it straddles the boundary between 500 Stauffer Drive and Activa lands. It would also situate Strasburg Road on the west side of the B&B business at 500 Stauffer Drive, minimizing to some degree the impacts to this easterly oriented operation. However, this alignment exhibits the following disadvantages that are deemed to outweigh its advantages:

- Similar to Alignment W1, it does not fully meet traffic operations, transit or servicing objectives due to distance from planned communities north of Stauffer Drive;

- Due to the width of the Blair Creek crossing, it would impose the largest impact to Natural Heritage Features including wetlands, regulated Species at Risk habitat, streams and fish habitat (2 crossings), wildlife habitat, groundwater recharge areas (including surface/groundwater interactions). As the study progressed, based on discussions with GRCA and MNR, it is expected that the window/gap in the Provincially Significant Wetland area within the Blair Creek corridor within which this alignment is situated will disappear and all vegetation communities within the corridor will be included in the PSW complex\textsuperscript{20}. If the PSW boundaries are reviewed, it is expected that additional “complexing” will include the heretofore unevaluated wetlands north and south of Stauffer Drive that would likely have to be drained and filled to construct Alignment C2;

- The B&B operation will still be somewhat adversely affected (noise impacts) by the Strasburg Road alignment to the west and the extension of Robert Ferrie Drive to the

\textsuperscript{20} MNR staff have reviewed the information in the draft ESR for the Roseville Swamp – Cedar Creek provincially significant wetland complex within the study area, and have advised the Project Team that the previously unevaluated wetland north of Stauffer Drive is now considered provincially significant. GRCA has expressed interest in reviewing boundaries of this PSW in the Upper Blair Creek corridor. If the Conservation Authority provides MNR with new information, or if new information becomes available through MNR’s review of the ESR, the details of the wetland complex (e.g., boundary) may be reviewed.
north, both of which would be approximately 270 m from and downwind of the main building; and

- This option will affect the western periphery of the Cultural Heritage Landscapes at 500 Stauffer Drive (CHL 2) and on the Activa lands (CHL 7), displace a significant segment of the Reidel Drive scenic-heritage roadscape (CHL 6), and possibly displace the house at 271 Reidel Drive (CHL 1), depending on the ultimate grading requirements at this location.

Based on the foregoing disadvantages, the Project Team recommends that **Alignment C2 not be adopted as the Technically Preferred Alignment.**

**East Alignments (E2, E3, E4)**

North of Stauffer Drive, Alignments E2, E3 and E4 share the same advantages and disadvantages because they are coincident. The Project Team recognizes that these alignments would be the most disruptive to the B&B business and Cultural Heritage Landscape (CHL 2) at 500 Stauffer Drive. In addition, they are closest to the farm pond at 500 Stauffer Drive, a dug pond that supports a localized aquatic terrestrial ecosystem, and will sever the internal connection between the house and the woodlot in the northeast corner of the property.

However, the alignment north of Stauffer Drive:

- Will result in the least impacts to agricultural operations in terms of severances (including the farm at 500 Stauffer Drive) and take the least prime agricultural land out of production;
- Is considered the most effective alignment from a traffic operation, transit, and municipal servicing perspective because it is the closest to existing and approved/planned communities;
- Is the least expensive from capital cost, operations and maintenance perspectives; and
- Would be most compatible with Regional and City long range planning policy directions (no intrusion into the Countryside area).

The remainder of the discussion here focuses on the East alignments south of Stauffer Drive.

**Alignment E2** – is favoured by the Region of Waterloo because it would result in the least intrusion on the Countryside area; is optimal from a traffic operation, transit, and municipal servicing perspective (since it uses the existing Reidel Drive corridor and is the closest to OMB approved development in Doon South Phase 2); and is economical compared to other East alignment alternatives, since it does not require lengthy extensions of Blair Creek Drive and its associated watermain and sanitary services (refer to September 6, 2011 letter to City of Kitchener in Appendix B).

However, there are two primary considerations by the Project Team that overrode these advantages:

- From a Natural Heritage perspective, although the travelled portion of the existing Reidel Drive corridor is already disturbed, the imposition of the wider footprint required to implement the Strasburg Road Extension will result in impacts to adjacent features that are more significant than those affected by an alignment further west in the Blair Creek corridor. These impacts include:
displacement of wetland buffers at the Blair Creek crossing that represent important amphibian and other wildlife habitat;

- displacement of a vegetation species at risk (butternut tree) on the west side of Reidel Drive, which would result in Endangered Species Act permitting requirements in addition to those associated with crossing Jefferson Salamander regulated habitat for all alignments crossing the Blair Creek corridor; and

- potential displacement of a large Black Walnut specimen on the east side of Reidel Drive and wildlife habitat in the cultural woodlot associated with the residence at 271 Reidel Drive on the west side.

- From a Cultural Heritage perspective, there was considerable interest from some members of the Project Team in taking advantage of the opportunity to preserve as much of the Reidel Drive scenic-heritage roadscape (CHL 3 and CHL 6) as possible, with a view to incorporation of the road corridor in the Doon South Community Trail network. In addition, there is an interest in preserving the cultural heritage landscape (CHL 2) at 271 Reidel Drive to the greatest degree possible. Alignment E2 could result in the displacement of the house at this location.

Based on these considerations, the Project Team recommends that Alignment E2 not be adopted as the Technically Preferred Alignment.

Alignment E3 – is of concern to the Region of Waterloo for the reasons cited above for Alignment C2 (and for Alignment C1 during the alignments screening stage), since it is not optimal from a traffic, transit and municipal servicing perspective, and results in an intrusion into the Countryside area. Further, as indicated above in the description of the alignments screening process, there is a concern with the proximity and configuration of the staggered Strasburg Road-New Dundee Road-Cameron Road intersection legs with respect to possible adverse impacts to traffic operations in the New Dundee Road corridor (addition of a side friction/conflict point).

However, Alignment E3 would require the shortest crossing of the Blair Creek corridor and is the most advantageous from a Natural Heritage perspective. It would also result in the fewest proximity impacts (noise; encroachment on CHL 2) to the tenant-occupied residence at 271 Reidel Drive of any of the East alignments.

Alignment E4 – substantially achieves the natural and cultural heritage objectives of moving off the Reidel Drive corridor, and is preferable to Alignment E3 with respect to eliminating the traffic operations concerns at the New Dundee Road/Cameron Road intersection. However, its crossing of the Blair Creek corridor would create marginally greater impacts than that of Alignment E3.

Based on the foregoing considerations, the Project Team is recommending that a hybrid of Alignments E3 and E4, referred to Alignment E4 Modified, be adopted as the Technically Preferred Alignment. Alignment E4 Modified incorporates Alignment E4 to Stauffer Drive, uses the Alignment E3 crossing point of the Blair Creek corridor, and returns to the Alignment E4 corridor near the future Blair Creek Drive intersection, as shown in Figure 4.7.
Figure 4.7: Alignment E4 Modified in Relation to Alignments E3 and E4
4.5.2 Summary Rationale for Technically Preferred Alignment

The Technically Preferred Alignment (Alignment E4 Modified) is shown in Figure 4.8.

Figure 4.8: Technically Preferred Alignment (E4 Modified)
The Project Team concluded that Alignment E4 Modified represents an acceptable balance of advantages and disadvantages across the spectrum of evaluation criteria and should be adopted as the Technically Preferred Alignment.

The summary rationale for selection of Alignment E4 Modified is as follows:

- It is adequate for meeting traffic operations, transit, and servicing requirements.
- It represents the shortest crossing of the Blair Creek corridor, minimizing impacts to natural heritage features, including wetlands, streams and fish habitat, groundwater resources, and wildlife.
- It exhibits relatively high overall conformance with Region of Waterloo and City of Kitchener planning policies, including an acceptable level of intrusion on the Protected Countryside; and impacts to agricultural resources/operations.
- It results in an acceptable balance of impacts to and preservation of cultural heritage resources and provides opportunity to enhance the scenic heritage road and trail network in the Doon South Community.
- It has the second lowest capital cost and private property requirements.

Table 4.6 presents a graphic summary of how Alignment E4 Modified compares with the other alignments, exhibiting the preferred attributes of Alignments E3 and E4.

Table 4.6: Summary Comparison of Alignment Alternatives

<table>
<thead>
<tr>
<th>EVALUATION FACTOR</th>
<th>ALIGNMENT ALTERNATIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EAST</td>
</tr>
<tr>
<td>Natural Environment</td>
<td>E2</td>
</tr>
<tr>
<td>Socio-Economic Environment</td>
<td></td>
</tr>
<tr>
<td>Cultural Environment</td>
<td></td>
</tr>
<tr>
<td>Transportation/Utilities</td>
<td></td>
</tr>
<tr>
<td>Financial/Technical</td>
<td></td>
</tr>
</tbody>
</table>
4.6 Refinements of the Technically Preferred Alignment

4.6.1 Pond at 500 Stauffer Drive and Scenic Heritage Road

Based on comments received at and following PIC No. 3, the horizontal alignment of Alignment E4 Modified was reviewed to determine if it can be shifted further east to increase the distance between the road and the dug pond at 500 Stauffer Drive.

Two options were reviewed to refine the alignment at this location, both requiring the need to reduce the horizontal curve radius from 250 m to 200 m. The revisions of the alignment were constrained by the crossing of the Blair Creek corridor to the south and the woodlot to the north of 500 Stauffer Drive. These options are illustrated in Figure 4.9.

Figure 4.9: Alignment Refinement Review (Alignment E4 Modified)
The following concerns were identified with regard to these refinements:

- Although the smaller radius is within the design criteria range, the angle of horizontal deflection is noticeably sharper, and contributes to a safety concern, with the introduction of a short acute horizontal curve immediately following the long tangent to the north.

- The refined alignments encroach on the existing Reidel Drive/Stauffer Drive intersection, displacing a segment of the scenic-heritage roadscape (CHL 6), and creating a barrier to the proposed Doon South Scenic Roads Community Trail Network at this location.

- Alignment E4 Modified already avoids the pond, with the edge of boulevard located 10 m from the edge of pond. The refined alignments will result in approximately 20 m of additional distance, which is not expected to represent a perceptible difference with respect to the overall distance from the house.

- Although the pond is considered Candidate Significant Wildlife Habitat\(^{21}\), the additional distance would not reduce the potential for turtles to attempt to continue to use the pond. Turtle movements to and from the pond would still be impacted by the road and should be addressed through mitigation treatments such as the introduction of ecopassage during Detail Design.

- Therefore, maintaining the road geometry and scenic-heritage roadscape is deemed to outweigh the benefits of the additional distance that can be provided.

Rather than shifting the road, it is recommended that Alignment E4 Modified be maintained as the Technically Preferred Alignment, without refinements. The cross-section impact in front of 500 Stauffer Drive can be reduced by eliminating ditches and can be screened by introducing additional vegetative plantings along the road boulevard fronting the entire property.

A similar boulevard treatment is proposed to maintain and screen the Reidel Drive/Stauffer Drive intersection and other cultural heritage landscape features.

These screenings are discussed further in Section 5 of the ESR.

4.6.2 Intersections

A signal warrant analysis using the future traffic volumes has been conducted for all the new intersections, and has confirmed that signal control will be required at Robert Ferrie Drive, Blair Creek Drive and New Dundee Road upon opening of the Strasburg Road extension. The warrant analysis is found in Appendix D.1.

Initial roundabout screenings have also been conducted at these new intersections (refer to Appendix D.1) and results from the initial screenings indicate that a roundabout might be an attractive option at Strasburg Road/Robert Ferrie Drive and Strasburg Road/Blair Creek Drive, albeit a signal control at these two intersections would have a lower total life-cycle cost by taking into account the implementation cost and a 20-year injury collision cost. In both cases, the roundabout option has a slightly higher life-cycle cost than a signal control configuration by a ratio of less than 1.1. As a result, the City may wish to consider implementing a roundabout at these two intersections. Final design details of these two roundabouts will be reviewed during

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\(^{21}\) The pond is deemed to have some significance as wildlife habitat, since it likely provides the function of overwintering habitat for snapping turtles (or other turtles) and supports a special concern species. This habitat is limited to the pond and edges based on the field work to date.
the Detail Design stage. The final location of the Robert Ferrie Drive intersection is subject to further planning studies.

A full range of options has been reviewed at the intersection of New Dundee Road and Strasburg Road; these options are also presented in Appendix D.1. Profile corrections and/or widening may be required on New Dundee Road to construct a full intersection without any prohibitions on traffic movements. Widening on New Dundee Road will be required to address intersection capacity requirements. The following options were reviewed:

- Signalization without profile correction
- Signalization with profile correction
- Shifted signalized intersection along existing profile
- Staggered signalized intersection
- Roundabout

A roundabout screening was conducted for the intersection at New Dundee Road and Strasburg Road to compare the roundabout option with the most favourable signalization option (no profile correction). The roundabout option has the lowest total life-cycle cost compared to the other signal control options, which suggests that a roundabout might also be an attractive option for this location. However, because of the hill crest location at New Dundee Road/Strasburg Road, it may be difficult for drivers to see and react to the roundabout layout when approaching on an up gradient. To address this concern, considerations should be given to refine the grading to the round-about approaches, provide raised chevron signs and provide landscaping at the centre of the roundabout. Since New Dundee Road falls under the jurisdiction of the Region of Waterloo, the feasibility of implementing a roundabout at this intersection will be the subject of further discussions with the Region and be considered in more detail. Appendix B Selected Correspondence and Minutes of Meeting provides the results of discussions between the City and the Region to date. Final design details of this roundabout would need to be reviewed during the Detail Design stage.

The implementation of a roundabout at New Dundee Road is subject to Regional Municipality of Waterloo council approval.
5.0 DESCRIPTION OF RECOMMENDED DESIGN

5.1 Features of Recommended Roadway Design

5.1.1 Road Geometry and Cross-Section

Alignment E4 Modified has been selected as the Technically Preferred Alignment (TPA), and has been developed based on the Design Criteria presented in Section 4.1, including the following key design criteria:

- Road Classification: four-lane urban secondary arterial road (30 m right-of-way) with 3.5 m lane width, and 7.0 m boulevard width, including 3.0 m multi-use paths on each side
- Design Speed = 70 km/h
- Posted Speed = 60 km/h
- Stopping Site Distance = 110 m
- Minimum Horizontal Radius = 200 m
- Minimum Vertical Curve (Crest) K = 25
- Minimum Vertical Curve (Sag) K = 25
- Maximum Grade = 5.0%
- Minimum Grade = 0.5%
- Maximum Superelevation = 4.0%

A preliminary design for the TPA is provided in Appendix E, including plan-over-profile drawings, and property requirements. The proposed Typical Cross-Section is shown in Figure 5.1.
Figure 5.1: Proposed Typical Cross-Section
Roundabouts have been recommended as the preferred intersection control at the proposed intersection of Strasburg Road with New Dundee Road, Blair Creek Drive, and Robert Ferrie Drive.

