BURNSIDE

Bridge and Transportation Network Study for Bridges 2-WG, 3-E, 5-E, & 7-E

Township of Centre Wellington
1 MacDonald Square
Elora ON N0B 1S0

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R.J. Burnside & Associates Limited
292 Speedvale Avenue West Unit 20
Guelph ON N1H 1C4 CANADA

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R.J. Burnside & Associates Limited

Report Prepared By:

Andrew Dawson, P.Eng.
Project Manager
AD/MB:smm/tc

Report Reviewed By:

Matthew Brooks, P.Eng.
Senior Vice President, Municipal Services & Structures

Executive Summary

R.J. Burnside & Associates Limited (Burnside) was retained by the Township of Centre Wellington (Township) to complete a Bridge and Transportation Network Study for Bridges 2-WG, 3-E, 5-E, and 7-E. A total of 16 alternatives are available based on a total of four bridge structures, each with the option of being closed or open. This large series of alternatives was reduced to six alternatives using high-level screening to eliminate alternatives that would not successfully address the problems or opportunities associated with this study.

At the onset of the project, a review of the applicable Project Descriptions outlined in the Municipal Engineering Association (MEA) Guide for Municipal Class Environmental Assessments (EAs) (February 2024) was completed and identified that the appropriate Schedule of Municipal Class EA would be dependent on the findings of the cultural heritage and archaeological assessments. Following the completion of the Cultural Heritage Evaluation Report (CHER) and the Stage 1 Archaeological Assessment, it was determined that all project activities would be classified as Exempt under the MEA Guidelines.

The Alternative Solutions were evaluated against the transportation, natural environment, economic, social and cultural environment of the Study Area.

The preferred solution is Alternative 5, which consists of the replacement / opening of Bridges 2-WG, 5-E, and 7-E, and the permanent closure of Bridge 3-E. The preferred solution consisting of opening Bridges 2-WG, 5-E, and 7-E ranked between first and third in all weighting scenarios considered and was the most consistent highly rated alternative, providing the highest combined score on the sensitivity analysis, confirming its selection of the preferred solution.

The preferred solution has many significant benefits and addresses several of the problems and opportunities including:

- Replaces all structures that benefit emergency first response times.
- Replaces the three bridges with the most benefit to:
  - Travel times for agricultural equipment.
  - Simplified routes for deliveries, buses, municipal services, etc.
  - Commute times for local residents to surrounding areas.
- Eliminates need for agricultural equipment to travel on arterial routes / County Roads.
- Provides opportunities for use as emergency detour routes during closures of County Roads.
- Allows opportunities for improvements to fisheries and erosion concerns identified at 2-WG and 5-E during replacement works.
- Highest cost-benefit ratio.

A key component of the study included consultation with the public, Indigenous communities, and agencies that may have an interest in the project. Consultation with stakeholders included a Notice of Public Open House #1, Notice of Public Open House #2, and Notice of Completion. A letter was also sent to Indigenous communities in advance of study initiation.

Comments or concerns regarding the Project are to be directed to the Township for a response.

Table of Contents

Tables

Figures

Appendices

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In the preparation of the various instruments of service contained herein, R.J. Burnside & Associates Limited was required to use and rely upon various sources of information (including but not limited to: reports, data, drawings, observations) produced by parties other than R.J. Burnside & Associates Limited. For its part R.J. Burnside & Associates Limited has proceeded based on the belief that the third party/parties in question produced this documentation using accepted industry standards and best practices and that all information was therefore accurate, correct and free of errors at the time of consultation. As such, the comments, recommendations and materials presented in this instrument of service reflect our best judgment in light of the information available at the time of preparation. R.J. Burnside & Associates Limited, its employees, affiliates and subcontractors accept no liability for inaccuracies or errors in the instruments of service provided to the client, arising from deficiencies in the aforementioned third party materials and documents.

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1.0 Introduction and Background

1.1 Introduction

R.J. Burnside & Associates Limited (Burnside) was retained by the Township of Centre Wellington (Township) to complete a Bridge and Transportation Network Study for Bridges 2-WG, 3-E, 5-E, and 7-E, which are in close proximity to one another in the southeast quadrant of the Township. These structures have had load limitations applied or have been closed to vehicular traffic based on recommendations of structural Engineers due to their severely deteriorated condition.

The Township has recognized the impact of having numerous closed structures on the overall connectivity of the local community and initiated this study to evaluate the role of each structure on the overall transportation network and consider improvements to some or all of the subject bridges to improve connectivity within the Study Area. The results of this study will be used by the Township for future capital planning requirements for the subject bridges.

The existing conditions, proposed alternatives, and manner in which public consultation was conducted are presented in this Project File Report (PFR).

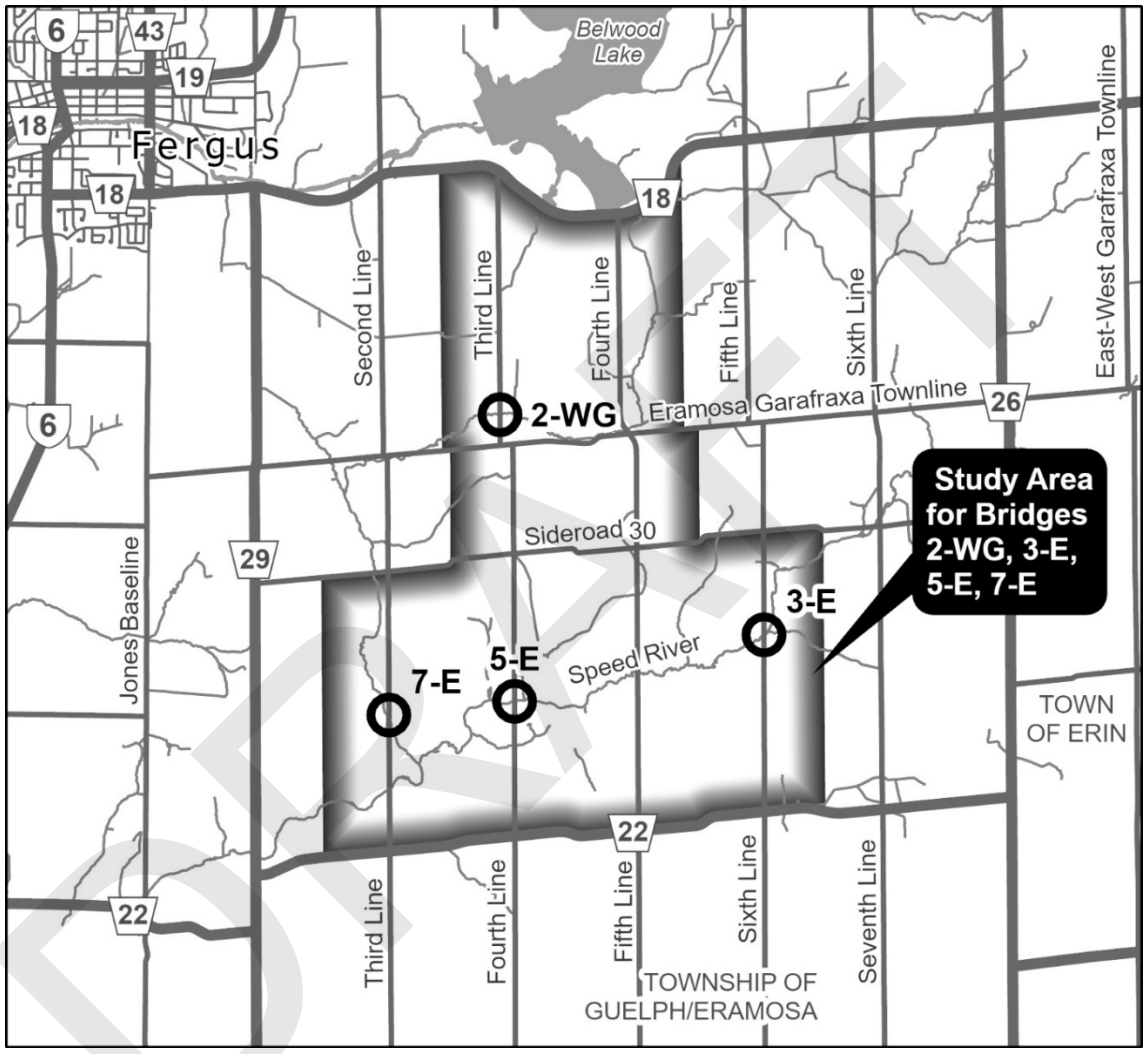
1.2 Study Area

The four bridges being reviewed are located in the southeast quadrant of the Township of Centre Wellington, southeast of the community of Fergus, Ontario. The bridges cross the Speed River and its associated tributaries. These structures were built prior to the amalgamation of the Township of Centre Wellington, which occurred in 1999. Bridge 2-WG is located in the south end of the former Township of West Garafraxa and Bridges 3-E, 5-E, and 7-E are located in the northeast quadrant of the former Township of Eramosa. The locations of the bridges are illustrated in Figure 1 and further described below.

- **Bridge 2-WG:** Located on Third Line of former Township West Garafraxa, between Eramosa Garafraxa Townline and Wellington Road 18, approximately 340 m north of Eramosa-Garafraxa Townline.
- **Bridge 3-E:** Located on Sixth Line of former Township of Eramosa, between Sideroad 30 and Wellington Road 22, approximately 1.9 km north of Wellington Road 22.
- **Bridge 5-E:** Located on Fourth Line of former Township of Eramosa, between Sideroad 30 and Wellington Road 22, approximately 1.5 km north of Wellington Road 22.

- **Bridge 7-E:** Located on Third Line of former Township of Eramosa, between Sideroad 30 and Wellington Road 22, approximately 1.5 km north of Wellington Road 22.

Figure 1: Study Area



The letters in the bridge identification numbers indicate the former Township prior to the amalgamation of Centre Wellington. Reference is provided to the former Townships throughout the report because the names of the roads change at the Eramosa-Garafraxa Townline and can cause some confusion. For example, Bridge 2-WG is located on Third Line of former Township of West Garafraxa, (north of Eramosa-Garafraxa Townline); however, if you continue south on the nearest roadway south of Eramosa-Garafraxa Townline, it is the Fourth Line of former Township of Eramosa.

The four bridges service a Rural community which is home to agricultural, residential, and commercial properties. The network of roads within the study area carries vehicular traffic and agricultural equipment and connects the local community within the Study Area to the neighbouring areas of Fergus, Elora, Belwood, Rockwood, Erin, Guelph, and beyond.

1.3 Municipal Class Environmental Assessment

The planning of public sector projects or activities that have the potential for environmental effect are subject to a Municipal Class Environmental Assessment (MCEA) as required by Ontario's Environmental Assessment Act, R.S.O. 1990 (EAA).

The MCEA process was developed by the Municipal Engineers Association (MEA), in consultation with the Ministry of the Environment, Conservation and Parks (MECP), as an alternative method to Individual Environmental Assessments for recurring municipal projects that were similar in nature, usually limited in scale, and with a predictable range of environmental impacts, which were responsive to mitigating measures.

The MCEA solicits input from regulatory agencies, the Municipality, Indigenous Communities, and the public at the local level. This process leads to an evaluation of the alternatives in view of the significance of the environmental effects, including the technical, natural, social / cultural, and economic impact of a project, and the choice of effective mitigation measures.

1.3.1 Exemption of Project from Ontario's Environmental Assessment Act

At the onset of the project, a review of the applicable Project Descriptions outlined in the Municipal Engineering Association (MEA) Guide for Municipal Class EAs (February 2024) was completed and identified that the appropriate Schedule of Municipal Class EA would be dependent on the findings of the cultural heritage and archaeological assessments.

Following the completion of the Cultural Heritage Evaluation Report (CHER) and the Stage 1 Archaeological Assessment, it was determined that all project activities would be classified as Exempt under the MEA Guidelines, as follows:

- Bridges 2-WG, 5-E, and 7-E were found to not have cultural heritage value or interest and would be considered Exempt under Project Description 31a of the MEA Guide if the preferred solution involved reconstruction of or alteration to the structures, or under Project Description 24a if retirement of the existing bridges were the preferred solution.
- Bridge 3-E was identified to have cultural heritage value or interest, but was considered Exempt under Project Description 31b, following the completion of the Archeological Screening Process (ASP), which identified no negative impacts to

archaeological resources, and the commitment of the Township to conserve the heritage attributes of the bridge in accordance with the recommendations of the Heritage Impact Assessment (HIA).

Projects classified as 'Exempt' through the MEA Guide to Municipal Class EAs, either directly or through screening processes, are exempt from the requirements of Ontario's Environmental Assessment Act. An activity that is classified as Exempt may not be elevated to a Schedule B or C process; however, the Municipality may choose to carry out a similar process to a Schedule B or C EA, outside of the formal process of the MCEA.

1.3.2 Archaeological Screening Process

The Township completed the Archaeological Screening Process for Bridge 3-E in accordance with Ontario Heritage Act, R.S.O. 1990, c O.18. A Stage 1 Archaeological Assessment was completed on May 13, 2024, and determined that "the study areas were identified to exhibit low archaeological potential due to previous disturbance or poorly drained conditions". The study areas are considered free of archeological concerns and no further archaeological assessment is recommended. As such, it has been determined that the project will have no negative impacts to archaeological resources and the requirements of the Archaeological Screening Process have been met. In consideration of this, the project was completed without further application of the Environmental Assessment Act.

Following the completion of the Archaeological Screening Process, which confirmed that all project activities related to this study would be exempt from the Environmental Assessment Act, a Notice of Project Screening was provided to the Ministry's regional contact and Indigenous Communities to provide the opportunity for comments on the screening process. A Streamline Project Initiation Form was also provided to the MECP to identify that the project has been screened for exemption.

1.3.3 Continued Public Engagement

Although this study has been screened to be exempt from the Environmental Assessment Act, the Township recognizes that engagement with Indigenous communities, agencies, stakeholders, and the public is an integral component of the decision-making process for the future of these bridge structures. Accordingly, the Township continued with a process similar to the Schedule B EA process, but outside of the formal regulations of the Environmental Assessment Act.

2.0 Problem Statement

2.1 Study Purpose

As previously indicated, the Township has recognized the impact of having numerous closed structures on the overall connectivity of the local community. The purpose of this study is to evaluate the role of each structure on the overall transportation network and consider permanent closure or improvements to some or all of the subject bridges in order to address current concerns of the local community and provide direction to the Township's capital planning for their bridge infrastructure inventory.

The objective of this study is to provide a traceable decision-making process while offering effective consultation with the community, ministries, first nations, conservation authorities, and other stakeholders in order to consider and review a number of potential alternatives, with due consideration of the effects that they could have on the physical, natural, social, cultural, economic, and technical environments.

2.2 Study Justification

The four bridges included in this study have significantly deteriorated, to the point of load limitation (Bridge 2-WG) or closure to vehicular traffic (Bridges 3-E, 5-E, and 7-E). Given the close proximity of the bridges, these capacity limitations are impacting the overall transportation network within the local Study Area, which has resulted in additional concerns to the local population and affected stakeholders. The deteriorated state of the closed structures also poses a risk to the public and the environment, resulting in liability concerns to the Township.

2.3 Problems and Opportunities

At the onset of this study and during the first Public Open House, consultation with the public and stakeholders was undertaken to help identify the problems and opportunities that were present due to the current conditions or that may occur with the opening or permanent closure of the bridges. A summary of the comments received during the first Public Open House, which formed the basis of the problems and opportunities explored during this study, are available in Appendix B. The concerns raised by the public and stakeholders during consultation can be summarized as follows:

- Increased commute times to surrounding communities.
- Delays to emergency response times as a result of bridge closures.
- Lengthy detours or disruptions to farm equipment travel between agricultural lands within the study area and surrounding community.
- Complicated routes for service vehicles such as waste collection, school buses, snow ploughs, delivery vehicles, etc.

- Requirement for slow-moving agricultural equipment to travel on busier arterial routes (County Roads) due to no alternative north-south routes with bridge closures.
- Lack of formal turn-around at location of closed bridges.
- Inadequate signage which does not clearly identify access limitations, causing vehicles to travel down roads and turn-around.
- The failing state of the remaining infrastructure presents risks to the public and the surrounding environment should collapse occur.
- The Study Area Population feels 'forgotten' because improvements are occurring in other locations of the Township and not within the Study Area.
- Potential impacts to the cultural heritage or archeological resources due to construction activities.
- Potential impacts to built heritage associated with the removal of the existing bridges.

The following opportunities were also identified through the study and consultation:

- Opportunity to provide wider crossings to accommodate farming equipment.
- Potential to evaluate the use of cheaper structure types such as culverts or narrow bridge structures, to reduce the total capital expenditure requirements.
- Opportunity for geometry and alignment improvements to reduce the potential for erosion and provide additional aquatic and wildlife habitat and / or passage.
- Opportunity to improve road safety, by improving sight lines and providing roadside safety elements.
- Opportunity for offering emergency detour routes for adjacent Wellington County Roads with replacement of certain structures.

