NUCLEAR WASTE MANAGEMENT ORGANIZATION
SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

Infrastructure Baseline and Feasibility Study Report - Southwestern Ontario Community Study

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This report has been prepared under contract to the NWMO. The report has been reviewed by the NWMO, but the views and conclusions are those of the authors and do not necessarily represent those of the NWMO.

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MORRISON HERSHFIELD

Infrastructure Baseline and Feasibility Study
Southwestern Ontario Community Study

For Nuclear Waste Management Organization
NWMO P.O. No.: 2001020

MH Project No.: 203524900

Revision 3
June 21, 2022

MORRISON HERSHFIELD

Infrastructure Baseline and Feasibility Study Southwestern Ontario Community Study

For Nuclear Waste Management Organization

NWMO P.O. No.: 2001020

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1 INTRODUCTION

1.1 Background and Context

Since 2012, the Municipality of South Bruce (MSB) has been involved in a process of learning about the Nuclear Waste Management Organization's (NWMO) Adaptive Phased Management (APM) Project ('the Project') for the long-term management of Canada's used nuclear fuel. The two remaining siting areas in the process are the South Bruce Area and the Ignace Area, and their surrounding areas. The NWMO plans to complete all preliminary assessment work and to select one community/area to host the Project by 2023. Preliminary studies suggest that the Project can be implemented safely in the South Bruce area for a repository that will contain and isolate used nuclear fuel from people and the environment for the long timeframes required.

Further detailed studies are required to fully assess the potential impacts of the Project in the community and regionally. Building on previous work, engagement completed to-date, and the MSB's 36 Guiding Principles, the NWMO and the MSB are working together to prepare a suite of community studies which will be shared broadly with the community. The list of socio-economic community studies is included in **Appendix A**. These studies were undertaken by the NWMO or MSB, with some being joint efforts. The MSB has retained consultants (the GHD team) to develop a number of studies and to peer review others developed by the NWMO and their consultants (the DPRA Canada Inc. (DPRA) team). The information acquired through these studies is expected to help South Bruce leadership and residents make informed decisions about whether the Project is a good fit for their community, and if they are willing to consider hosting it and under what circumstances and terms.

This *Infrastructure Baseline and Feasibility Study* is one of the community studies being prepared. This study is organized as follows:

- Purpose and Scope (**Section 1.3**)
- Methodology (**Section 2**)
- Existing Conditions (**Section 3**)
- Relevant Adaptive Phased Management Project Characteristics (**Section 4**)
- Preliminary Analysis/Effects Assessment (**Section 5**)
- Options Assessment (**Section 6**)
- Summary (**Section 7**)
- References (**Section 8**)

Note to Reader:

This and other community studies are preliminary and strategic in nature, all intended to identify possible consequences (e.g., to infrastructure) in the South Bruce Area based on our current level of understanding of the Project. Using information known at this point in time, these community studies will describe a range of possible consequences that are the subject of specific and separate studies. For each possible consequence, potential options are offered to leverage opportunities and/or mitigate possible negative consequences/effects.

It is important to note that these community studies (developed collaboratively by the NWMO and the MSB) being investigated at this time are not the formal or final baseline or effects studies that will be part of the Impact Assessment (IA). Those studies will be completed at a later date if the Project is located in the area. However, these current studies will inform the effects studies that will be initiated at a later date.

These community studies are intended to support current dialogue between the MSB and the NWMO regarding a potential hosting agreement by:

a) Exploring in more detail the questions, aspirations and topics of interest expressed by the community through the Guiding Principles approved by the MSB following the project visioning process completed in the community;
b) Assisting the NWMO and the MSB in developing a deeper understanding of the community aspirations/values and to work with the MSB in identifying possible programs and commitments which ensure that the Project will be implemented in a manner that fosters the well-being of the community and area;
c) Advancing learning and understanding on topics of interest to the neighboring areas; and
d) Providing the community with information it has requested to help them make an informed decision in 2023.

The NWMO is committed to collaboratively working with the communities to ensure questions, concerns and aspirations are captured and addressed through continuous engagement and dialogue.

The NWMO will independently engage with the Saugeen Ojibway Nation to understand how they wish to evaluate the potential negative effects and benefits that the Project may bring to their communities.

1.2 Land Acknowledgement

It is acknowledged that the lands and communities discussed in this report are situated on the Traditional Territory of the Anishinabek Nation: The People of the Three Fires known as Ojibwe, Odawa and Pottawatomie Nations. The Chippewas of Saugeen and the Chippewas of Neyaashiinigmiing (Nawash), now known as the Saugeen Ojibway Nation, are the traditional keepers of this land and water. It is also recognized that the ancestors of the Historic Saugeen Métis and Georgian Bay Métis communities shared this land and these waters.

1.3 Purpose and Scope

Objectives for this study are described in the *Infrastructure Baseline and Feasibility Study Work Plan* (DPRA, 2021). The overall objective of the *Infrastructure Baseline and Feasibility Study* is to identify the existing and planned infrastructure in the MSB and the incremental change that would be needed if the use of the municipal infrastructure was a feasible option to service the project.

The specific objectives of the *Infrastructure Baseline and Feasibility Study* are to:

1. Evaluate the feasibility of expansion of the municipal infrastructure to serve the on-site needs of the project.
2. Evaluate the needed expansion of the municipal infrastructure to support housing and other development needs that arise with the project
3. Identify strategies for the supply of needed infrastructure for both the project and the other developments, including timing of necessary expansions.

The NWMO will be responsible for the completion of the *Infrastructure Baseline and Feasibility Study*. This study was undertaken by Morrison Hershfield Limited, a sub-consultant to DPRA, the prime consultant to the NWMO.

1.3.1 Guiding Principles

The *Infrastructure Baseline and Feasibility Study* is relevant to MSB Guiding Principles (2020) #10, #18, #27, #29 and #32:

- #10: “The NWMO will identify the potential for any positive and negative socio-economic impacts of the Project on South Bruce and surrounding communities and what community benefits it will contribute to mitigate any potential risks.”
- #18: “The NWMO will commit to relocate the working location of a majority of its employees to South Bruce as soon as it is reasonably practicable to do so after the completion of the site selection process.”
- #27: “The NWMO will fund the Municipality’s preparation of a housing plan to ensure that the residents of South Bruce have access to a sufficient supply of safe, secure, affordable and well-maintained homes.
- #29: “The NWMO will prepare an infrastructure strategy that addresses any municipal infrastructure requirements for the Project and will commit to providing appropriate funding for any required upgrades to municipal infrastructure required to host the Project in South Bruce.”
- #32: “The NWMO, in consultation with the Municipality and other local and regional partners, will prepare strategy to ensure there are sufficient community services and amenities, including health, child-care, educational and recreational facilities, to accommodate the expected population growth associated with hosting the Project in South Bruce.”

The *Infrastructure Baseline and Feasibility Study* provides information directly relevant to Principle #29 and contributes more generally to Principles #10, #18, #27 and #32.