The location of Robert Ferrie Drive is subject to further planning studies.

The roundabout at New Dundee Road is subject to Regional Municipality of Waterloo council approval. Therefore, a signalized intersection may still be considered as the intersection control at this location.

Final design details of the roundabouts will be determined during the Detail Design stage.

Retaining walls may be required at the southeast and southwest corners of New Dundee Road and Cameron Drive to reduce property impacts.

5.1.2 Drainage and Stormwater Management

A Drainage and Stormwater Management Report has been prepared, and included in Appendix D.8. Key recommendations are summarized in this Section.

Crossing Culverts and Ditches

Four (4) new crossing culverts will be required under the proposed road extension. In addition, a bridge will be constructed over Blair Creek. A preliminary sizing for the crossing culverts is included in Table 5.1.

The crossings were reviewed based on the following criteria:

- No overtopping of Strasburg Road during the Regional Storm;
- Ensure that the proposed Strasburg Road works does not cause significant impacts on the existing flood elevations upstream or downstream of the road extension. The GRCA requires that the proposed flood elevations should be reduced or maintained as compared to the existing flood elevations (based on the refined original model).

For the Crossing E4C (Blair Creek), the HEC RAS model obtained from GRCA was updated and cross-sections and culvert coding were inserted in the model to ensure that no negative impact would be anticipated from the proposed creek crossing. The size for Crossing E4c was determined based on ecological and wildlife crossing requirements (see Section 5.1.6 for further detail). The final structure size and type will be determined during Detail Design.

**Table 5.1: Overview of the Recommended Crossing Structures**

<table>
<thead>
<tr>
<th>Crossing Structure ID</th>
<th>Approx. Station</th>
<th>Flow Direction</th>
<th>Size/Type</th>
<th>Approximate Catchment Area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>E4a</td>
<td>8+712</td>
<td>West to East</td>
<td>600 mm CSP</td>
<td>22.5</td>
</tr>
<tr>
<td>E4b</td>
<td>8+824</td>
<td>West to East</td>
<td>700 mm CSP</td>
<td>14.4</td>
</tr>
<tr>
<td>E4c (Upper Blair Creek Crossing)</td>
<td>9+369</td>
<td>West to East</td>
<td>10,000 mm single span bridge</td>
<td>210.2</td>
</tr>
<tr>
<td>E4d</td>
<td>9+520</td>
<td>West to East</td>
<td>600 mm CSP</td>
<td>12.8</td>
</tr>
<tr>
<td>E4e</td>
<td>10+470</td>
<td>West to East</td>
<td>600 mm CSP</td>
<td>10.5</td>
</tr>
</tbody>
</table>
Ditches will be provided along the toe of slope in fill sections where required to convey overland sheet flows to the crossing culvert locations.

Interceptor ditches are proposed along the back of the boulevard in cut locations, to ensure any overland sheet flows from the cut slopes do not flow over the proposed multi-use trail. These interceptor ditches will not be provided at sensitive locations where land impacts are to be minimized.

**Roadway/Pavement Drainage**

The storm sewer systems draining the pavement for the proposed roadway configuration are to be designed in general to convey the 10 year design storm event, while at sag points, the sewer outlet should be designed to convey the 100 year design storm event. The major drainage system for the roadway is to be designed to convey overland flow to the adjacent watercourses via roadway without flooding the adjacent properties.

Several external connections have been identified for Strasburg Road:

- The drainage area from the proposed Robert Ferrie Drive connection has been added as an external area based on the assumed high point shown on the road profile (see Appendix E). As Robert Ferrie Drive is to be part of a future Planning Study/Class EA no storm sewer concepts were prepared for this roadway;

- The connection at Blair Creek Drive (East-West Collector) drains away from Strasburg Road and therefore does not contribute to its drainage system;

- New Dundee Road, will be urbanized, and drainage from west of the proposed intersection contributes to the Strasburg Road catchment. The east leg of New Dundee Road drains easterly, away from the Strasburg Road catchment; and

- Cameron Road south of New Dundee Road where the drainage is directed south, away from the Strasburg Road catchment.

The proposed storm sewer system is illustrated in the preliminary design drawings (Appendix E).

**Storm Water Quantity Control**

Catchment areas that are located within the Upper Blair Creek watershed require flow quantity control. Storage facilities will be designed to control post-development flow rates to match target flow rates for different storm events as identified in the Upper Blair Creek Functional Drainage Study Final Report, Stantec, March 2009.

Catchment areas that are located within the Strasburg Creek watershed require flow quantity control as well. Storage facilities will be designed to control post-development flow rates to match pre-development flow rates for different storm events.

A review of external SWM ponds was undertaken to establish the potential to retrofit these facilities to provide SWM control of roadway flows. Only the proposed SWM Facility 5 from the Stauffer Woods Subdivision (MTE Consultants, 2009) is located in an area that allows servicing of the Strasburg Road drainage. Consultation with MTE staff indicated that although the pond design is fairly tight with respect to reserve storage it may be feasible to retrofit the design to account for runoff from a portion of Strasburg Road. The requirements to handle the additional drainage area will require confirmation during the development approvals for Stauffer Woods and during detail design for the Strasburg Road extension.
The Strasburg Road drainage will be directed to the pond through a 140m storm sewer extending under Reidel Drive immediately north of 271 Reidel Drive.

In the event that SWM Facility 5 is unable to meet the requirements for controlling flows from Strasburg Road, consideration should be given to providing a separate pond upstream of the Reidel Drive culvert crossing (adjacent to 271 Reidel Drive). Alternatively, super-pipe storage consisting of twin 185 m of 2.0m diameter pipe will be required.

For the remaining Strasburg Road sewer systems four additional potential pond sites were identified:

- 0.24 ha pond block (Pond A) to service the approximately 340 m of New Dundee west of the proposed Strasburg Road roundabout. Pond will discharge to the existing overland flow route to Strasburg Road Culvert E4a;
- 0.35 ha pond block (Pond 1) west of Strasburg Road to service approximately 410 m of Strasburg Road from Station 8+840 to Station 9+250. Pond will outlet to the existing overland flow route to Upper Blair Creek;
- 0.28 ha pond block (Pond 2) west of Strasburg Road to service approximately 270 m of Strasburg Road from Station 9+530 to Station 9+800. Pond will outlet to the existing overland flow route to Upper Blair Creek; and
- 0.62 ha pond block (Pond 3) east of Strasburg Road to service approximately 900 m of Strasburg Road from Station 9+800 to Station 10+700. Pond will outlet to the existing overland flow route to Strasburg Creek.

Where ponds are not feasible, storage pipes located in the roadway will be used to control the post-development flows to the target flow rates as identified in the Upper Blair Creek Functional Drainage Study Final Report. The section of Strasburg Road adjacent to Upper Blair Creek from Station 9+250 to 9+530 cannot be drained to any of the proposed ponds and will therefore require storage in pipes within the roadway, as summarized in Table 5.2.
The proposed storm sewer system, outlets and storm water management strategy is summarized in Table 5.2.

### Table 5.2: Preliminary Storm Sewer System Design

<table>
<thead>
<tr>
<th>Storm Sewer System ID</th>
<th>Station From</th>
<th>Station To</th>
<th>Drainage Area (ha)</th>
<th>Preliminary Pipe Size range (mm)</th>
<th>Sewer Outlet ID (and Strategy)</th>
</tr>
</thead>
<tbody>
<tr>
<td>System A (along New Dundee Road)</td>
<td>0+800</td>
<td>1+140</td>
<td>1.02</td>
<td>300- 450</td>
<td>Oa (to SWM Pond A)</td>
</tr>
<tr>
<td>System 1</td>
<td>8+294</td>
<td>8+840</td>
<td>1.91</td>
<td>300 - 600</td>
<td>O1 (to SWM Pond 5)</td>
</tr>
<tr>
<td>System 2</td>
<td>8+840</td>
<td>9+250</td>
<td>1.23</td>
<td>300 - 450</td>
<td>O2 (to proposed SWM Pond #1)</td>
</tr>
<tr>
<td>System 3</td>
<td>9+250</td>
<td>9+340</td>
<td>0.27</td>
<td>300 - 375</td>
<td>O3 (super pipe and OGS #1 that outlets to Upper Blair Creek; super pipe size = 76m long of 1800mm diameter pipe (or equivalent) with orifice control.)</td>
</tr>
<tr>
<td>System 4</td>
<td>9+340</td>
<td>9+530</td>
<td>0.57</td>
<td>300 - 375</td>
<td>O4 (super pipe and OGS #2 that outlets to Upper Blair Creek; super pipe size = 81m long of Twin 1800mm diameter pipes (or equivalent) with orifice control.)</td>
</tr>
<tr>
<td>System 5</td>
<td>9+530</td>
<td>9+800</td>
<td>0.81</td>
<td>300 - 375</td>
<td>O5 (to proposed SWM Pond #2)</td>
</tr>
<tr>
<td>System 6</td>
<td>9+800</td>
<td>10+700</td>
<td>3.42</td>
<td>300 - 675</td>
<td>O6 (to proposed SWM Pond #3)</td>
</tr>
</tbody>
</table>
Storm Water Quality Control

Grand River Conservation Authority requires water quality controls commensurate with the maximum downstream habitat type and hence, Enhanced Protection (Level 1) is required for the entire study limits.

The stormwater management strategy is summarized as follows (refer to Appendix D.8 for additional detail on development of this strategy):

- **Road Area 1 (Sta.8+294 to Sta. 8+840):** Runoff from this area (1.91 ha) will be conveyed by storm sewer running under Strasburg Road Extension from New Dundee Road to Station 8+840, extends eastward under Reidel Drive and discharge at sewer outlet O1 to SWM 5. SWM 5 is part of the Stauffer Woods Subdivision 30T-08203, Preliminary Stormwater Management Report completed by MTE, June 2008.

- **Road Area 2 (Sta. 8+840 to Sta. 9+250):** Runoff from this area (1.23 ha) will be conveyed by storm sewer running under Strasburg Road Extension from Station 8+910 to Station 9+250 and discharge at Sewer outlet (O2) located at Station 9+250 LT to the proposed SWM pond #1.

- **Road Area 3 (Sta. 9+250 to Sta. 9+340):** Runoff from this area (0.27 ha) will be conveyed to underground storage unit for quantity control and then discharged at Sewer outlet (O3) located on the east side of Strasburg Road Extension just south of Upper Blair Creek. An Oil/Grit Separator will be installed at Station 9+340 RT for quality control treatment.

- **Road Area 4 (Sta. 9+340 to Sta. 9+530):** Runoff from this area (0.57 ha) will be conveyed to underground storage unit for quantity control and then discharged at Sewer outlet (O4) located on the east side of Strasburg Road Extension just north of Upper Blair Creek. An Oil/Grit Separator will be installed at Station 9+390 RT for quality control treatment.

- **Road Area 5 (Sta. 9+530 to Sta. 9+800):** Runoff from this area (0.81 ha) will be conveyed by storm sewer running under Strasburg Road Extension from Station 9+740 to Station 9+530 and discharge at Sewer outlet (O5) located at Station 9+530 LT to the proposed SWM pond #2.

- **Road Area 6 (Sta. 9+800 to Sta. 10+700):** Runoff from this area (2.70 ha) will be conveyed by storm sewer running under Strasburg Road Extension from Station 9+840 to Station 10+700 and discharge at Sewer outlet (O6) located at Station 10+700 RT to the proposed SWM pond #3.

### 5.1.3 Municipal Services and Utilities

The City of Kitchener’s standard 30 m secondary arterial urban cross-section is proposed for the Strasburg Road Extension, matching into the same cross-section proposed for the road north of the Class EA study area, and will provide a standard location within the new road corridor for each utility, including Kitchener-Wilmot Hydro, Kitchener Gas, Bell, Rogers Cable, and Region of Waterloo watermain (see Section 5.1.7 for further discussion on the Region’s watermain). Kitchener-Wilmot Hydro also provides roadway illumination, which will be required for the urban cross-section.

In addition, the City provides sanitary sewer and local watermain services, and may install this infrastructure along the new road corridor along the standard offset, if required.
5.1.4 Vegetative Screening and Buffering Plans

Four locations have been identified for requiring vegetative screen and buffering along the new road alignment. The two farm complex locations at 271 Reidel Drive and 500 Stauffer Drive require tree and shrub planting as a buffer next to the roadway to assist in mitigating aesthetic and cultural heritage landscape impacts. In the same vicinity, the Stauffer Drive and Reidel Drive components of the Doon South Scenic Community Trail Network (CHL 3 and CHL 4) require aesthetic treatment. This will provide a visual screen of the new road and slope embankments from the property owners’ and trail users’ vantage points. In each case, the features to be protected are located on lands lower than the new roadway, requiring a full vegetative screening along the proposed property/right-of-way limit. Plantings are to include a mix of both deciduous and coniferous trees with areas of mass shrub planting. Possible species for consideration are: Red Maple, American Basswood, Red Oak, Quaking Aspen, White Spruce, Eastern White Pine, Common Chokecherry, Snowberry and Staghorn Sumac.

The fourth vegetative buffer location is at the Blair Creek watercourse crossing. Treatment at this location will be implemented through an ecological restoration approach to ensure compatibility with existing vegetation communities and wildlife habitat requirements. Restoration shrub and tree planting between the road and natural valley features will begin to establish new edge vegetation and provide a buffer for the exposed ravine trees within the creek corridor. If a guiderail is to be provided at the bridge approach, the foreslope can be planted with buffer plantings that can tolerate dry soil conditions. Plantings to consider include Staghorn Sumac, Chokecherry, Snowberry and Wild Red Raspberry. At the grading limits, plantings of both shrubs and trees can be considered to enhance the growth of edge vegetation. These areas can be planted with a variety of indigenous trees and shrubs, including American Basswood, Eastern Hop-hornbeam, Pussy Willow, Common Elderberry, Red-osier Dogwood and White Cedar.

The conceptual buffer and ecological restoration planting configurations are shown in Appendix E Design Plates.

5.1.5 Property Access

It is understood that both Reidel Drive and Stauffer Drive (east of Reidel Drive) will be completely closed to motor vehicles after construction of the Strasburg Road Extension is complete. A driveway/entrance will be introduced at the intersection of Strasburg Road Extension with existing Stauffer Drive, with the west leg of Stauffer drive maintained to provide access to 500 Stauffer Drive and the Activa lands at the west end of Stauffer Drive.

