ONTARIO MINISTRY OF TRANSPORTATION

Highway 401 Improvements from 1 km west of the Homer Watson Boulevard Interchange to 1.5 km east of the King Street Interchange

PRELIMINARY DESIGN, DETAILED DESIGN AND CLASS ENVIRONMENTAL ASSESSMENT STUDY

DESIGN AND CONSTRUCTION REPORT
G.W.P. 3080-12-00

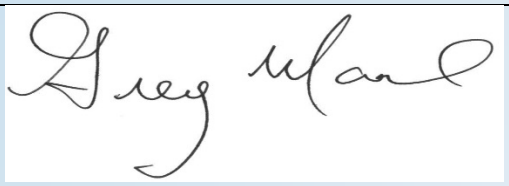
November 2019

DESIGN AND CONSTRUCTION REPORT

HIGHWAY 401 IMPROVEMENTS FROM 1 KM WEST OF THE HOMER WATSON BOULEVARD INTERCHANGE TO 1.5 KM EAST OF THE KING STREET INTERCHANGE

MINISTRY OF TRANSPORTATION, WEST REGION
G.W.P. 3080-12-00

PREPARED BY:



GREG MOORE, B.E.S.
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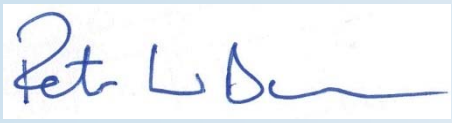

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DATE: NOVEMBER 2019

Disclaimer

WSP prepared this report solely for the use of the intended recipient, the Ontario Ministry of Transportation, in accordance with the professional services agreement between the parties. The report is intended to be used in its entirety. No excerpts may be taken to be representative of the findings in the assessment.

The conclusions presented in this report are based on work performed by trained, professional and technical staff, in accordance with their reasonable interpretation of current and accepted engineering and scientific practices at the time the work was performed.

The content and opinions contained in the present report are based on the observations and/or information available to WSP at the time of preparation, using investigation techniques and engineering analysis methods consistent with those ordinarily exercised by WSP and other engineering/scientific practitioners working under similar conditions, and subject to the same time, financial and physical constraints applicable to this project.

WSP disclaims any obligation to update this report if, after the date of this report, any conditions appear to differ significantly from those presented in this report; however, WSP reserves the right to amend or supplement this report based on additional information, documentation or evidence.

WSP makes no other representations whatsoever concerning the legal significance of its findings.

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In preparing this report, WSP has relied in good faith on information provided by others, as noted in the report. WSP has reasonably assumed that the information provided is correct and WSP is not responsible for the accuracy or completeness of such information.

Benchmark and elevations used in this report are primarily to establish relative elevation differences between the specific testing and/or sampling locations and should not be used for other purposes, such as grading, excavating, construction, planning, development, etc.

Design recommendations given in this report are applicable only to the project and areas as described in the text and then only if constructed in accordance with the details stated in this report. The comments made in this report on potential construction issues and possible methods are intended only for the guidance of the designer. The number of testing and/or sampling locations may not be sufficient to determine all the factors that may affect construction methods and costs. We accept no responsibility for any decisions made or actions taken as a result of this report unless we are specifically advised of and participate in such action, in which case our responsibility will be as agreed to at that time.]

This limitations statement is considered an integral part of this report.

The Public Record

A copy of this document has been submitted to the following office of the Ministry of the Environment, Conservation and Parks to be placed on the Public Record to fulfill the requirements of the Ministry of Transportation's *Class Environmental Assessment for Provincial Transportation Facilities* (2000).

Ministry of the Environment, Conservation and Parks
Guelph Regional Office
1 Stone Road W.
Guelph, Ontario N1G 4Y2

This Design and Construction Report is also available for public review on the project website (https://Hwy401GrandRiverBridges.ca), and during normal business hours at:

Ministry of the Environment, Conservation and Parks
Guelph District Office
1 Stone Road West
Guelph, Ontario

City of Kitchener
Clerk's Office
Kitchener City Hall
200 King Street West, 2nd Floor
Kitchener, Ontario

City of Cambridge
Clerk's Office
Cambridge City Hall
50 Dickson Street
Cambridge, Ontario

Regional Municipality of Waterloo
Office of the Clerk
150 Frederick Street
Kitchener, Ontario

Government Information Office
Kitchener City Hall
200 King Street West
Kitchener, Ontario

Idea Exchange (Cambridge Public Library)
Preston Branch
435 King Street East
Cambridge, Ontario

The Ministry of Transportation is committed to ensuring that government information and services are accessible for all Ontarians. For communication supports or to request project material in an alternate format, please contact one of the Project Team members listed below.

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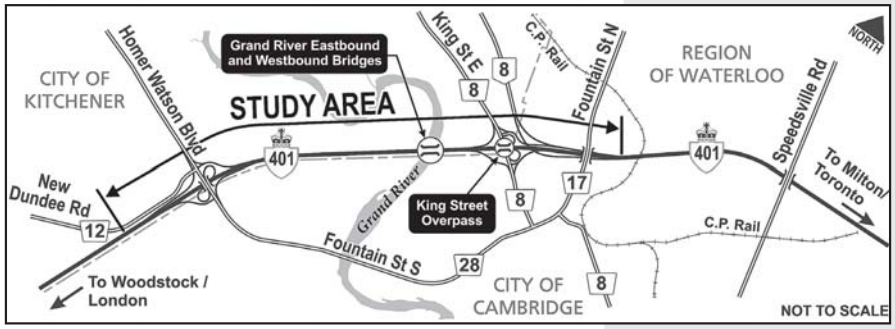
Ce document hautement spécialisé n'est disponsible qu'en anglais en virtue du règlement 411/97, qui en exempte l'application de la Loi sur les services en français. Pour de l'aide en français, veuillez communiquer avec le ministère des Transports, Bureau des services en français au: 905-704-2045 ou 905-704-2046.

Notice of Filing: Design and Construction Report

Highway 401 Improvements from 1 km west of the Homer Watson Boulevard Interchange to 1.5 km east of the King Street Interchange Preliminary Design, Detailed Design and Class Environmental Assessment Study (G.W.P. 3080-12-00)

THE STUDY

The Ontario **Ministry of Transportation (MTO)** retained **WSP** to undertake the Preliminary Design, Detailed Design and Class Environmental Assessment (EA) Study for improvements along Highway 401 from 1 km west of the Homer Watson Boulevard interchange to 1.5 km east of the King Street interchange, in the Cities of Kitchener and Cambridge, within the Regional Municipality of Waterloo, as shown in the key plan.



The improvements include:

- Replacement of the Highway 401 Grand River Bridges (eastbound and westbound) to accommodate the ultimate Highway 401 widening;
- Localized widening of Highway 401 to accommodate traffic staging and the widened Grand River Bridge structures;
- Rehabilitation of the King Street Overpass on Highway 401;
- Reconfiguration of a portion of the King Street ramps and interchange;
- Pavement reconstruction with median barrier replacement;
- Storm sewer reconstruction; and
- Extending the high mast lighting from Highway 8 westerly to the Homer Watson Boulevard interchange.

THE PROCESS

This study has followed the *Class Environmental Assessment for Provincial Transportation Facilities* (2000) process for Group "B" projects, under which the Transportation Environmental Study Report for the improvements to Highway 401 and Highway 8 in an area encompassing the Grand River Bridges and the King Street interchange was completed in 2009 and EA approval was obtained in 2010. This study includes portions of the 2010 EA approved plan. A review was undertaken and determined that there have been no significant changes to the EA approved plan and the study proceeded to Detailed Design.

The Detailed Design is nearing completion and a Design and Construction Report (DCR) has been prepared documenting the detailed design, construction staging, and potential environmental impacts and proposed mitigation measures. The DCR is being filed for public review from **November 14, 2019 to December 16, 2019,** and is available on the project website (www.Hwy401GrandRiverBridges.ca) and at the following locations during regular business hours:

Ministry of the Environment, Conservation and Parks
Guelph District Office
1 Stone Road West
Guelph, ON

City of Kitchener
Clerk's Office
Kitchener City Hall
200 King Street West, 2nd Floor
Kitchener, ON

Regional Municipality of Waterloo
Office of the Clerk
150 Frederick Street
Kitchener, ON

Government Information Office
Kitchener City Hall
200 King Street West
Kitchener, ON

City of Cambridge
Clerk's Office
Cambridge City Hall
50 Dickson Street
Cambridge, ON

Idea Exchange (Cambridge Public Library)
Preston Branch
435 King Street East
Cambridge, ON

COMMENTS

Interested persons are encouraged to review this document and provide comments by **December 16, 2019.** If you wish to obtain additional information or provide comments, please contact:

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e-mail: Greg.Moore2@wsp.com

Comments may also be submitted by visiting the study website at www.Hwy401GrandRiverBridges.ca

If you have any accessibility requirements to participate in this project, please contact one of the Project Team members listed above.

Comments and information will be collected to assist the MTO in meeting the requirements of the Ontario *Environmental Assessment Act.* Information will be collected in accordance with the *Freedom of Information and Protection of Privacy Act* and the *Access to Information Act.* With the exception of personal information, all comments will become part of the public record.

Ontario

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GLOSSARY

AA	Archaeological Assessment
CNWA	*Canadian Navigable Waters Act*
DCR	Design and Construction Report
DFO	Department of Fisheries and Oceans, Canada
EA Act	*Ontario Environmental Assessment Act*
EASR	Environmental Activity Sector Registry
EMS	Emergency Medical Services
ESA	*Endangered Species Act*
GRCA	Grand River Conservation Authority
G.W.P.	Group Work Project
HOV	High Occupancy Vehicle
IAA	*Impact Assessment Act*
MBCA	*Migratory Birds Convention Act*
MECP	Ministry of the Environment, Conservation and Parks
MTCS	Ministry of Tourism, Culture and Sport
MNRF	Ministry of Natural Resources and Forestry
NHIC	Natural Heritage Information Centre
NSA	Noise Sensitive Area
MTO	Ontario Ministry of Transportation
OLA	Outdoor Living Area
OPP	Ontario Provincial Police
OWRA	*Ontario Water Resources Act*
PIC	Public Information Centre
PTTW	Permit-to-Take-Water
ROW	Right-of-Way
SAR	Species at Risk
TESR	Transportation Environmental Study Report

1 PROJECT OVERVIEW

1.1 Background

In 2009, the Ontario Ministry of Transportation (MTO) completed a Transportation Environmental Study Report (TESR) documenting the provincial transportation needs for Highway 401 and Highway 8 in an area encompassing the Grand River Bridges and the King Street interchange. The 2009 TESR was filed for a 30-day review period and, subsequently, approved and cleared in March of 2010.

In 2016, MTO retained WSP to undertake the Preliminary Design, Detailed Design and Class Environmental Assessment (EA) Study for improvements along Highway 401 from 1 km west of the Homer Watson Boulevard interchange to 1.5 km east of the King Street interchange, in the Cities of Kitchener and Cambridge, within the Regional Municipality of Waterloo.

1.2 Summary Description of the Undertaking

Highway 401 is a key transportation corridor through the Province of Ontario, frequented by local, commuter, seasonal and truck traffic. Within the study limits, Highway 401 services vehicles travelling into, out of, and through the Regional Municipality of Waterloo. The existing Highway 401 eastbound and westbound bridges over the Grand River have reached the end of their service lives. These bridges require replacement to avoid further deterioration with increased maintenance costs and provide a cost-effective means of widening the structures to accommodate the ultimate Highway 401 widening and the Highway 401 / Highway 8 freeway-to-freeway interchange. The King Street Overpass also requires rehabilitation to extend its service life.

This study was undertaken to identify the immediate needs for Highway 401 within the study limits and to protect for future property requirements for the long-term needs, including the ultimate Highway 401 widening.

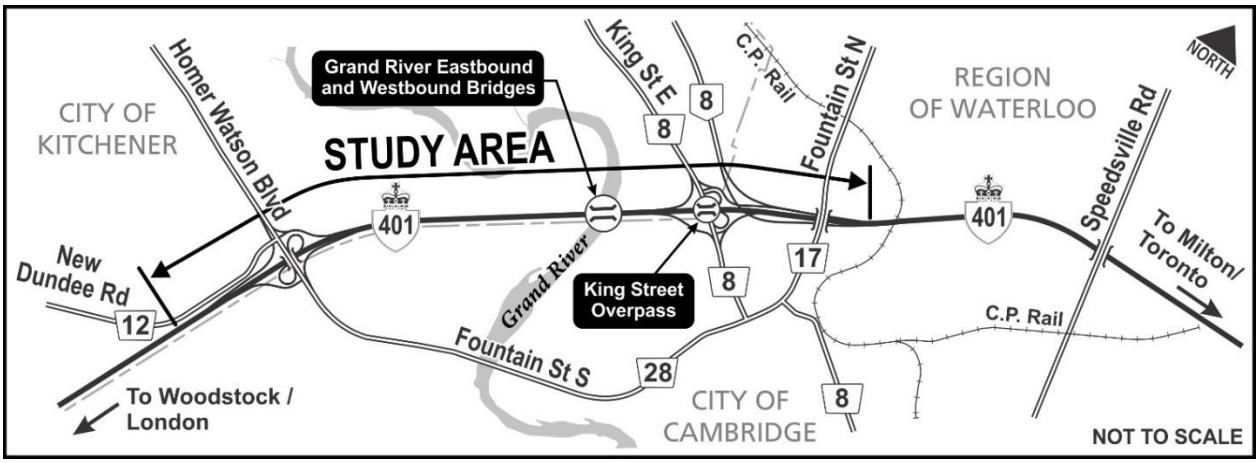
The Detailed Design Plan for the Highway 401 improvements includes portions of the EA approved plan documented in the 2009 TESR and involves the following works:

- Replacement of the Highway 401 Grand River Bridges (eastbound and westbound) to accommodate the ultimate Highway 401 widening;
- Localized widening of Highway 401 to accommodate traffic staging and the widened Grand River Bridge structures;
- Rehabilitation of the King Street Overpass on Highway 401;

- Reconfiguration of a portion of the King Street ramps and interchange;
- Pavement reconstruction with median barrier replacement;
- Storm sewer reconstruction; and
- Extending the high mast lighting from Highway 8 westerly to the Homer Watson Boulevard interchange.

The project location is shown in **Exhibit 1-1**.

Exhibit 1-1: Project Location



Improvements to the ultimate Highway 401 / Highway 8 interchange are not part of the scope of this project and the timeline for these improvements is not yet known.

It should be noted that Regional Road 8 is referred to as King Street East in the City of Kitchener and Shantz Hill Road within the City of Cambridge. For the purposes of this report, "King Street" and the "King Street interchange" refer to King Street East/Shantz Hill Road, and the interchange of Highway 401 with Regional Road 8, respectively.

High Occupancy Vehicle (HOV) Lanes

The potential for high occupancy vehicle (HOV) lanes and the reconfiguration of the King Street interchange as part of the ultimate Highway 401 widening was reviewed as part of this study.

Highway 401 is currently a six-lane highway within the study area. There are currently no HOV lanes on Highway 401 between Homer Watson Boulevard and Fountain Street. Adjacent to the study area (east), MTO is currently undertaking construction to widen Highway 401 from six lanes to ten lanes from King Street East to Hespeler Road to accommodate one HOV lane in each direction (target completion date of 2019).

The current study review concluded that HOV lanes should not be implemented at this time within the project limits for the following reasons:

- Future traffic operations on Highway 401 within the study limits may not make the HOV lanes attractive in the peak periods.
- There are safety and operational concerns with vehicles making west-to-north and north-to-west movements to access the HOV lane in the short distance between the future Highway 8 directional ramps and the Homer Watson Boulevard interchange.

MTO will review the situation regularly to assess traffic operations in this area, as it may be more practical at some point in the future to implement HOV lanes west of Homer Watson Boulevard and this may open opportunities to extend HOV lanes through to Highway 8.

1.3 Environmental Assessment Act Process

1.3.1 Ontario Environmental Assessment Act

The MTO *Class Environmental Assessment for Provincial Transportation Facilities* (Class EA) was approved under the *Ontario Environmental Assessment Act* in the Fall of 1999 and amended in 2000. The Class EA defines the group of projects and activities, and the environmental assessment processes that MTO has committed to follow to plan, design, and implement these types of projects. Provided that this process is followed, projects and activities included under the Class EA do not require formal review and approval under the *Ontario Environmental Assessment Act*. Further details on the Class EA process for Group 'B' projects are contained in the Class EA. Readers interested in these matters are encouraged to refer to that document.