The *Infrastructure Baseline and Feasibility Study* provides information that the NWMO and MSB can use to inform an infrastructure strategy and funding arrangements (as described by Principle #29) in the future as part of negotiations of a draft hosting agreement and/ or subsequent studies/ discussions if the South Bruce Area is ultimately selected as the Project location. For clarity, development of an infrastructure strategy is not part of the objectives / work plan for this study.

1.3.2 Peer Review Approach

An earlier draft of this *Infrastructure Baseline and Feasibility Study Report* was reviewed by MSB consultants according to their Peer Review Protocol. The Peer Review Protocol provides for a collaborative approach to conducting the peer review, with peer review activity occurring throughout the execution of the study. The *Infrastructure Baseline and Feasibility Study* is an NWMO-led study, with the NWMO determining the spatial Study Area, the data and inputs used to establish baseline conditions, and the assessment of the forecasted effects resulting from the Project.

The peer review has been carried out on the scope and framing of the study, data inputs, baseline conditions and the effects assessment. Options developed by the NWMO to address potential effects were presented to the NWMO and MSB in the draft study report.

This final *Infrastructure Baseline and Feasibility Study Report* reflects the comments provided by the MSB peer review consultants on the earlier draft report, and subsequent discussions with the peer review team, the MSB and their consultants.

For the *Infrastructure Baseline and Feasibility Study*, the peer review was led by R.J. Burnside & Associates Limited.

1.3.3 Spatial Boundaries

The spatial boundary for the *Infrastructure Baseline and Feasibility Study* is the boundary of the MSB (including Teeswater, Mildmay and Formosa). **Exhibit 1** in **Appendix C** illustrates the boundary of the MSB.

1.3.4 Temporal Boundaries

The temporal boundaries for the *Infrastructure Baseline and Feasibility Study* are as follows:

- Near-term (2023 to 2032) – Pre-Construction
  - Aligns with end of site preparation phase in 2032 and design and construction start 2033
- Mid-term (2033 to 2042) - Construction
  - Aligns with construction phase ending in 2042 and operations start 2043
- Long-term (2043 and beyond) – Operations
  - Aligns with operations phase (approximately 40 years; does not include monitoring and decommissioning)

2 METHODOLOGY

2.1 General Approach

The NWMO and the MSB drafted Statements of Work for each community study in response to the MSB's 36 Guiding Principles. As previously mentioned, the community studies are being undertaken by the NWMO or the MSB, with some being joint efforts.

The socio-economic community studies were categorized into three themes: Economics, Social Cultural, and Infrastructure and Aggregate. The studies were then allocated a unique ID code to identify which theme the study is associated with (see **Appendix A**).

The following methodology pertains to the 13 community studies solely or jointly led by the NWMO.

Based on the Statements of Work, work plans for each community study were developed. The work plans:

- Outlined the peer review approach with the MSB
- Identified linkages to other studies
- Identified the spatial and temporal boundaries
- Identified key assumptions that will dictate the completion of the study
- Described the tasks associated with the study and schedule for each task
- Identified key information sources and data collection methods

Draft work plans were reviewed by the MSB and its peer review team. Formal peer review team comments on the draft community study work plans were received in September 2021. The peer review of the draft *Infrastructure Baseline and Feasibility Study* work plan was undertaken by R.J. Burnside & Associates Limited.

DPRA provided Comment Disposition Tables and revised work plans to respond to the peer review comments in October 2021. In a memo dated November 3, 2021, the GHD team provided acknowledgement of comments that were addressed in the revised community study work plans or flagged to be addressed in future work such as the community study reports.

Several consultant consortium meetings and "check-in" meetings with the MSB and its peer review team were held during the development of each study.

In addition, meetings with neighbouring municipalities (i.e., the Township of Huron-Kinloss, Municipality of Brockton and Township of North Huron) were held to discuss the progress and scope of the community studies.

Appendix B includes details of knowledge holder interviews/meetings that relate to the *Infrastructure Baseline and Feasibility Study*.

2.2 Data Collection/Information Sources

Data and key information for this study was collected from primary sources such as knowledge holder interviews and secondary sources such as Project information from the NWMO and data/documents from local and regional organizations. The sections below describe how data and information was collected from these sources.

2.2.1 Knowledge Holder Interviews

The selection of knowledge holders was undertaken through an iterative review process between the NWMO and the MSB and its peer review team. Interviews were scheduled by the NWMO and a representative from the NWMO, the NWMO's consultants and the MSB peer review team were present. The knowledge holders were provided with an Interview Guide prior to the interview to provide background information on the Project and a general framework for the interview. During the interview, the NWMO's consultants and MSB's peer review team also asked specific questions relevant to applicable community studies. The NWMO representative took notes during the interviews and distributed the notes and any documents received from the knowledge holder to the consultants/peer review team members. Information received from these interviews has been used in the development of the study report.

Knowledge holder interviews were undertaken with the following organizations:

- Bruce Telecom
- EPCOR Utilities Inc. (EPCOR)
- Hydro One Networks Inc. (HONI)
- MSB
- Wightman Telecom

The initial set of knowledge holders was identified by the NWMO and MSB. Additional knowledge holders were identified based on input from the NWMO's consultants and the peer review team to ensure that interviews covered as many of the private utilities servicing the Study Area as possible.

Enbridge Group Inc. (Enbridge) declined to be interviewed for the study.

Further details on the knowledge holder interviews are provided in **Appendix B**.

2.2.2 Other Key Information and Data Sources

Table 2-1 summarizes other key information and data sources used in the preparation of this Report.

Table 2-1: Data Collection Methods and Sources

Data	Primary	Secondary
Project information	N/A	• APM 2021 DGR Lifecycle Cost Estimate Update Cost Summary Report (Heimlich, 2021) • Community Studies Planning Assumptions (Confidential) (NWMO, October 2021) • Deep Geological Repository Conceptual Design Report Crystalline/Sedimentary Rock (Naserifard et al., 2021) • Deep Geological Repository Transportation System Conceptual Design Report Crystalline/Sedimentary Rock (Taylor, 2021)
Existing infrastructure including existing expansion plans	Knowledge holder Interviews	• Publicly available information (e.g. annual regulatory reporting for drinking water and sewage treatment systems, permits and licenses) • Reports and maps provided by the MSB and utility providers (e.g. maps of existing infrastructure, expansion studies)
Housing statistics – existing	N/A	• Statistics Canada Data (Statistics Canada, 2017a, b and c) • *Plan the Bruce, Good Growth. Discussion Paper* (Bruce County, 2021)
Population growth expectations	N/A	• *South Bruce and Area Growth Expectations* (metroeconomics, 2022)
Future housing expectations	N/A	• *South Bruce and Area Growth Expectations* (metroeconomics, 2022)

This *Infrastructure Baseline and Feasibility Study* has taken into account the findings from the *Housing Needs and Demand Analysis Study* (Keir Corp., 2022); conversely, the findings from this *Infrastructure Baseline and Feasibility Study* have been considered in other community studies, including the *Housing Needs and Demand Analysis Study* and the *Land Use Study* (MHBC and DPRA, 2022).