The above-noted concerns and opportunities have shaped the investigations that were undertaken throughout this study, to allow the alternatives to be evaluated against their ability to address the concerns raised.

3.0 Supporting Studies

To address the problems and opportunities noted above and evaluate the alternative solutions, a series of background studies related to the technical, natural, cultural heritage, social and economic environments have been undertaken. These studies provide context for the existing conditions, as well as assess the extent to which improvements to each structure would aid in resolving the problems or capturing the opportunities previously outlined.

3.1 Policy and Planning

A review of existing planning and policy data was conducted to obtain secondary source information relating to the technical, natural, cultural and social environments within the Study Area and to provide an overview of existing policy framework in the study area. Sources reviewed include, but are not limited to:

- Planning Act and Provincial Policy Statement;
- Township of Centre Wellington Official Plan;
- County of Wellington Official Plan;
- Township of Centre Wellington Transportation Master Plan; and
- Clean Water Act – Source Water Protection.

The information below is a summary of policy and planning commitments related to the general Study Area. Additional references to the plans and policies related to areas of specific interest (i.e., transportation or natural heritage) are provided in the appended supporting studies, where applicable.

3.1.1 Provincial Policy Statement and Official Plans

The Provincial Policy Statement (PPS) provides policy direction on matters of provincial interest related to land use planning and development (MMAH, 2024). County and Official Plans provide additional policy which is more specific to the Study Area. Policy of the Township's Official Plan only applies to the Elora and Fergus Urban Centres, including Salem and Belwood. Given that the Study Area is outside these Urban Centres, the Study Area is governed by the County of Wellington's Official Plan. In general, the County's Official Plan outlines that decisions for land use shall be made for development that provides economically strong, healthy, and socially responsible community and which protect the natural and cultural heritage for this and future generations. The following are excerpts from the County's Official Plan future commitments which may apply to this study:

- Ensure that County residents have convenient access to commercial uses and services.
- Ensure cost effective development and land use patterns.

- Maintain the small town and rural character of the County.
- Protect the agricultural land base for farming.
- Ensure that farmers, following normal farming practices, are not hindered by conflicting development.
- Provide the infrastructure required to accommodate growth in an environmentally and fiscally responsible manner.
- Maintain clean water, clean air and a healthy, diverse and connected Greenlands system.
- Protect, restore, or, where feasible, improve the diversity, connectivity and ecological functions of natural heritage features and areas such as wetlands, environmentally sensitive areas, streams and valley lands, woodlands, areas of natural and scientific interest, discharge and recharge areas and other open space areas.
- Prevent, eliminate or minimize the risks to public health or safety and to property caused by natural hazards.
- Ensure that County residents continue to have convenient access to health care, education and cultural facilities.
- Develop a safe and efficient transportation system for people, goods and services.

These commitments from the Official Plan will be considered in the analysis of the alternatives considered in this Study.

3.1.2 Land Use and Zoning

The Study Area comprises Rural and Greenland systems. The Official Plan designates that rural areas will be the focus for resource activities and that the Greenland system will be the focus for protection of the natural heritage system.

The existing land use designation identified by the Wellington County Official Plan includes mainly prime agricultural, green lands, and core green lands. Large portions of the study area are also identified as Schedule C Sand and Gravel Resources on the County's Official Plan. There are two Class 'A' licensed Aggregate Operations within the Study Area including St. Marys Cement Inc. located on Sixth Line (Eramosa) south of Bridge 3-E, and Oustic Sand and Gravel located on Fifth Line (Eramosa). There is also a Class B licence Aggregate Operation located on Third Line (Eramosa) south of Bridge 5-E. A Golf Course is present at the corner of Fourth Line (Eramosa) and Wellington Road 22.

Zoning within the Study Area consists mainly of Agricultural and Environmental Protection lands, with Extractive Industrial (M3) zoning at the aggregate pits and Open Space Golf Course (OS-GC) at Wild Winds Golf Course on Fourth Line. No lands are officially zoned Commercial, however, it is understood that some businesses operate out of agricultural zoned properties, such as the Herwynen Sawmill south of Bridge 3-E, and

several other small businesses related to farming, equestrian boarding and training, and canine boarding or breeding.

3.1.3 Transportation Master Plan

The Township of Centre Wellington Transportation Master Plan (2019) classifies all non-Wellington County roads within the Study Area as Local Rural in existing conditions. The Master Plan recommends that Fifth Line (Eramosa) and Fourth Line (West Garafraxa) form part of the proposed improvements to the Transportation Network. Fourth Line (West Garafraxa) is planned for medium-term road improvements to upgrade the road to an Arterial 2-lane road. This north-south corridor is part of the Draft Provincial-Wide Cycling Network. Although none of the subject bridges are located directly on this roadway, it is located between bridges and the preferred solution determined through this study may have a minor impact on the traffic which travels along this route.

Additional context to transportation related plans and policies are provided in Appendix A.1.

3.1.4 Clean Water Act -Source Water Protection

As a result of the *Clean Water Act* (Ontario Regulation 287/07), communities in Ontario are required to develop source protection plans in order to protect their municipal sources of drinking water. These plans identify risks to local drinking water sources and develop strategies to reduce or eliminate these risks.

A review of the MECP (formerly MOECC) Source Water Protection Information Atlas indicates Bridge 5-E is located immediately adjacent to a Highly Vulnerable Aquifer and Bridge 2-WG is located within a low vulnerability (Score = 4) of Well F5 in Centre Wellington and the Cross Creek and Huntington Estates wells in the Township of Guelph-Eramosa.

The Clean Water Act defines a “prescribed threat” as “an activity or condition that adversely affects, or has the potential to adversely affect, the quality or quantity of any water that is or may be used as a source of drinking water and includes an activity or condition that is prescribed by source protection regulation as a drinking water threat.” The Province has identified 22 activities that could pose a threat if they are present in vulnerable areas, (listed in Section 1.1 of the Clean Water Act). Project activities are not prescribed drinking water threats and are not anticipated to pose a risk to drinking water.

3.2 Technical Environment

3.2.1 Transportation Network Study

As part of the analysis of the technical environment, a study on the overall transportation network within the study area was conducted to review the current and future road use and evaluate the impacts associated with the opening or closure of the four subject bridges on the overall connectivity of the local community to emergency response, cross-community travel, and localized travel within the study area.

3.2.1.1 Transportation Network Overview

The Study Area encompasses an approximately 30 km^2 system of roads that are situated in a relatively grid-like manner, as illustrated previously in Figure 1 above. The road network provides connectivity within the Study Area, and to the neighbouring communities of Fergus, Elora, Belwood, Rockwood, Erin, Guelph, and beyond.

A summary of the road characteristics for the Study Area is provided below in Table 1. The roads in which the bridges are situated generally run in a southeast to northwest orientation, with the intersecting roads being oriented in a southwest to northeast orientation. However, for the purpose of this study, the roads carrying the bridges will be classified as ‘North-South’, and the intersecting roads will be classified as 'East-West’.

Table 1: Study Area Roadway Characteristics

Road	Classification	Travel Direction	Surface Type	Regulatory Speed Limit	Average Annual Daily Traffic	
					Volume (vehicles / day)	Year Measured
Third Line (West Garfraxa)	Two-Lane Local Rural	North-South	Gravel	80 km/h (un-posted)	50	2018
Third Line (Eramosa)	Two-Lane Local Rural	North-South	Gravel	80 km/h (un-posted)	70	2018 (pre-closure)
Fourth Line (Eramosa)	Two-Lane Local Rural	North-South	Gravel	80 km/h (un-posted)	50	Assumed per 3rd Line WG.
Fifth Line (Eramosa) & Fourth Line (West Garafraxa)	Two-Lane Rural Arterial	North-South	Paved	60 to 80 km/h (posted)	1,300 to 1,500	2023
Sixth Line (Eramosa)	Two-Lane Local Rural	North-South	Gravel	80 km/h (un-posted)	99 (pre-closure) 54 (post-closure)	2018 2023
Wellington Road 29	Two-Lane Rural Arterial	North-South	Paved	80 km/h (posted)	4,500 to 5,400	2021 & 2022
Wellington Road 26	Two-Lane Rural Arterial	North-South	Paved	80 km/h (posted)	3,600	2021
Eramosa – Garafraxa Townline	Two-Lane Rural Collector	East-West	Paved	80 km/h (un-posted)	620	2022
Sideroad 30	Two-Lane Local Rural	East-West	Gravel	80 km/h (un-posted)	110	2021
Wellington Road 18	Two-Lane Rural Arterial	East-West	Paved	70 km/h (posted)	7620	2022
Wellington Road 22	Two-Lane Rural Arterial	East-West	Paved	80 km/h (posted)	2,100 to 2,400	2023

Based on the average annual daily traffic (AADT) volumes, all four bridges are located on Low Volume Roads. Low Volume Roads are roads which have an AADT of less than 400 vehicles per day. Bridges on Low Volume Roads are allowed to be designed to lesser standards in certain aspects due to the lower risks associated with low traffic volumes. Exceptions to design criteria will be later discussed in the relative subsections of this report.

Several of the roads in the Study Area do not have posted speed limits. While these unposted roadways are considered to have regulatory speed limits of 80 km/h in accordance with the Highway Traffic Act (located outside of built-up area), it is apparent by travelling the roads that the road geometry and sightlines would not meet the required criteria of current codes for an 80 km/h design speed. This has been confirmed within the local area of the bridge structures by topographic survey of the road profile, which indicates that the design speeds of the roadways in the direct vicinity of the bridges range from 40 km/h to 60 km/h. Further details on the existing road profiles in the direct vicinity of the bridges can be found in the Existing Geometry and Physical Conditions technical memorandum of Appendix A.2.

The road networks serve a primarily rural community which is heavily agricultural. Traffic on the local roadways consists mainly of passenger vehicles. Heavy trucks travelling on the subject roads of this study should be limited to those directly accessing properties within the study area. Heavy trucks associated with operations of the nearby quarry and sawmill located on Sixth Line Eramosa should be utilizing the arterial routes of the surrounding Wellington Roads 18, 22, 26, and 29, and Fifth Line (Eramosa) / Fourth Line (West Garafraxa), which have been designed for higher volumes of truck traffic. Due to the agricultural land use of the subject area, the local roads are also travelled by large agricultural equipment to gain access to farmed lands around the study area.

Although there is no formal active transportation network within the study area, it is understood that these low-volume roads are used by the public for recreational activities such as walking, horseback, or cycling.

Under current conditions, Bridges 3-E, 5-E, and 7-E are closed to vehicular traffic and Bridge 2-WG has a load limitation of 15 tonnes. These closures result in local residents, businesses, and visitors of the study area being required to travel additional distances to reach destinations located between the closed bridges and the nearest intersection. The impacts of the closures and the three bridges are summarized in the subsections below, and further detailed in the Transportation Network Study Report included in Appendix A.1.

3.2.1.2 Cross-Community Connectivity

To address the concerns related to the additional time and travel distances required by local residents travelling to or from surrounding communities, a study was undertaken to quantify the magnitude of the changes with each individual bridge or combinations of bridges being opened or closed.

The local roads impacted by the bridge closures are not part of the main network for travel between neighbouring communities of Fergus, Elora, Belwood, Rockwood, Guelph, or Erin, and therefore do not impact the travel network outside of the local community. However, for residents or businesses located directly within the study area, travel times to these neighbouring communities are impacted.

The Transportation Network Study included in Appendix A.1 contains a detailed review of the travel times and distances based on origins or destinations to the north or south of the bridges to six surrounding communities, including Elora, Fergus, Belwood, Guelph, Rockwood, and Erin.

The findings of the study are summarized in Table 2 for individual bridges being opened or closed. It should be noted that the total and average time and distance savings are based on the six specific routes analysed to allow for comparative scoring and that the time savings for other origins and destinations may vary slightly. For this analysis, there were no compounding effects of opening more than one structure. The preferred routes never cross over more than one structure and therefore the results for combinations of open and closed structures can be achieved by summing the savings of each individual bridge.

Table 2: Summary of Cross-Community Travel Impacts for Opening / Closure of Individual Bridges

Bridge ID	Time Saved with Open (mins)		Distance Saved with Open (km)	
	Average	Total	Average	Total
2-WG	02:08	12:49	3.1	18.8
3-E	01:17	07:43	1.7	10.1
5-E	01:47	10:45	2.1	12.8
7-E	01:24	08:23	1.9	11.2

Based on the above, Bridge 2-WG provides the most benefit when it is open compared to closed, followed by Bridge 5-E, 7-E, and then 3-E.

In the overall analysis of the preferred solution, these impacts of closures were weighted with the pre-closure average annual daily traffic volumes to recognize the size of the population that would be impacted.

3.2.1.3 Emergency Response

To address concerns related to the emergency response times to local properties, a traffic analysis was completed to determine travel times and distances for emergency response times between properties north and south of the bridges to the nearest Hospital in Fergus and nearby Fire Halls and OPP Stations in Fergus and Rockwood. The response facilities in Rockwood have been analyzed as one destination, considering that the fire and ambulance both respond out of the Guelph Eramosa Station, and the OPP Station is located directly across the street, so there would be no difference in travel times or distances. It is also noted that all three stations out of Fergus would utilize the same route once they reach Highway 6, so the time and distance savings from each site is the same; however, the total response time differs slightly for each station. The results of the study are shown in Table 4. Further details on the emergency response analysis are provided in the Transportation Network Study included in Appendix A.1.

A review of the comparison of response times from the stations in Fergus to the stations in Rockwood have been completed to determine which facility would be able to provide the quickest response in each scenario. The governing 'first response' stations and associated impacts to times with bridge opening / closure are summarized in Table 5.

In considering the effects of opening or closing bridges, the number of current properties benefited has also been considered in the evaluation. A summary of the number of properties on each side of the bridges is provided in Table 3.

Table 3: Number of Properties on Each Side of Bridge

Bridge ID	Number of Properties Impacted	
	North of Bridge	South of Bridge
2-WG	15	2
3-E	10	11
5-E	16	12
7-E	10	8

Table 4: Summary of Emergency Response Time Impacts for Opening / Closure of Individual Bridges

Destination	Response Time from Emergency Response Origins (mins)											
	Fergus Fire Hall			Groves Memorial Hospital			Fergus OPP			Rockwood Stations		
	Closed	Open	Savings	Closed	Open	Savings	Closed	Open	Savings	Closed	Open	Savings
North of Bridge 2-WG	7:17	7:17	0:00	9:22	9:22	0:00	10:19	10:19	0:00	17:03	13:43	3:20
South of Bridge 2-WG	10:48	10:48	0:00	7:44	7:44	0:00	10:48	10:48	0:00	13:04	13:04	0:00
North of Bridge 3-E	11:04	11:04	0:00	13:09	13:09	0:00	14:05	14:05	0:00	13:09	11:29	1:40
South of Bridge 3-E	13:15	12:08	1:07	15:21	14:14	1:07	16:17	15:10	1:07	10:25	10:25	0:00
North of Bridge 5-E	8:31	8:31	0:00	10:39	10:39	0:00	11:35	11:35	0:00	12:36	12:06	0:30
South of Bridge 5-E	11:48	9:42	2:06	13:56	11:50	2:06	14:52	12:46	2:06	10:55	10:55	0:00
North of Bridge 7-E	7:40	7:40	0:00	9:48	9:48	0:00	10:44	10:44	0:00	13:46	12:50	0:56
South of Bridge 7-E	10:11	9:18	0:53	12:19	11:26	0:53	13:15	12:22	0:53	11:12	11:12	0:00

Table 5: Summary of First Response Stations and Time Savings with Bridges Open

Destination	Time Savings from Emergency Response Station with Fastest Response Time						
	Fire		Ambulance [2]		OPP		Total Time Savings
	Station	Time Savings (mins)	Station	Time Savings (mins)	Station	Time Savings (mins)	
North of Bridge 2-WG	Fergus	0:00	Fergus	0:00	Fergus	0:00	0:00
South of Bridge 2-WG	Fergus	0:00	Fergus	0:00	Fergus	0:00	0:00
North of Bridge 3-E	Fergus	0:00	Rockwood	1:40	Rockwood	1:40	3:20
South of Bridge 3-E	Rockwood	0:00	Rockwood	1:07	Rockwood	0:00	1:07
North of Bridge 5-E	Fergus	0:00	Fergus	0:00	Fergus	0:00	0:00
South of Bridge 5-E	Fergus [1]	2:06	Rockwood	2:06	Rockwood	0:00	4:12
North of Bridge 7-E	Fergus	0:00	Fergus	0:00	Fergus	0:00	0:00
South of Bridge 7-E	Fergus	0:53	Rockwood	0:53	Rockwood	0:00	1:46

[1] The quickest response station with Bridge 5-E closed is the Rockwood station, but is Fergus with Bridge 5-E Open.