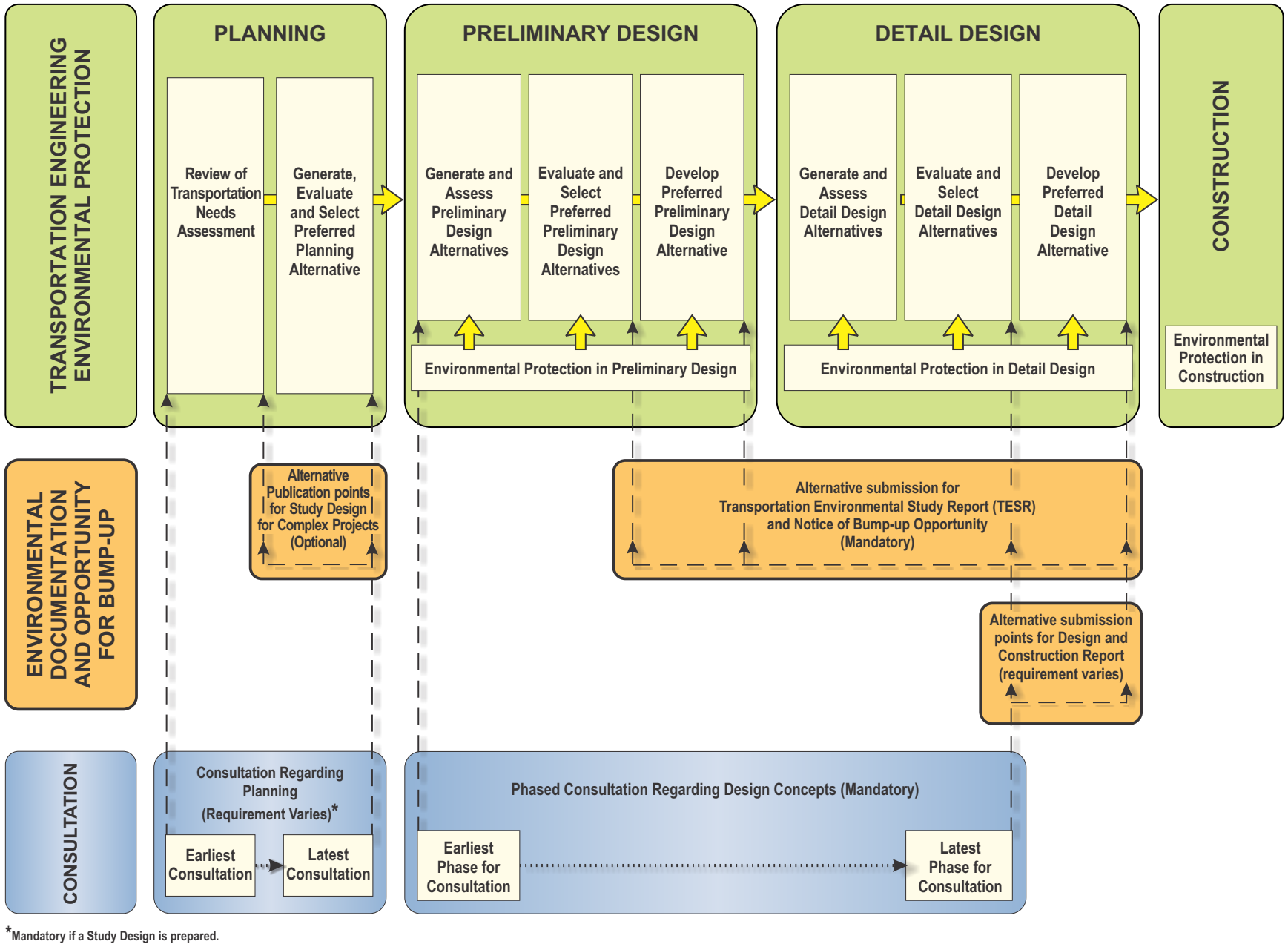
This study followed the MTO Class EA process for Group 'B' projects, which generally includes realignments and widenings of existing highways and freeways over land and water, new interchanges or modifications to existing interchanges, and/or new highway service facilities. Group 'B' projects are generally similar in nature, recur frequently, and have a generally predictable range of environmental effects for which standard mitigation can be used.

The MTO Class EA planning process approach for Group 'B' projects and key study tasks are illustrated in **Exhibit 1-2**. **Exhibit 1-3** highlights the key steps in the study that followed the MTO Class EA process.

Since construction has not commenced since 2009, a “five-year review” of the 2009 TESR was undertaken as a component of this Preliminary Design, Detailed Design and Class EA Study. A review of the current environmental conditions within the study area was completed to determine if there were any new conditions in the study corridor that might affect the proposed design improvements. A review of surrounding land uses (new residential / educational land uses) was also undertaken.

Following the five-year review of the 2009 TESR, the project team determined that the proposed improvements that are being implemented by this study have no significant design modifications that alter the basic concept of the EA approved plan. As there were no significant changes to the EA approved plan, the project proceeded to Detailed Design.

This Design and Construction Report (DCR) documents the results of the five-year review and the Highway 401 improvements identified as part of this Detailed Design study, including design features, potential environmental impacts and proposed mitigation measures.



*Mandatory if a Study Design is prepared.

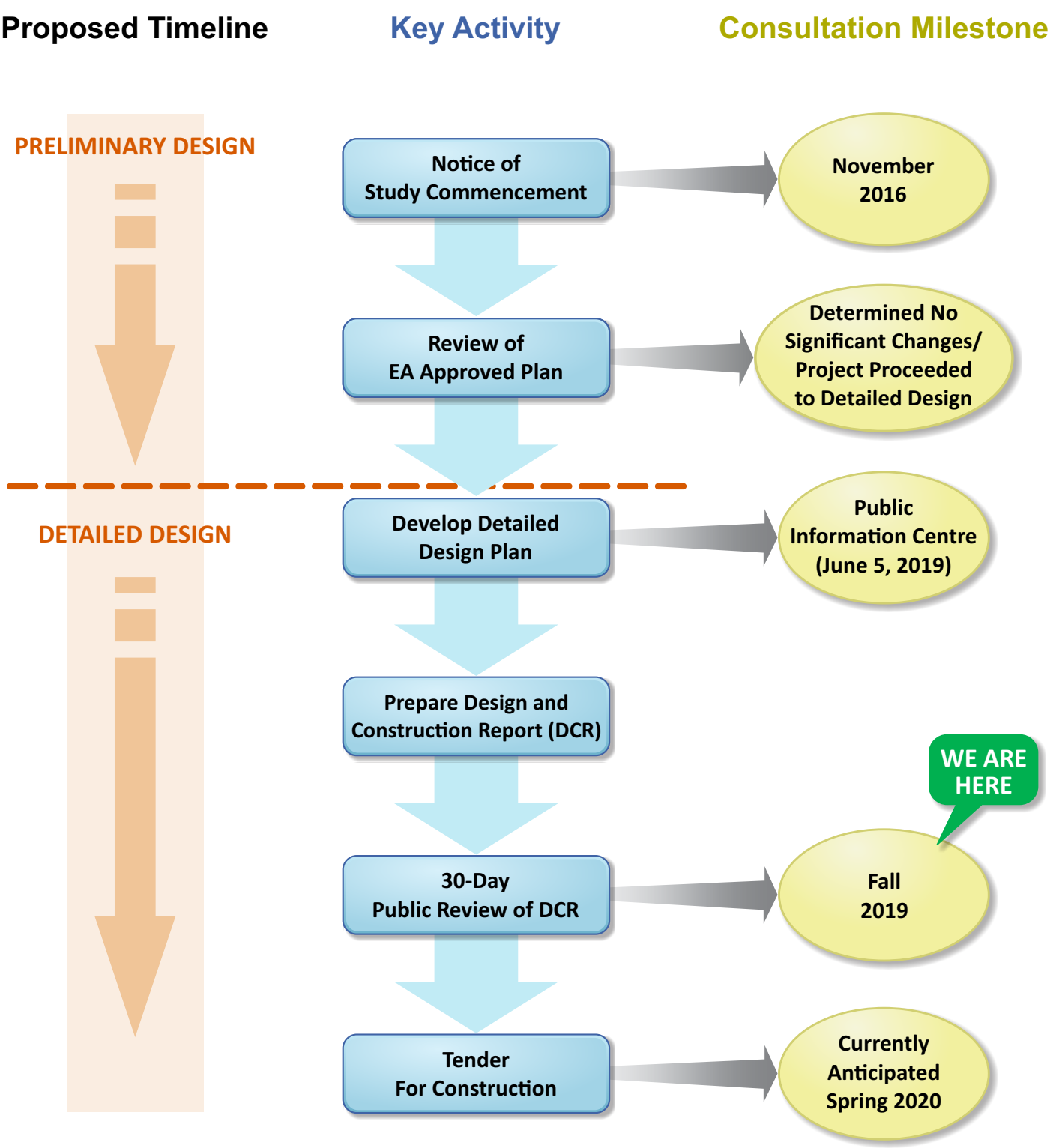
Ontario

wsp

Highway 401 Improvements from 1 km west of the Homer Watson Boulevard Interchange
to 1.5 km east of the King Street Interchange
Design and Construction Report
G.W.P. 3080-12-00

Exhibit 1-2

Overview of the Class EA Process
for Group 'B' Projects


Proposed Timeline
Key Activity
Consultation Milestone
PRELIMINARY DESIGN
DETAILED DESIGN
Notice of Study Commencement
November 2016
Review of EA Approved Plan
Determined No Significant Changes/ Project Proceeded to Detailed Design
Develop Detailed Design Plan
Public Information Centre (June 5, 2019)
Prepare Design and Construction Report (DCR)
WE ARE HERE
30-Day Public Review of DCR
Fall 2019
Tender For Construction
Currently Anticipated Spring 2020

1.3.2 Impact Assessment Act

The *Impact Assessment Act,* 2019 (IAA 2019) and associated regulations came into effect on August 28, 2019. Under IAA 2019, a federal environmental assessment is required for "designated projects." A designated project is one that includes one or more physical activities that are set out in the regulations under IAA 2019 or by order of the Federal Minister of the Environment.

This Preliminary Design and Class Environmental Assessment Study was reviewed by the Project Team against the Federal Regulations Designating Physical Activities, and the Project Team determined that the study is not "designated" and therefore will not require a federal environmental assessment.

More information about the Impact Assessment Act (2019) is available at the following link: https://www.canada.ca/en/impact-assessment-agency.html.

1.4 Purpose of the Design and Construction Report

This Preliminary Design, Detailed Design and Class EA Study addresses the need for improvements for Highway 401 from 1 km west of Homer Watson Interchange to 1.5 km east of King Street interchange, including the replacement of the Grand River Bridges and the rehabilitation of the King Street Overpass.

This study builds upon the previous Planning and Preliminary Design phase approved in 2010, which determined the planning requirements for the ultimate provincial transportation needs for Highway 401 and Highway 8.

This Design and Construction Report (DCR) documents the environmentally significant aspects of the improvements along Highway 401 from 1 km west of the Homer Watson Boulevard interchange to 1.5 km east of the King Street interchange, including the replacement of the Highway 401 Grand River Bridges. This DCR documents the portions of EA approved plan documented in the 2009 TESR that are being implemented as part of this Preliminary Design, Detailed Design and Class EA Study.

The study followed the MTO Class EA process for a Group 'B' project as defined in the *Class Environmental Assessment for Provincial Transportation Facilities* (2000).

This Design and Construction Report (DCR) has been prepared to:

- Describe the improvements to be constructed;
- Document specific environmental effects associated with the project and proposed mitigation;

- Identify any refinements to the project described in the 2009 TESR that have been incorporated during the development of the design details for portions of the EA approved plan being implemented as identified in this study;
- Identify measures that have been incorporated into the design and contract drawings;
- Address any commitments to future work identified in the 2009 TESR; and
- Summarize the consultation undertaken with external agencies, affected/adjacent property owners and interested members of the public during Detailed Design.

This DCR is being made available to the public, other interested parties and external agencies for a 30-day review period as required under the MTO Class EA. A notice of DCR submission was posted on the project website (https://Hwy401GrandRiverBridges.ca), published in local newspapers (i.e. *Waterloo Region Record, The Kitchener Post, Turtle Island News, and Two Row Times*), and sent to external government agencies, Indigenous Communities, local municipalities, utilities, affected property owners, local stakeholder groups, and members of the public on the project mailing list.

There is an opportunity at any time during the MTO Class EA process for interested persons to provide comments and review outstanding issues. The DCR is available for a 30-day public and external agency review period. Any concerns raised by members of the public, interested groups or technical and external agencies during this review period should be discussed with MTO or their consultants identified in the project notice, as all comments received during the review period will be considered by the MTO.

2 CONSULTATION / ENGAGEMENT PROCESS

Engagement has been an integral component to this study. External agencies, Indigenous communities, City of Kitchener, City of Cambridge, Regional Municipality of Waterloo, emergency service providers, local school boards, utilities, and members of the public (including adjacent property owners, interest groups, and the general public) were engaged throughout the study.

Stakeholders and interested parties were engaged through direct contact with the Project Team via mail, email, phone, or fax, local newspaper advertisements (*Waterloo Region Record, The Kitchener Post, Turtle Island News, and Two Row Times*), a project website (https://Hwy401GrandRiverBridges.ca), and at key consultation milestones (Study Commencement, Public Information Centre (PIC), and DCR Filing), and meetings with local municipalities.

A study mailing list was developed at the beginning of the study. Members of Provincial Parliament, external government agencies, Indigenous communities, local municipalities, emergency service providers, school boards, utilities, interest groups, adjacent property owners, potentially impacted property owners, and members of the public were included on the study mailing list.

2.1 External Agency Consultation

External agencies (including government agencies), City of Kitchener, City of Cambridge, Regional Municipality of Waterloo, local interest groups, and property owners were notified regarding the commencement of this study by letter or email on November 21, 2016. They were also notified of the PIC on May 17, 2019, and of the DCR filing on November 13, 2019. The Ministry of Transportation (MTO) notified the local Members of Provincial Parliament (MPPs) of the study commencement on November 16, 2016.

All external agencies were provided with a form on which they could provide comments and/or background information relevant to the study, as well as the project website address. **Appendix A** provides all relevant correspondence.

The following external agencies, including Federal and Provincial government agencies were consulted as part of this study:

Federal & Provincial Government Agencies

- Fisheries and Oceans Canada
- Ministry of Indigenous Affairs
- Ministry of Agriculture, Food & Rural Affairs
- Infrastructure Ontario
- Ministry of Tourism, Culture and Sport
- Ministry of the Environment, Conservation and Parks
- Ministry of Natural Resources and Forestry
- Ministry of Municipal Affairs
- Ministry of Energy, Northern Development and Mines
- Ministry of Community Safety and Correctional Services
- Ontario Provincial Police

Municipal/District School Boards

- City of Kitchener
- City of Cambridge
- Region of Waterloo
- Waterloo Region District School Board
- Canadian Pacific Railway
- Goderich-Exeter Railway
- Waterloo Catholic District School Board
- Conseil Scolaire de District Catholique Centre-Sud
- Conseil Scolaire Viamond

Utilities

- Hydro One Networks Inc.
- Bell Aliant
- Union Gas
- Rogers
- Telus Communications Inc.
- Rogers Communications Inc.
- Eastlink

Stakeholders/Interest Groups

- Doon Valley Golf Course
- RiverEdge Golf Course
- Ontario Federation of Agriculture
- Ontario Federation of Snowmobile
- Conestoga College Cambridge Campus
- Friends of the Grand River
- Grand River Conservation Authority
- Greater Kitchener-Waterloo Chamber of Commerce
- Real Estate Board of Cambridge
- Grand River Transit
- Doon Pioneer Park Community Association
- Pinegrove Community Association
- Deer Ridge Estates Social Club
- Cambridge Municipal Advisory Committee
- Heritage Kitchener
- Waterloo Region Heritage Foundation
- Landmark Cinemas
- Costco Wholesale
- ATS Automation
- Four Points by Sheraton Cambridge
- Preston Heights Community Group
- Lower Doon Neighbourhood Association
- Doon Pioneer Park Community Association
- Grand Hill Village Neighbourhood Association
- Toyota Motor Manufacturing Canada

2.1.1 Municipal Consultation

Meetings were held during the study with the following municipalities. Available meeting minutes are on file with MTO.

- May 8, 2019 – Regional Municipality of Waterloo meeting to present the proposed improvement works, construction staging plans and timelines, and to discuss coordination of work with the Region's King Street rehabilitation project.
- May 8, 2019 – City of Kitchener meeting to present the proposed improvement works, construction staging plans and timelines, and discuss potential impacts to the Doon Valley Golf Course, including the golf cart path, during construction.

Exhibit 2-1 provides a summary of external agency participation.

Exhibit 2-1: Summary of External Agency Participation

Agency	Comments Received	WSP Response / Action
Mike Hinsperger, Staff Sergeant Waterloo Regional Police – Traffic Branch	Comment received on Dec. 20, 2016 requested to be involved with the planning of the King St. Ramp Interchange to ensure that regional roads are not over taxed out.	Response sent on Feb. 16, 2017 noted the Project Team will contact representatives from the Regionally Municipality of Waterloo throughout the study.
Neil Main, Fire Chief Cambridge Fire Department	Comment received on Dec. 20, 2016 requested that emergency access be maintained at all times.	Response sent on Feb. 16, 2017 noted the project team will provide copies of the proposed construction staging and potential road closures, as requested.
Amaraine Laven Grand River Conservation Authority	Comment received on Jan. 11, 2017 requesting to be kept informed about the study, as the study area contains natural heritage and hazard features regulated by the GRCA.	Response sent on Feb. 16, 2017 noted that terrestrial, fish, archeology, drainage/hydrology, socio-economic/land-use, and noise field investigations are being carried out as part of the study, and requested any relevant information that the GRCA may have, if applicable. The project team also noted that it was in contact with the Ministry of Natural Resources and Forestry and the Department of Fisheries and Oceans to determine species-at-risk (SAR) permitting requirements associated with the potential SAR within the study area.
Diana Lupsa, P.Eng. Project Manager Engineering Services City of Kitchener	Comment received on Jan. 18, 2017 inquired if there were impacts to the “Kitchener” sign and for additional details on the golf course impacts.	Response sent on Feb. 16, 2017 noted: • The “Kitchener” sign will likely be impacted by construction. The Project Team will contact representatives from the City of Kitchener in the coming months to discuss the study, including the potential impacts to the “Kitchener” sign. • Permanent impacts to the Doon Valley Gold Club are not anticipated. There will be construction impacts through dust, noise, vibration and access.

2.1.2 Species at Risk Consultation

The following meetings were held during the study with the Ministry of Natural Resources and Forestry (MNRF) and the Department of Fisheries and Oceans (DFO) regarding Species at Risk (SAR) potentially impacted by the construction works:

- March 8, 2018 – MNRF and DFO meeting to discuss the Endangered Species Act (ESA) permitting requirements and next steps.
- November 14, 2018 – MNRF and DFO meeting to discuss ESA permit and DFO approval requirements.
- January 15, 2019 – MNRF and DFO meeting to discuss footprint impacts and proposed compensation / offsetting measures.