The Municipality of South Bruce (metroeconomics, 2022) prepared base case ('without the Project') projections for population, housing and employment for the Municipality of South Bruce. A corresponding set of incremental 'anticipated Project effects' projections for each of these demographics was also prepared (metroeconomics, 2022) utilizing Municipality of South Bruce Project-related growth targets. For this *Infrastructure Study*, metroeconomics' population projections were incorporated in the analysis.

2.3 Assessment

The general methodology followed for this study is as follows:

Step 1	Data Collection	Background review and assembly of available infrastructure data; telephone interviews with key knowledge holders; description of existing infrastructure; description of existing plans for

		infrastructure expansion; assessment of level of service and capacity provided by existing infrastructure; description of relevant Project-related characteristics
Step 2	Inputs from Other Studies	Consider data and findings from other studies, e.g. the *Housing Needs and Demand Analysis Study Report*
Step 3a	Analysis and Assessment	Assessment of impacts of Project-associated population growth; assessment of direct Project-related needs (e.g., servicing of Centre of Expertise and APM DGR Facility); Strengths / Weaknesses / Opportunities / Threats assessment
Step 3b	Effects Management Options	Development of options to mitigate negative impacts and enhance positive impacts
Step 4-7	Conclusions and Reporting	Preparation of this Report; review and finalization of Report.

2.4 Limitations

The study relies in part on information gathered from knowledge holder interviews. The accuracy and completeness of this information may have been limited by the knowledge and experiences of those individuals who participated, and by restrictions on sharing confidential information.

As noted above, Enbridge declined to be interviewed for the study and did not provide any useful information in response to written requests. Information regarding existing and planned natural gas infrastructure is therefore limited to that which is publicly available (very limited) or was gained from the knowledge holder interview completed with EPCOR.

3 EXISTING CONDITIONS

3.1 Population Growth Expectations

Populations in the Study Area (Municipality of South Bruce) experienced a 0.2% average annual decline between 2011 and 2016, but are estimated to have grown at an average annual rate of 2.1% between 2016 and 2021. The *South Bruce and Area Growth Expectations* (metroeconomics, 2022) anticipate continued growth through the study period (as defined in **Section 1.3.4**). **Table 3-1** indicates expected new homes and total populations in the Study Area. These values do not include the impact of the Project, which is presented in **Section 4.1**. It is understood that these growth expectations are higher than those published by Bruce County in the fall of 2021.

Table 3-1: MSB Population and Homes Expectations

Year	Description	Dwellings		Population	
		New dwellings in MSB, cumulative	Dwellings in MSB, total	Population increase in MSB, cumulative	Population in MSB, total
2011	Historic data[1]	-	2,346	-	5,685
2016	Historic data[2]	-	2,381	-	5,639
2021	Current estimate[3]	0	2,360	0	6,250
2031	Forecast[3]	+490	2,850	+1,170	7,420
2041	Forecast[3]	+840	3,200	+2,150	8,400
2046	Growth planning horizon[3]	+940	3,300	+2,510	8,760

[1] Statistics Canada, 2012
[2] Statistics Canada, 2017a
[3] metroeconomics, 2022

To consider the impact of population growth on local infrastructure such as water supplies and sewage treatment plants, the locations of growth must be considered. The *Plan the Bruce: Good Growth Discussion Paper*, (Bruce County, 2021) provides the following information regarding the available housing supply in each community within the existing settlement areas of the Study Area:

Table 3-2: Available Housing Supply

Community	Total Housing Supply on Vacant Lands Plus 10% Intensification	Percentage Distribution of Supply
Formosa	240	24%
Mildmay	450	45%
Teeswater	320	32%
Rural Areas	0[1]	0%
Municipality of South Bruce (Total)	**1,020**	**100%**

[1] The *Plan the Bruce: Good Growth Discussion Paper*, (Bruce County, September 2021) does not indicate any population growth in MSB outside the communities of Formosa, Mildmay and Teeswater.

Because the total number of new homes required will come close to exhausting the total housing supply, for the purposes of this Report it has been assumed that new housing will be required in all three communities. This differs from the *Plan the Bruce: Good Growth Discussion Paper* (Bruce County, September 2021) which allocates the vast majority (84%) of new housing to Mildmay, but overall anticipates a much lower level of Study Area growth (490 new homes in comparison to the 940 new homes expected by metroeconomics, 2022).

3.2 Existing Infrastructure

3.2.1 Introduction

The existing infrastructure and level of service provided varies across the Study Area. As is typical across Ontario, water, wastewater and solid waste infrastructure is owned and operated by the MSB. Other infrastructure is owned and operated by private utilities including HONI, Westario Power Inc. (WPI), Enbridge, Wightman Telecom (WHM) and Rogers Communications Inc. (RCI). Within rural areas (and in the community of Formosa) some services are provided by private property owners (e.g. water wells and septic systems) or are unavailable (e.g. natural gas).

Table 3-3 summarizes the areas served by each infrastructure provider. The following sections provide information about each category of infrastructure, including the service area and existing level of service. **Exhibit 1** in **Appendix C** illustrates the locations of existing infrastructure.

Table 3-3: Existing Infrastructure Providers

	Formosa	Mildmay	Teeswater	Rural Areas
Water	None	MSB	MSB	None
Sewage	MSB	MSB	MSB	None
Stormwater/ Drainage	MSB/BC[1]	MSB/BC[1]	MSB/BC[1]	MSB/BC[1]
Solid Waste	MSB	MSB	MSB	MSB
Electrical power	HONI	WPI	WPI	HONI
Natural gas	EGI	EGI	EGI	None
Telecommunications (fixed line)	WHM	WHM	WHM/RCI	WHM

[1] BC is responsible for drainage infrastructure on County Roads

Legend:

BC	Bruce Country
EGI	Enbridge Group Inc.
HONI	Hydro One Networks Inc.
MSB	Municipality of South Bruce
RCI	Rogers Communications Inc.
WHM	Wightman Telecom
WPI	Westario Power Inc.

Infrastructure providers are continually responding to demand changes resulting from increasing populations, new technologies and evolving level-of-service expectations. This section of the Report therefore also describes needs for immediate infrastructure upgrades to satisfy current demands without the Project. Plans already in place for expansion or upgrades are described where information about these was made available by infrastructure providers.

Future expansion needs are also described within the following sections, where they provide a baseline for assessment of the potential effects of the Project.

This Report focusses on expansion and upgrades of infrastructure. Lifecycle-based asset renewal needs have not been explored as part of the current study, because infrastructure will continue to require end-of-life renewal regardless of Project effects on the Study Area.