Access to 271 Reidel Drive will be maintained by introducing a driveway from Blair Creek Drive via a section of existing Reidel Drive.

These accesses are shown on the preliminary design drawings presented in Appendix E of this ESR.

In addition, field accesses will be introduced to maintain agricultural operations, and will be confirmed during Detail Design based on the requirements of the adjacent landowners (refer also to Section 5.2.6 Land Use).

All existing access points on New Dundee Road and Cameron Road will be retained.
5.1.6 Blair Creek Crossing

Several crossing options were considered at Blair Creek, including a closed bottom culvert, open footing culvert, and a clear-span bridge structure. From a hydraulic perspective, a small culvert will convey the drainage, but will not address ecological concerns.

The GRCA prefers that the chosen structure be a clear span bridge or an appropriately sized open footing culvert, that requires no alteration of the existing stream bed, and that approaches, abutments, footings, and armouring is constructed above the ordinary watermark. The structure is to also consider wildlife passage.

Given this requirement, a minimum 10 m single span bridge with wing walls has been included in the design. This proposed configuration will eliminate in-water work, and will provide adequate wildlife passage. A preliminary geotechnical investigation was conducted for this crossing, the results of which are presented in Appendix D.9.

The final structure size will be confirmed during detail design to address the meander belt width of Blair Creek.

5.1.7 Watermain

A 600 mm diameter Regional watermain will extend from the terminus of the future 600 mm watermain proposed north of the Class EA study area, southerly to the intersection of future Blair Creek Drive and Strasburg Road, and will continue east along future Blair Creek Drive as a 450 mm diameter Regional watermain, as per OMB Approved plan 30T-08203.

This trunk watermain extension will provide additional water supply from Pressure Zone 4 to Pressure Zone 2W to the Doon South Community in Kitchener. The need for the improved water supply was identified in the ‘Kitchener Zone 2 and 4 Optimization Study’ completed by Stantec Consultants in May, 2009. A preliminary design for the watermain along the proposed road extension is included in Appendix E. The preliminary design is based on the Region of Waterloo Design Guidelines including the following key design parameters:

- The watermain location is within the eastbound lane at the Region of Waterloo’s standard offset location.
- 1.8 m of cover is provided over the watermain obvert and 0.5 m clearance under all culvert crossings.
- The watermain material within the open-cut section will be Concrete Pressure Pipe (CPP). CPP becomes the preferred pipe material over Polyvinyl chloride (PVC) in sizes exceeding 300 mm diameter due to failure frequency and failure mode.
- The watermain crossing Blair Creek will be installed by horizontal directional drilling methodology. The pipe material will be High-density polyethylene having a radius of 300 m.
- Connections are provided at all proposed intersections complete with isolation valves.
- Where the roadway curves at suitably large radius, pipe defections will be accomplished through individual joint deflections.

The Blair Creek crossing on the Strasburg Road Extension between Stauffer Drive and the future Blair Creek Drive Extension is an environmentally sensitive area. A Technical Memo and Evaluation Matrix assessing the different watermain crossing options of Blair Creek is included.
in Appendix D.10. The memo looked at four options to the watermain crossing: open cut, suspending the watermain from the bridge structure, tunnelling, and horizontal directional drilling. The options were evaluated against the following factors: environmental impacts, technical issues/constructability, approvals/property requirements and costs. The assessment concluded that from the perspective of environmental impacts, dewatering, cost and ease of construction, installation by horizontal directional drilling is the preferred option. During the detailed design and installation of the watermain crossing it is recommended that the mitigation measures as outlined in the Department of Fisheries Operation Statement for High-Pressure Directional Drilling be followed (http://www.dfo-mpo.gc.ca/regions/central/habitat/os-eo/provinces-territories-territoires/ab/os-eo09-eng.htm).

5.2 Potential Environmental Effects, Proposed Mitigation and Commitments to Further Work

5.2.1 Fish and Fish Habitat

Potential Aquatic Impacts and Mitigation Measures

Works in and around water features containing fish and fish habitat have the potential to result in the harmful alteration, disruption or destruction (HADD) of fish habitat as defined in the federal Fisheries Act. HADD includes any changes that prevent the physical, biological or chemical attributes of fish habitat from providing food, reproduction, cover and movement corridors, or any change in fish habitat that reduces its capacity to support one or more of life processes of fish (DFO, 1998).

Although the proposed Strasburg Road Extension Alignment E4 Modified is deemed to be the optimal crossing of the Blair Creek corridor, it may have the potential to adversely affect the aquatic environment and surface water quality. The proposed works for the proposed road extension will involve work in close proximity to the watercourse for the construction of the structure conveying Blair Creek (refer to Section 5.1.6). The works may also include other construction activities near the watercourse, such as earth excavation/grading, excess material storage, equipment maintenance activities and wastewater management. These works have the potential to impact fish habitat by altering/removing physical habitat (i.e., 7,385 m² of riparian vegetation). Potential effects include impairment of water quality, and direct fish kills or destruction of habitat due to spills (e.g., chemical or sediment) resulting in short term population decline.

There is no in-water work proposed for the dug pond that is located just north of Stauffer Drive and Reidel Drive at 500 Stauffer Drive. However, indirect impacts to fish and fish habitat are possible due to land-based construction activities (e.g., earthworks) near the pond.

Potential effects to fish and fish habitat that are applicable to the proposed works include:

- Alteration/loss of riparian vegetation (potential loss of allochthonous inputs (food supply/sources), such as leaf matter and terrestrial insects);
- Discharge of sediment to a watercourse from earth/spoil stockpiles, grading and excavation activities associated with the road extension and associated culvert works resulting in the impairment of water quality and/or physical damage to habitat;
- Release of fuel, oil, grease contaminants from mobile equipment resulting in unacceptable contaminant concentrations in the receiving watercourse/waterbody;
Displacement/stranding/mortality of fish during construction from use of mobile equipment (pumps, backhoe, etc.); and

Change to sensitive life stages/process (i.e., spawning) if near-water works are not timed appropriately.

As indicated in Section 3.3.3 of this ESR, the reach of Blair Creek upstream in the vicinity of the proposed Strasburg Road Extension crossing exhibits diffuse groundwater contribution and lack of a defined channel, which obscure the stream flow to the extent that flow is not discernable through the wetland. Consequently, although this reach could provide seasonal coldwater fish habitat, except for the V-notch weir located at the Reidel Drive culvert, which is currently considered to be a barrier to the upstream passage of fish, this reach does not provide permanent fish habitat. Therefore, under existing conditions, potential impacts to fish habitat are not considered significant.

Recommended environmental design and construction mitigation measures to avoid and/or minimize potential impacts to the aquatic environment and surface water for consideration in future phases of the project include:

- Design and install native woody riparian vegetation and groundcover to pre-construction conditions or better. A conceptual plan for ecological restoration of the crossing area is alluded to in Section 5.1.4 and presented in Appendix E Design Plates.

- Design and implement an appropriate Erosion and Sediment Control Plan (ESCP) to prevent erosion of exposed soils and migration of sediment to the watercourse in accordance with GRCA’s best practice requirements, including:
  - Limiting the size and duration of disturbed areas (3Rs – retain, reduce, revegetate), including conducting work in a continuous fashion to minimize the duration of potential impacts and limiting the area of disturbance to a manageable area, and stabilization/re-vegetation of exposed soils immediately following construction;
  - Identification of, and appropriate phasing of work in, critical and non-critical management areas;
  - Appropriate seasonal controls, including winter shutdown protection;
  - Strategic use of vegetation buffers between work areas and natural areas.

- Install and maintain the most appropriate erosion and sediment control measures for the work area, such as straw bale flow checks, heavy duty silt fence barriers, and temporary rock flow checks, to prevent erosion of exposed soils and migration of sediment to watercourses. Routinely inspect sediment and erosion control structures, including after storms, and repair as required. The structures will be cleaned out when accumulated sediment reaches half the design height.

- Implement timing restrictions during construction for near-water work to protect sensitive life stages of fish, as identified by MNR (coldwater – in-stream window July 1 to September 15).

- Store, handle and dispose of all excess materials in a manner that prevents their entry to the watercourse.
• Operate, maintain and store all equipment and materials (e.g., fuel, lubricants) in a manner that prevents the entry of any deleterious substances to the watercourse.

• Design permanent drainage and stormwater management systems to mimic overland drainage patterns and control runoff quality/quantity contribution to watercourse features.

• Store, handle and dispose of all excess materials by storing, handling and disposing of all materials generated during site preparation, construction and operations to prevent their entry into watercourses.
  o Place temporary stockpiles of material a minimum of 30 m away from the watercourse and ensure material is stabilized to prevent sediment laden runoff from entry into watercourses.
  o Prepare a spill/emergency response plan for construction and operations.

• Equipment re-fuelling will take place no closer than 30 m from any watercourse to prevent water contamination due to accidental fuel spills.

• Manage dewatering and concrete effluent, where applicable, from excavations and structural works to prevent release of contaminated water to receiving watercourses.
  o Direct dewatering effluent to temporary settling basins, filter bags and energy discharge diffusers, as required.
  o Capture and transport concrete effluent off-site for disposal.

• Prohibit/limit construction access to watercourse/watercourse banks.

• A vegetative buffer should be maintained between the roadway and the pond at 500 Stauffer Drive for the protection of the riparian zone and the aquatic habitat within the pond (refer to Section 5.1.4 and Appendix E).

Scale of Negative Effects and Net Residual Effects

Remaining residual effects after the application of mitigation measures were assessed in terms of the resulting Scale of Negative Effect (extent, duration, and intensity) in the context of the fish habitat being affected (i.e., the sensitivity of fish and fish habitat). The Department of Fisheries and Oceans (DFO) Risk Management Framework, which incorporates the above two factors (i.e., Scale of Negative Effect and Sensitivity of Fish/Fish Habitat), was used to characterize the level of risk (high, medium or low) that any residual effects after the application of mitigation pose to fish/fish habitat, and thus the likelihood of a Harmful Alteration, Disruption or Destruction (HADD) or No HADD occurring as a result of the proposed works. Results from this assessment were then used to help determine whether the works will result in the HADD of fish habitat, as defined under the Fisheries Act.

The Grand River Conservation Authority (GRCA) has a Level 3 agreement in place with the DFO. In accordance with the agreement and DFO’s Risk Management Framework, GRCA will complete an aquatic effects assessment to determine potential impacts of the proposed work on fish and fish habitat during the Detail Design phase for the project. This process includes an assessment to determine the level of risk (high, medium or low) that any residual effects after the application of mitigation pose to fish/fish habitat, and thus the likelihood of a HADD or No HADD occurring as a result of the work.
From the preliminary assessment completed as part of this study, it is expected the proposed work associated with the proposed road extension will be characterized as “Low Risk” by GRCA and, as such, will not result in a HADD of fish/fish habitat, providing the appropriate mitigation measures are applied. In conclusion, from the assessment, no significant residual effects to surface water resources are anticipated from the project with implementation of the identified mitigation.

Monitoring

An environmental monitoring plan to assess the mitigation measures for protection of aquatic and surface water resources will be prepared, if needed, in future phases of the project.

Monitoring during construction is anticipated to focus on:

- Routine inspections of temporary erosion and sediment control measures to ensure they are operating effectively to prevent any release of sediment-laden runoff to Blair Creek/500 Stauffer Drive pond.
- Monitoring of treatment systems for any dewatering and/or concrete effluent to avoid any release of contaminated water to receiving watercourses.
- Compliance monitoring of best management practices related to refuelling and excess materials storage and handling.

5.2.2 Vegetation Communities

Impact Assessment of the Technically Preferred Alignment

The Technically Preferred Alignment (TPA) for the extension of Strasburg Road from north of Stauffer Drive to New Dundee Road will have impacts to both natural and culturally impacted vegetation communities (forest, wetland, cultural communities) present within the study area.

Removals have been categorized into cultural vegetation communities (meadows, thickets, plantations, woodlots), forest vegetation communities, wetland communities (includes PSW and other wetlands), and hedgerows.

The principle direct impact consists of the removals associated with construction. For the TPA, this will result in 1.34 ha of vegetation removals consisting of 0.64 ha of cultural vegetation, 0.25 ha of forest communities, 0.24 ha of wetland communities, and 0.20 ha of hedgerow. This alternative is a combination of the short-listed alignments, and adopted the crossing of the wetland corridor from Alignment E3, and follows the Alignment E4 south of the wetland corridor to the intersection with New Dundee Road. This alignment avoids direct impacts to mature forest communities, and minimizes vegetation removals within the Blair Creek corridor by crossing at the narrowest point within the study area.

It should be noted that the removals values associated with the ELC wetland designations and the MNR PSW are not additive. They are derived from two separate datasets of the same area, and as result there is significant overlap or extension/reduction of areas in a number of locations, depending on what was observed during the field program. Given the hydrologic connectivity observed in the field between the officially designated PSW, and the wetland units delineated as part of the ELC work program, all wetland removals were considered significant in terms of impacts.

The cultural vegetation removals are of limited significance due to the previously disturbed nature of the communities. The forest removals are considered to be of moderate significance. Though the forest communities affected are of lower quality, with few mature specimens, they
are associated with the slopes of the Blair Creek valley containing the PSW and provide a good buffer between the wetland and agricultural activities to the north and south. Although impacts to the wetland communities have been minimized with the TPA, they are not insignificant, and include 0.20 ha of designated PSW removals. Impacts to other wetland communities are also significant, since they include areas of the same unit, identified during field recognizance, which extend the wetland south from the designated PSW boundary. There also may be some encroachment on a small cattail marsh located south of the PSW, which, while not part of the PSW, likely contributes to function of the overall system through hydrologic linkage. Hedgerow removals are of minor significance from a vegetation standpoint due to the general absence of significant trees.

In order to minimize the potential for negative impacts to vegetation communities along the new Strasburg Road Extension, the following general mitigation measures are recommended:

- Design and implement an appropriate ESCP, as described in Section 5.2.1.
- Re-stabilize and re-vegetate exposed surfaces as soon as possible, using native vegetation seed mixes and plantings (as per design drawings). Refer to conceptual Blair Creek ecological restoration plan in Section 1.5.4 and Appendix E.
- Clearly delineate ROW (right-of-way) vegetation clearing limits on both construction drawings and in the field and field confirm with the Contractor prior to clearing and grading. Equipment, materials and other construction activities will not be permitted in these zones.
- Prepare and implement a Vegetation Management/Tree Protection Plan. Vegetation that does not require removal for the purposes of the construction will be protected through the installation and maintenance of temporary vegetation protection measures (e.g., temporary fencing).
- Trees to be removed will be felled into the ROW (and away from watercourses) to avoid disturbance to off-ROW vegetation, as well as aquatic areas.
- Tree grubbing will be restricted to the required activity zone. Where possible, tree stumps will be cut flush to the ground and grubbing will be avoided to minimize soil disturbance, particularly in erosion prone areas.
- Cut and grubbed material will be disposed of through chipping. Where possible, cut material may be piled and re-used for wildlife habitat or in edge treatments. This material will help retain soil moisture and prevent weed spread.
- Undertake tree management activities as required for both driver safety and health of the balance vegetation units that will be encroached on (i.e., removal of hazard trees within a defined Hazard Zone on the new edge of the unit). The edges of cleared areas will be specifically reviewed and damaged trees will be checked and treated, or removed. Hazard and windthrow susceptible trees will be identified and removed.