Available meeting minutes are on file with MTO.

In addition to the above meetings, MTO / WSP corresponded with DFO, MNRF and MECP throughout the study to determine the SAR requirements and to obtain an ESA permit and Fisheries Act Authorization (FAA) prior to construction. An ESA permit and Fisheries Act Authorization are currently being obtained and will be in place prior to the start of construction.

The ESA permitting process has recently moved from MNRF responsibility to MECP review / permitting responsibility.

2.2 Indigenous Engagement

The Ministry of Indigenous Affairs was sent a letter at study commencement on November 21, 2016 to review the Indigenous Communities on the project mailing list, and to identify any additional Indigenous communities or organizations that may have an interest in the study. No responses were received.

The following Indigenous Communities and Organizations were notified at project engagement milestones, including the Study Commencement (letters mailed November 21, 2016), the Notice of PIC (letters mailed May 17, 2019), and the Notice of Design and Construction Report:

- Mississaugas of the Credit First Nation
- Six Nations of the Grand River
- Haudenosaunee Confederacy Chiefs Council
- Haudenosaunee Development Institute

Project notifications were also published in the *Turtle Island News* and *Two Row Times* newspapers.

The Mississaugas of the Credit First Nation (MCFN), Six Nations of the Grand River (SNGR), and Haudenosaunee Confederacy Chiefs Council (HCCC) via the Haudenosaunee Development Institute (HDI) were contacted by MTO to identify whether these communities had an interest in being involved with this project. Representatives expressed an interest and have been engaged throughout the study, receiving project status updates at scheduled Liaison Committee meetings.

MTO held a meeting with staff from the MCFN Department of Consultation and Accommodation in early 2017. MCFN indicated an ongoing interest in the project and environmental impacts / issues and mitigation. MTO also reviewed the project and environmental impacts at a meeting with staff from SNGR in August, 2019.

2.3 Public Consultation

On November 21, 2016, notification letters announcing Study Commencement were distributed by mail to the study mailing list, and an Ontario Government Notice (OGN) was published in the *Waterloo Region Record, The Kitchener Post, Turtle Island News, and Two Row Times* on November 23, 2016. The project website (https://Hwy401GrandRiverBridges.ca) was also launched November 23, 2016 to coincide with Study Commencement and has remained active with regular updates occurring throughout the study.

Additionally, the Study Commencement OGN was distributed to all residents and property owners within the vicinity of the study area in the Cities of Kitchener and Cambridge through Canada Post's unaddressed mail service (i.e. bulk mail) to approximately 3,700 residents and businesses abutting the study limits. The principles of consultation requiring notification at the beginning of the study and notification to those stakeholders most directly affected were achieved through this notification method. The Notice of DCR filing OGN was also distributed by the same method. Copies of all relevant correspondence are located in **Appendix A**.

Public Information Centres (PICs) are informal meetings where area residents and other interested parties are provided the opportunity to review planning and design plans, and ensure timely, user-friendly opportunities for public input. One PIC was held during this Preliminary Design, Detailed Design and Class Environmental Assessment Study and is further detailed in **Section 2.3.1**. The PIC was an important part of the overall consultation program for this project and was designed to identify concerns and provide opportunities for input regarding the project.

2.3.1 Public Information Centre (PIC)

The PIC was held on June 5, 2019, at the Conestoga College Doon Campus, Residence & Conference Centre within the City of Kitchener from 4:00 p.m. to 8:00 p.m. An external agency and municipal session took place from 3:00 p.m. to 4:00 p.m. in advance of the public session.

The purpose of the PIC was to provide an opportunity for interested parties to review the Detailed Design and construction staging plans for the Highway 401 improvements within the study limits.

Notification of the PIC for this project occurred through direct notification letters mailed and/or e-mailed to the project mailing list (including agencies, municipalities, and members of the public) on Friday, May 17, 2019. A Notice of PIC letter was sent to the local Member of Provincial Parliament (MPP) on Wednesday, May 15, 2019. In addition, the Ontario Government Notice of PIC was sent via Canada Post bulk mail to approximately 3,700 residents and businesses abutting the study limits.

The Notice of PIC was posted on the study website and published in the Waterloo Region Record, Turtle Island News, and Two Row Times on May 22, 2019. The Notice of PIC was also published in the Kitchener Post on May 23, 2019.

Thirty-nine (39) participants signed the PIC registration sheet, and three (3) comment sheets were submitted at the PIC, and ten (10) comments were received after the PIC by email. The most frequent comments that were gathered before, during, and following the PIC are summarized in **Exhibit 2-2**.

Exhibit 2-2: Summary of Key Comments Received from PIC

Summary of Key Comments Received from PIC	MTO'S Response / Action Taken
Questions regarding timing and duration of construction and staging. Concerns regarding detour routes.	Construction is anticipated to begin as early as Spring 2020, subject to funding and approvals. For a project of this scope, the work will likely be phased over four years. In general, Highway 401 will maintain minimum 3 lanes westbound across the bridge structure and 2 lanes of eastbound traffic lanes during all phases of construction. Regarding timelines for ramp closures to complete the Highway 401 improvement work within the study limits, it is anticipated that construction staging will require the following ramps closures: • Stage 1 King Street Interchange S-W Ramp closure - 12 months • Stage 2 King Street Interchange W-N Ramp closure - 6 months • Stage 3 King Street Interchange N/S-E Ramp closure - 6 months • Stage 3 King Street Interchange W-N Ramp closure - 6 months • Stage 3 King Street Interchange S-W Ramp closure - 3 months It is anticipated that the during peak periods, four lanes on King Street will remain open during construction. There will be some night time and non-peak hour construction for soffit repair, column wrapping, abutment repair, and deck widening that will require a single lane closure. The exact timing for the above closures will be subject to the start of construction.
Questions regarding noise and noise barriers. Request for noise walls in parts of the study area.	The review of potential noise walls determined that they were not considered to be economically feasible for the proposed improvements being implemented as part of this study. Thus, noise walls are not recommended and are not included as part of this detailed design plan for the improvements to Highway 401 within the study limits.

Summary of Key Comments Received from PIC	MTO'S Response / Action Taken
	MTO will confirm the limits and heights of the recommended noise barriers as identified in the EA approved 2009 TESR during the future Detailed Design Study for the ultimate Highway 401 / Highway 8 interchange.
Requests for trees to be planted following construction. Requests for a park on Limerick Drive.	Comments were noted by MTO. MTO has not identified any surplus lands within their right-of-way at this time. MTO also needs to protect lands for the future construction of the ultimate Highway 401 / Highway 8 interchange.
Inquiries regarding what MTO will do with surplus property following construction and property impacts	
Comment that the open area on Limerick Drive should be dedicated as Indigenous Land and reference the Haldimand Treaty – 6 miles either side of the Grand River Bridge is dedicated land and needs tribute paid to it.	
Several comments of support for the proposed design/work.	Comments noted.
Property specific questions / concerns.	MTO will continue working with affected property owners and compensate those owners whose private property is physically impacted by the proposed improvements on a one-on-one basis.
Questions from the Kitchener Easy Riders Bicycle Club: Q1. When the Highway 401 widening is complete, will the King Street crossing meet Provincial road-safety standards for cyclists, pedestrians, those using strollers and wheel-chair users? (If "Yes" please advise on the individual standards that will have been met)	A1. The scope of this project includes the rehabilitation and improvements to Highway 401, the King Street Overpass bridge, and the replacement of the Highway 401 Grand River Bridge. The improvements will meet all required road safety standards, including along King Street, within the Ministry's property. The scope of this project does not include improvements along King Street as it is a Regional Municipality of Waterloo roadway. The Region is currently undertaking a Preliminary Design Study for the reconstruction of King Street East that includes the section at Highway 401.
Q2. Will there be separated pedestrian/cycling paths under the bridge after construction is complete?	A2. This project does not include providing a separate pedestrian/cycling path under the bridge.

Summary of Key Comments Received from PIC	MTO'S Response / Action Taken
Q3. Will there be signage to warn/guide motor vehicle drivers, cyclists and pedestrians using the Highway 401 ramps?	A3. This project does include the provision to provide additional warning guide signage in relation to active transportation.

3 Detailed Description of the Plan

3.1 Major Features of the Work

This section addresses the main features of the plan and improvements to Highway 401 within the study limits.

The plan for the improvements to Highway 401 within the study limits is provided in **Exhibit 3-1a** and **Exhibit 3-1b**.

Highway 401

The improvement works includes three (3) km of Highway 401 improvements extending from one (1) km west of Homer Watson Boulevard to 1.5 km east of the King Street Interchange. The Highway 401 improvements include widening of the westbound / eastbound roadway, a grade raise west of the Grand River Bridge, pavement reconstruction, new median storm sewer, drainage improvements, new median tall wall, new guide rails, new overhead signage, and high mast lighting. New additional lanes on Highway 401 do not form part of the scope of this project; however, it does include extending the westbound King Street N-W ramp as a continuous speed change lane to Homer Watson W-N/S ramp. Pavement rehabilitation (mill and resurface) will take place on the Highway 401 King Street interchange ramps and on King Street within the MTO ROW.

Grand River Bridges

The existing Highway 401 Grand River structures have reached the end of their service life and require replacement. The replacement bridge structures are planned to accommodate the future ultimate widening of Highway 401 from six lanes to eight lanes through the study area.

The two existing 6-span Highway 401 Grand River Bridges (3 lanes eastbound and 3 lanes westbound) are to be replaced with two new 4-span steel girder bridges to support the widened Highway 401 cross-section. Details of the works include:

- Removal of the existing bridges over Highway 401 and the construction of two (2) new 225 m long, 4-span bridges with a 40-55-75-55 m span configuration;
- Construction of one set of piers within the floodplain on the west bank, and construction of two sets of piers that will be within the permanently wet area of the Grand River;
- Cutting of the existing in-stream piers to 300 mm below the river bed, with footings left in place; and
- Construction of access roads on the west and east river banks, into the floodplain.

King Street Overpass

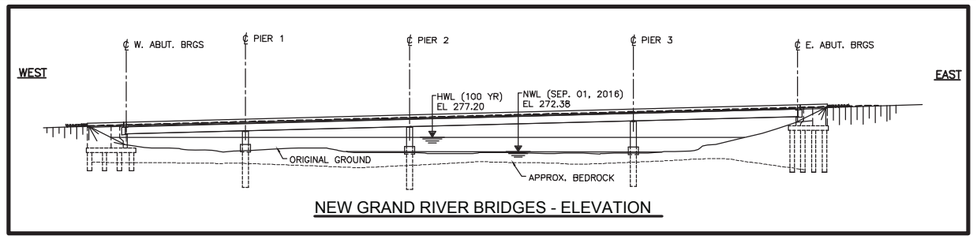
The Highway 401 and King Street Overpass requires a two (2) metre widening (one (1) metre along each direction), full rehabilitation that replaces the existing deck concrete overlay and replacement of the existing parapet walls.

Tributary Culverts

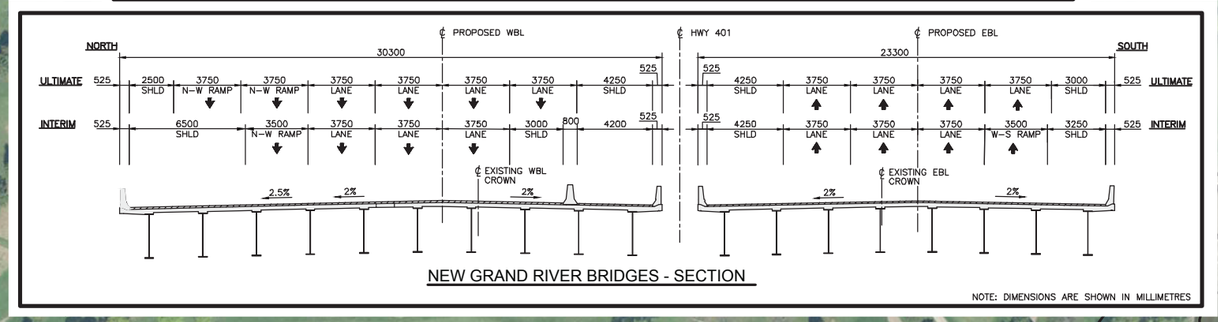
The following culverts will undergo extension works:

- The Tributary of Blair Creek – C1 (Station 13+204) will have an approximately nine (9) m long extension added to the north / upstream end of the culvert. This will result in an additional nine (9) m of enclosure of the drainage feature.

- The Tributary of Grand River – C2 (Station 13+530) will have an approximately 16 m long extension added to the north / upstream side of the culvert, and approximately 10 m long extension added to the south / downstream end. These extensions will result in about 26 m of additional shading / enclosure of the drainage feature.



NEW GRAND RIVER BRIDGES - ELEVATION



NEW GRAND RIVER BRIDGES - SECTION

NOTE: DIMENSIONS ARE SHOWN IN MILLIMETRES

GRAND RIVER

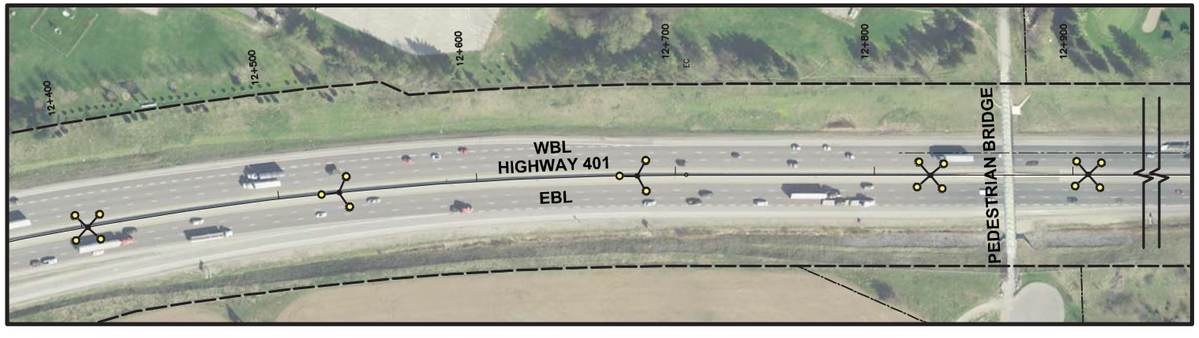
FLOW

NEW GRAND RIVER BRIDGES

TIE INTO EXISTING HIGHWAY 401 WESTBOUND

WBL
HIGHWAY 401
EBL

MATCHLINE - STA. 14+200



SCALE
15m 0 30m
Horizontal

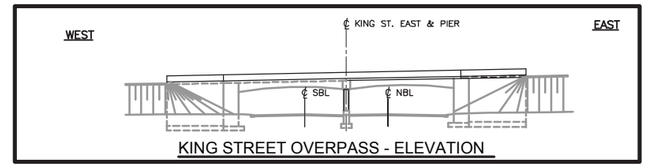
LEGEND:
- EXISTING RIGHT-OF-WAY
- PROPOSED ASPHALT SURFACE
- PROPOSED SHOULDER
- HIGH MAST LIGHTING POLE
- CONVENTIONAL LIGHTING POLE

Ontario

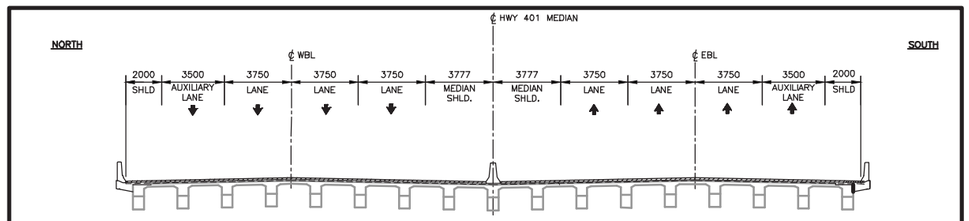
wsp

Highway 401 Improvements from 1 km west of the Homer Watson Boulevard Interchange
to 1.5 km east of the King Street Interchange
Design and Construction Report
G.W.P. 3080-12-00

Exhibit 3-1a
Detail Design Recommended Plan (Part 1 of 2)



KING STREET OVERPASS - ELEVATION



KING STREET OVERPASS - SECTION

NOTE: DIMENSIONS ARE SHOWN IN MILLIMETRES

MATCHLINE - STA. 14+200

KING STREET EAST

WBL HIGHWAY 8 EBL

KING STREET OVERPASS

N-W RAMP

S-W RAMP

E-N/S RAMP

W-N RAMP

N/S-E RAMP

W-S RAMP

14+300 14+400 14+500 14+600 14+700 14+800 14+900 15+000 15+100 15+200 15+300

WBL HIGHWAY 401 EBL

TIE INTO EXISTING HIGHWAY 401 EASTBOUND

LINDEN DRIVE

KITCHENER ROAD

SCALE
15m 0 30m
Horizontal

LEGEND:

- EXISTING RIGHT-OF-WAY
- PROPOSED ASPHALT SURFACE
- PROPOSED SHOULDER
- HIGH MAST LIGHTING POLE
- CONVENTIONAL LIGHTING POLE

Ontario

wsp

Highway 401 Improvements from 1 km west of the Homer Watson Boulevard Interchange
to 1.5 km east of the King Street Interchange
Design and Construction Report
G.W.P. 3080-12-00

Exhibit 3-1b
Detail Design Recommended Plan (Part 2 of 2)

4 Potential Environmental Effects, Mitigation Measures and Commitments to Future Work

This section of the Design and Construction Report outlines the direct and indirect potential effects associated with the project, and the mitigation measures and the commitments to future work that will be implemented to minimize effects and ensure compliance with legislated requirements.