3.2.2 Water

There are two drinking water systems (DWS) in South Bruce: Mildmay and Teeswater. Each DWS serves the local community via watermains which generally extend to all streets with residential or commercial properties within these settlement areas. All other properties in MSB use private wells to obtain water. **Table 3-4** describes the components of each DWS. **Table 3-5** indicates the capacity of each system. The extents of each DWS are illustrated in **Exhibit 1 (Appendix C)**.

Table 3-4: DWS System Components

	Mildmay	Teeswater
Wells	2	1
Well Pumps	1 submersible pump in each well	None (well is artesian)
High Lift (Distribution) Pumps	None	3 pumps located in pump house
Treatment / Disinfection	Sodium Hypochlorite System	Sodium Hypochlorite System
Standby Power	Diesel Generator	Diesel Generator and Diesel Pump
Treated Water Storage	Elevated Tank	None
Watermain Diameters (mm)	150 – 400 (majority is 150)	150 – 250 (majority is 150)
Watermain Total Length (km)	12	12

Source: Veolia Water (2021b)

Table 3-5: DWS System Capacity

	Mildmay	Teeswater
Pump capacity	19 L/s x 2	25 L/s x 3
Permit to Take Water (PTTW) Maximum Daily Flow	1,600 m^3/day (19 L/s) per well	1,600 m^3/day (18.5 L/s)
PTTW maximum flow	1,260 L/min (21 L/s) per well	3,900 L/min (65 L/s)
Treated Water Storage Capacity	1,000 m^3	None

Source: MECP (2014a and b), Veolia Water (2021b), BM Ross (2019)

Table 3-6: DWS Existing Service Level

	Mildmay	Teeswater
Number of properties with water service	555	478
Estimated population with water service	1,277	1,004
2018-2020 Average Daily Flow	561 m³/day	392 m³/day
2018-2020 Average of Annual Maximum Daily Flow	1,195 m³/day	821 m³/day
% of PTTW Maximum Daily Flow Limit	75%	51%
Average Demand per Capita[1]	439 L/d	390 L/d
Actual Maximum Day Peak Factor	2.3	2.1
Assumed Peak Rate Factor[2]	3.75	3.75
Estimated Peak Flow	24.3 L/s	17.0 L/s
Treated Water Storage Requirement for Existing Conditions[3]	979 m³	833 m³

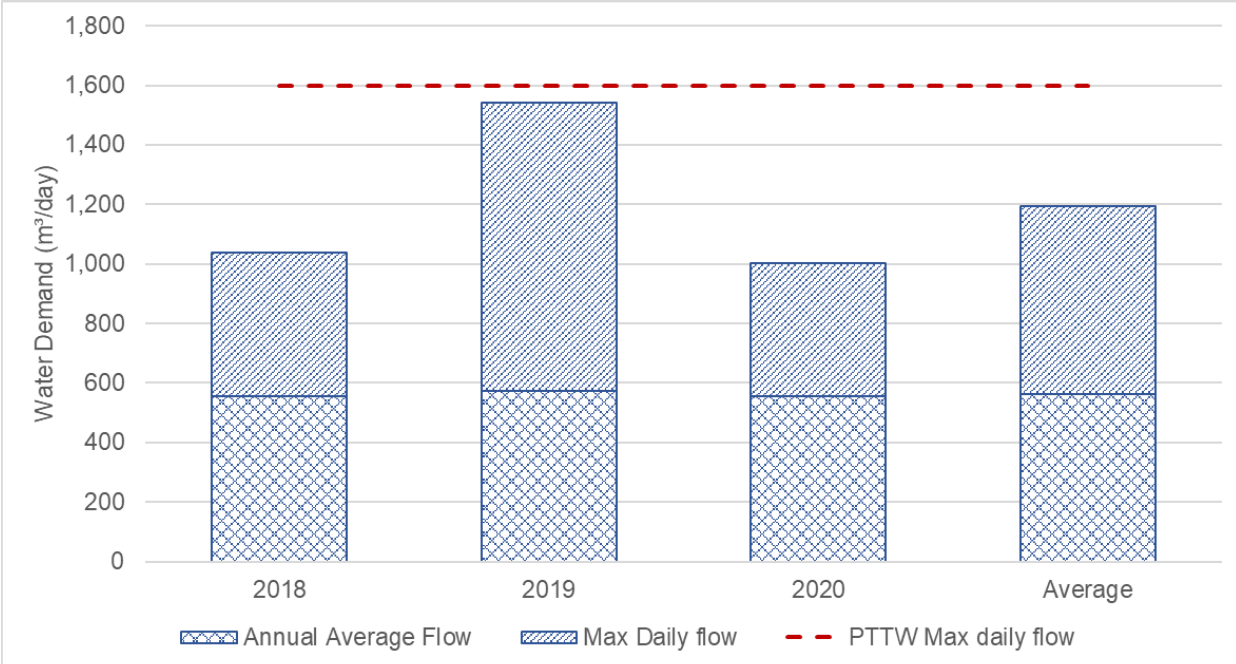
Source: Veolia Water (2021b). Customer data from MSB.

Based on actual water demands in recent years (**Figure 3-1** and **Figure 3-2**), both systems currently operate within the Permit to Take Water (PTTW) and pump capacities. The volume of treated water storage provided by the Mildmay system meets Ontario Ministry of the Environment, Conservation and Parks (MECP) standards (MECP, 2008b) for fire protection and domestic water supply.

Because the Teeswater system has no treated water storage, the 'firm capacity' of the system is assessed with the two largest pumps out of service. The firm capacity is therefore 25 litres per second (L/s). This is sufficient to meet current peak domestic/commercial demands but does not provide the MECP's suggested fire flow of 64 L/s[4]. The Teeswater system would therefore require additional pumping capacity or treated water storage to be considered to provide adequate municipal fire protection.