Unnecessary traffic, dumping and storage of materials over tree roots will be avoided. As outlined for aquatic resources above, the contractor will develop an appropriate product handling; spills prevention and management plan prior to construction that will be in place on site, along with required equipment and materials throughout construction. All spills will be immediately controlled and reported to the authorities having jurisdiction and the City's representative (Contract
Administrator – refer to Section 6.2 Monitoring). Vehicle maintenance and refuelling will be carried out at the maintenance areas in the works yards or at commercial garages, whenever possible. Refuelling should not be permitted within 30 m of any forest, wetland or watercourse, or the top-of-bank areas.

5.2.3 Wildlife
Impacts to wildlife habitat and community are categorized as short term construction related impacts, and long term operational related impacts.

Short Term/Construction
Short term or construction related impacts are anticipated as a result of grading, vegetation removal, installation of roads and associated structures, equipment/vehicle movement and general construction activity. The majority of these impacts are predicted where construction occurs within or in close proximity to existing habitat, linkages, or corridors.

Proposed mitigation includes minimizing the construction footprint and extent of habitat removed, the implementation of construction limits (defined on plan, and physical demarcation in the field), erosion and sediment control fencing, adherence to timing windows and oversight by an environmental monitor to ensure mitigation is working effectively. It is anticipated that the construction footprint will be refined during Detail Design through the completion of site-specific field studies.

Proposed mitigation should, at minimum, include:

- Ensure that silt/sediment control fencing is installed to adequately prevent the overland transport of silt and sediment into habitat to be retained (both terrestrial and aquatic).
- Restore disturbed areas immediately post-construction with native and non-invasive species.
- Adhere to timing windows as per the Migratory Bird Convention Act (MBCA) and for other sensitive wildlife periods, such as amphibian breeding/migration. Adherence to MBCA timing windows and timing windows for sensitive amphibian breeding/movement periods for the removal of vegetation and for works in close proximity to retained habitat will serve to prevent disruptions to breeding individuals, nests, eggs and fledglings that may be in close proximity to the construction area.
- Clearly delineate/mark construction area and ensure that no accidental encroachment occurs into natural areas.
- Retain an on-site environmental monitor who is trained for site-specific occurrences of potential SAR or other wildlife species to provide timely responses to any problems related to impacts to wildlife.

Long Term/Operations
Long term or operations related impacts are also expected to include indirect effects that occur in areas adjacent to the road footprint. Operations effects include the potential for a ‘barrier effect’ created by the new road crossing of or a reduced connectivity of the natural heritage system, potential increase for animal-vehicle conflicts, wildlife habitat degradation or indirect habitat impacts (salt spray, noise, light, litter, etc.), and the potential for cumulative effects as a result of other development proposed in the project area.
Potential mitigation measures to reduce such impacts include:

- Incorporate ecopassages for target species and locations, and install appropriate directional/exclusionary fencing. It is anticipated that ecopassages will be developed in consultation with the MNR to address SAR habitat requirements. Other areas for potential ecopassage should be evaluated during Detail Design, and it is anticipated that additional information will be gathered to better inform decisions on ecopassage design and placement specific to the project area.
- Educate drivers regarding the potential for wildlife in the area (e.g., wildlife crossing signs).
- Ensure new vegetation community edges and/or roadside edges are planted with species that will serve to buffer the interior habitats from salt spray.
- Develop a salt management plan for sensitive areas.
- Minimize area of disturbance by selection of the shortest crossing of the natural heritage system, thereby minimizing the extent of indirect habitat/edge habitat degradation (this is currently built into the proposed TPA).
- Restore vegetation community edges and disturbed areas with native and non-invasive vegetation species.
- Limit mowing and herbicide applications at roadsides.
- Manage stormwater drainage to provide treatment and maintenance of flow patterns to avoid sedimentation and erosion in retained vegetation communities and aquatic habitat.
- Use directional lighting and design the roadway to minimize noise and vibration.
- Ensure pre-development surface and groundwater drainage patterns are retained, particularly where wetlands, vernal pools and other natural features that contain features or functions sensitive to water level fluctuations/hydroperiods may be affected.
- Protect, restore and create new habitat where feasible (may occur as part of an ESA Permit overall benefit plan for Jefferson Salamander).
- Development of a stewardship plan for preservation of adjacent natural heritage areas.

Proposed mitigation will be incorporated in future project phases, as outlined above, for all wildlife species. However, any mitigation specific to Species at Risk will be developed as part of the permitting process and the associated overall benefit plan under the *Endangered Species Act, 2007*. The overall benefit plan is required in addition to mitigation measures to minimize impacts.

Cumulative effects on the wildlife habitat and communities are anticipated in areas where future development will abut the identified buffers/setbacks to the communities in combination with the road operational effects. Cumulative effects are anticipated to be reduced by selection of the TPA, which will maintain the existing, or close to existing, Countryside Line to limit urban development from surrounding the wildlife habitat in the project area. To minimize the road effects in a long term development scenario, the mitigation recommendations herein are
intended to maintain connectivity, prevent a barrier effect, and to minimize indirect habitat decline.

Long term and operations further work commitments should include monitoring of the mitigation measures at the operations phase for effectiveness, and for an adaptive response (refer also to Section 6.2 Monitoring). This is recommended for effectiveness of edge or salt management plans and the health of retained wildlife habitat and communities (which may be assessed through vegetation community monitoring). Effectiveness monitoring should also serve to direct and inform any stewardship activities. It is anticipated that an overall benefit plan for SAR in the project area will be developed through additional field investigations at the Detail Design stage, and in consultation with MNR.

5.2.4 Groundwater

The lands west of Reidel Drive have been identified as Regional Recharge Areas and are important in terms of providing recharge to the Strasburg and Ayr wells and contributing baseflow to Blair Creek.

Although the Region has no immediate plans to develop additional groundwater supplies in this area, it remains a target area for future water supply with respect to the Long Term Water Strategy. Therefore, the groundwater resources in the area also require consideration for protection for this reason.

As a result of the above and following review of the study area data, potential impacts to groundwater quality and quantity associated with the project have been identified, as follows:

- Development can restrict recharge to the underlying aquifer systems, which can result in a reduction of groundwater flows to municipal water supply wells and local baseflow to Blair Creek.
- The long term cumulative loading of road salt could have consequences for water quality in the underlying aquifers. This not only has the potential to impact existing groundwater users and the surface water quality of the Blair Creek drainage system, but could affect a future potential water supply option for the Region.

The selected TPA is noted to intersect two cross-sections of wetland, and passes just south of a pond located on a private property. Minor water interception issues may be associated with the identified recharge area and discharge to the creek, although no significant concerns are anticipated.

SLE understands that the existing farm pond at 500 Stauffer Drive is spring-fed and is likely hydraulically connected to the owner’s personal supply well via the shallow aquifer. This is consistent with MOE water well records that identify a shallow overburden well in the area. While the area crossed is a mixed recharge/discharge zone, the majority of impacts would be expected to discharge into Blair Creek and the PSW, with a small portion of impacted surface water also infiltrating on a seasonal basis to the upper groundwater. The thickness and types of overburden between the surface and regional bedrock aquifer is suitable to make direct impacts to the bedrock unlikely.

There is also the possibility for eventual impacts to the drinking water well at 271 Reidel Drive, as the well is downgradient of the anticipated right-of-way for the road. However the likelihood of parameter concentrations reaching levels where impacts would be noted is remote, other than potentially for sodium, which, at a concentration of 20 mg/L, is not recommended for people restricted to low sodium diets.
It is understood that salt spray from vehicle movement in the road corridor can be expected to extend up to 30 m either side of the roadway. This may result in some limited salt loading for the pond at 500 Stauffer Drive, depending upon prevailing winds, which are typically away from the pond (from the northwest) during the winter months. A more important issue would be management of road run-off during melt periods to ensure that it is not directed to an infiltration zone that is directly hydraulically connected to the pond or upgradient of the resident’s water supply well. This has been addressed through the Drainage and Stormwater Management plan (refer to Section 5.1.2), as runoff from the paved surface of the road will be directed away from the pond.

Mitigation measures include minimizing the use of low permeability cover within the recharge zone. The additional impervious surface represented by the Strasburg Road Extension itself is relatively small (3.84 ha\(^{22}\) (<1% of the total study area). Therefore, this will not significantly affect the overall groundwater recharge capacity of the area.

During construction of the Blair Creek crossing, environmental protection and mitigation to protect groundwater resources will include implementation of standard construction practices, conformance with GRCA requirements identified/prescribed during the Detail Design permitting process, and additional control measures that may be identified through the initiation of site-specific adaptive management assessments in the field. In this regard, design principles will focus on minimizing the excavation requirements for spread footings (if utilized), and providing post-construction stabilization and enhancement of disturbed areas.

Measures to ensure that any groundwater encountered during construction is maintained, filtered, and released will be implemented in general accordance with OPSS 518.

Groundwater quality protection also translates into proper spills management during construction (and during operation), and maximizing roadway runoff quality prior to release to receiving areas.

With respect to post-construction monitoring, it is suggested that, due to the proximity of the shallow groundwater wells at 500 Stauffer Drive and 271 Reidel Drive, a well nest consisting of at least two monitoring wells at each location be installed prior to construction to obtain pre-construction information on fluctuations in quantity and quality near the water table, and near the screened interval of the residential water wells. This will provide baseline and construction period information, should impacts suspected to be attributable to the construction and operation of the roadway be identified.

If in fact impacts to the residential wells are noted, typical mitigation would be the decommissioning of the existing shallow wells and re-installation of newer ones screened in the bedrock aquifer by licensed well drillers in accordance with provincial regulations. It is noted that this would also result in a reduction of risk for other potential drinking water quality impacts unrelated to the roadworks (i.e. agricultural impacts, microbiological impacts).

5.2.5 Contaminated Property

Although no evidence was noted during the site inspections and data review that contaminated sources are present within the preferred alignment, it is possible that fuel tanks (underground and/or above ground) could be present, or were formerly present, at the older properties such as the three farms located on Stauffer Drive, Reidel Drive and New Dundee Road.

\(^{22}\) Excludes Robert Ferrie Drive and Blair Creek Drive impervious surfaces.
While the potential for adverse environmental impacts within the study area is considered low, no further environmental work is recommended at this time, as the TPA for the Strasburg Road Extension does not encroach on the developed areas of the farm properties. If the design alignment ultimately does change, such that it is located in closer proximity to the developed portions of the rural properties, Phase I ESAs should be conducted as part of the Detail Design works to confirm the lack of potential contaminated sources.

5.2.6 Land Use

Existing Land Use

The proposed alignment will create severances of the property at 500 Stauffer Drive and the Stonefield Development lands south of Stauffer Drive west of Reidel Drive. This will affect farming operations on these parcels with respect to internal access/circulation. In addition, the introduction of the new Strasburg Road alignment and the closure of Reidel Drive to vehicular traffic will affect external access to these lands, as well as to the Activa lands at the west end of Stauffer Road and east of Reidel Drive. SLI has consulted the two farm operators who currently provide custom planting and harvesting services on the lands under consideration (Mark Hermann – 500 Stauffer Drive lands; Brian Domm Farms Ltd. – Activa and Stonefield lands) to discuss potential effects/constraints and possible alternative access provisions.

Farm at 500 Stauffer Drive - The agricultural fields at 500 Stauffer Drive are currently accessed via Reidel Drive to a single access point on Stauffer Drive west of the main driveway to the property; all fields on the property are then accessed via internal circulation routes. Access through the Hearthwood subdivision or Caryndale Drive is impractical due to the size of equipment being used. The Strasburg Road alignment will sever the farm roughly in half. In addition, the Robert Ferrie Drive alignment currently shown in the City of Kitchener Municipal Plan would sever the farm in an east-west direction.

Land tillage and planting and spraying of crops are done in April and May annually. Crop harvesting and subsequent discing of the land are done in October and November. The widest pieces of equipment travelling to site on the road network are the planter and combine (16 feet); the 35-foot wide header is transported to site, mounted there, and moved via internal circulation routes. Forty-foot long double trailer loads are moved off the site during harvesting.

New Strasburg Road will accommodate the movement of agricultural equipment to this site, with the equipment generally occupying two lanes. Field access to the west farm can be retained off Stauffer Drive via the new Strasburg Road/Stauffer Drive intersection, which will be designed with turning radii to accommodate the largest equipment in use (see below). The operator has suggested that the most appropriate way to access the east farm parcels will be to introduce field entrances off Robert Ferrie Drive, with Strasburg Road access being via the Strasburg Road/Robert Ferrie Drive intersection, rather than via field entrances directly off Strasburg Road. Movement between the east parcels (north and south of Robert Ferrie Drive) can be accommodated by introducing opposing field entrances off Robert Ferrie Drive. Movement from the west to the east farm could most safely be accommodated by introducing a field entrance opposite the east leg of the Strasburg Road/Robert Ferrie intersection. If this is not feasible, access would be via the Stauffer Drive-Strasburg Road-Robert Ferrie Drive route. Field entrances would require an appropriately sized break in the concrete curb (recommended 25-30 ft/7.6-9.1 m). The operator would prefer to keep the 35-foot header on the combine, once it has been mounted on site, to move from field to field. This may be possible for movements between the east fields, but impractical for moving between the west and east farms. The time required to mount or dismount the header is approximately 10 minutes.
**Activa Lands** – New Strasburg Road will accommodate the movement of agricultural equipment to the Activa lands, with the equipment generally occupying two lanes. Access to the Activa lands from the west via Fischer-Hallman Road is not practical. Movement of equipment on Strasburg Road will occur over most of the farming season (spring-summer-fall) on an annual basis, since crops include winter wheat that is harvested in July. Field access to the Activa lands at the west end of Stauffer Drive can be retained off the existing entrance via the new Strasburg Road/Stauffer Drive intersection. The equipment used on this site is larger than that used at the 500 Stauffer Drive farm (22.5-foot wide combine; 52-foot long transport trailers for crop movement; 76-foot long combine/header transported to site, with 40-foot wide header mounted at site). Therefore, this operation will dictate the curb radii at the Strasburg Road/Stauffer Drive intersection.