[2] Ambulatory Response time considers travel to property from quickest station (as noted), plus travel to hospital from property

Table 4 shows that there are only minor changes to the response times from the stations with the quickest response times; however, it is recognized that emergency response may not always be available from the nearest response station and in certain instances, emergency response vehicles may be required from more than one station. Additionally, when calculating the total response savings for ambulatory care used in the evaluation of alternatives, the time from the origin to the Groves Memorial Hospital was utilized in the calculation, in recognition that the hospital would be the proposed destination in health-related instances.

Similar to the cross-community analysis, the preferred routes to the evaluated destinations do not cross more than one of the subject bridges. Therefore, the results of a combination of bridges being opened or closed can be determined through the summation of the results of the individual bridges.

In the analysis of alternatives, the associated time savings were weighted by the number of properties impacted to determine the overall relative scoring of the alternatives.

3.2.1.4 Slow Moving Vehicles

In recognition that the study area is predominantly agricultural land use, an evaluation of travel times for slow moving agricultural equipment was also completed to address comments received from the public. This analysis used a 20 km/h travel speed and avoided the busier County of Wellington Roads where possible. Although it is recognized that the slow-moving vehicles may be permitted to travel on the busier Wellington Roads, it is understood that the preference would be to have these vehicles use lower volume roads so as to not impact routes designed for continuous through traffic. It is also recognized that some operators of slow-moving vehicles would prefer to use local roads from a safety perspective. However, in some instances such as when Bridge 2-WG is closed, there is no alternative to using the busier Wellington Roads.

A preference for solutions which provide alternative routes to using the surrounding Wellington Roads as well as the north-south corridor of Fifth Line (Eramosa) and Fourth Line (West Garafraxa) was identified. These routes currently see increased traffic volumes, which are expected to further increase with the planned improvements scheduled as part of the Transportation Master Plan. In order to accomplish this without significant detour, Bridges 5-E, and 2-WG would be required to be open at minimum.

The findings of the study are summarized in Table 6 for individual bridges being opened or closed. It should be noted that the total time and distance savings are based specifically on the distinct routes analysed to allow for comparative scoring. Time savings for other origins and destinations may vary slightly. For further information on the analyzed routes and study findings, refer to Appendix A.1.

Table 6: Summary of Total Time & Distance Savings for Slow-Moving Vehicles along Analyzed Routes

Bridge ID	Time Saved (mm:ss)	Distance Saved (km)
2-WG	43:58	18.7
3-E	47:18	19.8
5-E	56:45	23.7
7-E	54:38	22.8

When looking at the effects of opening individual bridges, the most benefit is provided by opening Bridge 5-E, followed by Bridge 7-E, 3-E, and then 2-WG. However, there are compounding benefits recognized when opening some combinations of bridges. As such, a series of combinations were run as part of the analysis. Not all scenarios were necessarily run; however, all scenarios are able to be determined through a combination of the scenarios run. For example, the results of the scenario with Bridges 2-WG, 3-E, and 7-E being open can be determined through combining the effects of the scenarios for Bridges 2-WG and 3-E being opened with the effects of Bridges 2-WG and 7-E being opened, in consideration that the combination of Bridges 3-E, and 7-E have no compounding effects.

The results of opening combinations of bridges that were carried forward in the evaluation of alternatives (refer to Section 5.0) are summarized in Table 7 below.

Table 7: Impacts to Slow-Moving Vehicle Travel for Combinations Considered in Alternative Solutions

Alternative	1	2	3	4	5	6
Bridges Open	2-WG	None	All	2-WG, 3-E & 7-E	2-WG, 5-E & 7-E	2-WG & 7-E
Time Saved (h:mm:ss)	0:43:58	0:00:00	3:25:01	2:31:11	2:37:31	1:41:54
Distance Saved (km)	18.7	0.0	85.4	42.4	65.6	42.4

3.2.1.5 Local Community Travel

An additional traffic analysis was completed to determine the impacts associated with vehicles travelling within the Study Area. This study analyses routes that may be used by local residents travelling to neighboring properties or by service and delivery vehicles such as postal service, snow ploughs, waste collection vehicles, etc. Further details and all routes analyzed as part of this study are outlined in Appendix A.1. The results of the improvements for individual bridges are shown in Table 8. The results for the combinations of opened bridges carried forward in the evaluation of alternatives (refer to Section 5.0) are summarized in Table 9. It should be noted that the total time and

distance savings are based specifically on the distinct routes analysed to allow for comparative scoring. Time savings for other origins and destinations may vary slightly.

Table 8: Summary of Total Time & Distance Savings for Travel within Study Area

Bridge ID	Time Saved (mm:ss)	Distance Saved (km)
2-WG	14:00	18.7
3-E	5:28	7.0
5-E	6:35	8.8
7-E	6:01	8.0

Table 9: Impacts to Travel within Study Area for Combinations Considered in Alternative Solutions

Alternative	1	2	3	4	5	6
Bridges Open	2-WG	None	All	2-WG, 3-E & 7-E	2-WG, 5-E & 7-E	2-WG & 7-E
Time Saved (h:mm:ss)	0:14:00	0:00:00	0:34:22	0:24:17	0:26:53	0:18:47
Distance Saved (km)	18.7	0.0	45.8	27.6	38.4	27.6

As shown in the tables above, Bridge 2-WG offers the most benefit to travel within the study area, followed by Bridges 5-E, 7-E, then 3-E. However, compounding effects for opening multiple bridges are recognized for this study, as shown in Table 9.

3.2.2 Bridge Improvement Study

As part of the overall project study, an evaluation of the existing bridge conditions and a series of potential improvements to each structure were also completed to determine the preferred improvement at each specific bridge site. This study included:

- A review of the existing roadway and bridge geometry to allow comparison to current standards and identify areas of potential improvements to increase the safety and usability of the bridge and approach road.
- A review of the physical conditions of the existing bridges to identify the structural concerns and determine the feasibility and scope of work associated with potential rehabilitation.
- Analysis of various structure types to evaluate opportunities for using different types of crossing structures such as multi-cell culverts, narrow-lane bridges, and various types of single-span bridges.
- Hydrology study and hydraulic analysis to determine the applicable flow rates of the watercourse at each site and determine the structure and road geometry required to ensure that the proposed improvement does not result in increased flooding or erosion potential.

Detailed technical memorandums related to the Existing Geometry and Physical Condition, the Evaluation of Structure Improvement Types and the Hydrology and Hydraulic evaluation are available in Appendices A.2, A.3, and A.4. A summary of the findings of these reports are provided below.

3.2.2.1 Existing Geometry and Physical Condition

A summary of the four bridges being evaluated as part of this study is provided in Table 10.

Table 10: Existing Bridge Information

ID	Structure Type	Road Name	Span (m)	Deck Width (m)	Year Built	Year Closed
2-WG	Half-Through Concrete Girders	Third Line (West Garafraxa)	10.7	5.5	1921	N/A
3-E	'Rainbow' Bowstring Arch	Sixth Line (Eramosa)	13.5	5.0	1919	2022
5-E	Half-Through Concrete Girders	Fourth Line (Eramosa)	12.2	5.6	1923	2013
7-E	Concrete Through Girders	Third Line (Eramosa)	8.2	4.8	1920	2021
*Note: Deck Width refers to the driving platform width between inside face of barriers.						

All four bridges are considered to be narrower than the recommended minimum 6.0 m width for a two-lane bridge on a Low Volume Road. Bridges 2-WG, 3-E, and 5-E have driving platform widths within the range of 4.9 m to 6.0 m, which is a range that is not recommended for use by current standards due to the illusion that the bridge may be wide enough for two-vehicles.

The existing bridge and approach road widths do not meet the Township's typical standard for a two-lane road, which requires a 9.1 m wide driving platform, consisting of 3.35 m wide lanes and 1.2 m wide shoulders. To achieve the Township platform width, replacement of each bridge would be required.

There are currently no posted speed limits at any of the bridge locations. In accordance with the Highway Traffic Act of Ontario, Section 128.1, that applicable statutory speed limit of 80 km/h is applicable for non-posted roads in a rural environment. However, based on surveys on the immediate approaches of the roadway, the applicable design speeds based on sightlines are outlined in Table 11, according to the 2017 TAC Geometric Design Guide for Canadian Roads (TAC GDG) and the associated MTO Design Supplement (October 2023).

Table 11: Existing Road Geometry & Details

Bridge ID	Road Name	Rate of Curvature		Design Speed
		Crest	Sag	
2-WG	Third Line (West Garafraxa)	12 +/-	18 +/-	60 km/h
3-E	Sixth Line (Eramosa)	5 – 6 +/-	9 – 10 +/-	40 km/h
5-E	Fourth Line (Eramosa)	17 – 18 +/-	14 - 15 +/-	50 km/h
7-E	Third Line (Eramosa)	13 – 15 +/-	18 – 19 +/-	60 km/h

Based on the above findings, the design speed of the road is less than the assumed regulatory posted speed limit. Regulatory Speed Limit signs should be considered by the Township to allow for enforcement of travelled speeds to be within the design speeds which provide adequate sight lines and stopping distances for user safety.

The four structures included in this study were all constructed circa 1920 and are experiencing advanced states of deterioration. At current, Bridges 3-E, 5-E, and 7-E have been closed to traffic and a 15-tonne gross vehicle weight load limitation applies to Bridge 2-WG. The load limitations and closures were recommended by K. Smart Associates Limited, following a load restriction review assignment on behalf of the Township which began in 2016 and involved ongoing inspections of the condition of the structures.

In general, the main load carrying elements of the bridges have reduced capacity due to aging concrete and reinforcing steel, which has been exposed to the elements for over 100 years. The overall capacity of the truss or beam elements have been reduced to a point of significant concern due issues such as loss or disintegration of concrete resulting in disengagement of the embedded steel from the concrete member, significant corrosion of the embedded reinforcing steel or scour of the substructure elements due to decreased concrete strength and abrasive forces. Further details relating to the specific areas of concern on each bridge are outlined in the Existing Geometry and Physical Conditions technical memorandum of Appendix A.2.

The state of deterioration of all four bridges has reached a point where rehabilitation of the structures would no longer be considered economically feasible. The significant amount of work required to offset capacity loss on the main structural members would come at a significant cost and the overall service life of the structure would still be limited given its vintage of 100 years, which has already exceeded the typical service life of 75 years. Further, in considering that the original bridges were not originally designed to carry current vehicular loading, a load limitation would always remain on the structure, even if repairs were achievable.

3.2.2.2 Evaluation of Structure Improvement Types

Several structure types were evaluated to determine the preferred structure improvement most suitable to address the problems and opportunities identified during this study. The following improvement options were considered:

1. Rehabilitation
2. Two-Lane Bridge Replacements
   a) Single Span, Slab on Prestressed Girder Bridge
   b) Single Span, Precast Concrete Rigid Frame
   c) Precast, Concrete Twin-Cell Concrete Box Culverts
   d) Multi-cell, Round Corrugated Steel Pipe (CSP) Culverts
3. Narrow Two-Lane Bridge Replacement with Prefabricated Modular Bridge

Some of the options considered are limited in their application, based on achievable spans of certain structure types or by the general site geometry such as existing channel width or by the amount of fill between the existing watercourse and the proposed road. For the purpose of this study, the applicable span range for each structure type is provided in Table 12.

Table 12: Applicable Span Range for Structure Types

Structure Type	Applicable Span Range
Rehabilitation	Same as existing.
Single Span Slab on Prestressed Girder	6 m to 40 m +/-
Single Span Precast Concrete Rigid Frame	Up to 16 m
Twin Cell Precast Concrete Box Culverts	Up to 2 x 6.4 m cells = 12.8 m total.
Multi-Cell Round Corrugated Steel Pipes	Up to 4 x 3 m cells = 12 m total.
Prefabricated Modular Bridge	6 m to 40 m +/-

An evaluation was completed for the structure improvement types, which analysed each structure type against the following criteria:

- The driving platform width available and the ability of this width to meet Township standards, provide the required width for crossing of large agricultural equipment and provide a safe transition from the approach roadway.
- Available load carrying capacity and the ability to carry current vehicular loads.
- The maintenance requirements associated with the bridge over its design life.
- The potential need for property easements or acquisition.
- The degree of environmental impacts associated with disturbance to the creek bed, excavation and grading limits.
- The relative hydraulic capacity and the hydraulic efficiency of the structure opening and associated depth required from the soffit to the centreline of road.
- The ability to maintain or conserve heritage attributes or provide sympathetic design features to the existing bridges.

- The accommodation for pedestrian use.
- Construction cost and duration.
- Service life.

The evaluation determined that the preferred solution for improvement should involve the replacement of the structure with a two-lane, single-span open-bottom structure which provides a 9.1 m wide driving platform between barriers, capable of carrying wide agricultural equipment and providing designated shoulders for use by pedestrians. This solution results in the most efficient hydraulics and minimizes the impacts to the watercourse by limiting excavations for foundations on each side of the watercourse, allowing flows to be maintained through the natural channel during construction (with temporary cofferdams installed around substructure excavations). For structures with spans less than 16 m, the preferred structure replacement type would be a precast concrete rigid frame. For structures larger than the 16 m maximum span for typical precast concrete rigid frames, the preferred structure replacement type is a concrete slab on side-by-side prestressed concrete girders.

It is noted that the structure evaluation for structures under a 16 m span scored closely between the Single Span Precast Rigid Frame and the Single Span Slab on Girder options, with the main difference in scoring being related to construction cost, duration and hydraulic performance. During detailed design, a further evaluation to confirm the structure type should be undertaken upon the collection of more refined hydraulic, geometric and geotechnical studies. For these smaller span structures, the use of prestressed solid slab girders may be utilized for analyzing the slab on girder option.

Further details of the evaluation are provided in the Evaluation of Structure Improvement Types technical memo of Appendix A.3.

3.2.3 Hydrology and Hydraulics

A hydrology and hydraulic study was completed to assess the existing conditions of the current bridge structures and determine the required geometry for replacement options being considered in the evaluation of alternative solutions.

All bridges are located on the Speed River or its tributaries. Burnside contacted the Grand River Conservation Authority (GRCA) to obtain relevant hydraulic modelling for the project area, however, existing models were not available. As such, Burnside conducted a hydrology study and created new short-reach hydraulic models using HEC-RAS version 6.5 computer model developed by the U.S. Army Corps of Engineers. Terrain data used in the model was based on localized topographic survey data, supplemented by LiDAR data (LiDAR2016to18_DTM-LkErie-W).

A detailed report outlining the hydrology and hydraulic study is provided in Appendix A.4. The results of the study are summarized below.

3.2.3.1 Hydrology

Peak flows for the hydraulic analysis have been based on flows calculated in Visual Otthymo (VO) and the Unified Ontario Flood Method (UOFM). In accordance with the MTO Highway Drainage Design Standards (MTO HDDS), the UOFM shall be used when accurate flow data is not available and when watershed conditions meet the limitations of the UOFM method. Since the UOFM method provides a range of potential flows, the VO model flows were used to determine which quartile of the flow range shall be used in accordance with MTO HDDS WC-1.4.

Key hydrologic parameters for the VO model including drainage areas, catchment lengths, catchment slope, soils, and land use were calculated in ArcHydro. The remaining hydrologic parameters including CN, Ia have been calculated by Burnside. The 24-hour SCS Type-II rainfall distribution was used for the 1:2, 1:5, 1:10, 1:25, 1:50, and 1:100-year Storm Event calculations. The Regional Storm Event was based on the Hurricane Hazel storm. The SCS storm distributions were based on the MTO IDF curve tool.

In all instances, the VO model flows calculated for the 50% Annual Exceedance Probability (AEP) through the 1% AEP exceeded the UOFM flows. Accordingly, the upper quartile flows from the UOFM were therefore utilized. The results of the hydrology studies are further outlined in Appendix A.4. The resulting flows used for the analysis of the structures are summarized in Table 13 below.

Table 13: Summarized Peak Flows

Bridge ID	Peak Flows (m^3/s)					
	50% AEP (2-yr RP)	10% AEP (10-yr RP)	4% AEP (25-yr RP)	2% AEP (50-yr RP)	1% AEP (100-yr RP)	Regional
2-WG	8.36	15.12	18.74	21.51	24.56	84.63
3-E	12.34	20.86	25.32	28.67	32.38	139.57
5-E	14.82	25.20	30.65	34.75	39.30	140.40
7-E	10.74	19.19	23.72	27.15	30.96	84.85

3.2.3.2 Hydraulic Design Criteria

The hydraulic design criteria used for the analysis incorporates the policies and criteria of three agencies, including the Ontario Ministry of Transportation (MTO), the Township of Centre Wellington and the Grand River Conservation Authority (GRCA). The criteria desired to be met is summarized as follows:

- The existing bridges are located on low volume roads and in accordance with the MTO Highway Drainage Design Standards WC-1 1.2.1, the Design flow for the bridge analysis is the 4% AEP, which is also referred to as the 25-year Return Period peak flow.