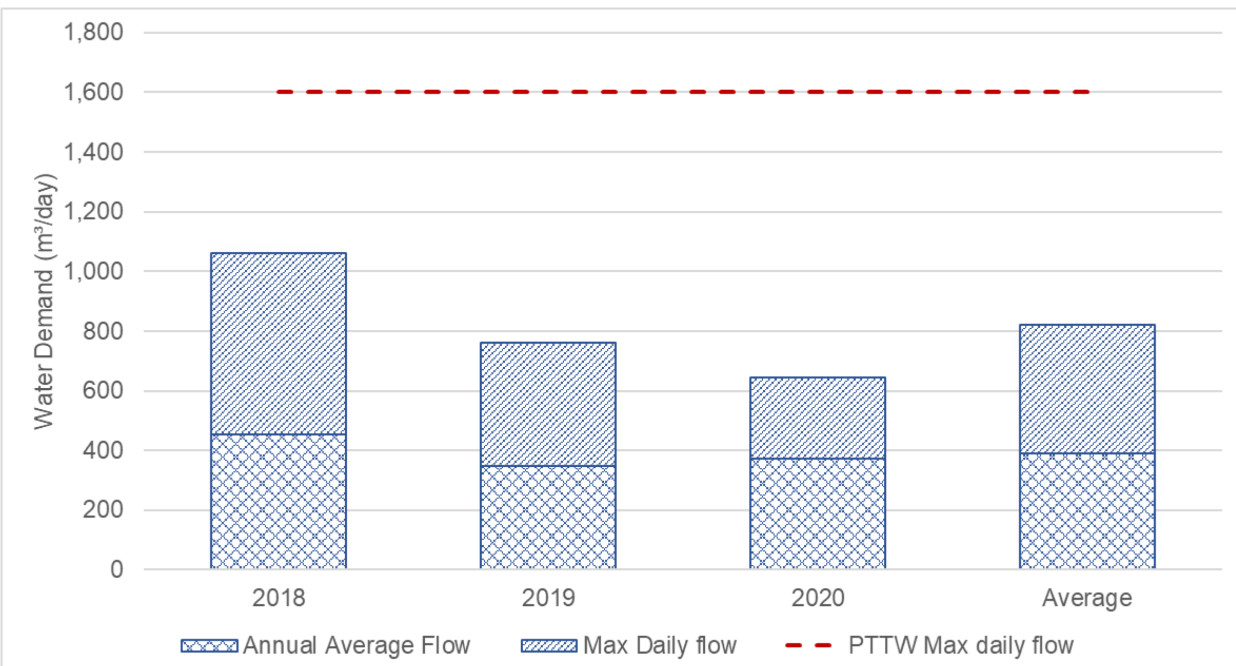
The existing Teeswater well is located within the regulatory floodplain established by the Saugeen Valley Conservation Authority, presenting a significant threat to water quality and reliability during flood events.

[1] Inclusive of industrial, commercial and institutional use, and non-revenue water
[2] From *Design Guidelines for Drinking Water Systems (MECP, 2008b*) Table 3-1
[3] Following *Design Guidelines for Drinking Water Systems (MECP, 2008b)* methodology
[4] From *Design Guidelines for Drinking Water Systems (MECP, 2008b)* Table 8-1



Source: Veolia Water (2021b).

Figure 3-1: Historical Water Demands in Mildmay



Source: Veolia Water (2021b). Customer data from MSB.

Figure 3-2: Historical Water Demands in Teeswater

Construction of two new wells (outside the regulatory floodplain) and a 1,191 cubic metres (m^3) elevated tank has previously been recommended to improve the redundancy and capacity of the

Teeswater DWS (BM Ross, 2019). The proposed tank size was selected to be sufficient for future population growth. Joint federal and provincial funding for this project was announced in April 2022, through the Green Infrastructure Stream of the Investing in Canada Infrastructure Program.

The MSB has commenced a study to plan servicing expansion to new development lands in Teeswater and Mildmay. It is understood that an outcome of this study will be to recommend upgrades to existing infrastructure where necessary to enable the servicing of the development lands. The scope of the study includes water, sanitary and stormwater infrastructure, and both linear and vertical assets. Planning for expansion of water service to Formosa does not form part of the scope of the study. Completion of the study is anticipated to be in fall 2022.

3.2.3 Sanitary Sewage

Sanitary sewage service is provided by the MSB in Mildmay, Teeswater and Formosa. Sewage in Mildmay is collected by a gravity sewer system and then pumped to Mildmay Wastewater Treatment Plant (WWTP). Refer to **Exhibit 1** (**Appendix C**) for locations.

Formosa is served by a combination of gravity sewers and a low-pressure sanitary sewer system, with connections serviced by grinder pumps at individual service locations. A central pumping station conveys sewage via a 9 kilometre (km) forcemain and gravity sewers to the Teeswater WWTP. This WWTP also receives sewage from gravity sanitary sewers servicing Teeswater, notably including dairy waste from Gay Lea Food Co-operatives Limited and brewery waste from Brick Brewing Ltd (not currently operating).

Table 3-7 describes the components of each sewage collection system. **Table 3-8** and **Table 3-9** provide a summary of the capacity and recent performance of each WWTP. **Figure 3-3** and **Figure 3-4** illustrate inflows received by the WWTP's in 2019 and 2020.

As indicated by **Figure 3-4**, industrial contributions make up the bulk of flows to the Teeswater WWTP (an average of 65% of flows).

Table 3-7: Sewage Collection and Treatment System Components

	Mildmay	Teeswater-Formosa
Pumping Stations	2	6
Sewer Diameters (mm)	200 – 350 (majority is 200)	75 – 300 (majority is 200; 75 mm sewers are within Formosa low-pressure system)
Sewer Total Length (km)	14	Teeswater: 14.3 Formosa: 5.1 Formosa forcemain: 9.4
WWTP Type	Extended Aeration	Sequencing Batch Reactor
WWTP Rated Capacity	966 m^3/day	1350 m^3/day
Number of Residential Units with Sanitary Sewer Service	538	Teeswater: 466 Formosa: 165
Estimated Population with Sanitary Sewer	1,237	Teeswater: 979 Formosa: 380
Average Day Flow per Capita[5]	360 L/d	210 L/d

Source: MECP (2014c and d), Veolia Water (2021a and c).

Table 3-8: Mildmay WWTP Performance

		2019	2020
Inflow (m^3/day)	*Rated Capacity*	966	966
	Annual Average	484	408
	Maximum Monthly Average	681	621
	Max Daily Flow	1369	1622
Effluent Monthly Average Carbonaceous Biochemical Oxygen Demand (CBOD) (mg/l)	*Objective*	15.0	15.0
	Limit	25.0	25.0
	Maximum Monthly Average	3.0	4.0
Total Suspended Solids (TSS) (mg/l)	*Objective*	15.0	15.0
	Limit	25.0	25.0
	Maximum Monthly Average	3.0	12.0
Phosphorous (mg/l)	*Objective*	0.8	0.8
	Limit	1.0	1.0
	Maximum Monthly Average	0.49	0.62
Nitrogen (mg/l)	*Objective*	3.0	3.0
	Limit	8.0	8.0
	Maximum Monthly Average	0.09	0.11
Bypass Events		0	0

Source: Veolia Water (2021a).