The portion of the Activa lands within the Doon South Community (Phase 2) east of Reidel Drive between the Stauffer Woods ESPA and the Blair Creek corridor is designated for Open Space use. However, it is expected that area may be retained for agricultural use in the foreseeable future. Current access to this parcel is via a field entrance off Reidel Drive, which could be retained and connected to a new field entrance off new Strasburg Road on the Stonefield lands west of Reidel Drive. Such vehicular access would be across the Reidel corridor suggested for incorporation in the Doon South trail system and would be governed accordingly.

**Stonefield Lands** – The triangular portion of the Stonefield lands immediately southwest of the existing Reidel Drive and Stauffer Drive intersection will be severed by the Strasburg Road alignment. This parcel is currently accessed via Reidel Drive, opposite the access to the Activa lands on the east side of Reidel. The remainder parcels may be too small or irregularly shaped to continue in agricultural use, but would be accessible via Stauffer Drive and Strasburg Road (using the field entrance introduced for the Activa lands to the east) if agricultural operations continue here. Field access from Stauffer Drive may be precluded if a stormwater management pond is situated immediately west of Strasburg Road and south of Stauffer Drive (Pond 2 identified in Section 5.1.2). Movement across Strasburg Road would require the appropriate break in the concrete curb (recommended 25-30 ft/7.6-9.1 m). This would accommodate the 40-foot wide header since it can be raised to pass over the curb and any guiderail that might be required.

Figure 5.2 illustrates existing and potential future field entrance locations.
Figure 5.2: Existing and Potential Agricultural Field Entrance Locations

Legend
- Existing Field Entrance
- Possible Future Field Entrance

Alignment E4 Modified
Residence/Bed & Breakfast at 500 Stauffer Drive – Existing vehicular access to the residence and B&B operation at 500 Stauffer Drive via local roads will be altered through the closure of Stauffer Drive and Reidel Drive. The access will be maintained by the introduction of the new Strasburg Road/Stauffer Drive intersection (refer to Appendix E Design Plates). The existing driveway will not be altered.

The woodlot in the northeast corner of the property supplies firewood for heating the house. With the severance of the property created by the Strasburg Road alignment, internal access to the woodlot will also be severed. However, the possible field entrance from Robert Ferrie Drive, described above, can be used to access the woodlot.

The B&B and house will experience adverse effects (aesthetics/visual intrusion and increased noise levels) due to the proximity of the new roadway (approximately 80 m from the house at its closest point) and the fact that views and guests’ use of the grounds are oriented to the east (towards the new roadway). Aesthetic/visual impacts will be mitigated through the introduction of vegetative screening incorporated in the landscape plan for the road corridor (refer also to potential impacts/mitigation to this cultural heritage landscape in Section 5.2.9. A conceptual landscape plan to achieve this is presented in Appendix E. Noise impacts are addressed in Section 5.2.7.

Residence at 271 Reidel Drive – Vehicular access to the tenant occupied residence at 271 Reidel Drive will be lost with the closure of Reidel Drive and direct access to Strasburg Road will not be permitted. Access to the house will be relocated to future Blair Creek Drive, as described in Section 5.1.5 and shown in Appendix E. This access will have to be coordinated with potential future use of the Reidel Drive corridor as part of the Doon South Community Trail Network.

Communities

The Strasburg Road Extension in the City of Kitchener Municipal Plan has been used to define the western boundary of the Doon South Community, and planning for the community to date has been premised on that alignment, with provisions for adopting the alignment emerging from this Class EA study. The alignment proposed in this study differs from that shown in the Municipal Plan, and has the potential to redefine the Doon South Community boundary, by relocating it slightly to the west, onto lands currently designated for Agricultural uses by the City and for Rural uses by the Region of Waterloo.

The redefinition of community boundaries is outside the scope of this EA study. However, the proposed Strasburg Road alignment will be used to inform future land use and community planning decisions by the City and the Region, particularly as this relates to the current deliberations on the Countryside Line, use of the Reidel Drive corridor and lands between Reidel and the new Strasburg Road alignment, and development applications in Doon South.

The proposed alignment may also influence redefinition of the Countryside Line north of Stauffer Drive, since it is situated slightly to the east of the currently proposed Countryside Line. In this area, the proposed Strasburg Road alignment is not expected to result in any changes to the boundary of the Brigadoon Community Plan.

5.2.7 Noise

The Technically Preferred Alignment (Alignment E4 Modified) is a combination of Alignment E3 and Alignment E4. The traffic volumes for the TPA are similar to those for Alternative E4 in Table 1 of Appendix D.4. Changes of at least 20% in traffic volumes are required for a 1dB
change in the sound level, so minor future deviations in traffic volumes will not affect the results of this analysis.

Table 5.3, below, summarizes the sound level increases that can be expected as a result of the implementing the TPA. The Points of Reception (POR) are shown in Figure 3.14.

<table>
<thead>
<tr>
<th>Point of Reception</th>
<th>Guideline Sound Level (dB Leq)</th>
<th>With Project Sound Level (dB Leq)</th>
<th>Impact (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>POR1 – Hearthwood Drive</td>
<td>45</td>
<td>47</td>
<td>2</td>
</tr>
<tr>
<td>POR2 – 500 Stauffer Drive</td>
<td>45</td>
<td>58</td>
<td>13</td>
</tr>
<tr>
<td>POR3 – 271 Reidel Drive</td>
<td>45</td>
<td>59</td>
<td>14</td>
</tr>
<tr>
<td>POR4 – Cameron Road</td>
<td>55</td>
<td>60</td>
<td>5</td>
</tr>
<tr>
<td>POR5 – New Dundee Road</td>
<td>57</td>
<td>59</td>
<td>2</td>
</tr>
</tbody>
</table>

A barrier 4 to 6 times the distance between the receptor and the roadway would be needed to achieve a 5 dB reduction in noise, while serving about 55 m² or 600 ft² of the OLA. Considering POR3 (271 Reidel Drive) as an example, a 200 m long 2.4 m tall barrier would be needed to protect an adequate amount of outdoor living area. Alternatively, a 150 m long 3.0 m tall barrier would provide a similar benefit. POR2 (500 Stauffer Drive) would require an even longer barrier (400 m long, 3 m high barrier), as it is further removed from the roadway, which curves around the receptor, and the barrier effect would be less.

Overall, building such a length of barrier for each individual residence is not economically practical. Hence, noise control is not recommended for the areas on this project where there is a 5 dB or greater increase in noise.

Construction Noise Review

The MOE and other agencies and municipalities in Ontario do not place receiver based restrictions on construction noise. Instead, all construction equipment used should adhere to the source-based guidelines as published by MOE in its publication NPC-115 “Construction Equipment”.

Chapter 450, Article 6 of the City of Kitchener’s Municipal Code restricts construction activity from 7:00PM one day to 7:00AM the next day. If construction activity is expected to occur outside of these prescribed periods, a bylaw exemption will be required.

Blasting is not expected to be required for the construction of this roadway and so particularly high vibration levels are not expected during construction.

5.2.8 Air Quality

The assessment of air quality impacts associated with the Technically Preferred Alignment was conducted by RWDI AIR Inc. and used dispersion modelling techniques to predict local air quality conditions at sensitive receptor locations near the project area. The air quality contaminants that have been assessed are identified in Section 3.4.4 Air Quality.
The assessment considered the impact of future contributions of the project to the local air quality in the study area. Future changes in emissions will be the result of both added traffic capacity due to the new connecting road, along with regulated improvements in vehicle exhaust emissions and gradual change over of the fleet, as older vehicles are replaced by newer, lower-emission vehicles. The details of the impact assessment are included in Appendix D.5 of this ESR.

The Strasburg Road Extension project area is currently a rural-use area, but the area is shown in the City of Kitchener’s Growth Management Plan to have areas with proposed subdivisions waiting for approval surrounding it. There are also several existing residences located close to the project area. A total of 5 discrete receptors (representing the existing residences) and 10 profile receptors (intended to represent future receptors) were modelled in this study to determine the future impacts to air quality of the project.

Table 5.4 presents the maximum predicted cumulative concentrations of the contaminants of interest for the Strasburg Road Extension. The cumulative concentrations, for all modelled contaminants and averaging periods, were less than their respective thresholds. Although the maximum predicted PM$_{10}$ concentration was approaching its respective threshold, the portion due to the proposed undertaking was much less than the ambient background concentration, which was estimated from the published PM$_{2.5}$/PM$_{10}$ due to the unavailability of actual monitoring data. The only other exception is benzene over an annual averaging period, and this is the result of a background concentration that already exceeds the threshold, as the predicted contribution from the project to the overall cumulative concentration (background plus predicted impact) is very small (<1.1%).
Table 5.4: Maximum Predicted Concentrations (µg/m³) for the 2031 Future-Build Scenario

<table>
<thead>
<tr>
<th>Contaminant</th>
<th>Averaging Period</th>
<th>Most Impacted Receptor</th>
<th>Predicted Conc.</th>
<th>Background Conc.[1]</th>
<th>Combined Conc.</th>
<th>Threshold</th>
<th>Source of Threshold Value</th>
<th>% of Threshold</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO</td>
<td>1 hr</td>
<td>R4</td>
<td>410</td>
<td>434</td>
<td>844</td>
<td>36,200</td>
<td>AAQC</td>
<td>2%</td>
</tr>
<tr>
<td></td>
<td>8 hr</td>
<td>R4</td>
<td>229</td>
<td>434</td>
<td>663</td>
<td>15,700</td>
<td>AAQC</td>
<td>4%</td>
</tr>
<tr>
<td></td>
<td>1 hr</td>
<td>R4</td>
<td>111</td>
<td>43.2</td>
<td>154.2</td>
<td>400</td>
<td>AAQC</td>
<td>39%</td>
</tr>
<tr>
<td></td>
<td>24 hr</td>
<td>R4</td>
<td>11.5</td>
<td>43.2</td>
<td>54.7</td>
<td>200</td>
<td>AAQC</td>
<td>27%</td>
</tr>
<tr>
<td>PM₂.₅</td>
<td>24 hr</td>
<td>R3</td>
<td>2.1</td>
<td>17.2</td>
<td>19.3</td>
<td>30</td>
<td>CWS</td>
<td>64%</td>
</tr>
<tr>
<td>PM₁₀</td>
<td>24 hr</td>
<td>R3</td>
<td>6.74</td>
<td>32</td>
<td>38.7</td>
<td>50</td>
<td>AAQC</td>
<td>77%</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>24 hr</td>
<td>R4</td>
<td>0.03</td>
<td>5.20</td>
<td>5.23</td>
<td>65</td>
<td>AAQC</td>
<td>8%</td>
</tr>
<tr>
<td>Acetaldehyde</td>
<td>24 hr</td>
<td>R4</td>
<td>0.02</td>
<td>2.55</td>
<td>2.57</td>
<td>500</td>
<td>AAQC</td>
<td>0.5%</td>
</tr>
<tr>
<td></td>
<td>30 min</td>
<td>R4</td>
<td>0.28</td>
<td>7.54</td>
<td>7.82</td>
<td>500</td>
<td>AAQC</td>
<td>1.6%</td>
</tr>
<tr>
<td>Benzene</td>
<td>24 hr</td>
<td>R4</td>
<td>0.06</td>
<td>1.35</td>
<td>1.41</td>
<td>2.3</td>
<td>AAQC</td>
<td>61%</td>
</tr>
<tr>
<td></td>
<td>Annual</td>
<td>R3</td>
<td>0.015</td>
<td>1.35</td>
<td>1.37</td>
<td>0.45</td>
<td>AAQC</td>
<td>304%</td>
</tr>
<tr>
<td>1,3-Butadiene</td>
<td>24 hr</td>
<td>R4</td>
<td>0.01</td>
<td>0.13</td>
<td>0.14</td>
<td>10</td>
<td>AAQC</td>
<td>1.4%</td>
</tr>
<tr>
<td></td>
<td>Annual</td>
<td>R3</td>
<td>0.0028</td>
<td>0.1250</td>
<td>0.1278</td>
<td>2</td>
<td>AAQC</td>
<td>6.4%</td>
</tr>
<tr>
<td>Acrolein</td>
<td>24 hr</td>
<td>R4</td>
<td>0.0017</td>
<td>0.1190</td>
<td>0.1207</td>
<td>0.4</td>
<td>AAQC</td>
<td>30%</td>
</tr>
<tr>
<td></td>
<td>1 hr</td>
<td>R4</td>
<td>0.0164</td>
<td>0.1190</td>
<td>0.1354</td>
<td>4.5</td>
<td>AAQC</td>
<td>3%</td>
</tr>
</tbody>
</table>

Note:  
[1] 1-hr, ½-hour, and 24-hour background concentrations were based on mean 90th percentile values over the most recent available 5-year period. Annual background values used 24-hour background concentrations as a conservative approach where annual data were not available.

[2] 8-hr predicted CO concentration is calculated from 1-hr predicted concentration using a published conversion factor (Ontario Regulation 419/05, 17(1)). 8-Hr CO background value 1-Hour CO value as a conservative approach as 8-Hour CO data was not available.

[3] 30-minute acetaldehyde concentration is calculated from 1-hr predicted concentration using a published conversion factor (Ontario Regulation 419/05, 17(1)).

Construction phase impacts were not included in the dispersion modelling analysis, but were addressed qualitatively in the assessment. It is recommended that, in order to minimize potential air quality impacts during construction, the construction tendering process should include requirements for implementation of an emissions management plan.

Overall, it is expected that the proposed project will not cause any air quality thresholds to be exceeded.

5.2.9 Built Heritage Features

Impact Assessment of the Technically Preferred Alignment

No buildings or significant landscape features will be removed as a direct result of construction of the Technically Preferred Alignment. It is expected that the identified cultural heritage resources can be conserved provided that appropriate follow-up studies, such as site-specific heritage impact assessments and/or landscape plans are undertaken at the earliest possible stage of more detailed planning for the technically preferred alignment. It is further expected that where impacts, such as alteration, are expected, appropriate mitigation measures such as minimization of encroachments and/or sensitive landscaping plans to maintain historic views and to preserve notable vegetation that contribute to the significance of cultural heritage resources, would be developed.