- In accordance with the MTO Highway Drainage Design Standards WC-2 3.3.1, there are no freeboard requirements for Low Volume Roads.
- In accordance with the MTO Highway Drainage Design Standards WC-2, 3.3.2, the minimum Clearance to the soffit shall be ≥ 0.0 m.
- In accordance with the MTO Roadside Design Manual, a barrier system is recommended on all crossings where the severity index of the fore slopes or culvert obstructions exceeds that of the guide rail.
- As per the policies of the Grand River Conservation Authority, the pre- to post-development conditions shall not result in negative impacts to the flood levels or erosion potential.

3.2.3.3 Hydraulic Analysis, Existing Conditions

The hydraulic performance of the existing bridges was modeled in HEC-RAS. One dimensional short-reach models were developed for Bridges 2-WG, 3-E, and 5-E. A two-dimensional short-reach HEC-RAS model was utilized for Bridge 7-E to better account for the channel alignment and to identify any spills of the channel that would be difficult to capture in the 1D model. The results of the modelling are summarized in Table 14. Refer to Appendix A.4 for additional details.

Table 14: Existing Hydraulic Conditions

Bridge ID	Existing Headwater Elevation (m)						Clearance at 4% AEP (m)
	50% AEP	10% AEP	4% AEP	2% AEP	1% AEP	Regional	
2-WG	410.73	411.02	**411.13**	411.22	411.31	413.17	0.35
3-E	401.27	401.39	**401.47**	401.52	401.76	402.72	0.09
5-E	393.02	393.43	**393.62**	393.73	393.82	394.62	-1.06
7-E	388.87	389.18	**389.29**	389.37	389.46	390.07	-0.03

As per above, Bridges 2-WG and 3-E meet the required clearance criteria for having the water elevation during the 4% AEP storm below the soffit of the bridge. Bridges 5-E, and 7-E are shown to have negative clearance, indicating the water surface is above the soffit low point during the 4% AEP storm and therefore do not meet the clearance criteria under existing conditions.

3.2.3.4 Hydraulic Analysis, Proposed Conditions

To determine a suitable structure size that meets the design criteria for a replacement structure, several iterations of proposed structure and road profile geometries were analyzed in HEC-RAS. The analysis was based on using the preferred structure types as determined in Section 3.2.2.2 of this report. Through these iterations, it was determined that the applicable geometry and structure types to be carried forward in the analysis of evaluations for each site are as outlined in Table 15.

Table 15: Structure Geometry for Hydraulic Analysis of Proposed Replacement Bridges

Bridge ID	Required Span (m)	Preferred Structure Type	Skew	Road Profile Design Speed
2-WG	14.94	Precast Concrete Rigid Frame	0 deg	60 km/h
3-E	18.0	Slab on Prestressed Box Girders	15 deg	50 km/h
5-E	14.94	Precast Concrete Rigid Frame	10 deg	60 km/h
7-E	11.58	Precast Concrete Rigid Frame	5 deg	60 km/h

The hydraulic performances for the preliminary geometry noted above are summarized in Table 16. All options provide overall improvement by reducing the headwater elevations under proposed conditions and providing increased clearances. The required clearances for the 4% AEP (25-year return period) design storm are met at all bridges except Bridge 5-E.

Although the desired clearances are not met under proposed conditions for Bridge 5-E, there is an overall improvement at the site and we believe the proposed new structure represents the most practical solution for the replacement. Increasing the span of Bridge 5-E requires a greater superstructure depth (from road centreline to underside of soffit), resulting in a need to increase the road profile, which resulted in negative impacts to the upstream flood elevations under the Regional storm which would not meet the criteria of the Grand River Conservation Authority.

Table 16: Hydraulic Performance of Preliminary Designs at All Bridges

Bridge ID	Headwater Elevation (m) [Difference vs. Existing]						Effective Soffit Elevation	Clearance at 4% AEP
	50% AEP	10% AEP	4% AEP	2% AEP	1% AEP	Regional		
2-WG	410.72 [-0.01] (P)	411.02 [0.00] (P)	411.13 [0.00] (P)	411.21 [-0.01] (P)	411.29 [-0.02] (P)	413.07 [-0.10] (P)	411.53 m	0.40 m (P)
3-E	401.27 [0.00] (P)	401.38 [-0.01] (P)	401.44 [-0.03] (P)	401.49 [-0.03] (P)	401.56 [-0.20] (P)	402.68 [-0.04] (P)	401.61 m	0.17 m (PLV)
5-E	393.01 [-0.01] (P)	393.40 [-0.03] (P)	393.57 [-0.05] (P)	393.68 [-0.05] (P)	393.80 [-0.02] (P)	394.67 [0.05] (AT)	392.58 m	-0.99 m (M)
7-E	388.90 [+0.03] (P)	389.19 [+0.01] (P)	389.30 [+0.01] (P)	389.38 [+0.01] (P)	389.45 [-0.01] (P)	390.06 [-0.01] (P)	389.46	0.16 m (PLV)

(AT) Considered to be within the typical allowable modelling tolerances of 0.1 m.
(P) Passes: Meets desirable criteria.
(PLV) Passes for Low Volume Road: Meets desirable criteria when considering low volume classification of roadway.
(M) Marginal: Does not meet desirable criteria, but provides improvements compared to existing.
(F) Fails: Does not meet minimum requirements of providing improvements.
(N/A) Not Applicable: Criteria is not applicable to structure type.

Further refinement of the bridge design and associated road profiles and guide rail can be completed during the detailed design phase to further optimize the hydraulic performance of the structures.

3.3 Natural Environment

A detailed Natural Heritage Study was conducted to determine the potential risks for impacts and available opportunities for improvements related to the natural environment, including both terrestrial and aquatic, at each bridge site. The study involved a review of a localized study area within 120 m radius around each bridge, which is anticipated to cover the area to be impacted by potential construction activities at the structure. Terrestrial and aquatic assessments were completed and included a review of various sources of background information as well as site visit components to confirm the background information as well as characterize the existing conditions at the site. Surveys for Ecological Land Classification (ELC), botanical inventory, wetland staking, and aquatic assessment were undertaken August 20, 2024.

The subject lands are in the jurisdiction of the Grand River Conservation Authority (GRCA) and the Guelph MECP District. The subject watercourses are a crossing of the main branch or tributary of the Speed River. All subject lands immediately adjacent the watercourse are identified in Schedule B1 of the Wellington County Official Plan as surrounded by Core Greenlands. The Wellington County Official Plan identifies that the stream and valleylands at the sites are considered significant natural features, providing protection to the watercourses. Any wetland, where identified, are considered a significant natural feature in the Official Plan as well.

A summary of the findings related to the Natural Environment are below. A full report identifying all natural feature constraints that will need to be protected or mitigated from short-term or long-term impacts is provided in Appendix A.5.

3.3.1 Bridge 2-WG

The natural heritage system adjacent to this structure is narrow, with hedgerows separating the watercourse from the agricultural lands. The northwest portion of the area contains a swamp feature that extends westward along the riparian edge. This swamp is not identified on the GRCA mapping.

A review of Natural Heritage Information Centre mapping indicates that Bridge 2-WG is situated on the border of an Evaluated, non-Provincially Significant Wetland (Missouri Willow Mineral Deciduous Thicket Swamp). The northwest portion of the swamp feature is not identified on GRCA mapping and extends westward along the riparian edge.

The ELC indicated the presence of five distinct ecosite communities from the road right-of-way. All communities identified are considered to be relatively common in Ontario, with one of these ecosites considered to be candidate Significant Wildlife Habitat – Turtle Wintering Areas. Potential habitat for Eastern Wood-pewee (Provincially Special Concern) is present as well as potential Monarch (Provincially Special Concern) habitat, which was identified at the structure, although no Milkweed was observed.

Two Swallow nests were identified under the structure during the field investigation.

The upstream reach flowed along a wooded corridor surrounded by an agriculturally dominated landscape with heavily vegetated banks. Downstream the watercourse is similar to the riparian habitat upstream, however, contained no large trees which exposes the watercourse to more sunlight. Undercut banks were observed in small patches on the east and west sides of structures, however they appear to result from footpaths. During the site visit, no fish were observed. Recommended habitat improvements noted that the soft bottom may benefit from addition of harder substrate (e.g., rock) to increase habitat heterogeneity and improve erosion protection.

Additional information can be found in the Natural Heritage Report which has been included in Appendix A.5.

3.3.2 Bridge 3-E

Bridge 3-E crosses an extensive treed swamp system associated with the riparian area, associated with the evaluated non-Provincially Significant Wetland. Three Swallow / Eastern Phoebe nests were identified under the structure during the field investigation.

The ELC indicated the presence of four distinct ecosite communities, two of which, the White Cedar Coniferous Swamp (SWCM1-1) and White Cedar-Hardwood Mineral Mixed Swamp (SWMM1-), are considered to be candidate Significant Wildlife Habitat for various species (Raptor wintering area, Bald Eagle & Osprey Nesting, Foraging, Perching, and Turtle Wintering Areas). The Forb Mineral Meadow Marsh (MAMM2) is considered to be candidate Amphibian Breeding Habitat (Wetlands) and Marsh Breeding Bird Habitat. The Dry-Fresh Gramnoid Meadow (MEGM) is candidate Special Concern and Rare Wildlife Species. All communities identified are considered to be relatively common in Ontario.

The upstream reach was surrounded by a riparian woodland with small grass-dominated banks, exposing the watercourse to sunlight with only ~40% coverage by overhanging trees and grasses. Downstream the watercourse is similar to the habitat upstream but with a coverage of only approximately 30%. There were minimal signs of erosion, likely due to the benefit of grass protection along the banks. The watercourse bottom was noted to be made of mostly muck with scattered cobble, gravel, and small boulders. Recommended habitat improvements noted that the soft bottom may benefit from addition of harder substrate (e.g., rock) to increase habitat heterogeneity and improve erosion protection.

Fish were observed and the watercourse is considered to provide fish habitat to spring spawning species. No aquatic species at risk were identified in the reviewed background information as potentially inhabiting the watercourse in the area of the site.

Additional information can be found in the Natural Heritage Report in Appendix A.5.

3.3.3 Bridge 5-E

The adjacent lands at this crossing are varied and include forest communities, plantation, rural residential, hedgerows, and pasture / hayfield. The rural properties only have a small area managed as manicured turf and are otherwise densely treed. A non-provincially significant wetland, identified on GRCA mapping, was noted downstream of the bridge but is anticipated to be outside the proposed area of impact.

No bird nests were identified under the structure during the field investigation.

Surveys for ELC, botanical inventory, wetland staking, and aquatic assessment were undertaken on August 20, 2024. The ELC indicated the presence of six distinct ecosite communities, two of which, the Fresh-Moist White Cedar Coniferous Forest (FOCM4-1) and Fresh-Moist White Cedar-Hardwood Forest (FOMM7-2), are considered to be candidate Significant Wildlife Habitat for various species (Raptor wintering area, Bald Eagle & Osprey Nesting, Foraging, Perching, and Special Concern and Rare Wildlife Species). The Open Pasture (OAGM5) is considered to be candidate Special Concern and Rare Wildlife Species. The Coniferous Plantation (TAGM1), Fencerow (TAGM5), and Rural Property (CVR_4) are not considered to contain candidate CWH. All communities identified are considered to be relatively common in Ontario.

The upstream reach was surrounded by a riparian woodland with small grass-dominated banks. There were minimal aquatic features noted upstream, with the exception of some boulders. The substrate consisted of approximately 60% cobbles, interspaced with sand and gravel, and muck along the shorelines. Downstream conditions are similar to the upstream, however the most notable differences were some wooden and concrete debris habitat features, as well as more signs of erosion (i.e., bank undercuts) along both banks.

The presence of a small patch of watercress indicates a minor amount of groundwater upwelling, which should not be impeded when considering improvements to the bridge. It is also recommended that stabilization of the banks be considered to reduce the risk of erosion.

Fish were observed and the watercourse is considered to provide fish habitat to spring spawning species. No aquatic species at risk were identified in the reviewed background information as potentially inhabiting the watercourse in the area of the site.

Additional information can be found in the Natural Heritage Report in Appendix A.5.

3.3.4 Bridge 7-E

The structure crosses a treed swamp system associated with the riparian area, associated with the evaluated non-Provincially Significant Wetland. The wetland areas were present along the bottom of roadside embankments on all corners of the structure but the northeast and are anticipated to be within the area of potential disturbance for bridge construction activities.

No bird nests were identified under the structure during the field investigation.

Surveys for ELC, botanical inventory, wetland staking, and aquatic assessment were undertaken on August 20, 2024. The ELC indicated the presence of three distinct ecosite communities. The majority of the land around this crossing being identified as White Cedar Mineral Coniferous Swamp (SWCM1-1) extending throughout the riparian corridor and associated with the evaluated wetland; this ecosite is considered to be candidate Significant Wildlife Habitat for various species (Raptor wintering area, Bald Eagle & Osprey Nesting, Foraging, Perching, and Turtle Wintering Areas). The Annual Row Crops (OAGM1) and Rural Property (CVR_4) are not considered to contain candidate CWH. All communities identified are considered to be relatively common in Ontario.

The upstream reach was surrounded by a densely wooded corridor, only entering an open area immediately in front of the structure. The well vegetated banks showed minimal signs of erosion. Downstream conditions were similar to the upstream. The substrate was noted to be mainly cobble, interspaced with sand and gravel and large boulders. The rocky shorelines showed no signs of erosion.

Fish were observed and the watercourse is considered to provide fish habitat to spring spawning species. No aquatic species at risk were identified in the reviewed background information as potentially inhabiting the watercourse in the area of the site. The area was noted to be of good quality fish habitat.

Additional information can be found in the Natural Heritage Report in Appendix A.5.

3.4 Cultural Environment

3.4.1 Built Heritage and Cultural Heritage Resources

A Cultural Heritage Evaluation Report (CHER) was completed by Parslow Heritage Consultancy Inc. for each of the four existing structures. The purpose of the study was to review relevant historical documents, evaluate any potential cultural heritage value or interest (CHVI) and provide recommendations of each bridge, as appropriate.

As part of the assessment, a site visit was conducted on April 29, 2024, to document the bridges and surrounding landscape. Of the four bridges evaluated, only Bridge 3-E was found to be a candidate for Listing under Section 27 of the Ontario Heritage Act (OHA), or Designation under Section 29 of the OHA. The other three structures (Bridges 2-WG, 5-E, and 7-E) did not meet any criteria for Cultural Heritage Value or Interest (CHVI), nor did they meet the 60-point threshold for heritage value based on the MTO bridge assessment standards.

Bridge 3-E was determined to meet the 60-point threshold for heritage value using the Ontario Ministry of Transportation (MTO) Heritage Bridge Evaluation Guidelines. The 'Rainbow Arch' Bowstring Truss of Bridge 3-E met eight of the nine criteria of Ontario Regulation 9/06. The bridge was determined to be representative of a unique style of bridge that was once prevalent in Wellington County, which displays a high degree of artistic merit and reflects a technical achievement that was designed by a local Fergus architect, Charles Mattaini. Bridge 3-E was noted to be one of a limited number of remaining examples of the 'Rainbow Arch' Bowstring truss and works of Charles Mattaini.

A Heritage Impact Assessment (HIA) of Bridge 3-E was also conducted by Parslow Heritage Consultancy Inc. to further review the CHVI, evaluate the potential direct or indirect impacts to the bridge based on the proposed alternatives of removal, rehabilitation, or replacement and provide recommendations for conservation options. The HIA identified options for conservation ranging from retention of the bridge with no major modifications, to full documentation of the existing structure prior to removal and where possible, salvage or elements of bridge for incorporation into new structure or for future conservation work or displays.

Further details can be found in the Cultural Heritage Evaluation Report and Heritage Impact Assessment included in Appendices A.6 and A.7.

3.4.2 Archaeology

A Stage 1 Archaeology Assessments of all four sites was conducted by Parslow Heritage Consultancy. The assessment provides compiled information about the Study Area's geography, history, and current land conditions. Background research indicated that the study areas could exhibit archaeological potential due to the proximity to tributaries historical transportation routes of the Grand River, the soil types being suitable for Indigenous agricultural practices and the presence of a 19th century sawmill located adjacent to Bridge 3-E. However, a property inspection conducted as part of the study determined that negative indicators of archaeological potential related to extensive previous ground disturbance associated with the construction of the bridges and roads as well as low-lying wet environments deemed all sites to have low archaeological potential.

Based on the results of the Stage 1 Archaeological Assessment, which has been provided in Appendix A.8, the study areas are considered to be free of archaeological concerns and no further archaeological assessments are recommended.

3.5 Social Environment

3.5.1 Community, Residential and Recreational Property, and Access Impacts

Access to all residential properties would be optimized with all bridges open; however, closure of the bridges would not eliminate access to any properties. The routes required to access properties may be impacted by bridge closures, as previously outlined in Section 3.2.1.

3.5.2 Pedestrian Use

While there are no formal trails or recreational facilities located within the Study Area, consultation with the community identified that residents use these low volume roads for recreational walks, horseback riding, and cycling. The current road network is not designed to support active transportation. The narrow bridge widths do not provide designated areas for pedestrian crossing and therefore users are forced to cross the bridge within the travelled portion of the roadway. If the bridges are closed to vehicular traffic, this alternative is acceptable; however, if the bridges are opened to traffic, it would be preferred, at minimum, to have a designated shoulder that would allow pedestrians to walk or ride along, outside of the travelled portion of the road.