Mitigation includes planning decisions, design features, construction requirements and construction constraints. The mitigation measures documented in this report have been developed with due consideration for the potential adverse effects of the project. The identified mitigation measures have been carried forward into the detailed design and will be refined prior to the construction, operation and maintenance phases of the project, as applicable. Refinements and enhancements to the mitigation measures will be made as warranted throughout all phases of the project to ensure that this project does not result in any significant adverse environmental effects.

The key to ensuring effective environmental quality control and risk management during the project is the development and proactive implementation of an approach that:

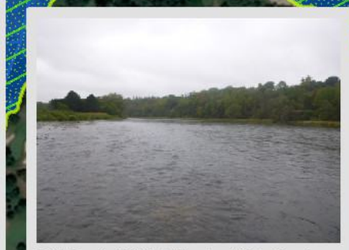
- Identifies the environmental sensitivities;
- Presents the environmental protection measures in a way that can be translated into contractual requirements and for which compliance can be verified; and
- Includes a monitoring program, as required, that verifies that the environmental protection measures are being implemented and are effective.

Environmental controls will be included in the contract documents to address specific environmental and operational concerns.

The existing environmental conditions are presented in **Exhibit 4-1**.

C3
- Photo taken from south side of highway culvert
- Culvert crossing conveys drainage from one side of the highway to the other
- Poorly defined habitat conditions that do not support fish (directly or indirectly) within the highway ROW

C2
- Photo taken from highway culvert looking upstream at wetland
- Culvert crossing conveys drainage from one side of the highway to another
- Poorly defined wetland conditions that does not support fish (directly or indirectly) within the highway ROW



Bald Eagle Habitat / Raptor Wintering Area
- Special Concern, ESA – recorded as flyovers along Grand River with no breeding habitat recorded within the study area. No significant impacts to the local nesting or wintering Bald Eagle populations are anticipated.

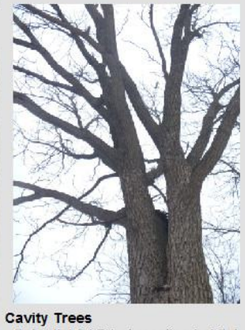
Monarch Habitat
- Special Concern, ESA – individuals recorded in the study area. Proposed works may result in temporary disturbance/ loss of foraging / dispersal habitat. Milkweed will be included in seed mixes used, and this vegetation is expected to rapidly regenerate following completion of the proposed works and no significant impacts to the species are anticipated.

C8
- Photo taken from south side of highway culvert looking upstream
- Culvert crossing conveys drainage from one side of the highway to another
- Poorly defined habitat conditions that do not support fish (directly or indirectly) within the highway ROW

Turtle Habitat
- Special Concern, ESA – one road-killed individual was recorded and believed to be associated with habitat in the Blair Creek PSW, which will not be directly impacted. Indirect impacts will be mitigated by using temporary wildlife fencing and timing windows.

Grand River
- Photo taken from downstream of existing bridges from east bank looking up through highway corridor
- River habitat consists of run/riffle/flat morphology with localized, isolated small refuge pools along east bank under bridge
- West bank is low-lying floodplain area with cart path for golf course
- East bank relatively steep with evidence of localized erosion and scour
- River supports diverse warmwater fishery of sport, pan forage and baitfish including two species at risk (SAR) fish.
- WSP identified a number of mussel species within the river, including one SAR.

Migratory Bird Nesting on Bridge
- Temporary disturbance / temporary loss of avian nesting habitat on the existing bridge, which is used by MBCA-protected species (primarily Cliff Swallow). The future bridge design is expected to provide similar avian nesting habitat and potential impacts on nesting birds can be mitigated through timing windows.



Cavity Trees
- Potential SAR bat roosting habitat may be present in treed areas along the Grand River. Mitigation will include tree removal restriction during sensitive maternity roosting season (April 1 - October 31).

Legend
- Culvert Location
- Refined Study Limit
- Bald Eagle Wintering Area (City of Kitchener)
- Waterfowl Winter Concentration Area (City of Kitchener)

Land Information Ontario (LIO) Data
- Waterfowl Winter Concentration Area
- Deer Wintering Area
- Hydro Line
- Unknown Transmission Line
- Railway
- Permanent Watercourse
- Provincially Significant Wetland (PSW)
- Unevaluated Wetland

Ontario

wsp

Highway 401 Improvements from 1 km west of the Homer Watson Boulevard Interchange to 1.5 km east of the King Street Interchange
Design and Construction Report
G.W.P. 3080-12-00

0 100 200
Meters

Exhibit 4-1

Existing Environmental Conditions

4.1 Natural Environment

The existing conditions, including natural heritage features, vegetation communities, vascular flora, wildlife habitat and fish habitat, were collected in 2016-2017 through a combination of background data review and field investigations. Species of Conservation Concern / Species at Risk screening was also completed. Natural environment features are shown in **Exhibit 4-1**.

4.1.1 Terrestrial Ecosystems

The study area consists predominantly of residential and commercial properties, with some agricultural lands, generally separated by hedgerows. Mature forest and wetland features are interspersed throughout, associated with watercourses and ROW ditches. Within the proposed ROW, the lands are mostly cultural meadow communities dominated by non-native grasses such as Awnless Brome (*Bromus inermis* ssp. *inermis*). Manicured lawns and residential plantings make up a small portion of the ROW.

The species observed in the study area consisted of an approximately even mix of native and non-native plants (101 total species, 51 native, and 50 non-native). Many of the non-native species are typical of old field and disturbed areas. None of the observed species are listed under the Endangered Species Act (ESA 2007).

There were eight Ecological Land Classification (ELC) vegetation community types delineated in the study area, including: Dry-Moist Old Field Meadow (CUM1-1), Mineral Cultural Thicket (CUT1), Mineral Cultural Woodland (CUW1), Willow Mineral Thicket Swamp (SWT2-2), Willow Mineral Deciduous Swamp (SWD4-1), Fresh-Moist Poplar Deciduous Forest (FOD8-1), Fresh-Moist Willow Lowland Deciduous Forest (FOD7-3), and Dry-Fresh White Cedar Mixed (FOM4). These vegetation communities are shown in **Appendix B.**

Designated Natural Environmental Areas

One Provincially Significant Wetland (PSW) is located in the study area:

- The Blair Creek Wetland is associated with the Tributary of Blair Creek and is located 300 m east of the Morningside Drive pedestrian overpass. Portions of the mapped PSW extend within the south ROW (near culvert “C3”). Within the study area, this PSW feature is composed of Willow Mineral Deciduous Swamp (SWD4-1) Willow Mineral Thicket Swamp (SWT2-2).

Two PSW features are present in the original / broader study area:

- The Blair Creek Wetland also extends south of Highway 401, adjacent to the Fountain Street South intersection. Portions of the PSW also extend into the south ROW.

- Speed River Wetland Complex is associated with the Tributary of Speed River and is located adjacent to Rogers Drive, approximately 100 m south of the ROW.

One Significant Woodland is located in the northeast and southeast quadrants of the Grand River Bridges on Highway 401 study area.

No Areas of Natural and Scientific Interest (ANSI) are present within the study area surrounding the Grand River Bridges.

There are no Provincial Parks located within the study area.

Description of Potential Effects

Direct and indirect impacts will be largely confined to the proposed ROW**.** As identified above, vegetation communities in the ROW consist primarily of Cultural Meadow, an anthropogenic habitat considered common and widespread across the broader landscape which is not known to support sensitive species. None of the potentially impacted vegetation communities contain rare species. Following construction, similar vegetation is expected to regenerate naturally in those areas of the ROW temporarily disturbed for construction and staging.

Some potential sensitive vegetation features exist in the vicinity of proposed works, including:

- Unnamed Significant Woodland and;
- Black Walnut trees.

The limits of grading associated with the proposed works in the study area require only minor vegetation removal and any negative impacts from construction and staging on the adjacent Significant Woodland would be temporary. There are several Black Walnut trees that may be impacted or removed. While these species do not receive special protections, opportunities to protect this species should be considered where possible.

Additional potential indirect impacts to adjacent retained vegetation features during and following construction, include:

- Vegetation clearing / damage beyond the working area / ROW;
- Spills of contaminants, fuels and other materials that may reach semi-natural areas;
- Changes in drainage patterns (groundwater and / or surface runoff flow) that can impact dependent vegetation areas located either up-gradient or down-gradient of the ROW; and
- An increase in downstream runoff can result in erosion impacts on receiving vegetation.

These potential indirect impacts to vegetation and habitat features can be managed through implementation of standard mitigation measures, as outlined below and later in **Exhibit 4-5**.

Proposed Mitigation Measures

Impacts to vegetation communities and their associated habitat functions can be managed through the implementation of mitigation measures based on the specific works. A complete list of proposed mitigation measures is presented in **Exhibit 4-5**.

- Install temporary erosion and sediment control measures prior to construction, and maintain throughout construction.
- Re-stabilize and re-vegetate exposed surfaces as soon as possible following construction, using native vegetation seed mix and plantings (or other specific techniques where outlined).
- Vegetation that does not require removal for purposes of the construction will be protected through the installation and maintenance of temporary vegetation protection measures (e.g. temporary fencing).
- Where possible, Black Walnut trees will be identified for retention/tree protection measures.
- Unnecessary traffic and storage of materials over tree roots will be avoided.
- Where possible, topsoil removed during clearing / grubbing will be stored and utilized locally if soils are required after the construction phase, to facilitate a relatively quick reestablishment of the native species in the disturbed area.
- Any dredged, salvaged or stockpiled materials will be located within the delineated work area (removed from the natural feature) and stabilized to prevent migration of any sediment or debris to adjacent natural features. All excess soil and debris will be removed from the site following construction and properly disposed of.
- Trees will be removed during appropriate tree clearing window, September 1 to March 31, to avoid bird / bad impacts.

4.1.2 Wildlife and Wildlife Habitat

Birds

There were 46 avifauna species observed during the 2016-2017 field surveys in the study area. Breeding evidence was recorded for 35 of the 46 observed species. The highest diversity of bird species was found in the area that includes the Grand River Bridges and riparian zone habitat.

There were 33 bird species recorded in this area, including regionally significant species (e.g., American Redstart, Belted Kingfisher, Ruby-throated Hummingbird) and this higher level of diversity is to be expected with the variety of vegetation groups and the movement corridor function of this area.

An assessment for nesting birds protected under the *Migratory Birds Convention Act* (MBCA, 1994) was completed during breeding bird field surveys, with a particular focus on areas with potential impacts including the Grand River Bridge, the King Street Overpass and culverts. There were 51 Cliff Swallow nests recorded on the Grand River Bridges during the 2017 field surveys (36 south facing side, 15 on north facing side). Other nesting species on the Grand River Bridges include American Robin (MBCA protected), Eastern Phoebe (MBCA protected), and Rock Dove (not protected). No nests were observed on the King Street Overpass or in the culverts. One Ruby-throated Hummingbird (MBCA protected) nest was recorded in the ROW on the southeast bank of the Grand River. Three Tree Swallows were recorded nesting in boxes beyond the ROW, in the Doon Valley Golf course.

Mammals

There were 8 mammal species recorded during the 2016-2017 field surveys through direct observations or other evidence (burrows, tracks etc.): Coyote (*Canis latrans*), Eastern Chipmunk (*Tamias striatus*), Eastern Cottontail (*Sylvilagus floridanus*), Grey Squirrel (*Sciurus carolinensis*), Groundhog / Woodchuck (*Marmota monax*), Muskrat (*Ondatra zibethicus*), Raccoon (*Procyon lotor*) and White-tailed Deer (*Odocoileus virginianus*).

Suitable habitat for these mammal species is found throughout the natural features in the study area, with certain species restricted to wetland / riparian areas (Muskrat) and a higher diversity of mammal species associated with the Grand River riparian area.

The Grand River riparian zone is known to act as a significant movement corridor for local mammal populations, including White-tailed Deer. The forest east of Highway 8 near Sportsworld Drive is mapped as a Deer Wintering Area, however, the surrounding landscape in this area is highly developed and the boundaries of this feature may be historic / require revisions.

The general area is likely to support a range of other mammals often found in similar habitats, including: Red Fox (*Vulpes vulpes*), Red Squirrel (*Tamiasciurus hudsonicus*), Striped Skunk (*Mephitis mephitis*), Virginia Opossum (*Didelphis virginiana*) and a number of small mammals that often go undetected (for example shrews, voles and mice). None of the recorded mammals are SCC and all are provincially ranked as secure.

Low to moderate potential habitat for SAR bats is present in the study area. These include the Eastern Small-footed Bat, Little Brown Bat, Northern Myotis, and Tri-coloured bat.

Significant Wildlife Habitat

The following forms of Significant Wildlife Habitat (SWH) have been identified by MNRF in the study area:

- Raptor Wintering Area (for Bald Eagle) along the Grand River; and
- Deer Wintering Area in the forest east of Highway 8 near Sportsworld Drive.

No other SWH has been identified by the MNRF within or near the study area, however, the Grand River riparian zone is known to function as locally significant wildlife movement corridor and the PSW features are considered candidate habitat for amphibian breeding.

In addition, there is the potential for turtle nesting and hibernation habitat.

Species of Conservation Concern

For the purposes of this report, the term Species at Risk (SAR) refers to those species listed as Endangered, Threatened and Special Concern, under the Species at Risk Act (SARA) and / or listed on the Species At Risk in Ontario (SARO) List (Ontario Regulation 230 / 08) and protected under Ontario's Endangered Species Act, 2007 (ESA 2007). The term Species of Conservation Concern (SCC) encompasses both SAR and additional species designated by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and / or species designated by the Committee on the Status of Species at Risk in Ontario (COSSARO), as well as provincially rare species, MNRF "Area Sensitive" species and locally / regionally significant species.

A Species at Risk habitat assessment was completed for wildlife SCC with potential to occur in the study area (from resources such as previous reports from the area, NHIC records, MNRF Regional SAR species lists and MNRF / GRCA consultation).

Thirteen wildlife SCC were recorded during field surveys, including four SAR. Confirmed SAR in the study area include Bald Eagle, Bank Swallow, Snapping Turtle, and Monarch, which are further discussed below. There were fourteen SAR species that have a moderate to high potential of occurring in the study area but were not recorded during 2016-2017 field surveys: Barn Swallow, Eastern Wood-pewee, Grasshopper Sparrow, Bobolink, Eastern Meadowlark, Chimney Swift, Common Nighthawk, Red-headed Woodpecker, Wood Thrush, Northern Map Turtle, Eastern Ribbonsnake, Milksnake, and Little Brown Bat Myotis.

Description of Potential Effects

The proposed works are expected to have minimal or no impact on terrestrial SAR / SCC. No vegetation SAR were recorded and four SAR wildlife were confirmed within the study area. The potential impacts to these species are discussed below:

- **Bald Eagle** (Special Concern): Sensitive habitat for this species, including nesting and winter roost sites, are located outside of areas of direct impact. There is potential for indirect impacts during construction, such as temporary disturbance (noise, lighting) and reduced availability of foraging habitat in the area directly surrounding the bridge; however, the zone of disturbance is minimal in relation to the overall habitat along the Grand River corridor and no significant impacts to the local nesting or wintering Bald Eagle populations are anticipated.
- **Bank Swallow** (Threatened): No nesting habitat was recorded in the study area. Although there is potential for temporary disturbance within the foraging habitat, no significant impacts are expected.
- **Snapping Turtle** (Special Concern): There is likely habitat for this species in the Blair Creek PSW feature, which will not be directly impacted by the proposed works. Potential indirect impacts or temporary disturbance to adjacent wetland habitats can be effectively mitigated through the use of temporary wildlife fencing and other mitigation measures. There is also potential for this species to be impacted by works associated with the Grand River Bridges replacement; individuals may move along the Grand River corridor or overwinter within deeper pools surrounding the Grand River Bridges.
- **Monarch** (Special Concern): The proposed works may result in temporary disturbance or temporary loss of foraging / dispersal habitat for this species along the Grand River corridor and within the south ROW, east and west of the bridge (where abundant Milkweed vegetation was observed). This vegetation is expected to rapidly regenerate following completion of the proposed works and no significant impacts to the species are anticipated.
- **Bats** (Endangered)**:** A SAR bat habitat assessment survey identified 13 cavity trees in the area and two additional trees with potential Tri-coloured bat habitat (Bur Oak trees with dead leaf clusters). Of these identified trees, one cavity tree and one Oak tree will be impacted by the proposed access route works. The remaining 12 cavity trees and one mature Bur Oak tree will be retained in the adjacent forest area. Within the overall vegetation unit, SAR bat roosting habitat is more likely to occur where a higher density of suitable mature cavity trees is present, while the area directly adjacent to the existing highway has a lower density of cavity trees and increased disturbance.

  In August 2019, WSP completed an additional SAR bat habitat assessment for potential sensitive SAR bat maternity roosting habitat northwest of the Grand River Bridges in the buildings proposed for removal to accommodate the highway improvements and construction works. The buildings within the proposed access route were determined to have a low potential for providing sensitive SAR bat maternity roosting habitat.

With implementation of the recommended mitigation measures identified below and later in **Exhibit 4-5**, proposed tree removals are not expected to impact SAR bats and no ESA permitting requirements have been identified.

Other SCC confirmed in the study area include a number of locally significant or Area Sensitive bird species; no significant impacts on these SCC avifauna are anticipated as their breeding habitats are located outside of the areas with direct impacts.

Proposed Mitigation Measures

Impacts can be managed through the implementation of mitigation measures based on the specific works and character of the study limits. A complete list of proposed mitigation measures, is presented later in **Exhibit 4-5**.