Potential impacts of the preferred alignment on the following cultural heritage resources are based on the Ministry of Tourism and Culture document entitled Screening for Impacts to Built Heritage and Cultural Heritage Landscapes (September 2010):
271 Reidel Drive (CHL 1) - The proposed road extension will alter the setting of this resource through disruption of the associated fields, isolation of the resource, and obstruction of scenic views to the west of the farmhouse. Based on proximity of the resource to the new road, there is potential for ambient noise to be introduced, the extent of which may limit the long term viability of the resource as a residence.

500 Stauffer Drive (CHL 2) - The proposed road extension will alter the setting of this resource through disruption of the associated fields and obstruction of scenic views to the east of the farmhouse.

Reidel Drive (from Stauffer Drive southerly to Blair Creek) Roadscapes (CHL 3) – The proposed road extension will alter the setting of this resource, given that the TPA will be situated immediately adjacent to the northern terminus of the Reidel Drive roadscape where it intersects with Stauffer Drive.

Stauffer Drive (from Reidel Drive to Tilt Drive) Roadscapes (CHL 4) – The proposed road extension will alter the setting of this resource, given that the TPA will be in close proximity to the Stauffer Drive roadscapes as it approaches Reidel Drive.

Stauffer Drive (from Reidel Drive westerly to end of road) Roadscapes (CHL 5) – The proposed road extension will alter the setting of this resource given that the TPA will disrupt the eastern portion of the Stauffer Drive roadscape where it intersects with Reidel Drive, and introduce a new intersection of Stauffer Drive with the Strasburg Road, which will serve to maintain access to 500 Stauffer Drive and the Activa lands at the west end of Stauffer Drive.

Reidel Drive (from Blair Creek southerly to New Dundee Road) Roadscapes (CHL 6) – The TPA provides the opportunity to retain most of CHL 6 and incorporate it in the Doon South Scenic Road Community Trail Network. The proposed road extension will alter the setting of this resource through disruption of the southern terminus of the roadscape as it approaches New Dundee Road.

Remnant Farm Complex at western terminus of Stauffer Drive Roadscapes (CHL 7) – There are no expected impacts to this feature.

Recommendations

The Strasburg Road Extension may have a variety of impacts upon built heritage resources and cultural heritage landscapes. Impacts can include: direct impacts that result in the loss of resources through demolition or alteration, or the displacement of resources through relocation; and indirect impacts that result in the disruption of resources by introducing physical, visual, audible or atmospheric elements that are not in keeping with the resources and/or their setting.

Based on the results of background research and data collection, field survey, and analysis of potential impacts of the undertaking, the following recommendations have been developed.

- Road construction should be suitably planned in a manner that avoids any identified, above ground, cultural heritage resource.
- Maximize setbacks between identified cultural heritage resources and the proposed road alignment.
- Develop a vegetative screening/ buffering plan to minimize impacts on the setting of the two farm complexes and the four roadscapes and to ensure the long-term viability of the residential heritage resources. Conceptual plans in this regard have been developed for 271 Reidel Drive, 500 Stauffer Drive and the intersection of
Reidel Drive and Staffer Drive, as described in Section 5.1.4, and are presented in Appendix E Design Plates.

- **CHL 1**: The proposed road alignment will alter the setting of this resource and reduce its legibility as an intact agricultural landscape. As such, a detailed, resource specific heritage impact assessment (HIA) should be conducted by a qualified heritage consultant at the earliest stage possible during Detail Design to recommend an appropriate conservation plan. The assessment should follow the City of Kitchener’s HIA Terms of Reference and be submitted for review, comment and approval to heritage planning staff and the city’s Heritage Committee. In particular, the HIA should be conducted for the purposes of developing a suitable road design (consider grading, profile, elevation, setback, screening) that does not negatively impact the visual and physical experience of the landscape.

- **CHL 2**: The proposed road alignment will alter the setting of this resource and reduce its legibility as an intact agricultural landscape. As such, a detailed, resource specific HIA should be conducted by a qualified heritage consultant at the earliest stage possible during Detail Design to recommend an appropriate conservation plan. The assessment should follow the City of Kitchener’s HIA Terms of Reference and be submitted for review, comment and approval to heritage planning staff and the city’s Heritage Committee. In particular, the HIA should be conducted for the purposes of developing a suitable road design (consider grading, profile, elevation, setback, screening) that does not negatively impact the visual and physical experience of the landscape.

- **CHL 3, CHL 4, CHL 5 and CHL 6**: The proposed road alignment will result in alteration of these resources through disturbance. As such, a detailed HIA that considers all four roadscapes together should be conducted by a qualified heritage consultant at the earliest stage possible during Detail Design to recommend an appropriate conservation strategy. The assessment should follow the City of Kitchener’s HIA Terms of Reference and be submitted for review, comment and approval to heritage planning staff and the municipal heritage committee. An HIA should be conducted for the purposes of developing an appropriate road design that does not negatively impact the visual and physical experiences of the identified landscapes. The HIA should consider: incorporation of the roadscapes into the City of Kitchener’s trail system (Doon South Scenic Roads Community Trail Network); opportunities to appropriately link the new road with the trail system; and impacts of intersection configurations for Robert Ferrie Drive and Blair Creek Drive. The report should also contain a photo-documentation of the roadscapes.

The proposed preliminary design of the TPA incorporates these mitigation proposals to the degree possible at this stage in the planning and design process, but should be examined further for the refinement/enhancement of mitigation opportunities during Detail Design.

### 5.2.10 Archaeological Resources

The archaeological and historical context was analyzed to help determine the archaeological potential of the study area.

Section 1.3.1 of the MTC Standards and Guidelines for Consultant Archaeologists lists characteristics that indicate where archaeological resources are most likely to be found, and archaeological potential is confirmed when one or more features of archaeological potential are
present. Accordingly, the Strasburg Road Extension study area meets the following criteria used for determining archaeological potential:

- Previously registered archaeological sites (i.e., AiHc-22);
- Water sources: primary, secondary, or ancient water sources (i.e., Blair Creek);
- Early Euro-Canadian settlement (i.e., pioneer homestead); and
- Early historical transportation route (i.e., New Dundee Road, Reidel Drive, and Stauffer Drive).

These criteria characterize the study area as having potential for the identification of Aboriginal and Euro-Canadian archaeological resources.

**Archaeological Potential Model**

Archaeological potential models are developed as tools to assist land use planners and policy makers in evaluating the threat to archaeological resources that might occur through proposed land-development projects. Since the majority of archaeological sites have not yet been documented or registered with the OASD, the only alternative is to use archaeological science to partition the landscape into zones that exhibit archaeological potential versus those that do not. The result is an archaeological potential map against which the footprint of proposed development alternatives can be evaluated.

Using the information from known archaeological sites and historic features, GIS mapping was reviewed to determine if archaeological potential is present within the study area. The mapping of archaeological site potential confirmed that the study area exhibits archaeological potential. Archaeological potential mapping is presented in Figure 6 in Appendix D.7.

**Conclusions**

The Stage 1 Archaeological Assessment was conducted to assist with the Strasburg Road Extension EA. The background research determined that a single archaeological site, AiHc-22, has been registered within the Strasburg Road extension study area. Six additional archaeological sites have been registered within 1 km of the study area. A review of the general physiography and local nineteenth century land use of the study area suggested that it has potential for the identification of Aboriginal and Euro-Canadian archaeological sites.

An archaeological potential model was produced to corroborate the results of the background study. The potential model supports the conclusions of the background research and suggests that the study area contains archaeological potential.

**Recommendations**

In light of the results of the background research and archaeological potential modeling undertaken for the Stage 1 Archaeological Assessment of the Strasburg Road extension study area, ASI makes the following recommendations:

- Archaeological potential exists in the Strasburg Road Extension study area. All previously undisturbed lands will require a Stage 2 Archaeological Assessment (Property Survey), which must be conducted in accordance with Sections 2.1.1 and 2.1.2 of the MTC 2011 Standards and Guidelines for Consultant Archaeologists. The Stage 2 assessment must involve a combination of pedestrian survey of all ploughable lands and test pit survey for the remainder.
• Pedestrian survey involves systematically walking over freshly ploughed and weathered agricultural lands; and
• Test pit survey involves the systematic excavation of small test pits at 5 m intervals and can be conducted only in areas where ploughing is not feasible.

Notwithstanding the results and recommendations presented in this study, ASI notes that no archaeological assessment, no matter how thorough or carefully completed, can necessarily predict, account for, or identify every form of isolated or deeply buried archaeological deposit. In the event that archaeological remains are found during subsequent construction activities, the consultant archaeologist, approval authority, and the Cultural Programs Unit of the Ministry of Tourism, Culture and Sport should be immediately notified.

Advice on Compliance with Legislation

ASI advises compliance with the following legislation:

• This report is submitted to the Minister of Tourism, Culture and Sport as a condition of licensing in accordance with Part VI of the Ontario Heritage Act, R.S.O. 1990, c 0.18. The report is reviewed to ensure that it complies with the standards and guidelines that are issued by the Minister, and that the archaeological fieldwork and report recommendations ensure the conservation, protection and preservation of the cultural heritage of Ontario. When all matters relating to archaeological sites within the project area of a development proposal have been addressed to the satisfaction of the Ministry of Tourism, Culture and Sport, a letter will be issued by the ministry stating that there are no further concerns with regard to alterations to archaeological sites by the proposed development;

• It is an offence under Sections 48 and 69 of the Ontario Heritage Act for any party other than a licensed archaeologist to make any alteration to a known archaeological site or to remove any artifact or other physical evidence of past human use or activity from the site, until such time as a licensed archaeologist has completed archaeological fieldwork on the site, submitted a report to the Minister stating that the site has no further cultural heritage value or interest, and the report has been filed in the Ontario Public Register of Archaeology Reports referred to in Section 65.1 of the Ontario Heritage Act;

• Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48 (1) of the Ontario Heritage Act. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with sec. 48 (1) of the Ontario Heritage Act; and

### 5.3 Summary of Project Mitigation and Monitoring Requirements

Table 5.5 summarizes the environmental factor-specific issues, potential impacts, proposed mitigation measures, and net effects of implementing the proposed Strasburg Road Extension, as well as proposed monitoring and future additional/contingency investigations.