For scenarios with bridges closed, it is anticipated that the road would be travelled by vehicles accessing the local properties only. These reduced traffic volumes may make it more desirable for users to use the roadway for recreational activities such as walking, horseback riding, or cycling.

Comments were received by the public stating that if the bridges are closed to vehicular traffic, it would be preferred to have a pedestrian crossing maintained. Given that the pedestrian loading is substantially less than vehicular loading, the current state of the bridges that are closed to traffic are likely capable of carrying the anticipated volumes of pedestrian loading. It is recommended that if the structures are kept open for pedestrian access, that a detailed visual inspection be completed to confirm their suitability for carrying pedestrian loading at a regular interval of at least once per year. If concerns related to accelerating deterioration are identified that may suggest the state of the infrastructure's capacity would change between annual inspections, the Township should consider more frequent inspection.

3.5.3 Air and Noise Impacts

In general, the air pollution of the study area would be reduced with the bridges being opened, as the travel routes for accessing properties would be optimized by having through routes at all bridge locations.

Some local residents indicated a preference for the bridges to remain closed, as it results in reductions of the total traffic travelling the local roads and results in less noise created from passing vehicles.

3.5.4 Community Preference

Through consultations throughout the project, several local residents and business owners identified a preference for the opening or closure of the bridges. In some instances, these requests were general and applied to all bridges; however, comments related to preferences of certain bridge structures were also received. A summary of the preferences identified through the consultation process are summarized in Table 17. The preferences for opening all bridges have been included in the tally of each bridge.

Table 17: Community Preference

Bridge ID	Votes for Preferred Condition	
	Open	Closed
2-WG	14	0
3-E	14	4
5-E	15	3
7-E	13	0

3.6 Economic Environment

3.6.1 Commercial and Industrial Land Use and Activities

As outlined in Section 3.1, three industrial land use properties currently exist which consist of Class A and B Aggregate Operations. Additionally, although the lands are not officially zoned as commercial or industrial, it is known that the Herwynen Sawmill operates out of a property located on Sixth Line, between Wellington Road 22 and Bridge 3-E. Trucking operations related to businesses such as the Herwynen Sawmill or aggregate hauling from the local quarries should be being routed from these businesses to the nearest arterial roads (Wellington Road 22), given that the arterial roads are designed to a higher standard to support more frequent heavy truck loading. The closure of bridges does not impact hauling routes for the sawmill or aggregate pits, as they are all located between Wellington Road 22 and the bridge crossing.

Through consultations, the owner of the Herwynen Sawmill identified that the closure of Bridge 3-E has not resulted in noticeable impacts to the business operations in consideration that the business is accessed mainly via Wellington Road 22. It was noted however, that there may be some staff commuting from the local community that would benefit from the opening of Bridge 3-E. The magnitude of these potential benefits to staff have already been considered in Section 3.2.1.

3.6.2 Construction Cost Estimates

An estimation of the construction costs for the options of removal or replacement of each bridge have been completed based on current industry pricing. For the replacement structure costing, the required spans and preferred structure types outlined in Section 3.2.3.4 were utilized. The replacement costs outlined include the cost of structure removal. A summary of the estimated construction costs are provided in Table 18. Additional information regarding the construction cost estimates can be found in the Preliminary Construction Cost Estimate technical memo of Appendix A.9.

Table 18: Capital Costs for Removals and Replacements

Bridge ID	Structure Removal [1, 2]	Structure Replacement [1, 3]
2-WG	$150,000.00	$1,780,000.00
3-E	$150,000.00	$2,290,000.00
5-E	$150,000.00	$1,690,000.00
7-E	$150,000.00	$1,470,000.00

[1] Cost estimates are exclusive of engineering costs, property acquisition, utility relocations.
[2] Removal cost estimates do not account for improvements to the approach roadway.
[3] Replacement cost estimates include for structure removal and improvements to the roadway only within the necessary limits to tie into the proposed replacement structure. Costs associated with upgrading the roadway beyond the limits required for bridge work are excluded.

3.6.3 Operational and Maintenance Costs

Additional costs related to ongoing operational and maintenance activities have also been considered in this study.

Bridges that are closed to traffic and not yet removed require ongoing operational monitoring to ensure that the barricades which prevent vehicles from traversing the structures are maintained. Township Public Works staff provide visual inspections as part of regular road patrols and annual technical inspections by a qualified Engineer are required to ensure that pedestrian passage over closed structures continues to be made safe. Annual costs related to these ongoing inspections are estimated at approximately $1,000.00 to $2,000.00 per year.

When bridges are open to traffic, ongoing maintenance is an important aspect of extending the service life of the bridge. For bridges that are recommended for replacement, the proposed structure types involve jointless concrete structures which minimize the required annual maintenance to routine cleaning of sand, gravel, or debris from the structure. The annual maintenance cost for new structures is estimated at approximately $500.00 per year.

4.0 Consultation

Comprehensive consultation was a key component of this study. An effective consultation process was followed. The process was highly visible and maximized opportunities for the public, government agencies, and Indigenous communities to participate in a constructive manner with a process that was open, traceable, rational, and highly defensible.

The key features of the consultation process included:

- The identification of Indigenous communities, agencies, key stakeholders, local residents, and other interested or potentially affected parties that would need to be consulted during the Study. These contacts comprised the Project Contact List, which was used to maintain contact information for interested parties throughout the process and summarize comments received about the project and responses.
- Indigenous communities, agencies, key landowners / developers, local residents, and other interested or potentially affected parties of the study were notified of results at key points of the study.
- Engaging Indigenous communities, agencies, key landowners, local residents, and other interested or potentially affected parties at key points of the study to gather input and help inform key decision making.
- Responding to inquiries or comments in an efficient and timely manner.

Comments received throughout the study were incorporated into the study by determining appropriate background studies required to assess the comments and considering the comments during the evaluation of alternatives.

4.1 Notices

Notifications were mailed or emailed to all contacts on the Project Contact List created for this Study. Contacts were notified at the initiation of the project and were sent notices with invitations to attend the Two Public Open House presentations. All notices received information related to the purpose of the study, a link to the Township's project specific 'Connect CW' page which contained all relevant documents, narrated versions of the Open House for the public's review, and contact information for the Project Team to whom any questions or concerns could be directed.

All notices were also advertised in the Wellington Advertiser and made available to the public on the Township's 'Connect CW' webpage (https://www.connectcw.ca/bridge-transportation-network-study-four-bridges). Due to a Canada Post strike at the time of release of the notice for the second Public Open House, notices were hand delivered to all residences, emailed to contacts which had provided their contact information, and advertised on the Township social media accounts.

Indigenous Communities and the MECP were also provided a Notice of Project Screening, which identified that the project was considered Exempt from the Environmental Assessment Act after the completion of the Archaeological Screening Process.

At the conclusion of the study, an additional notice will be provided to the public and stakeholders to notify them of the conclusion of the study and the availability of this report for their review and comment.

The Project Contact List and all project notices are included in Appendix B.1.

4.2 Indigenous Communities

MECP has developed guidance on the steps to rights-based consultation with Indigenous communities and was contacted in May 2024 to determine the communities that may have an interest in the project. A copy of correspondence is provided in Appendix B.5.

A letter was sent to Indigenous Communities on June 11, 2024, to inform them of the upcoming study. The letter was sent to Indigenous Communities by Registered Mail to confirm receipt. Follow up phone calls were also made to the Communities. The Mississaugas of the Credit First Nation (MCFN)'s Department of Consultation and Accommodation (DOCA) identified that they only needed to be forwarded the completed report when available and be notified and kept informed on any archaeological work.

All communities were provided with a copy of the Cultural Heritage Assessment, Heritage Impact Assessment and Stage 1 Archaeological Assessment Reports for their review and comment. Comments were not received from all communities, but those who responded had minor comments or approved the report(s).

Two members of the Haudenosaunee Development Institute (HDI) and one representative of the Six Nations of the Grand River (SNGR) attended the site walkthrough with Burnside and Township staff on August 22, 2024. Copies of the Natural Heritage Report were provided to HDI, SNGR and MCFN for their review and comment.

The Notice of Project Screening was sent to Indigenous Communities on October 17, 2024, via email. Representatives of each community were also sent the Notice of Project Screening by Registered Mail to confirm receipt.

All communities were provided the Notices for Public Open House Nos. 1 and 2, which were sent via email and certified mail on July 12, 2024, and November 15, 2024, respectively. No representatives of the communities attended the open house events.

A summary of communication with identified Indigenous communities was maintained by Burnside on the Project Contact List and summarized in Table 19. Copies of all correspondence with Indigenous communities are provided in Appendix B.5.

Table 19: Summary of Indigenous Community Consultation

Indigenous Community	Follow-up	Comment Received	Study Team Response
Mississaugas of the Credit First Nation	June 17, 2024	Abby LaForme noted preference to be the contact for MCFN moving forward.	Adam Dickieson emailed Abby LaForme confirming their earlier conversation and that email will be used moving forward.
	June 18, 2024	Abby noted MCFN DOCA does not currently have capacity to participate in environmental work. Abby asked the final report to be shared.	
	August 7, 2024	Adam LaForme thanked Andrew for the provided Stage 1 AA and expressed that they will try to expedite review by August 29, 2024.	Andrew Dawson acknowledged MCFN's previous communication about lack of capacity and provided a project update, draft CHER and Stage 1 AA, and asked MCFN to confirm if there is any Aboriginal knowledge of archaeological sites/marine archaeological sites or historically documented evidence of past Aboriginal use, on or within 500 m of Bridge 3-E. Andrew thanked Adam in response to his email.
	August 14, 2024	Abby LaForme provided comments on the CHER.	
	August 29, 2024	Adam confirmed his review of the Stage 1 AA and noted he had no comments in response to Andrew's follow up email earlier that day.	Andrew thanked Adam and noted they will be provided with the final report for the project as requested by Abby.
	October 29, 2024		Mishaal Rizwan followed up on review comments for the Stage 1 AA and CHER.
	December 10, 2024		Mishaal provided the Natural Heritage report for review.
Six Nations of Grand River	June 20, 2024	Peter Graham confirmed Six Nations of Grand River's interest in the study, noting preference to review environmental studies and preferred alternatives.	Adam Dickieson provided background information on the project
	July 2, 2024	Dawn LaForme provided an Archaeology Monitoring Agreement.	Adam returned the signed agreement.
	July 25, 2024	Peter left a voicemail in response to Adam's follow up call; Peter confirmed receipt of the Notice of Open House and noted Six Nations does not attend Open Houses.	
	August 6, 2024	Peter thanked Andrew for the update and looped Tanya Hill-Montour in noting she oversees environmental monitoring and will be in touch is there is any interest.	Andrew provided a project update, the preliminary alternative solutions, draft CHER and Stage 1 AA, and asked Six Nations to confirm if there is any Aboriginal knowledge of archaeological sites/marine archaeological sites or historically documented evidence of past Aboriginal use, on or within 500 m of Bridge 3-E.
	August 9, 2024 August 15, 2024		Andrew followed up with Tanya to confirm interest in attending fieldwork on August 20, 2024.
	August 18, 2024	Tanya confirmed Six Nations will send a representative and asked Dawn to prepare an agreement.	Adam attached the signed agreement.
	August 27, 2024		Andrew followed up on SNGREC review of the CHER and Stage 1 AA.
	September 3, 2024		Andrew thanked HDI staff for their participation in the fieldwork attaching minutes and noted the team's understanding that SNGREC accepted the findings.
	October 29, 2024		Mishaal Rizwan followed up on review comments for the Stage 1 AA and CHER.
	December 10, 2024		Mishaal provided the Natural Heritage report for review.
	June 20, 2024	Request for details about the study to be sent by email.	Adam Dickieson provided background on the study including location (with map), studies to be completed, and request for HDI to indicate if they are interested in the study.

Indigenous Community	Follow-up	Comment Received	Study Team Response
Haudenosaunee Development Institute (HDI)	June 26, 2024	Raechelle Williams indicated HDI's interest in participation with field work and report review for natural environment and archaeology. Raechelle noted HDI staff would send Adam a Monitoring Agreement.	
	July 1, 2024	Shannon Hill requested information to prepare the agreement.	Adam provided the requested information along with a project update, the preliminary alternative solutions, draft CHER and Stage 1 AA, and asked HDI to confirm if there is any Aboriginal knowledge of archaeological sites/marine archaeological sites or historically documented evidence of past Aboriginal use, on or within 500 m of Bridge 3-E. Adam also asked for confirmation if HDI would like a field monitor to attend field work of if they would prefer to review the draft report.
	July 5, 2024	Raechelle confirmed HDI's interest in both field work and draft document review.	Andrew Dawson noted the next step is to review HDI's agreement for fieldwork monitoring and document review. Andrew followed up on the archaeological questions from Adam's previous email to HDI.
	August 12, 2024	Raechelle confirmed HDI staff contacts for those attending fieldwork on August 20, 2024.	Andrew thanked HDI staff for their participation in the fieldwork attaching minutes and noted the team's understanding that HDI accepted the findings.
	October 29, 2024		Mishaal Rizwan followed up on review comments for the Stage 1 AA and CHER.
	December 10, 2024		Mishaal provided the Natural Heritage report for review.

4.3 Municipal Heritage Committee

The project background information and findings of the Cultural Heritage Evaluation Report (CHER) and Heritage Impact Assessment (HIA) were presented to the Heritage Committee on October 8, 2024, by Mr. Adam Dickieson (Township of Centre Wellington Project Manager). A copy of the slides presented are included in Appendix B.3.

In general, the heritage committee was in agreement with the findings of the CHER which identified only Bridge 3-E to have built-heritage. Most questions were related to the feasibility of conservation options related to the relocation of all or parts of the bridge for commemorative options, or for replacement of the bridge with a similar structure type; however, it was noted that these options would be costly and potentially unachievable given the structure type and level of deterioration. Several members recognized that removal and replacement of the structure was likely the most feasible option given the load limitations and level of deterioration and noted that commemorative options could be further explored prior to removal. The meeting concluded with a motion that passed for the committee to receive the CHER and HIA for information, and that the committee be given more time to consider the Cultural Heritage Value of Bridge 3-E. A memo outlining the comments received from the members of Heritage Centre Wellington and the Township's responses is included in Appendix B.3.

4.4 Council

A Report to Council was provided to the Mayor and Members of Council on June 10, 2024, by Mr. Adam Dickieson, Project Manager, Township of Centre Wellington. The report provided an introduction of the project and the proposed process to be undertaken during the study.

Council was updated on the project status by Township staff as the project progressed. All members were included in notice distributions and invited to attend the Public Open House meetings. Members of council were present at each of the Public Open House events.

Council will be provided this report for review and comment prior to the finalization of the project. Any comments received from Council will be incorporated when confirming the final preferred solution for this study and the four bridges.

4.5 Grand River Conservation Authority

Pre-consultation emails were exchanged with Grand River Conservation Authority (GRCA) throughout the study. A request for any existing hydrology or hydraulic modelling was made on August 12, 2024. The GRCA confirmed that they did not have any existing modelling data for Bridges 2-WG, 5-E, or 7-E, and that the HEC-2 modelling

they had for Bridge 3-E was outdated and considered incorrect. During this correspondence, the GRCA indicated that the requirements are ultimately that they are looking for modelling to demonstrate that there are no impacts pre- to post-replacement.

The GRCA requested a copy of the information presented during the second Public Open House. They were provided a link to view the online presentation and copies of the presentation boards and open house presentation slides with applicable speaking notes.

A letter was received from the GRCA on January 7, 2025, following GRCA's review of the Natural Heritage Report and Public Open House information. The letter identified the following:

- A hydraulic assessment is to be submitted for replacement bridges and potentially for construction of turn-arounds to verify compliance with GRCA policies 8.1.15 to 8.1.16.
- A full environmental impact study is to be completed during detailed design of the bridges, in accordance with GRCA policy 8.4.7. The study may reference the Natural Heritage Report.
- The wetland limits are to be verified by GRCA staff during the growing season (May to September).
- A fluvial geomorphology assessment is required to address GRCA policy 8.9.2

Records of email correspondence are included in Appendix B.6.

4.6 Public Stakeholders

The opportunity for the public to provide comments to the Study Team was provided over the full duration of the study. Means of contacting the members of the Study Team were provided with each of the issued notices, starting with the Notice of Commencement. In addition to the option to correspond with the Township and / or Consultant Project Manager via email or phone call at any time, two in-person formal Public Open Houses were also provided, as well as the option to review the project information and open house content online and provide comment during an extended comment period via the Township's Connect CW website. A summary of the consultations with the public are provided below. All correspondence records are provided in Appendix B.