- Temporary exclusion fencing shall be in place prior to June 1 to prevent snakes and turtles from entering or nesting in the construction and / or grading area adjacent to the Grand River, Tributary of the Grand River (culvert C2) and Blair Creek PSW (culvert C3).
- To avoid potential impacts to overwintering turtles, installation of the causeways or other initial in-water works within the Grand River should be completed prior to September 1 to exclude turtles from the in-water work areas. Alternately, turtle exclusion measures, should be installed prior to September 1 to exclude turtles from the in-water work area, and a qualified biologist should be called on-site if turtles are observed during de-watering to identify and remove any turtles from the work area.
- Regular inspection of exclusion fencing is to be completed and damaged sections repaired immediately. The work site should be inspected for turtles, snakes or other wildlife that may have entered the construction zone or become trapped inside the fencing.
- If structure works cannot be scheduled outside the identified nesting season (April 1 to August 31), bird nesting preventative measures must be initiated prior to April 1st to prevent nesting on the structures in the year of construction. Bird nesting preventative measures are to be maintained until August 31 to avoid nesting attempts. Preventative measures may include tarping, netting and / or daily inspection with removal of 'in-process' nests (i.e. prior to nest completion and egg laying).
- If a nesting migratory bird is identified within or adjacent to the construction site and the construction activities are such that continuing construction in that area would result in a contravention of the MBCA, these construction activities will stop and Environment Canada will be contacted to discuss mitigation options.
- Creation of steep sloped soil piles within the construction areas should be avoided as this may create suitable Bank Swallow nesting habitat, and subsequent removal or alteration of these soil piles would impact Bank Swallow individuals or nesting habitat.

- Any wildlife incidentally encountered during construction will not be knowingly harmed and will be allowed to move away on its own. In the event that an animal encountered during construction does not move from the construction zone and construction activities are such that continuing construction in the area would result in harm to the animal, all activities that could potentially harm the animal will cease immediately and the Contract Administrator will be notified.

4.1.3 Fish and Fish Habitat

Grand River

The Grand River is a large, meandering river system in Southwestern Ontario. It originates near the Hamlet of Wareham, Ontario flowing south through rural areas and urban communities (including the Town of Kitchener) before outletting at the north shore of Lake Erie at Port Maitland. The Grand River at the Highway 401 bridges location consists of a relatively low gradient with moderate/low flows. The bridge crossings are located on a relatively straight section of the river.

MNRF provided a species list for the Grand River in the vicinity of the Highway 401 Bridges which included: Walleye, Northern Pike, Redhorse Species, Northern Hog, Longnose Dace, Greenside Darter, Rainbow Darter, Fantail Darter, Common Shiner, Silver Shiner, and Rock Bass.

Instream visual assessments of the Grand River were completed using mussel viewers beneath the bridges. No live mussels or shells were observed within the wetted portion of the channel during the assessment, however, shoreline surveys resulted in the collection of weathered bivalve shells. These included Wavy-rayed Lampmussel (SAR), Flutedshell, Spike, and Mucket.

Tributary of Blair Creek (C1)

This watercourse is a relatively small drainage feature that originates on the north side of the highway (within the ROW) and runs east. The watercourse is fed by both roadside ditch drainage and highway storm catchments, and flows in a south-easterly direction towards its outlet into Blair Creek approximately 940 m from the Highway 401 crossing.

Community sampling was only conducted on the Tributary of Blair Creek, as there was sufficient information available for the Grand River fish community, and there was no water in the Tributary of the Grand River. The Tributary of Blair Creek was sampled using standard multiple pass backpack electrofishing techniques.

Brook Stickleback was captured in the tributary both upstream and downstream of the highway crossing, suggesting that the drainage feature supports fish use within the ROW reaches at least seasonally.

Given that there does not appear to be a direct, defined downstream connection to a watercourse supporting a fishery (pond outlets to Blair Creek via overland flow only), this drainage feature can be characterized as supporting an isolated fishery only.

Tributary of the Grand River (C2)

This drainage feature crosses under Highway 401 approximately 310 m west of the Grand River Bridges. It is an ephemeral watercourse that originates as roadside ditch drainage associated with highway storm catchments. Due to the lack of channel definition, refuge habitat and flows at this culvert location, the drainage features existing conditions were not recorded. It was identified as supporting fish indirectly by contributing nutrient and allochthonous inputs to the downstream receiving watercourse – the Grand River.

Species at Risk

The watercourses within the study limits are classified by MNRF as warmwater. MNRF also confirmed that there are records of aquatic SAR within the vicinity of the Grand River Bridge crossings including Wavy-rayed Lampmussel, Silver Shiner and Black Redhorse. WSP confirmed the presence of Wavy-rayed Lampmussel within the study reaches by identification of weathered shells collected along the west shoreline.

There were no other aquatic SAR identified as potentially being in the Grand River, and the two drainage features were not identified as having any potential to support aquatic SAR within the highway corridor.

Description of Potential Effects

<u>Grand River</u>

The bridge works with potential to impact fish and fish habitat below the high water mark of the Grand River include:

- The construction of the new piers;
- The removal of the existing bridge piers;
- The placement of temporary causeways extending from each bank for construction purposes; and
- The creation of temporary construction access roads within the floodplain.

The construction of the in-water piers will result in the loss of habitat on the bed of the river. In addition, there will also be temporary alteration to the river bed associated with the placement of the temporary rock causeways required to complete the bridge replacement works. There will also be alteration to floodplain habitat below the high water mark (approximate elevation of 274 m) associated with the construction access roads and work areas adjacent to the river.

The above listed works will impact all of the fisheries species listed above through alteration to the general foraging and migration habitat present at the location of the causeways, however, the impacts will be localized in nature.

The footprint impacts calculated for each component of the bridge replacement works occurring below the high water mark are presented below in **Exhibit 4-2**. The causeway staging plans are presented in **Exhibit 4-3.**

Exhibit 4-2: Summary of Grand River Impacts

Item	Destruction	Alteration	
Piers (2 & 3)	338 m^2	-	
Construction Access Roads and Work Areas	-	6,490 m^2	
Causeways	-	Stage 1	West: 573 m^2; East: 206 m^2
		Stage 2	West: 682 m^2; East: 375 m^2
		Stage 3	West: 571 m^2; East: 295 m^2
Total :	**338 m^2**	**9,192 m^2**	

Permanent Destruction

Piers: 338 m^2

The total permanent in-water footprint impacts associated with the replacement and widening of the Grand River Bridges includes area for two sets of pier shafts is approximately 338 m^2. The impacted habitat includes flat / transitional habitat with fine / coarse substrates that will be lost during and following construction. These impacts could cause serious harm to the habitat that SAR fish and mussel potentially use in the vicinity of the Grand River Bridges through permanent loss of habitat.

Temporary Alteration

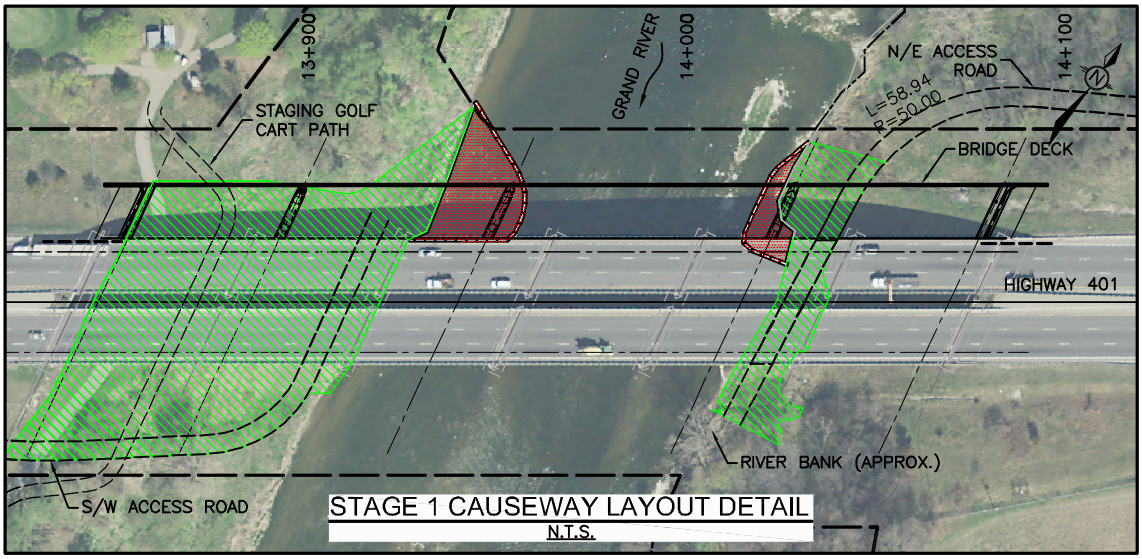
Causeways: 2,702 m^2

Temporary rock causeways (extending from both the west and east river banks) are required to form construction platforms for the works occurring below the high water mark. The exact shape, size and location of the causeways differs with each stage of construction and is dependent on the work to be conducted at each stage. Although they vary from year to year, in general the habitat being impacted remains the same. The causeways will impact the habitat for the duration that they are each in place, but will be removed from the channel during the restricted in-water work window (no in-water works from April 1st to June 30th of any given year) when sensitive life cycle functions are known to occur for the resident species. It is anticipated that the only works potentially resulting in negative impacts to fish and fish habitat is the area of causeway over-lap from one year to the next. The remainder of the causeways will only be in place for a short period of time and then completely removed.

The west causeways will impact transitional habitat (flat to riffle) immediately upstream of the existing bridges, and shallow (less than 0.5 m deep) riffle habitat dominated by cobbles (with gravel, sand and boulders scattered throughout) through the remainder of the ROW and immediately downstream of the existing bridges. This habitat is used generally for foraging by all species throughout the year, and as a migration corridor from September to December.

The east causeways will impact similar habitat as the west causeways immediately upstream of the existing bridges (flat transitioning to riffle habitat) that is used generally by resident and migrating species. Below the bridges, the habitat being impacted consists of a sand dominated pool (approximately 1 – 1.7 m deep) adjacent to the east bank. Immediately downstream of the pool habitat, the morphology transitions into riffle / flat habitat dominated by gravel and finer substrates. Riffle habitat is used for general foraging year-round; the pool habitat is likely used as refuge/nursery habitat in the summer and fall for most species, and potentially used for over-wintering habitat for Silver Shiner and Black Redhorse.

A small portion of the Stage 3 causeways are coincident with causeways that will be used in Stages 1 and 2. A total area of 169 m^2 is common between Stages 1 and 3, and 170 m^2 is common between Stages 2 and 3. As such only 373 m^2 of the west causeway and 154 m^2 of the east causeway in Stage 3 will impact habitat that had not been previously impacted during Stages 1 and 2. As a result, a total habitat area of 2,702 m^2 will be impacted by the causeways, of which 339 m^2 will be impacted across multiple stages.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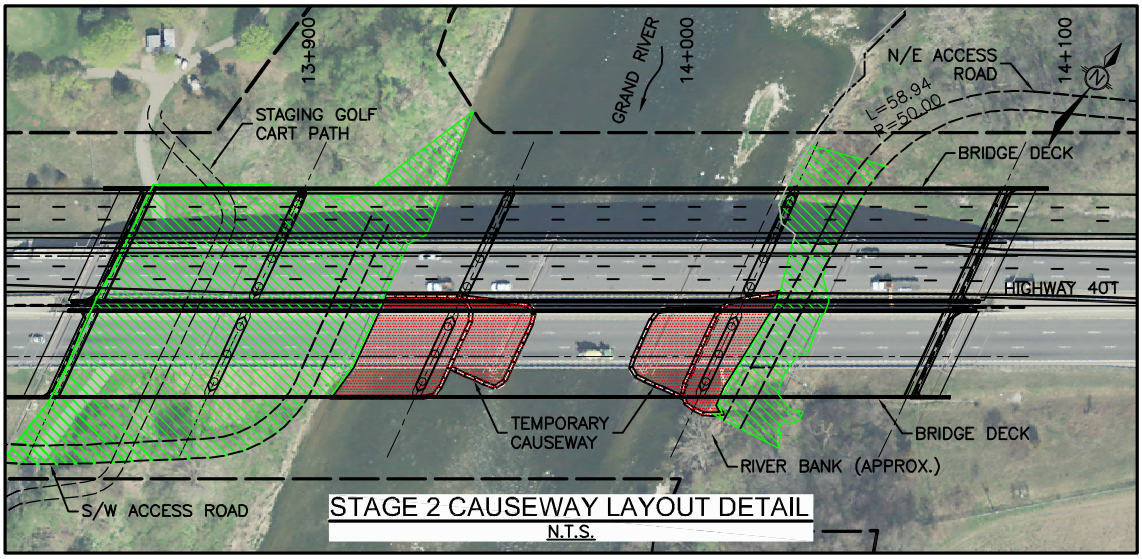
STAGING GOLF CART PATH
BRIDGE DECK
HIGHWAY 401
RIVER BANK (APPROX.)
S/W ACCESS ROAD
STAGE 1 CAUSEWAY LAYOUT DETAIL
N.T.S.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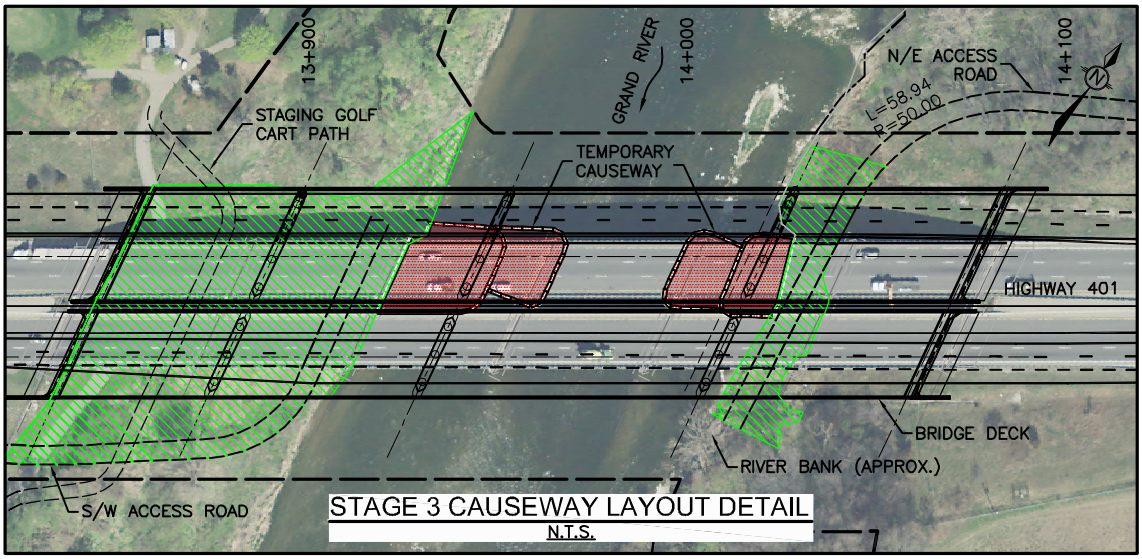
STAGING GOLF CART PATH
BRIDGE DECK
HIGHWAY 401
TEMPORARY CAUSEWAY
BRIDGE DECK
RIVER BANK (APPROX.)
S/W ACCESS ROAD
STAGE 2 CAUSEWAY LAYOUT DETAIL
N.T.S.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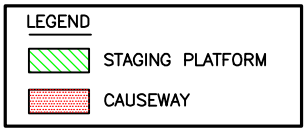
TEMPORARY CAUSEWAY
HIGHWAY 401
BRIDGE DECK
RIVER BANK (APPROX.)
S/W ACCESS ROAD
STAGE 3 CAUSEWAY LAYOUT DETAIL
N.T.S.


LEGEND
STAGING PLATFORM
CAUSEWAY

Construction Road Access 6,490 m^2

The impacts of the construction access roads and work areas below the high water mark will be confined to the floodplain, on the east and west banks of the river. Approximately 6,490 m^2 of floodplain habitat (5,670 m^2 on west bank and 820 m^2 on east bank) will be altered to accommodate the construction access roads for the duration of construction. The impacted floodplain habitat consists of Fresh – Moist Willow Lowland Deciduous Forest, Reed-canary Grass Mineral Meadow Marsh and Mineral Open Beach / Bar communities on the west bank. The impacted habitat on the east bank consists of Dry – Fresh White Cedar Mixed Forest and Cultural Meadow communities. Similar to the habitat within the river, the floodplain habitat is common throughout the Grand River valley and is not limited to the project area. The floodplain habitat that will be impacted by the construction access roads and work areas will be restored / re-instated once the access roads are no longer required.

Tributary Culverts

Both of the existing culverts (C1 and C2) are undergoing increases in enclosure length through extensions, resulting in an additional nine (9) m of channel being shaded for the Tributary of Blair Creek (C1), and 26 m for the Tributary of the Grand River (C2). These drainage features are not considered to support fish directly within the highway corridor and do not support a commercial recreational or Aboriginal fishery within the ROW reaches. As such, there will be no impacts on fish and fish habitat associated with these culvert extensions provided that standard mitigation measures are properly implemented to protect the receiving watercourses downstream. Therefore, serious harm to fish and fish habitat can be avoided at these two culvert locations, and further review under the Fisheries Act will not be required.

Proposed Mitigation Measures

Potential impacts to fish and fish habitat from temporarily disturbing and permanently removing habitat elements can be managed through the implementation of mitigation measures for works that must occur below the high water mark, as outlined below and later in **Exhibit 4-5**. Proposed mitigation measures have been developed based on the specific works and character of the Grand River.

- A warmwater permissible in-water construction timing window of July 1st to March 31st will be implemented at the crossings. No in-water works will be permitted between April 1st and June 30th of any given year.
- Vehicular and equipment maintenance and refueling will be undertaken in designated areas a minimum of 30 m from the watercourse and drainage features in accordance with OPSS 180 and controlled to prevent any discharge of equipment fuels and fluids onto the ground or into a watercourse.
- All machinery is to be washed a minimum of 30 m from the waterbody.