**Table 5.5: Summary of Potential Environmental Impacts, Proposed Mitigation Measures and Commitments to Further Work**

<table>
<thead>
<tr>
<th>Factor</th>
<th>Environmental Issue/Concern</th>
<th>Potential Construction/Operations Impact/Effect</th>
<th>Mitigation Measures/Net Effect</th>
<th>Monitoring/Future Work/Contingency</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ENGINEERING</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Transportation Network</strong></td>
<td>Property Access</td>
<td>Loss of existing access at 500 Stauffer Drive, 271 Reidel Drive and Activa lands at the west end of Stauffer Drive.</td>
<td>Introduce driveway/entrance from Strasburg Road to Stauffer Drive to serve 500 Stauffer Drive and Activa lands. Construct new driveway connection from Blair Creek Drive to 271 Reidel Drive via a segment of existing Reidel Drive.</td>
<td>Account for possible conflicts with potential future use of the Reidel Drive corridor as part of the Doon South Community Trail Network.</td>
</tr>
<tr>
<td></td>
<td>Modification of accesses on Cameron Road and New Dundee Road as a result of Strasburg Road-Cameron Road/New Dundee Road intersection configuration.</td>
<td></td>
<td>Retain property entrance locations on New Dundee Road and Cameron Road and modify geometrics as required.</td>
<td>Consult property owners, Region of Waterloo and Township of North Dumfries with respect to access design.</td>
</tr>
<tr>
<td><strong>Drainage and Stormwater Management</strong></td>
<td>Impairment of Blair Creek water quality; increased runoff and erosion potential; increased concentration of flow and peak flows</td>
<td>Discharge of stormwater runoff from storm sewer outlet to Blair Creek.</td>
<td>Stormwater management ponds and oil/grit separators are considered the most applicable and feasible water quality control options and have been incorporated in the preliminary design scheme. Storm water management ponds and/or oversized pipes will be incorporated to provide quantity control to stormwater runoff. Temporary erosion and sediment controls will be implemented to reduce risk of sedimentation during construction.</td>
<td>Refinement of stormwater management design in Detail Design Water quality monitoring in Blair Creek during operations phase. Implementation of an Erosion and Sediment Control Plan during construction Monitor for flooding and associated damage during/after storm events.</td>
</tr>
<tr>
<td>Factor</td>
<td>Environmental issue/Concern</td>
<td>Potential Construction/Operations Impact/Effect</td>
<td>Mitigation Measures/Net Effect</td>
<td>Monitoring/Future Work/Contingency</td>
</tr>
<tr>
<td>---------------</td>
<td>-------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Municipal Services and Utilities</td>
<td>Need for relocation of existing services</td>
<td>In general, the standard construction sequence for completing utility relocations will be used during construction and minimal impacts to existing services or service interruptions are expected.</td>
<td>Owners of existing residential, commercial and business properties will be notified in advance by the City if utility relocation will occur. Alternative access arrangements will be provided to the owner. Adequate protection will be in place to ensure site safety at all times to protect the public and the owners from the construction sites.</td>
<td>Conduct additional engineering surveys and contact utility owners further to ascertain the existence and nature of their plant, and feasibility of relocation. Monitor and address service disruptions (complaint protocol). A monitoring plan will be in place to ensure safety as a first priority for the public and employees.</td>
</tr>
<tr>
<td>Factor</td>
<td>Environmental Issue/Concern</td>
<td>Potential Construction/Operations Impact/Effect</td>
<td>Mitigation Measures/Net Effect</td>
<td>Monitoring/Future Work/Contingency</td>
</tr>
<tr>
<td>--------</td>
<td>-----------------------------</td>
<td>-----------------------------------------------</td>
<td>--------------------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>NATURAL ENVIRONMENT</td>
<td>Fish and Fish Habitat</td>
<td>Harmful alteration, disruption or destruction (HADD) of fish habitat</td>
<td>Discharge of sediment to a watercourse from earth/spoil stockpiles, grading and excavation activities associated with road extension and associated culvert works resulting in the impairment of water quality and/or physical damage to habitat.</td>
<td>Design and install native woody riparian vegetation and groundcover to pre-construction conditions or better.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Change to sensitive life stages if near-water works are not timed appropriately.</td>
<td>Design and implement an appropriate Erosion and Sediment Control Plan (ESCP) to prevent erosion of exposed soils and migration of sediment to the watercourse in accordance with GRCA’s best practice requirements, including:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Alteration/loss to riparian vegetation (potential loss of allochthonous inputs (food supply/sources) – leaf matter, terrestrial insects).</td>
<td>o Limiting the size and duration of disturbed areas (3Rs – retain, reduce, re-vegetate), including conducting work in a continuous fashion to minimize the duration of potential impacts and limiting the area of disturbance to a manageable area, and stabilization/re-vegetation of exposed soils immediately following construction;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Release of fuel, oil, grease contaminants from mobile equipment resulting in unacceptable contaminant concentrations in receiving watercourse.</td>
<td>o Identification of, and appropriate phasing of work in, critical and non-critical management areas;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Displacement, stranding, mortality of fish during construction from use of mobile equipment.</td>
<td>o Appropriate seasonal controls, including winter shutdown protection;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>o Strategic use of vegetation buffers between work areas and natural areas.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Implement timing restrictions during construction for near-water work to protect sensitive life stages of fish, as identified by MNR (coldwater – in-stream window July 1 to September 15).</td>
<td>Store, handle and dispose of all excess materials in a manner that prevents their entry to the watercourse.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Store, handle and dispose of all excess materials by storing, handling and</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Design permanent drainage and stormwater management systems to mimic overland drainage patterns and control runoff quality/quantity contribution to watercourse features.</td>
</tr>
<tr>
<td>Factor</td>
<td>Environmental Issue/Concern</td>
<td>Potential Construction/Operations Impact/Effect</td>
<td>Mitigation Measures/Net Effect</td>
<td>Monitoring/Future Work/Contingency</td>
</tr>
<tr>
<td>--------</td>
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<td>-----------------------------------------------</td>
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<td>-----------------------------------</td>
</tr>
<tr>
<td>Terrestrial Ecosystems</td>
<td>Both natural and culturally impacted vegetation communities (forest, cultural communities, wetlands and PSW)</td>
<td>Loss of approximately 1.34 ha of vegetation, consisting of 0.64 ha of cultural vegetation, 0.25 ha of forest communities, 0.24 ha of wetland communities (0.20 ha PSW), and 0.20 ha of hedgerow.</td>
<td>Re-stabilize and re-vegetate exposed surfaces as soon as possible, using native vegetation seed mixes and plantings (as per design drawings). Clearly delineate ROW vegetation clearing limits on both construction drawings and in the field and field confirm with the Contractor prior to clearing and grading. Equipment, materials and other construction activities will not be permitted in these zones. Prepare and implement a Vegetation Management/Tree Protection Plan. Trees to be removed will be felled into the ROW (and away from watercourses) to avoid disturbance to off-ROW vegetation, as well as aquatic areas. Tree grubbing will be restricted to the required activity zone. Where possible, tree stumps will be cut flush to the ground and grubbing will be avoided to minimize soil disturbance, particularly in erosion prone areas. Cut and grubbed material will be disposed of through chipping. Where possible, cut material may be piled and re-used for wildlife habitat or in edge treatments. This material will help retain soil moisture and prevent weed spread.</td>
<td>Environmental site inspections during construction and post-construction periods to ensure environmental protection/re-vegetation measures are implemented and working and any required remedial action is undertaken. Plantings of woody and herbaceous vegetation will be checked in accordance with Landscaping and Ecological Restoration Plans.</td>
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<td>disposing of all materials generated during site preparation, construction and operations to prevent their entry into watercourses. Equipment re-fuelling will take place no closer than 30 m from any watercourse to prevent water contamination due to accidental fuel spills. Prohibit/limit construction access to watercourse/watercourse banks. A vegetative buffer should be maintained between the roadway and the pond at 500 Stauffer Drive for the protection of the riparian zone and the aquatic habitat within the pond. Manage dewatering and concrete effluent, where applicable, from excavations and structural works to prevent release of contaminated water to receiving watercourses. o Direct dewatering effluent to temporary settling basins, filter bags and energy discharge diffusers, as required. o Capture and transport concrete effluent off-site for disposal.</td>
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<tr>
<td>Wildlife</td>
<td>Wildlife Habitat and Community – Short Term/ Construction</td>
<td>Direct impacts associated with habitat loss due to construction/grading/vegetation removal.</td>
<td>Undertake tree management activities as required for both driver safety and health of the balance of the vegetation unit (i.e., removal of hazard trees within a defined Hazard Zone). Unnecessary traffic, dumping and storage of materials over tree roots will be avoided. All spills will be immediately controlled and reported to the authorities having jurisdiction and the City’s representative. Refuelling should not be permitted within 30 m of any forest, wetland or watercourse, or the top-of-bank areas.</td>
<td>Minimize construction footprint and the extent of habitat loss required for the road footprint through refinement of the road design at detail design. Ensure that silt/sediment control fencing is installed to adequately prevent the overland transport of silt and sediment into habitat to be retained (both terrestrial and aquatic). Restore disturbed areas immediately post construction with native and non-invasive species. Adhere to timing windows as per the MBCA and for other sensitive wildlife periods such as amphibian breeding/migration to prevent disruptions to breeding individuals, nests, eggs and fledglings that may be in close proximity to the construction area. Clearly delineate construction area and ensure that no accidental encroachment occurs into natural areas.</td>
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<tr>
<td>Wildlife</td>
<td>Wildlife Habitat and Community – Long Term/ Operational</td>
<td>Damage and destruction of regulated habitat for Species at Risk (Jefferson Salamander).</td>
<td>SAR species mitigation will be developed as part of the permitting process and the associated overall benefit plan under the ESA, 2007. An overall benefit plan is required in addition to mitigation measures to minimize impacts.</td>
<td>Continued consultation with the MNR to develop an overall benefit plan and mitigation to address SAR habitat and individuals of the species (as part of a permit under the ESA, 2007). Additional studies may be required at detail design to ensure that impacts are minimized.</td>
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Detailed erosion and sediment control and monitoring plan for implementation during the construction phase as part of permit acquisition from GRCA, MNR, etc. The effectiveness of the ESC plans should be monitored during construction by an environmental monitor. Provide an on-site environmental monitor who is trained for site specific occurrences of potential SAR or other wildlife species.
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<tr>
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<td></td>
<td>Potential for habitat fragmentation, barrier effects, incidental kills through animal-vehicle conflict, etc.</td>
<td>Ensure the implementation of ecopassages for target species and locations, and install appropriate directional/exclusionary fencing. Educate drivers regarding the potential for wildlife in the area (e.g., wildlife crossing signs).</td>
<td>fully understood and appropriate mitigation measures (including ecopassage siting) are developed. Develop ecopassages in consultation with the MNR to address SAR habitat requirements. Field monitoring and additional data collection at detail design to assess and verify the extent of wildlife movement in the area. Monitoring the effectiveness of the ecopassages with adaptive feedback mechanisms to provide recommendations for retrofitting or other adaptive responses.</td>
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<td>Salt spray impacts to aquatic habitat and terrestrial habitat</td>
<td>Ensure new vegetation community edges and/or roadside edges are planted with species that will serve to buffer the interior habitats from salt spray. Develop/adapt a salt management plan for sensitive areas.</td>
<td>Longer-term monitoring post-construction for effectiveness of edge or salt management plans and the health of retained wildlife habitat and communities (which may be assessed through vegetation community monitoring).</td>
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<td>Habitat degradation/Indirect habitat impacts as a result of pollution, dust, litter, light, changes in surface and groundwater hydrology and noise pollution.</td>
<td>Minimize area of disturbance by selection of the shortest crossing of the natural heritage system, thereby minimizing the extent of indirect habitat/edge habitat degradation; Restore edges and disturbed areas with native and non-invasive vegetation species and. Limit mowing and herbicide applications at roadsides. Manage stormwater drainage to provide treatment and maintenance of flow patterns to avoid sedimentation and erosion in retained vegetation communities and aquatic habitat. Use directional lighting and design roads to minimize noise and vibrations. Ensure pre-development surface and groundwater drainage patterns are retained, particularly where wetlands, vernal pools and other natural features exist that contain features or functions sensitive to water level fluctuations/hydroperiods. This includes both features and functions within and outside the EA study area. Protect, restore and create new habitat where feasible (may occur as part of an ESA permit overall benefit plan). Development of a stewardship plan for Blair Creek corridor.</td>
<td>Effectiveness monitoring to ensure that post-construction mitigation measures are working effectively. Effectiveness monitoring should also serve to direct and inform any stewardship activities.</td>
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<tr>
<td>Groundwater and Hydrogeology</td>
<td>Threats to groundwater quality and quantity</td>
<td>Restriction of recharge to the underlying aquifer systems, which can result in a reduction of groundwater flows to municipal water supply wells and local baseflow to Blair Creek. The long term cumulative loading of road salt could have consequences to existing groundwater users and the surface water quality of the Blair Creek drainage system.</td>
<td>The additional impervious surface represented by the Strasburg Road Extension itself is relatively small (3.84 ha) (&lt;1% of the total study area). Therefore, this will not significantly affect the overall groundwater recharge capacity of the area. Measures to be implemented to ensure that any groundwater encountered during construction is maintained, filtered, and released in accordance with OPSS. Groundwater quality protection/proper spills management during construction and operation, and maximizing roadway runoff quality prior to release to receiving areas. The design principles to minimize the excavation requirements for spread footings (if utilized), and providing post-construction stabilization and enhancement of disturbed areas.</td>
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<td>Existing farm pond on the property at 500 Stauffer Drive is spring-fed and likely hydraulically connected to personal supply well via the shallow aquifer. Potential impacts to potable water well at 271 Reidel Drive.</td>
<td>Salt spray from vehicles can be expected to extend up to 30 m north and south of the road allowance, indicating that some limited salt loading could be expected for the pond.</td>
<td>Management of road run-off during melt periods to ensure that it is not directed to an infiltration zone that is directly hydraulically connected to the pond or upgradient of the resident's water supply well.</td>
<td>Efforts to promote at-source infiltration (where feasible) to infiltrate clean stormwater and/or ensure that road runoff is directed away from the recharge zone and the private residence pond should be conducted during Detail Design. A well nest, consisting of at least two monitoring wells to be installed at 500 Stauffer Drive and 271 Reidel Drive prior to construction to obtain pre-construction information on fluctuations in quantity and quality near water table and near the screened interval of the residential potable water wells.</td>
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<tr>
<td>Contaminated Property</td>
<td>No evidence noted that contaminated sources are present.</td>
<td>Impacts considered low.</td>
<td>None required.</td>
<td>If the design alignment ultimately does change such that it is located in closer proximity to the developed portions of the rural properties, Phase I ESAs should be conducted as part of Detail Design.</td>
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**SOCIO-ECONOMIC ENVIRONMENT**

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<tr>
<th>Land Use</th>
<th>Factor</th>
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<tbody>
<tr>
<td>Farming Operations – Access and Internal Circulation</td>
<td>Severance of farming operations at 500 Stauffer Drive and 271 Reidel Drive. Elimination or encumbrance of access to at 500 Stauffer Drive and Activa lands east and west of Reidel Drive.</td>
<td>Introduction of driveway/entrance to Stauffer Drive west of Strasburg Road. Access to 271 Reidel Drive will be maintained by introducing a driveway from Blair Creek Drive via a section of existing Reidel Drive. Introduction of field accesses off Strasburg Road, Stauffer Drive and Robert Ferrie Drive.</td>
<td>Field access provisions will be confirmed during Detail Design based on the requirements of the adjacent landowners.</td>
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<tr>
<td>Residence/Bed &amp; Breakfast operation at 500 Stauffer Drive</td>
<td>Reduced enjoyment of property and viability of business operation associated with aesthetics/visual intrusion and increased noise levels due to the proximity of the new roadway. Reduction/loss of direct access to woodlot for firewood supply at 500 Stauffer Drive.</td>
<td>Vegetative screening incorporated in the landscape plan for the road. Introduction of field access off Robert Ferrie Drive for access to woodlot.</td>
<td>Refinement and post-construction effects monitoring of vegetation screening. Field access provisions will be confirmed during Detail Design based on the requirements of the adjacent landowners.</td>
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<tr>
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<tr>
<td>Communities</td>
<td>Redefinition of planned community boundaries</td>
<td>The alignment proposed in this study differs from that shown in the Municipal Plan, and has the potential to redefine the planned Doon South Community boundary and the Region of Waterloo’s Countryside Line.</td>
<td>The TPA is represents the optimum balance of impacts across a comprehensive range of assessment criteria and is deemed acceptable with respect to the potential to redefine the Doon South Community boundary.</td>
<td>The proposed Strasburg Road alignment will be used to inform future land use and community planning decisions by the City and the Region, particularly as this relates to the current deliberations on the Countryside Line; use of the Reidel Drive corridor and lands between Reidel and the new Strasburg Road alignment; and development applications in Doon South.</td>
</tr>
<tr>
<td>Noise</td>
<td>Significant sound level increases at sensitive receptors</td>
<td>Residences at 500 Stauffer Drive and 271 Reidel Drive will experience sound level increases of 14 dB and 13 dB respectively.</td>
<td>Building the long lengths of noise attenuation barrier required to achieve the target noise reduction for each individual residence is not economically practical. Hence, noise control is not recommended for the areas on this project where there is a 5 dB or greater increase in noise.</td>
<td>Refinement and post-construction effects monitoring of vegetation screening.</td>
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Vegetation screening will be introduced to break line-of-sight at these receptors.
### CULTURAL ENVIRONMENT

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<tbody>
<tr>
<td>Built Heritage and Cultural Landscapes</td>
<td>Displacement or disturbance of Built Heritage Resources and Cultural Heritage Landscapes (CHL)</td>
<td>No impacts to Built Heritage Resources. Potential impacts to: 271 Reidel Drive (CHL 1) - The proposed road extension will alter the setting of this resource through disruption of the associated fields, isolation of the resource, and obstruction of scenic views to the west of the farmhouse. 500 Stauffer Drive (CHL 2) - The proposed road extension will alter the setting of this resource through disruption of the associated fields and obstruction of scenic views to the east of the farmhouse. CHL 3, CHL 4, CHL 5 and CHL 6: The proposed road alignment will result in alteration of these resources through disturbance.</td>
<td>A vegetative screening/buffering plan to minimize impacts on the setting of the two farm complexes and the intersection of Stauffer Drive and Reidel Drive (CHL 3/CHL 4) has been developed to ensure the long-term viability of the residential heritage resources and screening of the Doon South Scenic Road Community Trail at the north end of Reidel Drive. The TPA provides the opportunity to retain most of CHL 6 and incorporate it in the Doon South Scenic Road Community Trail Network.</td>
<td>A detailed, resource-specific heritage impact assessment (HIA) should be conducted for CHL 1 and CHL 2 by a qualified heritage consultant at the earliest stage possible during Detail Design to recommend an appropriate conservation plan. A detailed HIA for all four roadscapes (CHL 3, CHL 4, CHL 5, and CHL 6) should be conducted by a qualified heritage consultant at the earliest stage possible during Detail Design to recommend an appropriate conservation strategy. Refinement and post-construction effects monitoring of vegetation screening.</td>
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<tr>
<td>Archaeological Resources</td>
<td>Areas with potential for identification of Aboriginal and Euro-Canadian archaeological resources</td>
<td>The TPA crosses areas with potential for identification of Aboriginal and Euro-Canadian archaeological resources.</td>
<td>A Stage 2 Archaeological Assessment will be conducted on lands determined to have archaeological potential. Additional (Stage 3 and Stage 4) mitigation will be conducted, as required.</td>
<td>In the event that archaeological remains are found during subsequent construction activities, the consultant archaeologist, approval authority, and the Cultural Programs Unit of the Ministry of Tourism, Culture and Sport will be immediately notified.</td>
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6.0 PROJECT IMPLEMENTATION

This section of the ESR describes the City of Kitchener’s current thinking on how and when the Strasburg Road Extension project will move forward to implementation.