4.6.1 Response to Notice of Open House No. 1

Correspondence was received from several individuals following the issuance of the Notice of Public Open House (POH) No. 1. Several requests to be included on the mailing list for all future project updates were received. Comments are summarized as follows:

- Permanent closure should not be an option, more funding should be set aside for bridge maintenance.
- Detours caused by bridge closures are inconvenient for nearby residents, increasing trips from home to destinations in combination with other construction projects.
- One resident requested the last five OSIM or similar reports for the bridges subject to the study.
- Residents are not interested in bridge closures and have strong preference for bridges to remain open.
- Bridge 7-E is near home, however, closure has minimal impact to trips. Resident also noted that guard rails blocking the bridge are dangerous for pedestrians and cyclists.
- Are operational, safety or maintenance improvements being considered as part of this study?
- If the preferred alternative is to replace existing bridges, would a single lane be considered?
- What are the factors considered in the evaluation of alternatives?
- Please consider removing the vehicle turnaround on the north side of 3-E.
- Funding should not be spent replacing 3-E when 5th Line and 7th Line are nearby alternatives.
- Several residents noted agricultural equipment and car conflicts are increased due to detours caused by bridge closures.
- Several residents asked for timelines for this study and the potential bridge replacements and noted they would like to see quick action.
- First responders are delayed due to bridge closures. Signs for bridge closures are not sufficient and are ignored.
- Resident noted desire for 2-WG to remain open and noted closure would have several safety concerns.

A copy of the display boards is provided in Appendix B.2.

A total of 47 people signed in at POH No. 1 excluding the Study Team. A total of 23 comments were received in the comment period following POH No. 1. Comments were provided through paper comment sheets supplied at the POH. Copies of the comment sheets are provided in Appendix B.2.

The comments received through the formal comment sheets, as well as during the open forum conversations during POH No. 1 included the following themes:

- The issues of these closed structures have gone unaddressed for too long.
- Preference for Bridge 5-E not to re-open and concern it would be used as a bypass from the (Highway) 401.
- Several residents noted closure of any of the bridges will impact emergency services and that they should all remain open.
- Residents noted importance of the bridges to farmers.

- Signage for bridge closures is insufficient and emergency services are not aware of closures when travelling to calls.
- Bridge 2-WG is essential to for nearby residents.

All feedback from the public on the existing conditions and potential alternative solutions was reviewed by the project team and considered in the selection of the preferred alternative.

Additional information about the public open house is summarized in the POH No. 1 Summary Report in Appendix B.2.

4.6.2 Public Open House No. 2

POH No. 2 was held on December 6, 2023. POH No. 2 was arranged as an open house / drop-in session with a presentation at 6:30 p.m. After the presentation, residents and other interested persons could review the display boards and discuss comments, questions, and concerns with the Study Team.

A copy of the display boards is provided in Appendix B.4.

A total of 42 people signed in at POH No. 2, excluding the Study Team. A total of four comments were submitted at the open house. Comments were provided through paper comment sheets supplied at the POH. Copies of the comment sheets are provided in Appendix B.4.

The comments received through the formal comment sheets, as well as through conversation during the open conversation forum during the POH No. 2, and email correspondence following the POH included the following themes.

Key issues noted within the written responses relate to:

- Request to keep Bridge 7-E closed as long as possible to reduce the number of vehicles speeding down the road.
- Questions regarding timelines of the implementation of bridge replacements.
- Suggestion to rename fourth line to avoid confusion for navigation and deliveries.
- Suggestion for improved terrestrial passage via tunnels under the road.
- Opinion that there is not an adequate turn-around for vehicles at Bridge 3-E.
- Concerns related to decreased property value with the closure of the bridge.
- Requests for decreased taxes or return of capital levee since bridge not being replaced.
- Concerns related to impacts on businesses with closure.
- Concerns related to the delayed timelines of infrastructure improvements in the past.

The majority of received comments were already considered in the selection of the preferred alternative, and no new comments were significant enough to affect the selection of the preferred solution. Responses were provided indicating the justification to still support the preferred solution.

Additional information about the public open house is summarized in the POH No. 2 Summary Report in Appendix B.2.

5.0 Evaluation of Alternative Solutions

5.1 Identification of Alternative Solutions

A total of 16 alternatives are available based on a total of four bridge structures, each with the option of being closed or open. This large series of alternatives were reduced to six alternatives using high-level screening to eliminate alternatives that would not successfully address the problems or opportunities associated with this study. To start, the following two scenarios were deemed to be required as base references for comparisons:

- Bridge 2-WG open and all other bridges closed, to evaluate the current conditions.
- All Bridges Closed, which would be representative of the future conditions if no work was completed and Bridge 2-WG eventually required closure.

Additionally, the results of the Transportation Network Study, as outlined in Section 3.2.1 identified the following:

- Options with Bridge 2-WG closed would not be further evaluated, considering that no route would be available to access properties north of the bridge without using Wellington Road 18.
- At least one bridge out of Bridge 5-E and 7-E should be opened in order to minimize the additional length of travel that would be required for agricultural equipment while avoiding the use of busier routes of Fifth Line or Wellington Road 29.
- Alternatives with 7-E closed would not be further evaluated, considering that properties between Bridge 7-E and the nearby Bridge 8-E would be landlocked during future replacement work at Bridge 8-E if 7-E was closed.

As such, the following Alternative Solutions were carried forward for detailed evaluation:

Table 20: Alternative Solutions

Bridge ID	Alternatives					
	1	2	3	4	5	6
2-WG	Open	Closed	Open	Open	Open	Open
3-E	Closed	Closed	Open	Open	Closed	Closed
5-E	Closed	Closed	Open	Closed	Open	Closed
7-E	Closed	Closed	Open	Open	Open	Open

As outlined in Section 3.2.2.2, the preferred solution for the scenario noted as ‘Open’ involves replacement with a two-lane single-span bridge.

5.2 Evaluation Criteria

The overall objective of this study was to identify a Preferred Solution among the six alternatives using a systematic and transparent approach. The Preferred Solution is the Alternative that best addresses the Problem Statement with as few negative impacts as possible.

To this end, a set of Evaluation Criteria were identified to comparatively evaluate the Alternative solutions. The Evaluation Criteria includes:

Table 21: Summary of Evaluation Criteria

Transportation	
Cross-Community Travel	Quantitative measure of improvements on cross-community travel time / distance, measured based on the total benefit, weighted by the average traffic volumes estimated based on pre-closure traffic counts.
Emergency Response	Quantitative measure of impacts on emergency response times. Measured using a relative scale of total and average improvements, weighted by the number of properties impacted.
Slow-Moving Vehicle Accommodation	Quantitative measure of impacts to required travel distances which involve the avoidance of arterial routes where possible. Where busier roads must be used for routing, a decrease in the score was provided.
Local Community Travel	Quantitative measure of impact to travelling within the local community, which represents the impacts to service and delivery vehicles, school buses, etc. Measured based on the total time savings.
Natural Environment	
Environmentally Sensitive Areas	Qualitative ranking of the potential impacts / benefits that the alternatives would have on Environmentally Sensitive Areas, such as wetlands, woodlands, watercourses, etc.
Terrestrial Habitat	Qualitative ranking of the potential impacts / benefits to terrestrial habitats such as nesting areas for breeding birds, wildlife habitat, as well as habitat connectivity (ex: wildlife passage through structure openings), etc.
Fisheries / Aquatic Habitat	Qualitative ranking of the potential impact / benefits to aquatic habitat features and passage. Examples include impacts related to construction activities, improvements by eliminating barriers to passage, re-naturalization of the watercourse and embankments, etc.
Species at Risk (SAR)	Qualitative ranking of potential impacts / benefits to identified SAR such as Barn / Cliff swallows, bats, butternut trees, etc.

Economic Environment	
Capital Costs	Relative quantitative ranking of estimated construction cost.
Maintenance & Operational Costs	Relative ranking of long-term costs associated with typical maintenance repairs for the applicable structure type, maintenance of barricade systems for structure closures, and operational costs associated with access control for low-level crossings.
Social & Cultural Environments	
Social Environment	Qualitative ranking of the impacts / benefits to residential property and access, community facilities, recreational facilities, pedestrians, cyclists, noise impacts, and air quality.
Community Preference	A qualitative ranking of the alignment of the proposed alternative in comparison to the community's input on preferred structures to be opened or closed based on consultation with, and comments from, the public.
Archaeological	Qualitative ranking of the potential impacts to archaeological resources, including identified areas of archaeological potential, based on the anticipated limits of disturbance associated with the alternatives.
Cultural Heritage	Qualitative ranking of the potential impacts / benefits to built heritage resources and cultural heritage resources, considering value or interest of the structure and the ability to conserve or document heritage features and / or provide sympathetic features in replacement structures.

5.3 Summary of the Evaluation of Alternatives

The evaluation of the alternative solutions was based on an assessment of potential impacts and a review of input received from the public and regulatory agencies during the study process. Table 22 provides a summary of the evaluation of alternative solutions. A detailed evaluation matrix is provided in Appendix C.1, which provides further explanation of the reasoning behind each of the ratings. The relative ratings of the criteria are represented by graphical 'pies', for which the order of preference is indicated below:

Highest Impact / Least Preferred  Least Impact / Most Preferred

The 'pies' are visual representations of the actual numerical rating associated with the criteria. Where alternatives may appear to have the same rating based on the visual representation, the ranking is based on the numerical values, which may differ despite showing the same symbol.

The overall ranking of alternative solutions is provided at the end of Table 22. The Equal Weighting ranking is based on the main criteria (Transportation, Natural, Social & Cultural, and Economic) all being equally weighted. A sensitivity analysis ranking is also provided, which is based on the combined scores of the nine weighting scenarios evaluated in the Sensitivity Analysis. Refer to Appendix C.2 for a breakdown of the weighting scenarios considered in the sensitivity analysis.

Table 22: Summary of the Evaluation of Alternatives

Evaluation Criteria	Alternative 1: Do Nothing	Alternative 2: All Bridges Closed	Alternative 3: All Bridges Open	Alternative 4: Bridges 2-WG, 3-E, & 7-E Open	Alternative 5: Bridges 2-WG, 5-E, & 7-E Open	Alternative 6: Bridges 2-WG & 7-E, Open
Transportation						
Cross-Community Travel	◔	○	●	◕	◕	◑
Emergency Response Time	○	○	●	◑	◑	◔
Slow-Moving Vehicle Accommodation	◔	○	●	◕	◕	◑
Local Community Travel	◑	○	●	◕	◕	◑
Transportation Summary	◔	○	●	◕	◕	◑
Natural Environment						
Environmentally Sensitive Areas	◑	◕	◑	◑	◕	◕
Terrestrial Habitat	◕	●	◔	◑	◑	◕
Fisheries / Aquatic Habitat	○	●	◑	◑	◑	◔
Species at Risk	◕	●	○	◔	◔	◑
Natural Environment Summary	◑	●	◔	◑	◑	◑

Evaluation Criteria	Alternative 1: Do Nothing	Alternative 2: All Bridges Closed	Alternative 3: All Bridges Open	Alternative 4: Bridges 2-WG, 3-E, & 7-E Open	Alternative 5: Bridges 2-WG, 5-E, & 7-E Open	Alternative 6: Bridges 2-WG & 7-E, Open
Economic Environment						
Estimated Construction Costs	●	●	○	◔	◔	◑
Maintenance & Operational Costs	○	●	◔	◑	◑	◕
Economics Summary	◑	●	◔	◔	◑	◕
Social and Cultural Environment						
Social Environment	◔	○	◕	●	◕	◑
Community Preference	◔	◔	●	◕	◕	◑
Archaeological	◕	●	◑	◕	◕	◕
Cultural & Built Heritage	◔	◔	◕	◕	◕	◑
Social & Cultural Summary	◑	◔	◕	◕	◕	◑
OVERALL RANKING						
Equally Weighted Criteria	6	3	5	2	1	4
Sensitivity Analysis	6	5	3	2	1	4

6.0 Preferred Solution

As identified in Table 22 (and Appendix C), the preferred solution is Alternative 5, which consists of the Replacement of Bridges 2-WG, 5-E, and 7-E, and the permanent closure of Bridge 3-E. The preferred solution consisting of opening Bridges 2-WG, 5-E, and 7-E ranked between 1st and 3rd in all weighting scenarios considered and was the most consistent highly rated alternative, providing the highest combined score on the sensitivity analysis, confirming its selection of the preferred solution.

The preferred solution has many significant benefits and addresses several of the problems and opportunities previously noted in Section 2.3, as summarized below:

- Replaces all structures that benefit emergency first response times.
- Replaces the three bridges with the most benefit to:
  - Travel times with agricultural equipment.
  - Simplified routes for deliveries, buses, municipal services, etc.
  - Commute times for local residents to surrounding areas.
- Eliminates need for agricultural equipment to travel on arterial routes.
- Provides opportunities for use as emergency detour routes during closures of County Roads.
- Allows opportunities for improvements to fisheries and erosion concerns identified at Bridge 2-WG and 5-E during replacement works.
- Highest cost-benefit ratio.

6.1 Description of Proposed Undertaking

As indicated in Section 6.0, the preferred solution is to replace Bridges 2-WG, 5-E, and 7-E, and permanently close Bridge 3-E to vehicular traffic. Table 23 summarizes the proposed undertaking at each location, based on the results of the background studies provided in Section 3.0. It is noted that the geometry referenced for the bridges is based on the preliminary conceptual design completed as part of this study and may be subject to revision upon more refined design and analysis as part of the detailed design stage.

Table 23: Summary of Proposed Undertaking

Structure	Proposed Undertaking
2-WG	Remove existing bridge and replace with a single 14.94 m span precast concrete rigid frame bridge with a 9.1 m wide driving platform. Reconstruct approximately 180 m of road to provide a 60 km/h design speed vertical road profile.
3-E	Permanently close bridge to vehicular traffic and construct formal turn-around for vehicles at each end of the bridge. Maintain pedestrian access over bridge until its condition deems it unsafe to carry pedestrian loading. Complete regular inspection of the bridge to monitor its condition.
5-E	Remove existing bridge and replace with a single 14.94 m span precast concrete rigid frame bridge with a 9.1 m wide driving platform. Skew bridge 10 degrees to align with watercourse. Reconstruct approximately 120 m of road to provide a 60 km/h design speed vertical road profile.
7-E	Remove existing bridge and replace with a single 11.58 m span precast concrete rigid frame bridge with a 9.1 m wide driving platform. Skew bridge 5 degrees to align with watercourse. Reconstruct approximately 200 m of road to provide a 60 km/h design speed vertical road profile.

Conceptual Plan and Profile and General Arrangement drawings have been provided for the three replacement bridges in Appendix D.

6.2 Prioritization for Implementation

The proposed preferred solution involves the replacement of three bridge structures with a total construction cost of approximately $5,100,000. Given the large capital expenditure and the Township's typical annual budget for bridge works, the replacement of the three bridges will likely be required to be phased over several years. Recommendations regarding the prioritization for replacements are provided herein; however, the Township will ultimately be responsible for determining the relative needs of these bridges in comparison to other structures within the municipality during their capital planning and budgeting review to determine the ultimate timelines in which replacement is to occur.

In consideration of the current state of the bridges and the potential improvements to the transportation network that each bridge offers, as outlined in Section 3.2.1, the recommended prioritization is as follows:

1. Replacement of Bridge 5-E;
2. Replacement of Bridge 2-WG; and then,
3. Replacement of Bridge 7-E.

Given that Bridge 2-WG is still able to carry local load limited traffic, the current recommendation is to replace Bridge 5-E first since it opens up a non-arterial north-south corridor centralized in the study area and offers the most benefit to the Transportation Network.

Bridge 2-WG is recommended as the next priority bridge, as it will be approaching the end of its service life and may require further load reduction depending on the acceleration of deterioration that occurs between now and the eventual replacement of the bridge. With bridges 2-WG and 5-E replaced, the benefits of the Transportation Network for the north-south corridor would be realized by all vehicle types, including heavy trucks and farming equipment.

Lastly, the replacement of Bridge 7-E does not offer the same benefit to the Transportation Network, so it is considered the lowest priority. It is important that Bridge 7-E replacement occurs prior to Bridge 8-E reaching a deteriorated state that would limit the crossing of construction equipment. Based on the most recent OSIM inspection of Bridge 8-E, the concerns of load limitations are not high, so the replacement timeline for Bridge 7-E is of lower priority.

7.0 Environmental Impacts, Mitigation Measures, and Monitoring

The potential environmental impacts associated with construction, operation, and maintenance of the proposed bridge replacements within the Study Area have been identified and are summarized in Table 24. Proposed measures to mitigate these impacts and monitoring activities to ensure that the mitigation measures are implemented effectively are also provided in the table. All mitigation measures and monitoring activities shall be reviewed during the detailed design phase of the project.