- All machinery and equipment used will arrive on-site in a clean condition, free of fluid leaks, invasive species (e.g., *Phragmites australis*) and noxious weeds.
- No construction equipment shall enter a watercourse beyond the isolated work areas or the temporary causeways.
- In-stream sediment controls (i.e., cofferdams) will be installed and removed according to OPSS 805, unless otherwise specified.
- The pumping system used for dewatering for the construction of the bridges will be sized appropriately and monitored at all times.
- Any pipes / hoses conveying water in any watercourse during construction will be screened to prevent the entrainment of fish.
- If dewatering is required, sediment laden discharge water will be pumped into a vegetated area > 30 m from a watercourse or into a settling basin or similar measure to prevent the entry of deleterious substances from entering the watercourse.
- Both during and following the construction activities, a full restoration plan will be undertaken with phased implementation in conjunction with the construction activities.
- The construction access, work areas and associated requirements for removal of riparian vegetation will be minimized to the extent required for the construction activities, and these areas then delineated in the field using properly installed protective silt fencing. All temporarily disturbed areas will be re-stabilized following construction using appropriate means as outlined in OPSS 182.
- During construction, areas required for construction works or causeway installation will be isolated from the main flow path of the Grand River. After isolation and prior to in-water works, professional ecologists will catch and relocate trapped fish and mussels downstream of the proposed work area using appropriate methods (e.g., electrofishing, seine netting) and under a licence to collect fish from the MNRF. The mussel relocation will be carried out under an Endangered Species Act (ESA) Schedule C Permit from MECP to address aquatic SAR.

Although the majority of the proposed works can be mitigated such that serious harm to fish and fish habitat and SAR habitat is avoided, there are residual effects related to the placement of materials below the high water mark that could not be sufficiently mitigated such that serious harm is avoided. A Request for Review (RfR) form was submitted to the Department of Fisheries and Oceans (DFO) in February 2018. In April 2018, DFO indicated that the proposed works as described in the RfR form would cause serious harm to fish and fish habitat within the Grand River and it was determined that an Application for Authorization under Paragraph 35(2)(b) of the *Fisheries Act* is required for the project to proceed as proposed. A DFO Fisheries Act Authorization will be obtained prior to construction.

An Information Gathering Form (IGF) was submitted to MNRF concerning Wavy-rayed Lampmussel, Silver Shiner and Black Redhorse. MNRF responded on November 20, 2017 identifying that a "17(2)(c) permit under the Endangered Species Act will be required to undertake the proposed works" and issued ESA permit number GU-C-008-17.

Species at Risk, protected under MNRF's *Endangered Species Act*, have been identified in the Grand River where construction works could impact individual species and their habitats. An Information Gathering Form (IGF) was submitted to MNRF concerning Wavy-rayed Lampmussel, Silver Shiner and Black Redhorse. MNRF responded on November 20, 2017 identifying that a "17(2)(c) permit under the *Endangered Species Act* will be required to undertake the proposed works" and issued ESA permit number GU-C-008-17. The MNRF (now MECP) C-Permit under the ESA will be obtained prior to construction.

Standard mitigation measures are appropriate and will ensure that impacts from the proposed works are minimal. Mitigation measures are presented later in **Exhibit 4-5**.

4.1.4 Erosion and Sediment Control

Without the implementation of appropriate mitigation measures, erosion and generation of sediment during excavation and grading activities associated with the construction of the proposed improvements may impact the watercourses within the project area. Relevant mitigation measures for erosion and sediment control include the following:

- A comprehensive adaptive Erosion and Sediment Control (ESC) Plan will be developed prior to the start of construction to control erosion and prevent sediment-laden runoff from entering any surface water course and/or designated environmentally sensitive area. General mitigation measures will include:
  - Installation of temporary erosion and sediment control measures prior to construction, and adjustment and maintenance throughout construction;
  - Re-stabilize and re-vegetate exposed surfaces as soon as possible following construction; and
  - Vegetation that does not require removal for purposes of the construction will be protected through the installation and maintenance of temporary vegetation protection measures (e.g. temporary fencing).
- Work within or immediately adjacent to any body of water or regulated area will occur in accordance to any applicable permits as administered by applicable regulatory agencies, including DFO, MECP and MNRF.

4.1.5 Drainage and Surface Water

Drainage throughout the study area is through a combination of roadside ditches, channels, culverts and storm sewers to the Grand River. The drainage is conveyed through the highway ROW.

Modelling for drainage conveyance was carried out as part of this study and Grand River flooding of the Highway 401 westbound lanes during the 50 year and greater flows was identified at the low point of the highway approximately 400 m west of the west abutment of the existing Highway 401 and Grand River Bridges.

Based on the MECP Source Water Protection Information Atlas, the study area is located in a low to moderate vulnerable scoring for surface water and surface water intake protection.

During construction, the quality of surface water will need to be protected from sediment, fuel, fluid spills and construction debris. A site-specific environmental mitigation and monitoring plan to prevent spills and debris in surface water features and a contingency plan to efficiently mitigate any potential spills is recommended to be implemented during the construction stage of the project to ensure that surrounding properties and municipal infrastructure is protected.

Please refer to **Section 4.1.4** above for additional details regarding erosion and sediment control which will also address surface water quality.

4.1.6 Groundwater

A background review of relevant information was completed including MECP water well records, MECP Permits-to-Take-Water (PTTW), MECP Provincial Groundwater Monitoring Network (PGMN) records, MECP Provincial (Stream) Water Quality Monitoring Network (PWQMN) and Source Water Protection Information Atlas, and an environmental database report. In addition, regional to local references on geology, physiography, land use and climate data was also reviewed.

The search radius for these background reviews were all consistent with a 750 m radius around the approximate center point of the project, taken to be the Highway 401 crossing over the Grand River.

Ontario Ministry of the Environment, Conservation and Parks Water Well Records

The MECP Water Well Information System is a compilation of water wells drilled in the Province of Ontario for the purpose of human, agricultural and industrial consumption. Pursuant to the Ontario Water Resources Act (OWRA), any well drilled for these purposes must be drilled by an MECP licensed well drilling contractor and documented on a Water Well Record.

A total of 95 water well records were found within the 750 m study area, centred on the Highway 401 and Grand River Bridges.

Prior to construction, a private water well survey should be completed at all residential properties located on Greensview Drive to document baseline conditions of the existing private water wells. In addition, any water wells (including monitoring wells) in conflict with construction activities will be decommissioned in advance of construction.

Permit to Take Water (PTTW)

In accordance of the Ontario Water Resource Act (OWRA), the diversion of surface water or the extraction of groundwater in excess of 50,000 litres per day (24 hrs) requires a PTTW from the MECP.

Construction activities associated with this project result in a need for water taking due to dewatering requirements to facilitate the construction of the bridge abutments and piers for the replaced Highway 401 Grand River Bridges. As a result, a Category 3 PTTW will be obtained from the MECP prior to construction. Construction dewatering, and construction dewatering discharge management must conform to the terms and conditions of the MECP PTTW.

4.1.7 Management of Excess Materials

An excess materials management area for placement of the excess earth and granular materials generated from the project has been identified on the west side of the north-to-west ramp at the King Street interchange. Excess material management will be completed in accordance with applicable legislation and MTO's standard construction practices.

An MTO and MECP protocol identifies material-by-material management options both inside and outside the construction area, which includes the Highway 401 ROW and property with a boundary contiguous to the ROW. All excess materials may be reused or recycled. Inside the Highway 401 ROW, materials such as asphalt, concrete, swamp material, wood, earth and rock may be reused as a construction material or managed as fill. Materials also may be temporarily stockpiled in preparation for these uses. Management of excess materials outside the Highway 401 ROW, stockpiling and wood management depends on local circumstances.

Site protection is provided by the imposition of constraints and for the protection of water and air quality adapted from existing legislation. The constraint on the management of these materials also involves discussions and written agreements with property owners, and may involve consultation with MECP and other authorities. Where an excess material management option cannot meet constraints, another option must be pursued, or the material must be disposed of as waste.

4.2 Socio-Economic Environment

4.2.1 Land Use

Land uses in the study area are governed by the Region of Waterloo Regional Official Plan (ROP) (2015), the City of Kitchener Official Plan (2014) and the City of Cambridge Official Plan (2014).

The Cities of Kitchener, Cambridge and downtown Waterloo are all identified as Growth Centres in the Greater Golden Horseshoe Growth Plan (2017). The Region's ROP is consistent with Provincial policies and regulations and to provide a guideline for reasonable and practical growth in the Region to the year 2031.

The study area includes lands zoned for residential and commercial use along King Street, primarily residential immediately south of Highway 401, and a mix of commercial and industrial east of Highway 8, north of Highway 401.

There are active agricultural properties south of Highway 401, east of the Grand River. The agricultural property adjacent to the Grand River has been redeveloped as a residential subdivision.

4.2.2 Noise

Noise Assessment – Proposed Highway 401 Improvements for this Detailed Design Study
A noise assessment of current improvements was carried out to review potential noise impacts from the improvements being implemented by this study at the adjacent Noise Sensitive Areas (NSAs) in accordance with the MTO Environmental Guide for Noise (hereafter referred to as the Guide). The study outlined the nature of the noise sources and receptors, predictions of future noise levels expected from the noise sources, and recommendations.

Noise analysis was carried out to assess the potential noise impacts to the adjacent Noise Sensitive Areas (NSAs) in accordance with the Guide. MTO noise criteria reviews noise mitigation if the proposed undertaking results in a greater than or equal to 5.0 dBA increase or have absolute noise levels greater than or equal to 65.0 dBA when compared to future noise levels without the proposed undertaking.

The noise analysis determined that the future noise level increases from the improvements being implemented as part of this study are predicted to be less than 5.0 dBA, however, absolute noise levels were predicted to be greater than 65.0 dBA at some of the adjacent NSAs. Given this, the Project Team reviewed potential noise barriers along Highway 401.

Noise barriers were not considered to be economically feasible for the improvements to Highway 401 as part of this study based on the cost per benefitted receiver. Thus, noise barriers are not recommended and are not included as part of the detailed design plan for these improvements to Highway 401.

Future Noise Assessment – Ultimate Highway 401 / Highway 8 Interchange

During a future assessment for the ultimate Highway 401 / Highway 8 interchange, MTO will confirm the limits and heights of the recommended noise barriers as identified in the 2009 TESR for the interchange improvements. The 2009 TESR recommended the installation of sound barriers in the following locations:

- Approximately 3 meters high in the southeast quadrant of the existing Highway 401/King Street interchange along the existing ramp from Shantz Hill Road to Highway 401 eastbound; and
- Approximately 3-5 meters high in the northwest quadrant of the existing Highway 401/King Street interchange along the new Highway 8 south to Highway 401 eastbound ramp.

In addition, the feasibility of a noise barrier along the south edge of the Highway 8 southbound to Highway 401 eastbound direct ramp will be further reviewed during the future Detailed Design for the ultimate Highway 401 widening.

Construction Noise

A noise increase is anticipated during construction activities, and night work may be undertaken to reduce daytime traffic disruptions. Standard mitigation measures will be implemented to keep construction noise impacts to a minimum and are presented in **Exhibit 4-5**. The Contractor will be required to maintain equipment in good operating condition to prevent unnecessary noise and restrict idling of equipment to the minimum necessary to perform the work. MTO is legally exempt from the requirements of municipal noise bylaws.

4.2.3 Landscape Composition

A landscape composition plan was completed that included an examination of existing landscape conditions, vistas and landforms, and an inventory of potentially impacted vegetation. A photographic inventory of the study area was collected and a visual inventory of trees was also completed within and immediately adjacent to the highway ROW for the preparation of a tree management plan.

In addition to protecting the existing vegetation and limiting vegetation removals to only what is necessary to accommodate construction and construction staging, dense plantings of deciduous and coniferous tree mixtures will be implemented where possible to create visual buffers for private properties that are closest to the highway and in the vicinity of the Grand River Bridges.

4.2.4 Property Requirements

Private property is required for the widening of the Highway 401 and Grand River westbound bridge and the corresponding realignment of the Highway 401 and King Street interchange north-to-west ramp. Property acquisitions will be obtained in accordance with standard MTO procedures.

4.2.5 Navigability

The section of the Grand River at Highway 401 is not on the list of Scheduled Waters under the *Canadian Navigable Waters Act (CNWA)*, therefore, CNWA approval is not required. Public right to navigation will be considered in accordance with the CNWA. Anchors and cables for construction equipment will be marked.

4.3 Cultural Environment

4.3.1 Archaeological Resources

A Stage 1-2 Archaeological Assessment was completed in 2016 for the proposed right-of-way as shown in the 2009 TESR. This assessment determined that the proposed ROW is cleared of archaeological potential. In addition, a Stage 1-2 Archaeological Assessment was completed in 2019 for the study area beyond those areas identified in the 2009 TESR, as a result of additional property requirements. Concurrence from the Ministry of Tourism, Culture and Sport (MTCS) will be obtained prior to construction.

If any archaeological resources are discovered during construction, work in the area will stop and the appropriate authorities (e.g. police, coroner and the Registrar of Cemeteries, Ministry of Government Services.) will be contacted.

4.3.2 Built Heritage and Cultural Landscapes

The Grand River and Highway 401 were both identified as cultural heritage landscapes during the previous Preliminary Design phase.

The Highway 401 Grand River Bridges were not recommended for inclusion on the Ontario Bridge Heritage List.

A review of the MTCS checklist during the Detailed Design phase confirmed the King Street Overpass structure is over 40 years of age. MTO has confirmed that a Cultural Heritage Evaluation Study (CHER) for the structure is not required prior to construction.

4.4 Transportation

4.4.1 Construction Staging

The proposed replacement of the Highway 401 Grand River bridge structures and full rehabilitation of the Highway 401 King Street Overpass will be constructed in stages. Lane restrictions and / or detours may be required in stages on both the mainline and the side roads. Ramps will be closed as required during construction.

Grand River Bridges

The two existing 6-span Highway 401 Grand River Bridges (3 lanes eastbound and 3 lanes westbound) are to be replaced with two new 4-span steel girder bridges to support the widened Highway 401 cross-section. Details of the proposed works include:

- Removal of the existing bridges over Highway 401 and the construction of two (2) new 225 m long, 4-span bridges with a 40-55-75-55 m span configuration;
- Construction of one set of piers within the floodplain on the west bank (Pier 1 - below the high-water mark), and construction of two sets of piers that will be within the permanently wet area of the Grand River (Piers 2 and 3);
- Installation of temporary rock causeways constructed within the wetted channel that are required for construction of the in-water piers that will be in place from 2- 12 months (short term);
- Installation of proper containment measures (i.e. sand bags, concrete blocks) below the high-water mark to isolate the construction footprint out of the permanently flowing section of the river during construction; and

- Access roads constructed down both sides of the river for construction access; this will require vegetation clearing and grading in the area within and adjacent to the access roads.

The Highway 401 and Grand River Bridges will be replaced by reducing the eastbound lane to two traffic lanes and the westbound lane to two traffic lanes with a third westbound lane west of King Street interchange. Construction staging will require temporary widening of the westbound lane, median crossovers and a temporary eastbound realignment east of King Street interchange.

The westbound widening of the Grand River Bridge is to be completed first to accommodate the westbound traffic. Subsequently, the existing eastbound and westbound bridges will be removed and replaced.

Highway 401 will be temporarily widened to the east and west of the Grand River Bridges to accommodate traffic staging during construction of the bridge replacements. In general, during all phases of construction Highway 401 will maintain minimum 2 lanes of westbound (with 3 lanes westbound west of King Street interchange) and 2 lanes of eastbound traffic lanes.

King Street Overpass

The Highway 401 and King Street Overpass requires a full rehabilitation that replaces the existing deck concrete overlay and the existing parapet walls.

It is anticipated that construction staging will require the following ramps closures; however, this may alter during construction:

- Stage 1 King Street Interchange S-W Ramp closure
  - Traffic to access Highway 401 westbound through Homer Watson Boulevard / Highway 401 interchange
- Stage 2 King Street Interchange W-N Ramp closure
  - Temporary detoured through W-S ramp with a temporary signalized intersection on King Street.
- Stage 3 King Street Interchange N/S-E Ramp closure
  - Traffic to access Highway 401 eastbound through Sportsworld Drive /Highway 8 interchange.
- Stage 3 King Street Interchange W-N Ramp closure
  - Temporary detoured through W-S ramp with a temporary signalized intersection on King Street.

- Stage 3 King Street Interchange S-W Ramp closure
    - Traffic to access Highway 401 westbound through Homer Watson Boulevard / Highway 401 interchange

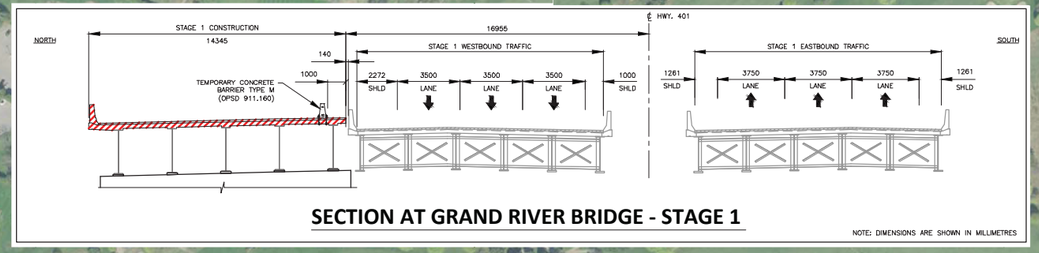
It is anticipated that during peak periods, four lanes on King Street will remain open during construction. There will be some night time and non-peak hour construction for soffit repair, column wrapping, abutment repair, and deck widening that will require a single lane closure.

In addition, short term (night time, non-peak hour) ramp closures may be required to accommodate the pavement rehabilitation work. The exact timing of any closures will be subject to the start of construction.