In addition, general commitments to environmental compliance and effects monitoring are described.

To inform and provide direction to Detail Design investigations, the Project Team’s understanding of approvals, permits, authorizations and clearances that must be obtained prior to construction are also identified. This includes the process for amending the Environmental Study Report, if required, in accordance with the Municipal Class EA process.

6.1 Construction Cost, Timing and Staging

The estimated cost of constructing the Strasburg Road Extension project from north of Stauffer Drive to New Dundee Road, including the Blair Creek Drive connection, will be in the order of $23.4 Million, as summarized below.

**Strasburg Road:**

- Roadwork: $4,200,000
- Storm Sewers and Appurtenances: $900,000
- Storm Water Management Ponds: $630,000
- Illumination: $700,000
- Structures: $800,000
- Sanitary Sewers and Appurtenances: $3,200,000
- Watermain and Appurtenances (including Blair Creek Drive): $2,900,000

**Sub-Total Strasburg Road:** $13,330,000

**Side Roads:**

- Blair Creek Drive (80 m additional length): $400,000
- Robert Ferrie Drive (0 m additional length): $0
- New Dundee Road (roundabout option): $2,500,000

**Sub-Total Side Roads:** $2,900,000

**TOTAL CONSTRUCTION:** $16,230,000

- Contingency and Property Costs (30% of Construction): $4,869,000
- Engineering and Administration (10% of Construction): $1,560,000

**GRAND TOTAL:** $22,659,000

In accordance with the City of Kitchener’s 2004 and 2009 Development Charges background studies, the Strasburg Road extension will be fully funded through development charges.

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23 Based on westerly limit of Robert Ferrie Drive shown in the current City of Kitchener Municipal Plan.
City's 10-year Capital forecast indicates that the Strasburg Road Extension construction process will be initiated in 2016. However, this proposed construction timing may be adjusted, and is expected to be contingent upon the availability of Development Charge funding and other capital project priorities.

### 6.2 Monitoring

As part of the City of Kitchener’s continuing commitment to environmental stewardship, comprehensive construction and post-construction monitoring programs will be instituted on this undertaking. The programs will assess the effectiveness of environmental mitigation, enhancement and compensation measures implemented to limit the net effects of the project, as well as the degree of compliance with environmental protection measures committed to during the construction period.

#### 6.2.1 Environmental Inspection during Construction

The City of Kitchener will retain the services of a qualified Contract Administrator to oversee all aspects of construction at the field level, including supervision of all activities conducted by the Contractor selected by the City to construct the project. The Contract Administrator will be the City’s representative during construction and will be present on-site during all construction activities. All instructions to the Contractor will be issued by the Contract Administrator.

From an environmental perspective, the Contract Administrator will be responsible for retaining the appropriate specialists to ensure that all construction activities are carried out in conformity with applicable environmental legislation, regulations and industry standards, and are consistent with provisions in the Contract Documents, which will reflect the commitments contained in this ESR and those developed during the Detail Design phase of the project. The Contract Administrator will also ensure that the conditions of approval specified in site-specific permits, approvals and authorizations secured from regulatory agencies for this project are adhered to, including documentation, reporting and on-site retention of such permits, as required.

Environmental compliance will be achieved through the establishment of an environmental inspection approach that includes the use of an Environmental Inspector operating under the direction of the Contract Administrator. The project will be subject to periodic on-site environmental inspection to ensure that the execution of the environmental component of the work is occurring as planned and to deal with any environmental problems that may develop during construction. The periodic on-site inspection will be supplemented by the support of environmental specialists retained by the Contract Administrator, as required, to assure the proper implementation of site-specific mitigation or remediation measures (e.g., monitoring of earthworks for discovery of archaeological resources).

In addition, the effectiveness of the environmental protection measures will be assessed to ensure that:

- Environmental protection measures required in the pre-construction (site preparation) phase are implemented and monitored during the construction activities (e.g., inspection for nesting migratory birds);
- Individual mitigation measures are providing the expected control and/or protection (e.g., dust and noise control);
- Composite control and/or protection provided by the mitigating measures is adequate (e.g., Erosion and Sediment Control Plan; winter shutdown);
Deficiencies (poor installation; ineffectiveness) are corrected in an effective and timely manner; and

Additional/enhanced mitigating measures are provided, as required, for any unanticipated environmental problems that may develop during construction, and appropriate contingency and emergency response plans are in place and being followed (e.g., spills control, discovery of archaeological artifacts or vegetation/wildlife Species at Risk, impacts to water wells). In addition, the City will develop and implement a strategic program to survey potentially affected potable water wells in proximity to the proposed works prior to and during construction, and will provide an alternate water supply to offset adverse affects attributable to the project in response to related concerns expressed by well owners.

To assist the Environmental Inspector and standardize the environmental inspection duties, a verification/checklist will be developed, listing all mitigation measures and commitments to be undertaken to ensure compliance with such commitments associated and requirements. Any concerns and required action will be detailed in a standard inspection report form and signed off on as the concerns are addressed or the additional work is completed.

The Environmental Inspector will have the mandate to verify that all environmental protection and mitigation/compensation measures are implemented. On behalf of the Contract Administrator, the Environmental Inspector will have the authority to direct the construction crews, through the use of field orders, to interrupt specific project activities if the proper protection measures are not in place. In the event that an environmental protection measure could be modified to better protect the environment (public and workers included), the inspector will have the authority to notify the Contract Administrator. Any such proposed interruptions or notifications will be recorded by the Environmental Inspector and promptly reported to the Contract Administrator and the City's Project Manager. The inspector will give immediate notification to the Contract Administrator if, in his/her opinion, there is failure to take appropriate action by the Contractor.

The Environmental Inspector will also monitor areas outside of the road corridor (or site) that have been identified as potentially sensitive to either direct or indirect impacts of the roadway construction (e.g., private properties and downstream reaches of Blair Creek).

6.2.2 Environmental Effects Monitoring

Environmental monitoring after construction is completed normally involves follow-up inspection/assessment of significant or special mitigation measures, and may include scientific monitoring. In the period immediately following construction the following inspection/monitoring will occur:

- Stability of new earthworks;
- Removal of all debris and excess materials as part of final site clean-up. Surplus excavated material (provided it is free of contaminated soils) will be reused during construction or transported to an environmentally suitable location.

In addition, any environmental issues and problems that have developed or remain unresolved after construction will be identified and addressed at onsite meetings with appropriate staff from the City and affected stakeholders (e.g., property owners, regulatory agencies), depending on the nature, extent and significance of the issue or problem.
For this project, the following longer term post-construction monitoring requirements have been established or are anticipated:

- Function of stormwater management treatments;
- Health and effectiveness of landscaping/screening components (500 Stauffer Drive, 271 Reidel Drive) and/or salt management plans and the health of retained wildlife habitat and communities (which may be assessed through vegetation community monitoring);
- Success of ecological restoration plantings (Blair Creek corridor);
- Ecopassage/wildlife barrier function;
- Long term impacts to potable water wells (500 Stauffer Drive and 271 Reidel Drive);
- Roundabout intersections operation.

6.3 Approvals Required Prior to Construction

The City of Kitchener will obtain the necessary permits and approvals for the construction, operation and maintenance of the Strasburg Road Extension project. This section of the report identifies both project-specific permits and approvals that are known to be required at this time, and those that are typically required for this type of project.

6.3.1 Municipal

The following municipal permits and approvals may be required for the construction of this project:

- City Council approvals (capital budget; tendering).
- A Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Permit from the Grand River Conservation Authority (GRCA), in accordance with Ontario Regulation 150/06 of the Ontario Conservation Authorities Act; for the crossing of the Blair Creek corridor.
- Approval for stormwater management facilities.
- Sewer discharge approvals.
- Approvals for Regional watermain, including Integrated Urban System permit.
- Exemptions from Kitchener Municipal Code 450/By-Law 87-258, as amended (regarding noise) for construction activities that must be conducted outside the hours of operation permitted in the by-law.
- Region of Waterloo work permit for construction activities on New Dundee Road (required for any excavation, cut or trench; to install, construct, place, move, remove, relocate, adjust, alter, clean, maintain, test, repair, replace, improve or restore infrastructure in, over, under, across or along a Regional road).
- Region of Waterloo Council approval for implementation of roundabouts.

6.3.2 Provincial

The following provincial permits and approvals may be required for the construction of the project:
• A Section 17(2)(c) permit under the *Endangered Species Act, 2007* for the alteration of Jefferson Salamander habitat. The City recognizes the dynamic nature of the *Endangered Species Act* with respect to habitat protection, and will continue to track changes to the legislation during the life-cycle of the project. Species that currently receive individual species protection under the legislation, will also receive general habitat protection under Section 10(1) in June 2013 (Section 10(4)(c) of the Act). Further, the Species at Risk in Ontario list (SARO – Ontario Regulation 230/08) is a living document and is amended periodically as a result of species assessment and re-assessments conducted by the Committee on the Status of Species at Risk in Ontario (COSSARO). The City will continue to monitor the SARO list throughout the planning and design of the project for any relevant updates (refer to webpage at [http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276722.html](http://www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/276722.html)).

• A Permit to Take Water (PTTW) from the MOE if dewatering for structural foundations exceeds 50,000 litres per day. The need for groundwater pumping will be re-assessed during Detail Design phase, when the culvert footing types and elevations are finalized. It is not expected that the PTTW requirement related to dewatering or diversion of flow from watercourse via mechanical means (pumping) will be required if Blair Creek is crossed with a clear span structure.

• Environmental Compliance Approvals from MOE for new sewers and stormwater management outfalls.

• Environmental Compliance Approvals from MOE for the new watermain.

• Ministry of Tourism, Culture and Sports acceptance and approval on any documentation of additional archaeological and built heritage resource investigations required to clear the corridor from further concern for this project. Accordingly, further archaeological and built heritage investigations (commencing with a Stage 2 Archaeological Assessment) will be conducted and the associated reports will be submitted to MTC for review and acceptance prior to any ground disturbance.

• Excess waste generated on-site that requires off-site removal should be in accordance with Ontario Regulation 347 under the Environmental Protection Act that provides for the transportation and processing of hazardous and non-hazardous waste.

• Where removal of potentially contaminated soil must take place, soils will be tested for those chemicals that may have been used or dumped within the area, and will be handled in accordance with Part XV.I of the Environmental Protection Act (EPA) and Ontario Regulation 153/04, Records of Site Condition. Similarly, the quality of all fill material brought on site will meet the Ontario Regulation 153/04 requirements for the respective property use.

### 6.3.3 Federal

It is possible that an environmental assessment prepared in compliance with the Canadian Environmental Assessment Act (CEAA) may be required. CEAA triggers and the prospect for invoking them are:

• A federal authority is the project proponent – The City of Kitchener is deemed to be the proponent (no trigger).
• Federal money or other form of financial support will be provided to implement the project – City of Kitchener development charges are deemed to be the primary funding source for the project (no trigger).

• Federal lands will be provided to implement the project – there are no federal lands that will be required for implementation of the Strasburg Road Extension (no trigger).

• A federal authority will exercise a regulatory duty under the Law List Regulation in relation to the project – it is possible that federally regulated permits, approvals or authorizations may ultimately be required (e.g., Fisheries Act, Species at Risk Act) (possible trigger). The Grand River Conservation Authority has a Level 3 agreement with the federal Department of Fisheries and Oceans (DFO). In accordance with the agreement and DFO’s Risk Management Framework, GRCA will complete an aquatic effects assessment to determine potential impacts of the proposed work on fish and fish habitat. This process includes an assessment to determine the level of risk (high, medium or low) that any residual effects after the application of mitigation pose to fish/fish habitat, and thus the likelihood of harmful alteration, destruction or disruption (HADD) of fish habitat occurring as a result of the work. From the assessment completed as part of this study, it is expected the proposed work associated with the Strasburg Road Extension will be characterized as “Low Risk” by GRCA and, as such, will not result in a HADD of fish/fish habitat, provided that the appropriate mitigation measures are applied.

As design progresses, the City of Kitchener will continue to monitor the Strasburg Road Extension project for potential CEAA triggers. If required, the City will prepare a Project Description and Scoping Document for review by the responsible federal authority (Responsible Authority) or the Canadian Environmental Assessment Agency. If only one responsible federal authority is likely to be involved, the City will deal directly with the Responsible Authority to assist in completing a CEAA screening for the project.

6.3.4 Environmental Study Report Amending Procedure

The Municipal Class Environmental Assessment process includes an addendum process for proponents to make changes to a project after completion of the Environmental Study Report review stage (Phase 4).

Modifications to the design and implementation of the Strasburg Road Extension proposed in this Environmental Project Report may occur due to unforeseen circumstances, including: changes in environmental conditions in the corridor that may affect anticipated project impacts and means of mitigating adverse effects; technological advancements; and funding availability. This may result in the project being inconsistent or non-compliant with commitments made in the ESR. Significant modifications to the project proposals or changes in the environmental setting that occur after the filing of the ESR will require preparation of an addendum to the ESR.

Changes to the project may also be required if there is a significant lapse of time between the filing of the ESR and the start of construction, since the proposed project and related environmental mitigation measures may no longer be valid or appropriate. If the period of time from the end of the public review period following filing of the ESR in the public record, or MOE’s denial of a Part II Order request, to the proposed commencement of construction exceeds ten (10) years, the City will be required to review the planning and design process and current environmental setting to ensure that the project and mitigation measures are still valid/appropriate. The review will also be documented in an addendum to the ESR.
The ESR Addendum will document the circumstances necessitating the changes to the project proposals, the environmental implications of the changes, and proposals to mitigate any associated negative effects. The Addendum will be filed with the ESR in the public record, and the same notification and review process and public right to request a Part II Order as described in Section 2.1.1 of this ESR will apply. Where an ESR Addendum is issued, only the project elements in the Addendum (the proposed changes to the recommended undertaking) are open for review.