Table 24: Summary of Impacts, Mitigation, and Monitoring Activities

Feature	Description of Potential Effects	Mitigation Measures	Monitoring Activities
Effects on Ecological Features and Functions			
Wildlife (General)	Temporary displacement and disturbance to wildlife and habitat during the construction phase. May include SAR and Species of Special Concern.	The footprint of the proposed disturbed area shall be minimized as much as possible. In the event an animal is encountered during construction and does not move from the construction zone, the Contract Administrator should be notified. If the construction activities are such that continuing construction in the area would result in harm to wildlife, construction activities in that location should temporarily stop and the MNRF or MECP can be contacted for direction. If temporary perimeter exclusion fencing is used at a location, it should be installed to allow wildlife to leave the fenced area during vegetation clearing. Once the work area has been cleared, it can be securely fenced to prevent wildlife from returning. The excluded area should be searched immediately following fencing installation for any wildlife (including SAR) that may have become trapped. Any wildlife should be safely relocated or permitted to escape, to a suitable habitat. All works should stop immediately and MECP should be contacted if SAR is encountered within the area to ensure compliance with the ESA. Avoid vegetation clearing during sensitive times of the year for local wildlife, such as spring and early summer (during breeding and migration seasons). The new structure will allow for wildlife passage below the structure if feasible. • Fencing to delineate the work zone will prevent encroachment into adjacent habitat supporting SAR and Species of Special Concern.	The Contractor will conduct regular monitoring of the erosion and sediment control measures to ensure they are acting as intended and are containing the work area.
Migratory Breeding Birds	Disturbance or destruction of migratory breeding bird nests / habitat may occur during construction phase (vegetation clearing)	To reduce the risk of contravening the federal Migratory Bird Convention Act, 1994 (MBCA), timing constraints shall be applied to avoid any limited vegetation clearing (including grubbing) and / or structure works (construction) during the active window for breeding birds, broadly from April 1 to August 31 for most species. Active nests (nests with eggs or young birds) of protected migratory birds, including SAR protected under the ESA, cannot be destroyed at any time of the year. If a nesting migratory bird (or SAR protected under ESA) is identified within or adjacent to the construction site (or during operations and maintenance activities) and the activities are such that continuing works in that area would result in a contravention of the MBCA or ESA, all activities should stop and the Contract Administrator (with assistance from an Avian Biologist) should discuss mitigation measures with the Town. If SAR are identified, all activities should stop and MECP should be contacted to ensure compliance with the ESA. The Contract Administrator can instruct the Contractor on how to proceed based on the mitigation measures established through discussions with the Township, the MECP and / or Environment Canada. • To avoid contravention of the MBCA and / or ESA, the bridge structure should be completely excluded with tarping or netting material prior to the next active window for breeding birds (i.e., by end of March) if construction works are to occur during the active window for breeding birds (as noted above). Tarping or netting of the bridge ensures that breeding birds are excluded from nesting on or under the structure while the bridge is being replaced.	If construction works occur during the active window for breeding birds, an Environmental Inspector should monitor the tarped or netted structure every two to three days to ensure that no bird nests are established on the bridge (some species such as Barn Swallow or Eastern Phoebe (Sayornis phoebe) have been reported to attempt nesting on the exterior of the tarp material used for exclusion).

Feature	Description of Potential Effects	Mitigation Measures	Monitoring Activities
SAR bat maternity-roosting habitat	Tree removals could impact wildlife	Trees that are identified as candidate bat maternal roosting habitat must be taken down outside the active bat window (active window is March 31 to October 1).	Further studies are required to confirm the extent of impacts and whether surveys are required to determine absence or presence of SAR bats.
Trees	Loss of woody vegetation and creation of new forest edges causing new growing conditions such as sun exposure and weed invasion.	A tree inventory will be completed during the detailed design to characterize and confirm required removals. Impacts will be minimized to remaining trees by implementing measures such as tree protection or ESC fencing to protect trees from grading impacts near adjacent construction. ESC measures and other specified protection measures must be installed prior to commencement of any construction or vegetation disturbance. No access, storage or stockpile of materials or equipment should occur within the area protected by the ESC and other protection measures. A replanting plan may be required to compensate for tree loss.	An Environmental Inspector should be engaged during the construction phase to review ESC and other protection measures for deficiencies. Monitoring of mitigation / compensation plantings will be associated with plant warranty inspections.
Vegetation	Temporary disturbance of meadow, swamp, hedgerow, marsh, forest and plantation vegetation may be required for access and construction.	Tree protection fence and ESC measures will delineate the areas of access and construction to reduce impacts extending unnecessarily into adjacent lands. Seeding of native grasses and wildflowers may be required to revegetate the disturbed areas that will be illustrated in replanting plan.	An Environmental Inspector should be engaged during the construction phase to review ESC and other protection measures for deficiencies. Monitoring of mitigation / compensation plantings will be associated with plant warranty inspections.
Fish and Fish Habitat	In-water works may be required, and the proposed works could potentially result in HADD to fish habitat and the death of fish by means other than fishing.	A qualified professional aquatic ecologist will submit a Request for Review to DFO for any bridge replacements or removals requiring in-water works. It is anticipated that a Letter of Advice will be obtained for the project based on the footprints of the structures and fish community present. During Detailed Design, correspondence shall be maintained with a qualified professional aquatic ecologist to determine appropriate mitigation measures and whether the proposal has potential to pose HADD to fish habitat and / or if the proposal has the potential to kill fish. Preferred mitigation measures include workzone isolation while maintaining flow downstream and fish salvage from the isolated work area. Efforts will be made in consultation with the DFO to mitigate should HADD to fish habitat occur. A fish salvage must occur under a License to Collect Fish for a Scientific Purpose obtained from the MNRF. Near-water work and work below the annual high-water mark will adhere to the appropriate in-water work timing window to avoid potential impacts to resident and migratory fish species. As the watercourses share a spring-spawning fish community, this would exclude in-water works from March 15 to July 15 of any year.	ESC monitoring during construction. Fish salvage prior to the commencement of any in-water works. Spill management plan to be created and measures to contain potential spills are to be on-site throughout construction.
Groundwater	Potential for localized groundwater quality impacts as a result of spills. Temporary dewatering in the work area.	Refueling of equipment and fuel storage shall be conducted in designated areas, at least 30 m away from the watercourses and any existing wells, with spill protection provided. The work area shall be dewatered as per recognized provincial standards and pumped into acceptable dewatering traps. These dewatering traps will be placed away from the watercourse to allow for infiltration prior to discharging to the watercourse.	ESC monitoring throughout construction. Spill management plan to be created and measures to contain potential spills are to be on-site throughout construction.

Feature	Description of Potential Effects	Mitigation Measures	Monitoring Activities
Surface Water / Hydrology / Stormwater	Potential for sediments to enter the watercourse due to stockpiling, excavation, and construction. Potential for localized water quality impacts in the case of spills. Potential for invasive species to enter the environment	The footprint of the disturbed area shall be minimized as much as possible, for example, vegetated buffers/setbacks will remain untouched adjacent to the watercourse, wherever possible. An Erosion and Sediment Control (ESC) Plan shall be developed during the detailed design phase of the project, prior to construction. Implementation of the erosion and sediment control measures shall conform to recognized standard specifications, such as Ontario Provincial Standards Specification (OPSS), and the requirements of the GRCA. A permit from the GRCA under the Development, Interference, with Wetlands and Alterations to Shorelines and Watercourses Regulation (Ontario Regulation 150/06) will be required prior to conducting the proposed works as work is proposed within a flood Regulated Area. In-water operation of heavy equipment shall be prevented, as well as minimizing the operation of any equipment on the banks of the watercourse. Stockpiled material will be stored and stabilized a minimum of 30 m from the watercourse. All materials and equipment used for the purpose of site preparation and project completion will be operated and stored in a manner that prevents any deleterious substance (e.g., petroleum products, silt, etc.) from entering the water. ESC measures (silt curtains, silt fence, rock check dams, etc.) shall be installed and maintained during the work phase, until the site has been stabilized. ESC measures will be inspected daily to ensure they are functioning and maintained as required. If ESC measures are not functioning properly, no further work will occur until the problem is resolved. Temporary mitigation measures shall be installed prior to the commencement of any clearing, grubbing, excavation, filling, or grading works and must be maintained on a regular basis, prior to, and after precipitation events. Water quality impacts related to surface water runoff shall be mitigated to avoid downstream impacts by controlling surface water run off within the boundaries of the site. All disturbed areas of the work site shall be stabilized immediately and revegetated as soon as conditions allow. All equipment fueling and maintenance shall be done at least 30 m from the watercourse to ensure that no deleterious substances enter the waterway. The Contractor shall be required to develop Spill Prevention and Contingency Plans for construction and operational phases of the project. Personnel will be trained in how to apply the Plans, and the Plans will be reviewed to strengthen their effectiveness and ensure continuous improvement. Spills will be immediately contained and cleaned up in accordance with provincial regulatory requirements and the contingency plan. A hydrocarbon spill response kit will be on site at all times during the work. Spills will be reported to the Ontario Spills Action Center at 1 800 268 6060. • All equipment and personal protective equipment must arrive on-site clean to prevent the potential transfer of invasive species (i.e., phragmites) to the local environment.	Monitoring of surface water quality will be completed along with regular ESC monitoring as outlined above Spill management plan to be created and measures to contain potential spills are to be on-site throughout construction

Feature	Description of Potential Effects	Mitigation Measures	Monitoring Activities
Effects on Cultural Heritage and Archaeological Resources			
Archaeological Resources	There is low potential for archaeological resources to be disturbed during construction based on the Archaeological Assessment report.	• Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48(1) of the Ontario Heritage Act. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out an archaeological assessment, in compliance with Section 48(1) of the Ontario Heritage Act. • The Funeral, Burial and Cremation Services Act, 2002, S.O. 2002, c.33 requires that any person discovering human remains must cease all activities immediately and notify the police or coroner. If the coroner does not suspect foul play in the disposition of the remains, in accordance with Ontario Regulation 30/11 the coroner shall notify the Registrar, Ontario Ministry of Public and Business Service Delivery, which administers provisions of that Act related to burial sites. In situations where human remains are associated with archaeological resources, the Ministry of Citizenship and Multiculturalism should also be notified (via email to archaeology@ontario.ca) to ensure that the archaeological site is not subject to unlicensed alterations which would be a contravention of the Ontario Heritage Act.	Any monitoring requirements identified through the Stage 2 Archaeological Assessment and any subsequent assessments will be implemented.
Cultural Resources	There is a potential for cultural resources to be impacted during construction.	• Should the Township of Centre Wellington decide to exercise protection of Bridge 3-E under the terms of the OHA, a Heritage Impact Assessment would be required as a next step. • While Bridges 2-WG, 5-E, and 7-E did not meet the thresholds for CHVI established by O. Reg. 9/06 (as amended by O. Reg. 569/22), or the minimum threshold of the MTO HBEG, each bridge still contributes to the history of reinforced concrete bridge construction in Wellington County and further considerations regarding the fate of these structures should aim to incorporate styling cues of the existing structures into any future designs.	No monitoring required.
Effects on Social Environment, Property, and Public Safety			
Private Property	Construction may cause damage to private property.	• Construction access routes will be clearly defined in consultation with private landowners prior to construction. • Construction areas will be clearly marked and fenced. • Any temporary access or staging areas will be restored to their pre-construction condition. • Timing of construction on private property will be agreed upon with the property owner.	A Construction Inspector will ensure that construction limits are well-marked and adhered to throughout construction.
Public Safety	Emergency Response could be impacted during construction.	• Bridge construction will be completed in either a phased manor, allowing one of traffic through at all times, or alternatively, bridge closure may be required. • Should bridge closure be required, EMS must be notified and detour plans will be completed as required.	No monitoring required.
Public Safety	The configuration of the bridges will impact access and routes for Emergency Response which could affect public safety.	• The Township will work with EMS to ensure that opening new routes are documented in EMS's database so access plans are updated in case of emergency.	No monitoring required.
Air Quality	Potential air quality impacts during construction.	• A complaint response protocol for nuisance impacts including dust emissions will be prepared during the detailed design phase of the project and implemented prior to construction. • During construction, the following mitigation measures shall be used: – The road shall be graded as required to remove potholes, ruts and ripples in the road surface. Efforts to prevent contamination of the road surface, such as spilling sands, silts and clays, will also help to minimize dust. – If appropriate equipment is available, the roadway should be sprayed with water as required to minimize dust generation prior to paving.	An environmental monitor shall regularly inspect construction work areas to ensure that dust suppression measures are being adequately applied and confirm the requirements outlined in the CMP are being followed. If dust suppression measures are not functioning properly, alternative measures shall be

Feature	Description of Potential Effects	Mitigation Measures	Monitoring Activities
		– The construction contractor will be required to develop a Construction Management Plan (CMP) that specifically addresses dust controls, and contingency plans to mitigate dust when it occurs. – Vehicles / machinery and equipment shall be in good repair, equipped with emission controls, as applicable, and operated within regulatory requirements. The contractor shall also be required to implement dust suppression measures to reduce the potential for airborne particulate matter resulting from construction activities. This should be in the form of water applications on exposed soils. – Considerations shall be given to using of chemical suppressants to reduce dust, use of wind barriers and limiting exposed areas which may be a source of dust and equipment washing. – The construction contractor shall develop a Construction Management Plan (CMP) that specifically addresses dust controls, and contingency plans to mitigate dust when it occurs.	implemented immediately and prioritized above other construction activities.
Noise	Potential for noise through the use of large equipment for construction of the proposed road extension.	• A complaint response protocol for nuisance impacts including construction noise shall be prepared during the detailed design phase of the project and implemented prior to construction. • Noise control measures shall be implemented where required during the construction phase, such as restricted hours of operation and the use of appropriate machinery and mufflers. The noise produced by the equipment can be limited through proper equipment maintenance. • All construction activities shall conform to the criteria set out in NPC-115 of 83 dB. • The construction contractor will be required to develop a Construction Management Plan (CMP) that specifically addresses noise controls, mitigation to be implemented and frequency of equipment inspection.	An environmental monitor shall regularly monitor construction noise to ensure that noise control measures are being adequately applied and confirm the requirements outlined in the CMP are being followed. If noise control measures are not functioning properly, alternative measures shall be implemented immediately and prioritized above other construction activities.

8.0 Climate Change Considerations

8.1 Climate Change

Climate change is defined as any significant change in long-term weather patterns. The term can apply to any major variation in temperature, wind patterns, or precipitation that occurs over time. Global warming describes the recent rise in the average global temperature caused by increased concentrations of greenhouse gas emissions (GHG) trapped in the atmosphere. Scientists have concluded that human activity is largely responsible for recently observed changes to our climate since GHGs are mainly caused by burning fossil fuels to produce energy.

Two types of climate change effects can be considered. The first is the effect that a project can have on climate change. In this case, the degree to which the project can provide some climate change mitigation measures is to be assessed. The second is the effect climate change has on the project. Climate change was considered during this study and is discussed in this Section.

8.2 Effects of the Project on Climate Change

No new traffic is expected to be generated as a result of this project. However, patterns may change as a result of bridges being reopened. Some travel routes may be shortened and more straightforward, resulting in minor reductions in vehicular emissions. At a minimum, it is expected that there will be no net increase in greenhouse gas emissions.

Existing vegetation will be retained to the extent possible. Removals will be kept to a minimum to limit direct effects to vegetation communities and vascular flora, as well as indirect effects (e.g., soil compaction and changes to topography and drainage). Disturbed areas will be re-stabilized, incorporating revegetation using non-invasive, preferably native plantings and / or seed mix appropriate to the site conditions and adjacent vegetation communities. Seed mixes will be used in conjunction with an appropriate non-invasive cover crop as appropriate.

8.3 Effects on the Project from Climate Change

There is potential for the project to be affected by climate change. Climate change is usually associated with any significant change in long-term weather patterns. Changes in the composition of the atmosphere are resulting in processes that alter global temperature and precipitation, in turn effecting local weather patterns. These processes can ultimately lead to increased occurrence of extreme weather events such as floods, droughts, ice storms, and heat waves.

Precipitation, whether it is rainfall, snowfall, or other forms of frozen / liquid water, is the key climate and weather-related variable of concern with respect to drainage and bridge design. As a result of climate change, storm events are predicted to become more intense, which can result in larger volumes of precipitation at one time. Other climate variables such as temperature are major inputs to evaporation and snowmelt processes. Increases in temperature are likely to impact precipitation and snowmelt runoff volumes discharged to watercourses.

During the detailed design, all bridge and Stormwater Management-related components of the project shall be designed with consideration for increased precipitation.

9.0 Detailed Design and Construction Commitments

The following list provides a preliminary set of commitments to be undertaken during the detailed design phase or construction phase of the Project to ensure that work is being completed in accordance with the commitments used during the evaluation of alternatives. These commitments shall be revisited during the detailed design phase of the Project, at which time any additional commitments shall be identified.