[5] Inclusive of industrial, commercial and institutional (IC&I) flows, and inflow/infiltration

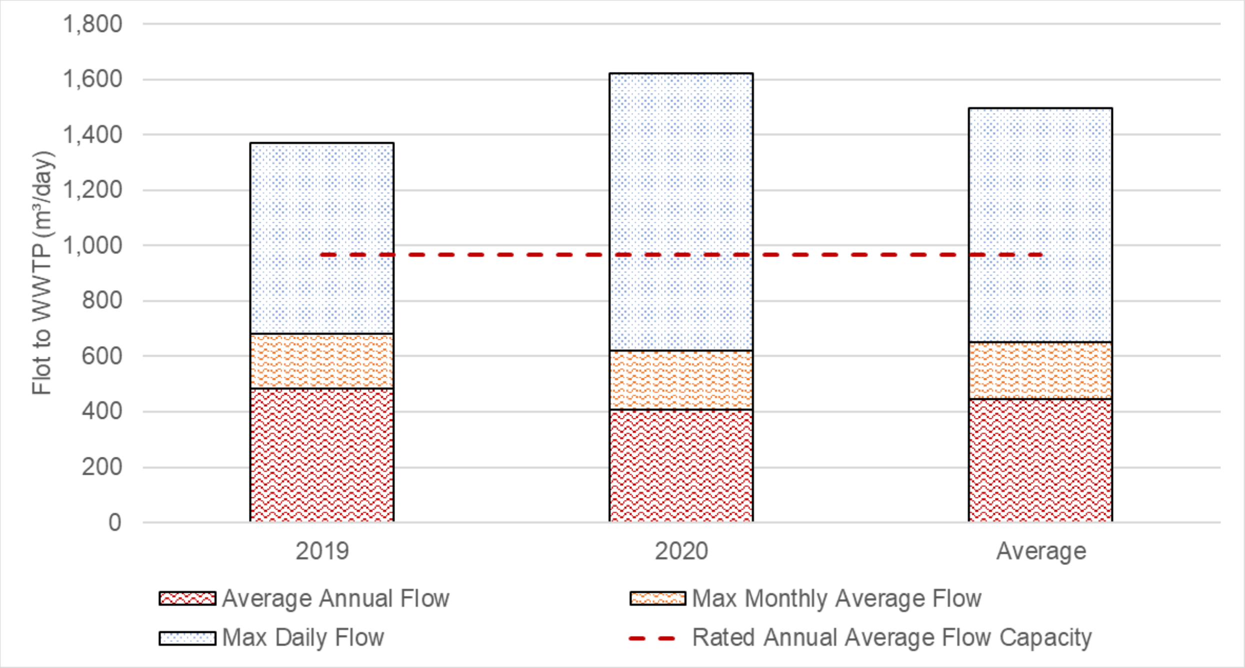


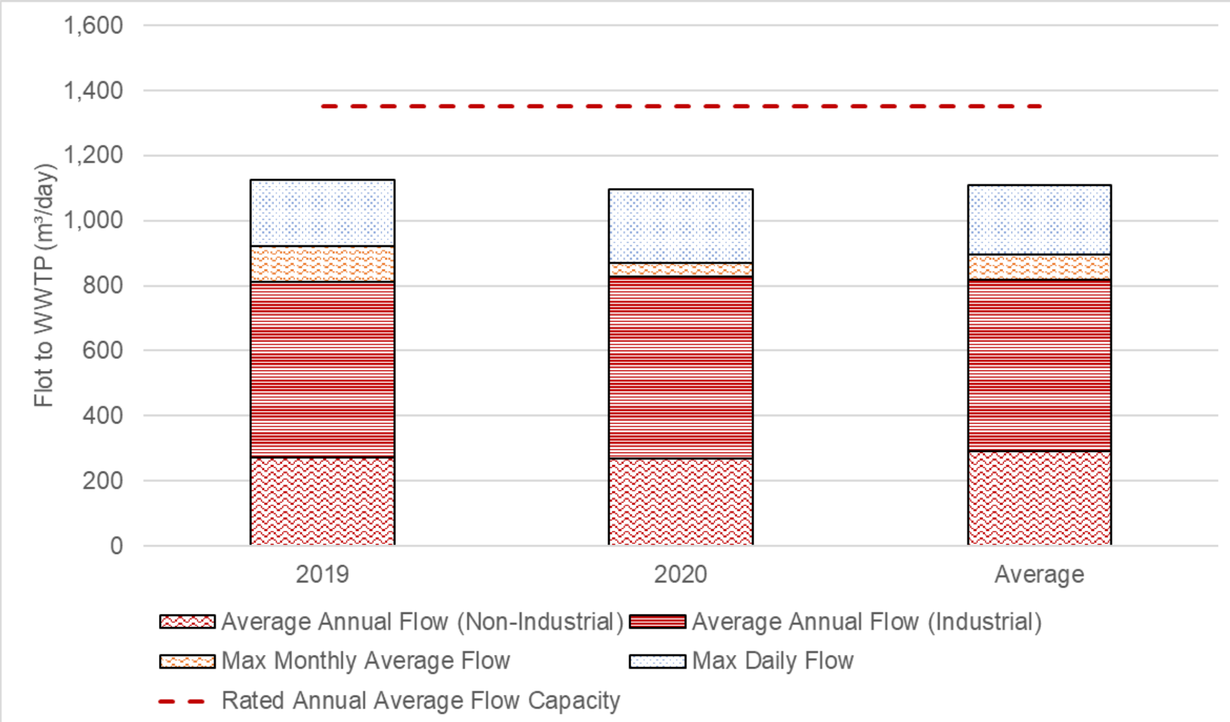
Figure 3-3: Existing Mildmay WWTP Inflows

Table 3-9: Teeswater WWTP Performance

		2019	2020
Inflow (m^3/day)	*Rated Capacity*	1350	1350
	Annual Average	810	827
	Maximum Monthly Average	921	869
	Max Daily Flow	1124	1095
Influent Loading (kg/day)	*Design Capacity*	900	900
	Annual Average	572	607
	Maximum Monthly Average	957	867
Effluent Monthly Average CBOD (mg/l)	*Objective*	5.0	5.0
	Limit	10.0	10.0
	Maximum Monthly Average	4.0	4.0
TSS (mg/l)	*Objective*	5.0	5.0
	Limit	10.0	10.0
	Maximum Monthly Average	8.0	6.0
Phosphorous (mg/l)	*Objective*	0.10	0.10
	Limit	0.15	0.15
	Maximum Monthly Average	0.20	0.13
Nitrogen (mg/l)	*Objective* *May 1 – Nov 30* *Dec 1 to Apr 30*	 1.0 2.0	 1.0 2.0
	Limit	3.0	2.0
	Maximum Monthly Average	4.55	0.13
Bypass Events		0	0

Source: Veolia Water (2021c).

Legend: Red — Limit exceeded
Amber — Objective exceeded



Source: Veolia Water (2021c).