Doon Valley Golf Course Trail

During construction, MTO and its representatives will coordinate with the Doon Valley Golf Course to provide a temporary golf cart path for pedestrian / golf cart access to the golf course within MTO's property limits. Flagging will be used during any intermittent interruptions on the golf path for construction vehicles. Closures of the golf cart path are anticipated to occur during the eastbound and westbound bridge demolition.

The construction staging plans for the Highway 401 Grand River Bridges and King Street Overpass are provided in **Exhibit 4-4**.



SECTION AT GRAND RIVER BRIDGE - STAGE 1

NOTE: DIMENSIONS ARE SHOWN IN MILLIMETRES

13+000 13+200 13+400 13+600 13+800 14+000 14+200 14+400

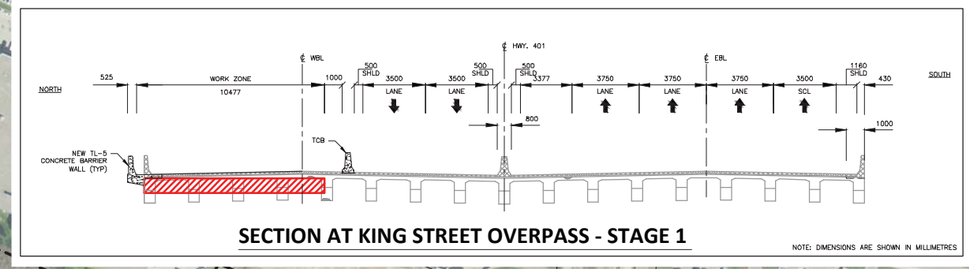
FLOW

HIGHWAY 401 WBL EBL

GRAND RIVER

MATCHLINE - STA. 14+430

CONSTRUCTION STAGING AND TRAFFIC MANAGEMENT - STAGE 1 (12 Months)		
Stage	**Construction Stage**	**Traffic Management**
1	- Construct new Grand River Bridge westbound widening lanes inclusive of piers, girders and bridge deck - King Street Overpass westbound bridge rehabilitation - Construct Highway 401 platform north of the ex. WBL to accommodate traffic in Stage 2	- King Street S-W ramp closure (approximately 12 months) - Highway 401 westbound three lanes from King Street Interchange to Homer Watson Boulevard - Highway 401 westbound reduced to two lanes through King Street Interchange - Highway 401 eastbound to remain on existing



SECTION AT KING STREET OVERPASS - STAGE 1

NOTE: DIMENSIONS ARE SHOWN IN MILLIMETRES

LEGEND:

- CONSTRUCTION ZONE
- TRAFFIC FLOW ARROW

HIGHWAY 8 EBL WBL

KING STREET EAST

CLOSED CLOSED

N-W RAMP S-W RAMP E-N/S RAMP W-N RAMP N/S-E RAMP W-S RAMP

14+600 14+800 15+000 15+200 15+400

MATCHLINE - STA. 14+430

WBL HIGHWAY 401 EBL

Ontario

wsp

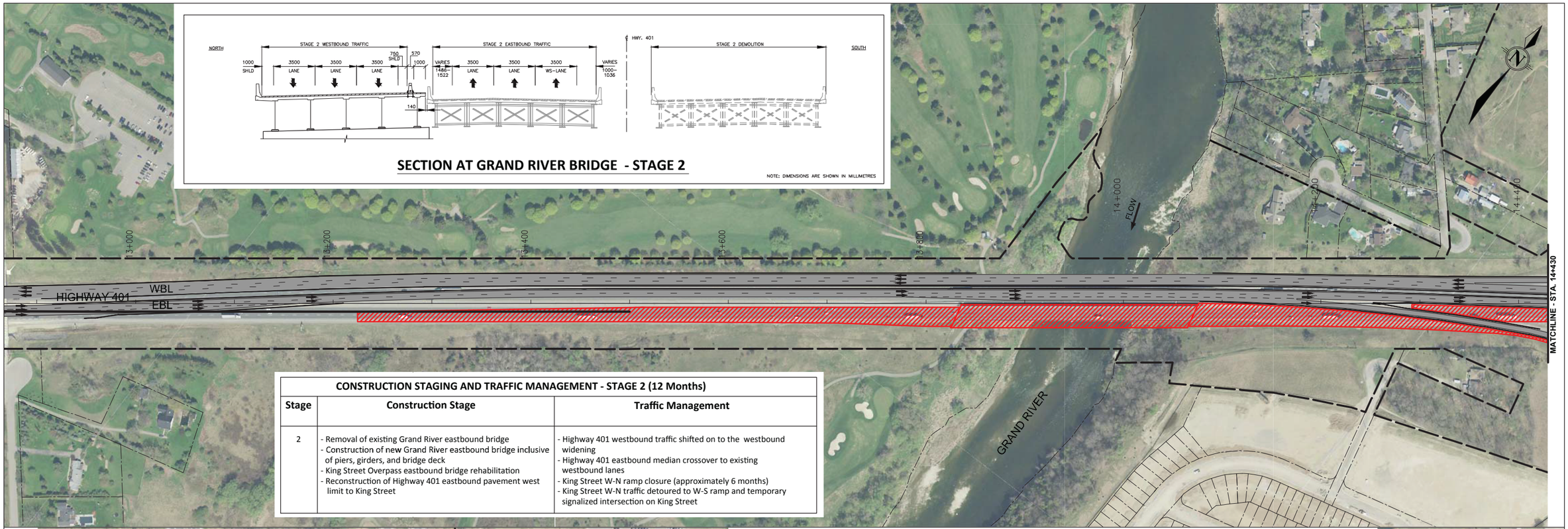
Highway 401 Improvements from 1 km west of the Homer Watson Boulevard Interchange to 1.6 km east of the King Street Interchange
Design and Construction Report
G.W.P. 3080-12-00

Exhibit 4-4a

Construction Staging - Stage 1

SECTION AT GRAND RIVER BRIDGE - STAGE 2

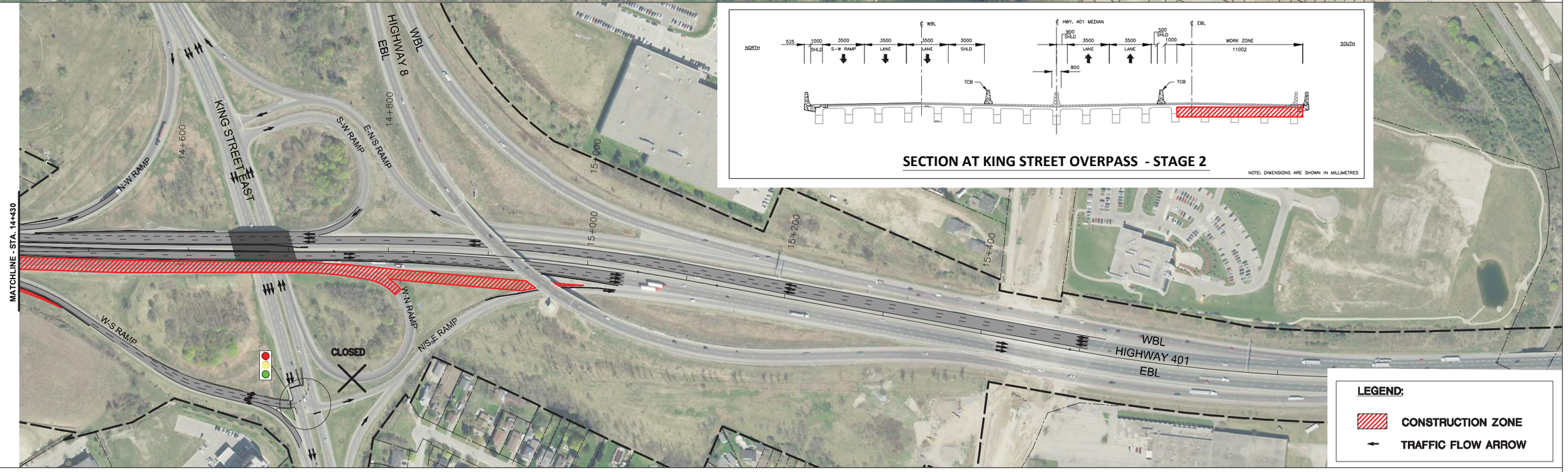
NOTE: DIMENSIONS ARE SHOWN IN MILLIMETRES



CONSTRUCTION STAGING AND TRAFFIC MANAGEMENT - STAGE 2 (12 Months)		
Stage	**Construction Stage**	**Traffic Management**
2	- Removal of existing Grand River eastbound bridge - Construction of new Grand River eastbound bridge inclusive of piers, girders, and bridge deck - King Street Overpass eastbound bridge rehabilitation - Reconstruction of Highway 401 eastbound pavement west limit to King Street	- Highway 401 westbound traffic shifted on to the westbound widening - Highway 401 eastbound median crossover to existing westbound lanes - King Street W-N ramp closure (approximately 6 months) - King Street W-N traffic detoured to W-S ramp and temporary signalized intersection on King Street

SECTION AT KING STREET OVERPASS - STAGE 2

NOTE: DIMENSIONS ARE SHOWN IN MILLIMETRES



LEGEND:

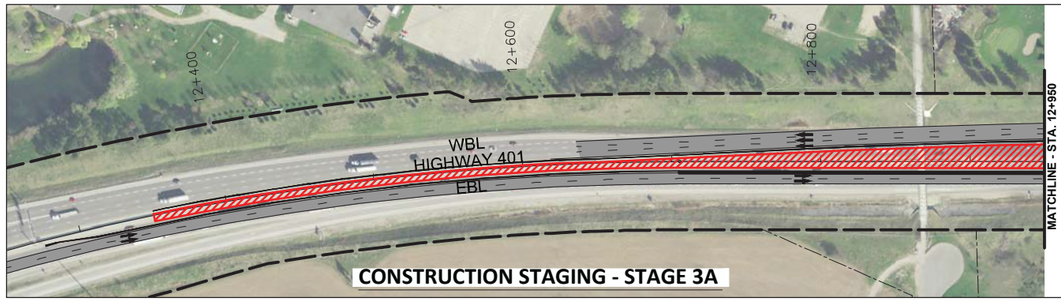
- CONSTRUCTION ZONE
- TRAFFIC FLOW ARROW

Ontario

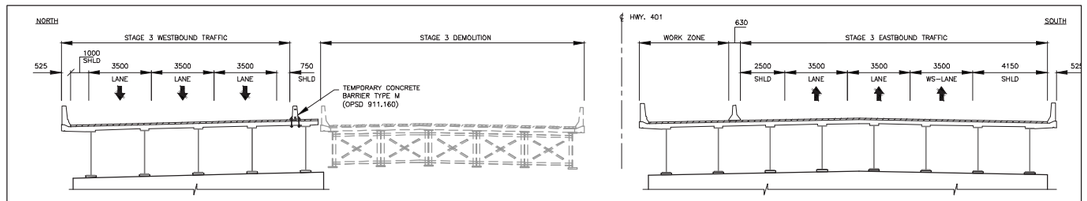
wsp

Highway 401 Improvements from 1 km west of the Homer Watson Boulevard Interchange to 1.6 km east of the King Street Interchange
Design and Construction Report
G.W.P. 3080-12-00

Exhibit 4-4b
Construction Staging - Stage 2

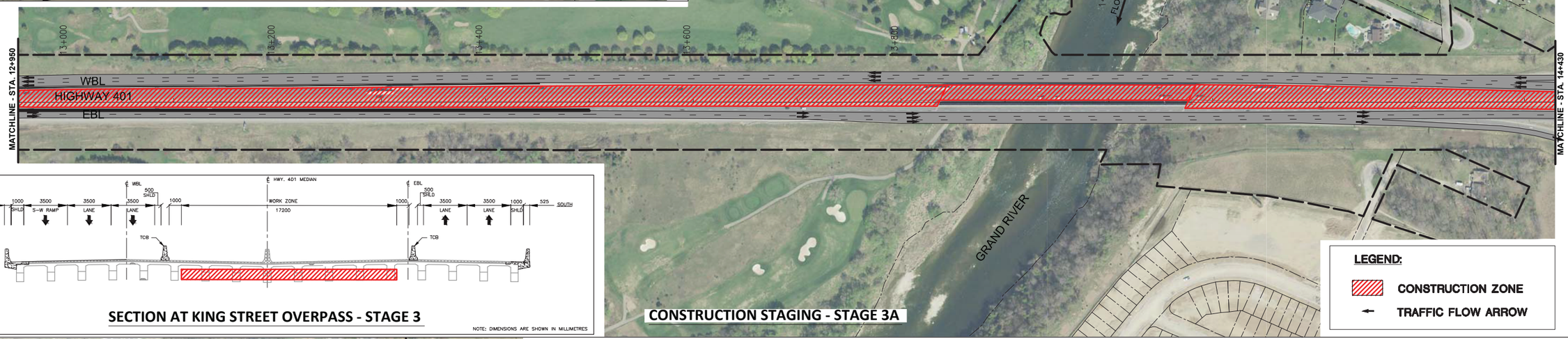


CONSTRUCTION STAGING - STA 3A



SECTION AT GRAND RIVER BRIDGE - STAGE 3

NOTE: DIMENSIONS ARE SHOWN IN MILLIMETRES



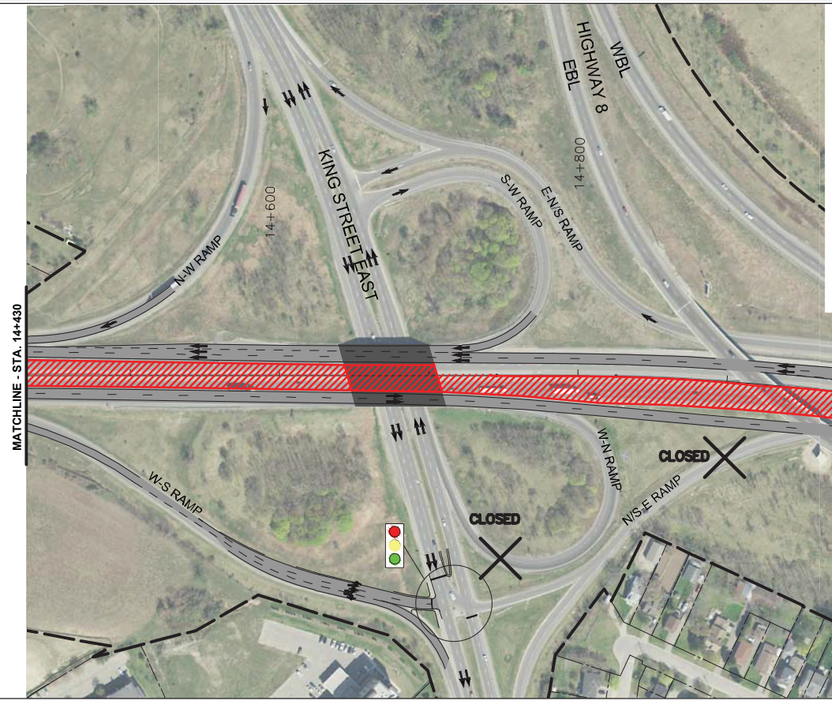
CONSTRUCTION STAGING - STAGE 3A

SECTION AT KING STREET OVERPASS - STAGE 3

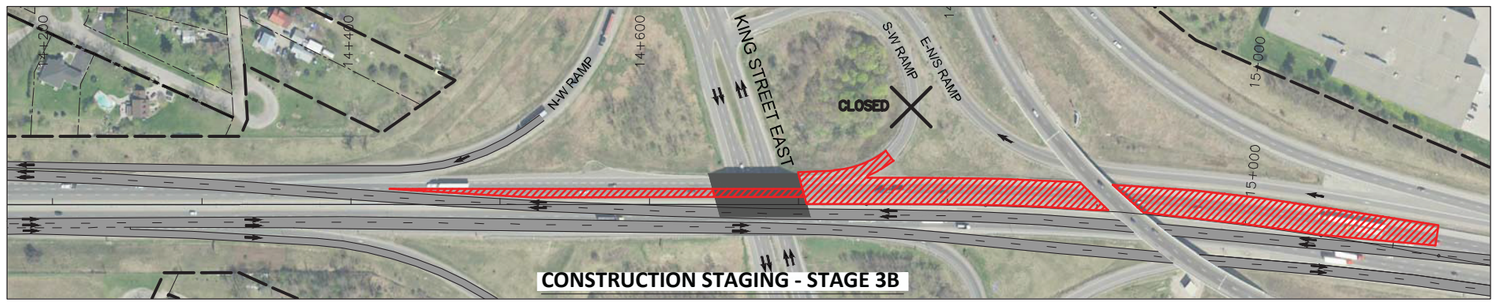
NOTE: DIMENSIONS ARE SHOWN IN MILLIMETRES

LEGEND:

- CONSTRUCTION ZONE
- TRAFFIC FLOW ARROW



CONSTRUCTION STAGING - STAGE 3A



CONSTRUCTION STAGING - STAGE 3B

CONSTRUCTION STAGING AND TRAFFIC MANAGEMENT - STAGE 3A/3B (3A - 6 Months / 3B - 6 Months)

Stage	Construction Stage	Traffic Management
3	- Removal of existing Grand River westbound bridge - Construction of new Grand River westbound bridge inclusive of piers, girders, and bridge deck - Westbound pavement reconstruction - Median barrier, high mast lighting and storm sewer replacement - King Street Overpass median bridge rehabilitation	STAGE 3A - Highway 401 eastbound on temporary alignment east of King Street - Highway 401 eastbound traffic on the new eastbound bridge - King Street N/S-E ramp closure (approximately 3 months) - King Street W-N ramp closure (approximately 3 months) - King Street W-N traffic detoured to W-S ramp and temporary signalized intersection on King Street STAGE 3B - Highway 401 eastbound on temporary alignment east of King Street - Highway 401 westbound crossover east of Grand River bridge - King Street N/S-E ramp closure (approximately 3 months) - King Street W-N ramp closure (approximately 3 months) - King Street S-W ramp closure (approximately 3 months)

Ontario

wsp

Highway 401 Improvements from 1 km west of the Homer Watson Boulevard Interchange to 1.6 km east of the King Street Interchange
Design and Construction Report
G.W.P. 3080-12-00

Exhibit 4-4c

Construction Staging - Stage 3

4.4.2 Illumination

Highway 401, including the Highway 8 interchange and King Street interchange, will be fully illuminated using a combination of high mast lighting and conventional lighting. LED lighting will replace the existing illumination. LED lighting technology is capable of providing better light trespass control.