9.1 Detailed Design Commitments

- A geotechnical subsurface investigation should be completed to provide recommendations on the appropriate foundation type and suitable bearing elevations. The required chemical testing and reporting required for compliance with Ontario Regulation 406/19 'On-site and Excess Soil Management' shall also be conducted during the geotechnical investigations at the detailed design stage to provide contractor's the applicable information required for selecting receiving sites.
- Additional topographic and / or bathymetric survey of the watercourse should be completed upstream and downstream of the bridge to confirm the elevations of the bottom of watercourse.
- A detailed Hydrologic and hydraulic modelling shall be completed to verify compliance of the proposed works with GRCA policies 8.1.15 and 8.1.16. The GRCA shall be consulted early in the detailed design stage to determine the scope of work for this exercise.
- Further investigations shall be undertaken to ensure the proposed alternatives will not impact potential erosion hazards that may be present due to riverine slopes and / or the meander belt of the creek. The requirement for engineering assessments such as geotechnical or fluvial geomorphology should be confirmed with the GRCA at the detailed design stage.
- A scoped environmental impact study, in accordance with GRCA Policy 8.4.7 shall be completed during Detailed Design. Wetland staking shall be undertaken during the growing season (May – September) and verified by GRCA staff. GRCA shall be circulated on a terms of reference for the Environmental Impact Study (EIS) at the onset of this work to ensure the scope of the EIS meets their requirements.
- A fluvial geomorphology assessment is to be completed to address GRCA Policy 8.9.2, which requires that "crossing structures avoid the Riverine Erosion Hazard in order to accommodate natural watercourse movement, wherever possible".
- A Subsurface Utility Engineering (SUE) investigation should be undertaken at any locations where excavation works are anticipated to occur. Utility conflicts should be confirmed in the detailed design stage and relocated prior to construction, if necessary.

- A further analysis of the preferred structure type with the additional information gathered during detailed design should be conducted to confirm whether the precast concrete rigid frame structure remains preferred, or if the cost, hydraulic performance and constructability of a prestressed solid slab concrete girder bridge may be preferred. The geometry and alignment of structures should also be reviewed during the detailed design stage.
- A review of preliminary grading areas of each site for SAR wildlife habitats such as bat roost trees and snake hibernacula should be completed.
- A tree inventory should be completed to determine and characterize required removals. The Six Nations of the Grand River Elected Council (SNGREC)'s list of plant species of interest and importance shall be reviewed to identify if vegetation proposed for removal is of interest to the SNGREC. Impacts to trees shall be minimized by implementing a tree protection plan in areas adjacent to construction or grading.
- If any Provincial SAR are identified during the tree inventory and / or associated detailed design studies, potential impacts will be mitigated to the extent possible and the MECP will be consulted with as needed to determine next steps and permitting requirements.
- Plant species loss should be minimized where possible, and a re-vegetation plan using native species and seed mix should be created. A re-planting ratio of ten replanted trees per one removed tree shall be used for quantifying replacements, as per the request of the Six Nations of the Grand River Elected Council (SNGREC). Re-planting should be completed on-site to the extent possible. Where the required re-planting quantities are unable to be achieved within the Township right-of-way (ROW), the preference is for the Township to strive to reach an agreement with the immediately adjacent landowners to allow for replanting on-site, beyond the Township ROW. If on-site planting is not achievable, off-site plantings to reach the desired ratios are acceptable to the SNGREC.
- Plant species identified for replanting shall be selected from the SNGREC's list of species of Interest / Importance which are suitable for the proposed planting locations. The Kayanase Greenhouse is available for consultation regarding replanting initiatives during detailed design.
- Near-bank cover plantings along the watercourse shall be included in the re-planting landscaping plan where possible, while considering the required offset of plantings from structures.
- An Erosion and Sediment Control (ESC) Plan shall be developed during the detailed design phase of the project in consultation with the GRCA and will conform to industry best management practices and recognized standard specifications such as Ontario Provincial Standards Specification (OPSS).

- All bridge and SWM-related components of the projected shall be designed with consideration for increased precipitation due to Climate Change.
- Where erosion protection, channel regrading / stabilization, or earth retaining structures are determined to be required, the use of “softer” means of protection shall be preferred over the use of hard surfaces unless it is unfeasible to do so.
- Should future work require an expansion of the study area, then a qualified heritage consultant should be contacted in order to confirm the impacts of the proposed work on potential heritage resources.
- All Indigenous communities previously engaged shall be contacted, if there are any substantial changes to the project / process or if the Owner applies for subsequent permits from the Ministry (MECP) that may be of interest or concern to communities.
- The Township shall comply with the Ontario Water Resources Act, 1990, c. O.40 with respect to the quality of water discharging into natural receivers. The footprint of disturbed areas shall be minimized to the extent possible. For example, vegetated buffers shall be left in place adjacent to natural vegetation features (forested areas) to the maximum extent possible.
- Any features that are identified as candidate bat maternal roosting habitat shall be taken down outside the active bat window (i.e., active window is March 31st to October 1st).
- A complaint response protocol for nuisance impacts including dust emissions shall be prepared during the detailed design phase of the project and implemented prior to construction.
- Should future work require an expansion of the study area, then a qualified heritage consultant should be contacted in order to confirm the impacts of the proposed work on potential heritage resources.
- If revisions to the designs result in ground disturbances beyond the previously disturbed lands, or beyond the areas previously evaluated during the Stage 1 Archaeological Assessment, additional archaeology assessment of the areas should be undertaken. Any further recommended archaeological assessments shall be undertaken by a licensed archaeologist as early as possible during detailed design and prior to any ground disturbing activities.

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

The Funeral, Burial, and Cremation Services Act, 2002, S.O. 2002, c.33 requires that any person discovering human remains must cease all activities immediately and notify the police or coroner. If the coroner does not suspect foul play in the disposition of the remains, in accordance with Ontario Regulations 30/11 the coroner shall notify the Registrar, Ontario Ministry of Public and Business Service Delivery, which administers provisions of that Act related to burial sites. In situations where human remains are associated with archaeological resources, the Ministry of Citizenship and Multiculturalism should also be notified (at archaeology@ontario.ca) to ensure that the archaeological site is not subject to unlicensed alterations which would be a contravention of the Ontario Heritage Act.

- Indigenous communities that were included in the EA contact list shall be consulted and given an opportunity to participate in any additional Archeological Assessment reporting and monitoring process, should it be determined that additional assessment is required.
- All Indigenous communities previously engaged shall be contacted, if there are any substantial changes to the project / process or if the Owner applies for subsequent permits from the Ministry (MECP) that may be of interest or concern to communities.
- Documentation of each structure should be compiled and deposited in a local publicly accessible repository in accordance with the recommendations of the Cultural Heritage Evaluation Report.
- Excess soils shall be managed in accordance with O. Reg. 406/19 and the MECP's "Management of Excess Soil – A Guide for Best Management Practices" (2014).
- If Bridge 3-E is to be removed in the future, the recommendations for conservation outlined in the Heritage Impact Assessment (see Appendix A.7) shall be undertaken, which involves documentation of the existing bridge, including the creation of architectural drawings of the extant bridge and filing of the documentation, including the Cultural Heritage Evaluation Report and the Heritage Impact Assessment to local historical societies, libraries and the municipal archives.

9.2 Construction Commitments

- The extent of vegetation removal shall be clearly delineated for the vegetation clearing and grubbing contractor. All tree work including branch pruning, root pruning, and removal shall be completed by an ISA Certified Arborist.
- An Environmental Inspector shall be engaged during the construction phase to review protection measures.
- A site inspector shall monitor the success of the seed mix application in re-vegetated areas. Seed mix should be re-applied by the contractor if bare patches are noticed or if it fails to germinate. Ecologists may be required to review site conditions if seed mix persists in not germinating.

- Trees to be retained beyond the limit of clearing should be protected using tree protection fence installed at the dripline or grading limit, whichever provides the greatest setback from the trees.
- Residential properties that are subject to tree removal on the adjacent ROWs may require reinstatement of native woody vegetation to compliment existing aesthetics and privacy screening where desired by the property Owner.
- To reduce the risk of contravening the *Migratory Bird Convention Act, 1994*, and Endangered Species Act, the structures shall be completely excluded with tarping / netting prior to the active breeding window for birds in the season leading up to the proposed construction works (i.e., by the end of March) and timing constraints shall be applied to avoid any limited vegetation clearing (including grubbing) and / or structure works (construction, maintenance) during the period between April 1 to October 31 to avoid the active period for the following:
  - Breeding birds – Broadly from April 1 to August 31 for most species (regardless of the calendar year).
  - Bat species – Considered to be between April 1 to October 31 of any calendar year.
  - If work must occur during the active breeding bird window, a qualified ecologist shall search the structures for active nests prior to work and every two to three days during activity.
- If a nesting migratory bird (or SAR protected under *ESA, 2007*) is identified within or adjacent to the construction Site (or during operations and maintenance activities) and the activities are such that continuing works in that area would result in a contravention of the *Migratory Birds Convention Act, 1994* or *ESA, 2007*, all activities shall stop and the Contract Administrator (with assistance from a qualified Avian Biologist) shall discuss mitigation measures with the Town.
- Should SAR be identified, all activities will stop and MECP shall be contacted immediately to ensure compliance with the ESA. The Contract Administrator shall instruct the Contractor on how to proceed based on the mitigation measures established through discussions with the County, the MECP and / or Environment Canada.
- Daily sweeps of the construction zone and equipment should be conducted to ensure wildlife, including SAR snakes or turtles, have not entered the work limits. In the event that an animal is encountered during construction and does not move from the construction zone, the Contract Administrator will be notified. If the construction activities are such that continuing construction in the area would result in harm to wildlife, construction activities in that location will temporarily stop and the MECP shall be contacted for direction.

- Wet weather restrictions shall be applied during Site preparation and excavation. Work will be avoided near watercourses and headwater drainage features during periods of excessive precipitation and / or excessive snow melt.
- Any in-water works shall occur in isolation of flowing waters, with work zone isolation achieved by placing cofferdams constructed of clean, non-erodible materials at the upstream and downstream limits of a given work area. Stream flows must be maintained downstream of in-water work areas through by-passing flows (by-pass culvert, channel, pumping etc.). Any isolated work areas shall be de-watered and dewatering shall be conveyed to a filtering system and flow dissipation device to mitigate sedimentation and erosion of the receiving waterbody.
- Any fish trapped in an isolated work area shall be captured and released outside of it prior to the commencement of in-water works. Any fish rescue shall be performed by a qualified aquatic ecologist / biologist. A License to Collect Fish (LCF) shall be obtained from the NDMNRF prior to any fish rescue occurring.
- In-water works will only be permitted to occur during the appropriate in-water works timing, which shall be confirmed with DFO and NDMNRF during the detailed design.
- Embankments shall be restored with erosion control blankets, topsoil, seeding mixtures approved by the GRCA, and plantings, where appropriate.
- Any stockpiled material shall be stored and stabilized away from the surface water features. All materials and equipment used for the purpose of Site preparation and road construction shall be operated and stored in a manner that prevents any deleterious substance (e.g., petroleum fuel, hydraulic fluids) from entering the environment.
- Refueling and maintenance of construction equipment should occur within designated areas only. Any hazardous materials used for construction will be handled in accordance with appropriate regulations.
- Should previously undocumented archaeological resources be discovered, they may qualify as a new archaeological site and therefore be subject to Section 48(1) of the *Ontario Heritage Act*. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out an archaeological assessment, in compliance with Section 48(1) of the *Ontario Heritage Act*.
- The *Funeral, Burial and Cremation Services Act*, 2002, S.O. 2002, c.33 requires that any person discovering human remains must cease all activities immediately and notify the police or coroner. If the coroner does not suspect foul play in the disposition of the remains, in accordance with Ontario Regulation 30/11 the coroner shall notify the Registrar, Ontario Ministry of Public and Business Service Delivery, which administers provisions of that Act related to burial sites. In situations where human remains are associated with archaeological resources, the Ministry of

Citizenship and Multiculturalism should also be notified (via email to archaeology@ontario.ca) to ensure that the archaeological site is not subject to unlicensed alterations which would be a contravention of the *Ontario Heritage Act*.

- A Construction Emergency Response and Communications Plan shall be developed and followed throughout the construction phase (including spill response plans). The Contractor shall develop spill prevention and contingency plans for the construction of new bridge infrastructure. Personnel shall be trained in how to apply the plans and the plans shall be reviewed to strengthen their effectiveness and continuous improvement. Spills or depositions into watercourses shall be immediately contained and cleaned up in accordance with provincial regulatory requirements and the contingency plan. A hydrocarbon spill response kit will be on-site at all times during the work.
  Spills shall be reported to the Ontario Spills Action Centre at 1-800-268-6060.
- The construction contractor shall be required to develop a Construction Management Plan (CMP) that specifically addresses dust controls, and contingency plans to mitigate dust when it occurs.
- The construction contractor shall be required to develop a Construction Management Plan (CMP) that specifically addresses noise controls, mitigation to be implemented and frequency of equipment inspection.
- Vehicles / machinery and equipment shall be in good repair, equipped with emission controls, as applicable, and operated within regulatory requirements. The contractor shall also be required to implement dust suppression measures to reduce the potential for airborne particulate matter resulting from construction activities. This should be in the form of water applications on exposed soils.
- Considerations shall be given to the use of chemical suppressants to reduce dust, use of wind barriers and limiting exposed areas which may be a source of dust and equipment washing.
- Noise control measures shall be implemented where required during the construction phase, such as restricted hours of operation and the use of appropriate machinery and mufflers. The noise produced by the equipment can be limited through proper equipment maintenance.
- All construction activities shall conform to the criteria set out in NPC115 of 83 dB.
- The contractor shall develop a Health and Safety Plan (HASP) and have it reviewed and approved by the County prior to implementing. The HASP shall follow the Occupational Health and Safety Act, 1990, and regulatory requirements.
- Operation of construction related vehicles shall be done in accordance with all appropriate safety policies and procedures, and based on Canadian Standards (Transport Canada, etc.).

- Contractor will be required to develop and implement a traffic management plan in coordination with Township of Centre Wellington. Adequate signage to give advance notice of disruptions and detours is to be provided by the contractor.

9.3 Permit Requirements

The following list provides a preliminary set of permit requirements that will need to be acquired prior to construction. A final list of permits shall be determined during the detailed design phase of the Project.

- The contractor shall obtain an Occupancy Permit from the Township for working within the ROW.
- A Permit to Take Water may be required should dewatering be necessary. Requirements for dewatering shall be determined during the detailed design phase of the Project.
- The Township is required to comply with the *Ontario Water Resources Act* with respect to the quality of water discharging into natural receivers. The footprint of disturbed area shall be minimized as much as possible. For example, minimizing distribution of excavated soil to minimize sedimentation to storm sewers.
- A permit approval shall be required from GRCA in accordance with O.Reg. 150/06 Regulation of Development, Interference with Wetlands and Alteration to Shorelines and Watercourses for construction works in GRCA regulated areas, including culvert extensions, drain relocations and watercourse modifications.
- If portions of woodland providing habitat for species at risk bats are to be removed, an Information Gathering Form shall be submitted to MECP, in accordance with the Endangered Species Act.
- A License to Collect Fish will be required for any fish relocations during construction.
- Approval under the *Fisheries Act* from DFO will be required for any in-water works.
- Ground disturbance activities shall not be undertaken until the Ministry of Citizenship and Multiculturalism has provided a letter indicating the recommended technical cultural heritage studies (e.g., Cultural Heritage Report, CHERs, HIAs) have been completed and are consistent with the requirements guidance and standards and with best practice guidance prepared by Ministry of Citizenship and Multiculturalism.
- A Permit from Wellington County to remove trees under By-Law 5515-09 shall be obtained.

10.0 Conclusion

In conclusion, the Bridges and Transportation Network Study completed for Bridges 2-WG, 3-E, 5-E, and 7-E has evaluated the impacts on the technical, natural, social and cultural environments and has determined that the preferred solution to be carried forward for future capital planning and implementation includes the replacement of Bridges 2-WG, 5-E, and 7-E, and the permanent closure of Bridge 3-E to vehicular traffic, with the construction of a formal turn-around and the continued use as a pedestrian crossing until such a time that the condition of the structure is deemed unsuitable for pedestrian loading. The preliminary geometry recommended for the replacement bridges is summarized in Table 25 below but should be further evaluated during the detailed design phase of the projects, upon the collection of additional information.

Table 25: Preliminary Bridge Replacement Geometry Recommendations

Bridge ID	Required Span (m)	Preferred Structure Type	Skew	Road Profile Design Speed
2-WG	14.94	Precast Concrete Rigid Frame	0 deg	60 km/h
5-E	14.94	Precast Concrete Rigid Frame	10 deg	60 km/h
7-E	11.58	Precast Concrete Rigid Frame	5 deg	60 km/h

This report will be made available for public review and comment through the Township of Centre Wellington's online 'Connect CW' platform. The project stakeholders will be notified of the availability of this report and requested to review and provide any comments within 30 calendar days of the notification.

If comments are received which may impact the previously completed evaluation of alternatives, the Township can consider revisiting and revising the analysis as required to incorporate the additional information. If the additional considerations result in a change in the preferred solution, an updated report will be provided to the public for further review.

If no further comments effecting the preferred solution are received, the Township may move forward to detailed design, approvals process and subsequent implementation of the preferred alternative.

11.0 References

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