Figure 3-4: Existing Teeswater WWTP Inflows

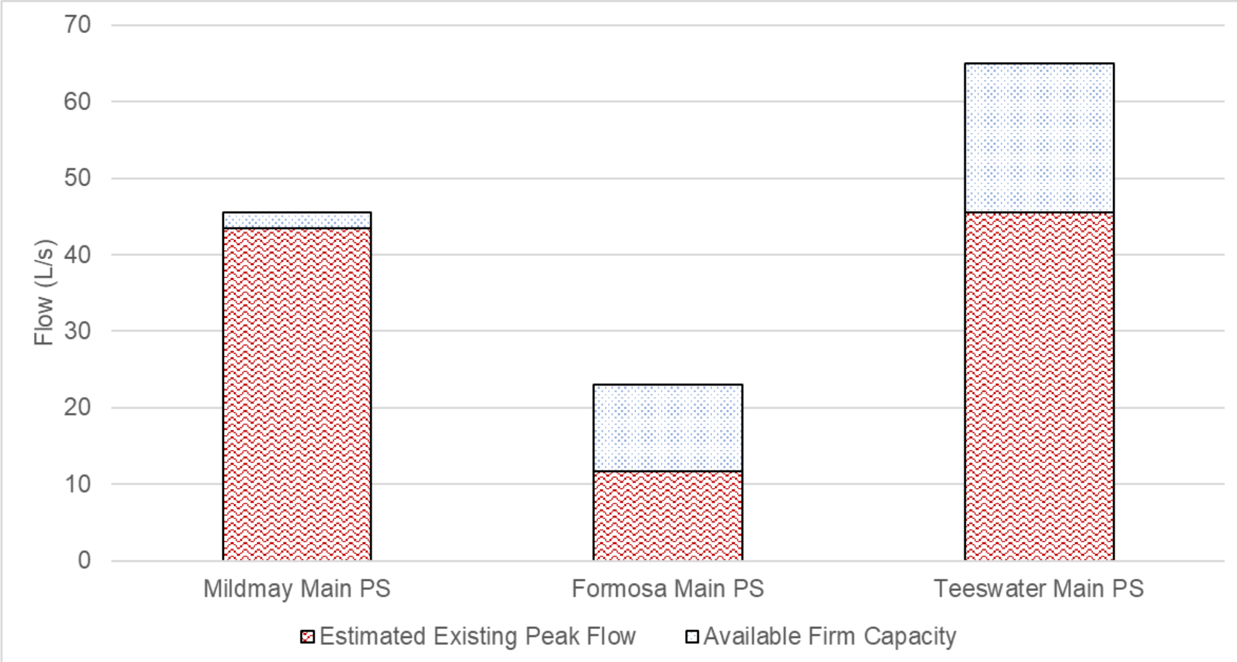
The primary limitation of the Teeswater WWTP capacity is Biological Oxygen Demand (BOD) loading (from high strength sewage), rather than sewage quantity (flow). The BOD loading exceeded the design capacity at times during 2019 and continues to be close to capacity. The high loading is likely the cause of the effluent objective and limit exceedances noted in **Table 3-9**.

The Mildmay WWTP is operating satisfactorily with no effluent objective or limit exceedances during 2019-2020. It is noted that the WWTP received maximum daily inflows that are significantly higher than the average inflows. This is likely to be the result of high inflow and infiltration of rainwater to the sanitary sewers, typically due to catch basins and roof leaders connected to sanitary sewers, or infiltration into deteriorated sewer pipes.

Each community is served by a main pumping station which pumps all sewage from the community to the site. Maintaining adequate capacity in these main pumping stations is essential to prevent overflows to adjacent watercourses. Peak sewage flows are compared with the firm capacity of each pumping station in **Figure 3-5**.

In the absence of flow monitoring data, these peak sewage flows were estimated assuming:

- Inflow and infiltration allowance of 0.28 litres per hectare per second (L/ha.s)
- Peak factor of 2.0 assumed for flows from Gay Lea Food Co-operatives Limited to Teeswater Main pumping station
- Peak factor estimated using Harmon Equation for all other flows



Source: Veolia Water (2021a and c).

Figure 3-5: Estimated Sewage Flows to Main Pumping Stations

The MSB has initiated a Class Environmental Assessment (EA) to study alternatives for the expansion of the Teeswater WWTP, with the intent to start construction in fall 2022. The Class EA will propose a 30% increase in flow capacity and a 100% increase in BOD loading capacity.

As described in **Section 3.2.2**, the MSB has commenced a study to plan servicing expansion to new development lands in Teeswater, Mildmay and Formosa. The scope of the study includes planning for expansion and upgrades of sanitary sewage infrastructure, beyond the immediate need to expand the Teeswater WWTP.

3.2.4 Stormwater/ Drainage

Drainage in most areas of Mildmay, Teeswater and Formosa is provided by catch basins and storm sewers which outlet to local watercourses/rivers. Stormwater management quantity control (attenuation of peak flows) and/or quality control (removal of suspended solids) is only provided for areas which have been newly developed or redeveloped within approximately the past decade. These include:

- Oil/grit separator providing quality control for 6.4 hectares (ha) of the Elora Street drainage area in Mildmay (approximately 1st Street to Vincent Street)
- Stormwater management facility (dry pond) and enhanced grass swale providing quantity and quality control for the 6.9 ha Noeckerville Hill Subdivision, under construction in Mildmay
- Stormwater management facility (dry pond) providing quantity control for 4.2 ha of the Teeswater Industrial Lands site (located on County Road 4)

These facilities provide stormwater management for approximately 15% of developed lands in Mildmay, and 5% of developed lands in Teeswater. There are no stormwater management facilities in Formosa.

Current regulatory requirements require stormwater management to be provided for most new development. As described in **Section 3.2.2**, planning of stormwater management and drainage for new development lands in Teeswater, Mildmay and Formosa forms part of the scope of the servicing study currently in progress by the MSB.

No retrofits of stormwater management for existing developed lands in the Study Area are currently proposed.

3.2.5 Solid Waste

3.2.5.1 Municipal Landfills

The MSB owns and operates two municipal landfills: the Mildmay-Carrick Landfill and the Teeswater-Culross Landfill. **Table 3-10** shows how these landfills are currently serving the MSB population. The landfill locations are shown in **Exhibit 1 (Appendix C)**.

Table 3-10: MSB Landfills

	Mildmay-Carrick Landfill	Teeswater-Culross Landfill
% of Total Population[6] Disposing Waste to each Landfill	56%	44%
Estimated Population Serviced by Landfill	3,473	2,777
Average Waste Disposal Rate (tonnes/year)	335	973

The Teeswater-Culross Landfill operates a weigh scale facility that records incoming waste tonnage. Based on 2019 and 2020 scale records, the average waste disposal rate for the landfill is 973 tonnes/year. The Mildmay-Carrick Landfill does not have a weigh scale facility and therefore an exact disposal rate is not known. The average waste disposal rate was estimated to be 335 tonnes/year using the landfill's reported five-year average fill rate and a waste compaction rate of 400 kilograms per cubic metre (kg/m^3). The average waste disposal rate (tonnes/year) is higher for the Teeswater-Culross Landfill due to operational restrictions imposed by the MSB on the Mildmay-Carrick Landfill.

Table 3-11 presents the estimated remaining site capacity of the Mildmay-Carrick Landfill and the Teeswater-Culross Landfill[7].