4.4.3 Emergency Access

Local municipalities, medical services and the Ontario Provincial Police will be notified of construction staging, start of construction, etc. to minimize delay in emergency response times during and after construction. The Contractor will prioritize emergency vehicles through the work zone.

4.4.4 Utilities

Existing utilities are predominately along King Street and crossing under Highway 401. There is an existing gas line crossing Highway 401 between the King Street Overpass and the Grand River Bridge that will remain and will not be impacted. There are no pipelines within the project area.

Utilities will be protected or relocated to permit the work to proceed.

4.5 Permits, Approvals and Authorizations

The following permits / approvals will be secured for the project:

- **ESA – Endangered Species Act:** MECP C-Permit ESA permit is required for aquatic SAR (Wavy-rayed Lampmussel, Silver Shiner and Black Redhorse) under the Endangered Species Act legislation.
- **Fisheries Act Authorization:** A Request-for-Review (RfR) was submitted to Department of Fisheries and Oceans in 2019, which determined that due to the new in-water piers and the temporary causeways impacts a Fisheries Act Authorization will be required to address the impacts on fish and fish habitat. A SARA-compliant DFO Fisheries Act Authorization will be obtained prior to construction.
- **Permit to Take Water (PTTW):** It is anticipated that construction activities associated with this project could result in a need for some water taking due to dewatering requirements. As a result, a Category 3 PTTW will be obtained from MECP prior to construction.

- **Archaeology:** Concurrence from the Ministry of Tourism, Culture and Sport (MTCS) will be obtained prior to construction.

4.6 Summary of Environmental Effects and Recommended Mitigation Measures

Exhibit 4-5 below summarizes the identified potential environmental impacts and proposed mitigation measures to follow during construction.

Legend	
MNRF: Ministry of Natural Resources and Forestry	RES/BUS: Local residents and/or business owners
MECP: Ministry of the Environment, Conservation and Parks	TC: Transport Canada
MTCS: Ministry of Tourism, Culture and Sport	UTIL: Utilities
MTO: Ministry of Transportation	DFO: Department of Fisheries and Oceans
EMS: Emergency Medical Services& Fire Dept	OPP: Ontario Provincial Police
GRCA: Grand River Conservation Authority	

Exhibit 4-5: Summary of Environmental Effects, Proposed Mitigation, and Commitments to Further Work

Issue #	Concern / Potential Effect	Relevant Agency	Mitigating Measure
Natural Environment			
1.0 Species at Risk (SAR)			
1.1	Species Encounters and potential impacts to SAR bats	MECP MTO MNRF DFO GRCA	• No vegetation removals are to occur between May 1 and September 30. • The limits of vegetation clearing associated with the proposed works shall be clearly staked in the field and disturbance beyond the staked limits shall not be permitted. • In the event that a SAR bat or possible SAR bat is found in the work area, all activities that could potentially harm the animal will cease immediately and the Contract Administrator will be notified. • In the event that an Endangered or Threatened species or possible Endangered or Threatened species is found in the construction area, all activities that could potentially harm the animal will cease immediately and the Contract Administrator will be notified.
1.2	Impacts to Barn Swallow	MTO MNRF	• The Grand River Bridge, King Street Overpass, and culverts are considered potential nesting habitat and should be re-assessed in the year of construction or the breeding season prior to construction.

Issue #	Concern / Potential Effect	Relevant Agency	Mitigating Measure
2.0 Vegetation			
2.1	Impacts to vegetation, interior habitat and native topsoil	MTO MNRF	• Install temporary erosion and sediment control measures prior to construction, and maintain throughout construction. • Routinely inspect erosion and sediment control measures, including after storms, and repair as required. • Re-stabilize and re-vegetate exposed surfaces as soon as possible following construction. • Vegetation that does not require removal for purposes of the construction will be protected through the installation and maintenance of temporary vegetation protection measures (e.g. temporary fencing). • Where possible, Black Walnut trees will be identified for retention/tree • protection measures. • Unnecessary traffic and storage of materials over tree roots will be avoided. • Where possible, topsoil removed during clearing / grubbing will be stored and utilized locally. • Any dredged, salvaged or stockpiled materials will be located within the delineated work area (removed from the natural feature) and stabilized to prevent migration of any sediment or debris to adjacent natural features.
3.0 Wildlife and Wildlife Habitat			
3.1	Impacts to Migratory Birds	MTO MNRF	• Awareness of the potential for nesting activity within the project limits during the Regional Nesting Period (approximately April 1 to August 31). • Avoidance of activities which may disturb or harm nesting migratory birds. Due to the proposed project timeline, construction activities will overlap with the Regional

Issue #	Concern / Potential Effect	Relevant Agency	Mitigating Measure
			Nesting Period; however, the contractor will ensure vegetation clearing (including grubbing and tree / shrub / grass removal) will be avoided during the Regional Nesting Period. • If structure works cannot be scheduled outside the identified nesting season (April 1 to August 31), bird nesting preventative measures must be initiated prior to April 1st to prevent nesting on the structures in the year of construction. Bird nesting preventative measures are to be maintained until August 31 to avoid nesting attempts. • If a nesting migratory bird is identified within or adjacent to the construction site and the construction activities are such that continuing construction in that area would result in a contravention of the MBCA, all activities will stop and Environment Canada will be contacted to discuss mitigation options. • Creation of steep sloped soil piles within the construction areas should be avoided as this may create suitable Bank Swallow nesting habitat, and subsequent removal or alteration of these soils pile would impact Bank Swallow individuals or nesting habitat.
3.2	Impacts to Bald Eagle (SCS)	MTO MNRF	• To avoid disturbance of winter roosting Bald Eagles, construction activities after sunset and/or the use of flood lighting should be avoided, where possible, during the wintering period of November 1 to April 10. • Prior to the beginning construction or in the year of construction, monthly monitoring should be completed by a qualified Ecologist during the courtship and nest building period (December 1 to March 31), to determine the presence / absence of breeding pairs or nest locations in the study area.
3.3	Impacts to Herpetofauna (Turtles and Snakes)	MTO MNRF	• Temporary exclusion fencing shall be in place prior to June 1 to prevent snakes and turtles from entering or nesting in the construction and / or grading area adjacent to the Grand River, Tributary of the Grand River and Blair Creek PSW. • To avoid potential impacts to overwintering turtles, installation of the causeways or other initial in-water works within the Grand River should be completed prior to September 1. Alternately, turtle exclusion measures, such as staked siltation curtain,

Issue #	Concern / Potential Effect	Relevant Agency	Mitigating Measure
			should be installed prior to September 1, and a qualified biologist should be on-site during de-watering to identify and remove any turtles from the work area. • Regular inspection of exclusion fencing is to be completed and damaged sections repaired immediately. The work site should be inspected for turtles, snakes or other wildlife that may have entered the construction zone or become trapped inside the fencing. Turtles should be placed back on the wetland or watercourse side of the fence. • Any equipment parked overnight in the area will also be inspected to ensure no snakes have climbed into / under it between April 1 and October 31. • Contract specifications will identify the potential for SAR to be encountered during construction and the procedures to be followed in the event of an encounter.
3.4	Impacts to Monarch	MTO MNRF	• Vegetation restoration / re-planting plans should consider incorporation of Milkweed species (primary food plant for Monarch) and other wildflowers.
3.5	Impacts to general wildlife, wildlife movement, and road mortality	MTO MNRF	• Any wildlife incidentally encountered during construction will not be knowingly harmed and will be allowed to move away on its own. In the event that an animal encountered during construction does not move from the construction zone and construction activities are such that continuing construction in the area would result in harm to the animal, all activities that could potentially harm the animal will cease immediately and the Contract Administrator will be notified. • To the extent possible, restore natural vegetation cover and avoid the use of sharp rip-rap rock beneath the Grand River Bridge. This will maintain movement opportunities along the Grand River corridor for terrestrial wildlife including White-tailed Deer, snakes and amphibians.
4.0 Fish and Fish Habitat			
4.1	Impacts to the Grand River during construction and local	MECP MTO MNRF DFO	• A warmwater permissible in-water construction timing window of July 1st to March 31st will be implemented at the crossings. No in-water works will be permitted between April 1st and June 30th of any given year.

Issue #	Concern / Potential Effect	Relevant Agency	Mitigating Measure
	habitat loss and alteration of substrates	GRCA	• Any temporarily stockpiled soil, debris or other excess materials, and any construction-related materials, will be properly contained (e.g. within silt fencing) in areas separated at least 30 m from the Grand River or its tributary/drainage features. • Deck drains will not directly enter the watercourse. • During construction, areas required for construction works or causeway installation will be isolated from the main flow path of the Grand River. After isolation, qualified biologists will catch and relocate trapped fish and mussels downstream of the proposed work area using appropriate methods (e.g., electrofishing, seine netting) and under a licence to collect fish from the MNRF. The mussel relocation will be carried out prior to works under an Endangered Species Act (ESA) Schedule C Permit from MECP to address aquatic SAR.
5.0 Erosion and Sediment Control			
5.1	Sediments released into the surrounding area	MECP MTO MNRF DFO GRCA	• Install temporary erosion and sediment control measures prior to construction, and adjust throughout construction. • Routinely inspect sediment and erosion control structures, including after storms, and repair / maintain as required. • Perimeter silt fence will be installed between the work areas and all reaches of those watercourses where works are required, including ditch and drainage works that drain to them. This fencing shall be properly installed and regularly inspected and maintained. It shall be left in place and maintained until all surfaces contributing drainage to these watercourses and drainage features are fully stabilized. • All exposed and newly constructed surfaces will be stabilized using appropriate means in accordance with the characteristics of the soil material and slope conditions. • Surfaces will be fully stabilized and re-vegetated as quickly as possible following completion of the works. The window for stabilization will be tightened within Environmentally Sensitive Areas.

Issue #	Concern / Potential Effect	Relevant Agency	Mitigating Measure
6.0 Groundwater			
6.1	Impacts to groundwater / private water wells	MTO MECP	• A Category 3 Permit to Take Water (PTTW) will be obtained from the Ministry of the Environment, Conservation and Parks prior to construction. • Prior to construction, a private water well survey will be completed at all residential properties located on Greensview Drive to document baseline conditions of the existing private water wells. • Any water wells (including monitoring wells) in conflict with construction activities should be decommissioned in advance of construction.
7.0 Excess Materials and Waste Management			
7.1	Excess soil generated during construction	MTO MECP MNRF	• Excess soil generated during construction will need to be managed in accordance with the applicable regulatory framework and MTO's standard construction practices. • Vehicular and equipment maintenance and refueling will be undertaken in designated areas a minimum of 30 m from the watercourse and drainage features in accordance with OPSS 180 and controlled to prevent any discharge of equipment fuels and fluids onto the ground or into a watercourse. • All machinery is to be washed, refueled and serviced a minimum of 30 m from the waterbody. • All machinery and equipment used will arrive on-site in a clean condition, free of fluid leaks, invasive species (e.g., Phragmites australis) and noxious weeds. • No construction equipment shall enter a watercourse beyond the isolated work areas or the temporary causeways. • A Spill Control and Response Plan should be developed and implemented to prevent deleterious substances from entering the natural environment. The plan should ensure machinery arrives on site in clean condition and maintained free of fluid leaks.

Issue #	Concern / Potential Effect	Relevant Agency	Mitigating Measure
			• An excess materials management area for placement of the excess earth and granular materials generated from the project has been identified on the west side of the north-to-west ramp at the King Street interchange
Socio-Economic Environment			
8.0 Air Quality			
8.1	Management of excess materials and Dust	MECP MTO	• Standard construction practices for the control of dust will be implemented during the construction period to minimize the generation and spread of dust. • Dust suppression shall be completed using water, not chemical suppressants.
9.0 Noise			
9.1	Construction noise	MTO Municipalities Area Residents	• The Contractor will be required to keep the idling of construction equipment to a minimum and to maintain equipment in good working order to reduce noise from construction activities. • If noise level emissions for the construction equipment in use exceed the sound level criteria for construction equipment contained in the MECP Model Municipal Noise Control Bylaw, MTO requires the contractor to comply with the sound level criteria where quieter alternative equipment is reasonably available.
10.0 Landscape			
10.1	Potential impacts to the existing landscape conditions	MTO MECP MNRF GRCA	• Detailed landscape plans and tree management plans will be included in the contract package and implemented as part of the overall construction works. • Where visual buffers will be impacted they should be protected where possible and replaced where not. • New woodlot edges created by vegetation removal should be buffered with new planting, as should any disturbed river bank area/s. • Specific attention should focus on minimizing the extent of disturbance on trees over 10 cm in diameter at breast height.

Issue #	Concern / Potential Effect	Relevant Agency	Mitigating Measure
			• Post-construction monitoring includes: — Monitoring and maintenance of plant material for a minimum of 2-years and an action plan implemented for the replacement of any plantings deemed unacceptable; — Monitoring of groundcover plantings (i.e. seeded areas) to ensure soils exposed during construction have been adequately covered and erosion / sedimentation is not occurring and an action plan implemented for any areas requiring remediation
11.0 Property			
11.1	Property impacts		• Property acquisitions will be obtained in accordance with standard MTO procedures.
12.0 Navigability			
12.1	Potential impacts to navigation		• Public right to navigation will be provided and anchors and cables for construction equipment will be marked.

Issue #	Concern / Potential Effect	Relevant Agency	Mitigating Measure
Cultural Environment			
13.0 Archaeology			
13.1	Archaeological resources and cultural heritage features	MTO MTCS Indigenous Communities	• If any archaeological resources are discovered during construction, work in the area will stop and the appropriate authorities (e.g. police, coroner and the Registrar of Cemeteries, Ministry of Government Services.) will be contacted. • In the event that human remains are encountered during construction, the Cemeteries Regulation Unit of the Ministry of Consumer Service (1-800-889-9768) should be notified. In situations where human remains are associated with archaeological resources, the Ministry of Tourism, Culture and Sport (MTCS) should also be contacted to ensure that the site is not subject to unlicensed alterations which would be a contravention of the *Ontario Heritage Act*. • Concurrence from the MTCS will be sought upon completion of any necessary archaeological investigations and reports and obtained prior to any sites being impacted by construction.
Transportation			
14.0 Construction Staging			
14.1	Traffic during construction	MTO Municipalities Residents & Businesses	• The proposed replacement of the Highway 401 Grand River bridge structures and full rehabilitation of the Highway 401 King Street Overpass will be constructed in stages to maintain traffic flow on Highway 401. Lane restrictions and/or detours may be required in stages on both the mainline and the side roads. • Ramps at the King Street interchange will be closed in stages as required during construction. • Highway 401 will be temporarily widened to the east and west of the Grand River Bridges to accommodate traffic staging. It is anticipated that the during peak periods, four lanes on King Street will remain open during construction. There will

Issue #	Concern / Potential Effect	Relevant Agency	Mitigating Measure
			be some night time and non-peak hour construction for soffit repair, column wrapping, abutment repair, and deck widening that will require a single lane closure. • Short term (night time, non-peak hour) ramp closures may be required to accommodate pavement rehabilitation work. • The exact timing for the above closures will be subject to the start of construction.
15.0 Illumination			
15.1	Road user safety and environmental concerns	MTO Municipalities Residents	• Full conventional illumination will be provided along the Grand River Bridges. • The design of the future lighting will consider a balance of road user safety and environmental concerns, including a review of potential shielding to minimize light trespass on adjacent sensitive areas.
16.0 Emergency Services			
16.1	Potential impacts to emergency services response times	MTO Municipalities OPP	• Notification will be sent to the Ontario Provincial Police, municipalities and emergency service providers to advise them of the detailed construction staging plan and the timing for construction. Consultation with OPP, municipalities and emergency service providers will take place as required to ensure minimal impacts during construction.
17.0 Utilities			
17.1	Impact to utilities	MTO Utilities	• Hydro and Bell service connections on the east side of the Grand River will be removed prior to construction. • The existing gas line crossing Highway 401 will not impacted.

5 Monitoring

If the impacts of construction are different than anticipated, or if the method of construction is such that there are greater than anticipated impacts, the Contractor's methods of operation will be changed or modified to reduce those impacts. During construction, the on-site Contract Administrator ensures that implementation of mitigating measures and key design features are consistent with the contract and any associated permits or approvals. In addition, the effectiveness of the environmental mitigating measures is assessed to ensure that:

- Individual mitigating measures are providing the expected control and/or protection;
- Composite control and/or protection provided by the mitigating measures is adequate;
- Mitigation measures are maintained and any necessary repairs are completed quickly; and
- Additional mitigating measures are provided, as required, for any unanticipated environmental problems that may develop during construction.

A qualified Environmental Inspector, as part of the Contractor Administrator assignment, will be retained to provide oversight on specific works, including channel realignments, to ensure that works are in accordance with the contract specifications and commitments to MNRF, MECP and DFO.

On-site construction administration staff will ensure that the environmental measures outlined in the contract are carried out. Post-construction monitoring will be carried out as required. In the event that problems occur, the MTO Environmental Section and appropriate provincial ministries and/or agencies will be contacted to provide additional input and recommendation.

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APPENDIX

A RELEVANT CORRESPONDENCE

APPENDIX

B VEGETATION COMMUNITIES