[6] The landfill capacities were estimated as of January 2021 based landfill reports authored by GM BluePlan Engineering Limited (2021, February and May).
[7] The landfill capacities were estimated as of January 2021 based landfill reports authored by GM BluePlan Engineering Limited (2021a and b)

Table 3-11: Landfill Capacity

	Mildmay-Carrick Landfill	Teeswater-Culross Landfill
Remaining Landfill Life (years)*	29.7	18.5
Remaining Landfill Capacity (m^3)*	31,150	51,270
Estimated Population serviced by landfill	3,473	2,777
Calculated Per-Capita Waste Disposal Rate (tonne/capita/year)	0.11	0.35
Average Waste Disposal Rate (tonnes/year)[8]	335	973
Estimated waste compaction rate (kg/m^3)	400	439

* Landfill capacity remaining for waste and daily/interim landfill cover only. Lifespan estimates based on the 2020 waste generation rate, compaction rate, and population. Landfill capacity for the Teeswater-Culross Landfill reflects the expansion volume as per the amended Environmental Compliance Approval dated March 7, 2022.

As of January 2021, the Mildmay-Carrick Landfill and Teeswater-Culross Landfill have 29.7 years and 18.5 years respectively of landfill life remaining. Note that these calculations are based on the 2020 MSB population and waste generation rate. The expected baseline population increase (without the Project) would reduce the lifespans to 22 years (Mildmay-Carrick Landfill) and 17.5 years (Teeswater-Culross Landfill) years. These lifespans are based on the 5-year average fill rate for each landfill based on periodic surveys of each landfill surface. These fill rates were calculated on a per capita basis to provide future fill rates for the projected populations.

To preserve the MSB landfill capacity, the MSB is actively seeking options to increase waste compaction and reduce airspace consumption. The landfill reports (GM BluePlan Engineering Limited, 2021a and b) have assumed the landfills are currently achieving waste compaction densities of approximately 400 kilograms per cubic metre (kg/m^3).

Figure 3-6 below provided by GM Blue Plan Engineering Limited (2021b) estimates that the combined landfill capacity for MSB would be 20 years continuing at the same compaction rate. However, the use of suitable compaction equipment, and/or improved, efficient and effective use of compaction equipment (i.e., a sheepsfoot compactor) could significantly extend the life of the MSB's landfills. A steel wheeled compactor can achieve waste compaction densities above 600 kg/m^3 which would significantly prolong the life of the landfills. Although no financial analysis has been completed by Morrison Hershfield, it is anticipated that there would be significant benefits associated with greater compaction methods. Landfills are a significant asset for small communities that should be managed well so that they last for as long as possible. Creating new landfills or transferring waste to other communities often results in significantly increased costs over the long term.

[8] Based on a 5-Year Average Waste Disposal Rate provided by GM BluePlan Engineering (2021b), and compaction rate calculated by Morrison Hershfield based on the 2-year average of waste quantities landfilled and a 5-year Average Fill Rate (m^3) provided by GM BluePlan Engineering (2021b).

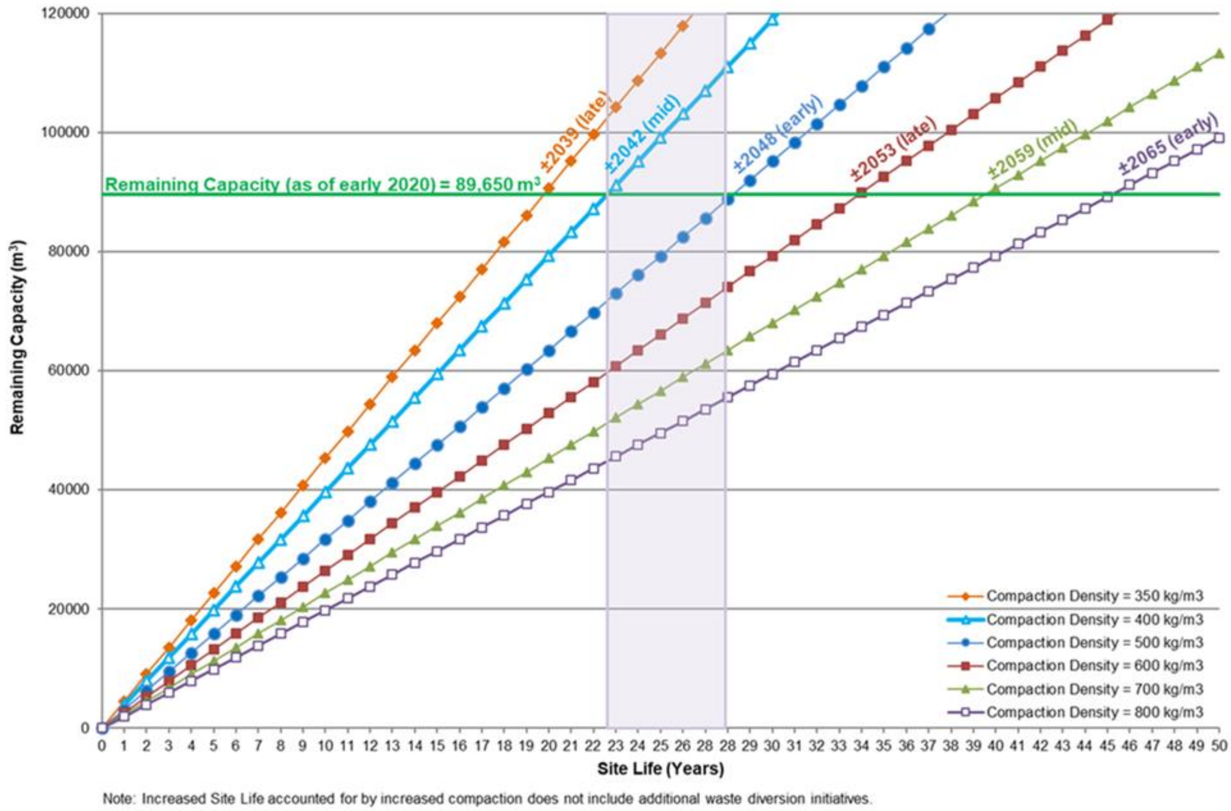


Figure 3-6: Waste Compaction Density versus Estimated Remaining Site Life for MSB's Landfill Sites (Combined)

As shown in **Figure 3-6**, the expected site lifespan of the landfills is projected for each compaction density. The shaded area illustrates the 6-year life extension from 2042 to 2048 when increasing the compaction density from the current 400 kg/m^3 to 500 kg/m^3. This estimate shows that generally each 100 kg/m^3 increase in waste density will provide a 5–6-year lifespan increase.

3.2.5.2 Waste and Recycling Collection

The MSB provides a municipal curbside collection service involving a weekly garbage and bi-weekly recycling pickup for residents living within MSB's urban areas. The MSB's Garbage Bag-Tag Program (also referred to as a Pay-As-You-Throw program) requires residents to purchase tags and attach one tag to each garbage bag at the curb to enable pickup on the collection day.

Curbside collection of recycling is contracted to the Bruce Area Solid Waste Recycling Association. The collection involves recyclables, such as plastics, newsprint, glass, boxboard, and metal containers placed into blue boxes at the curb. Other materials, e.g., electrical and electronic equipment (also referred to as e-waste), scrap metal, tires, mattresses and auto batteries, can be self-hauled by residents to the two municipal landfills. Rural area residents are required to drop off waste and recycling at the municipal landfills. In the fall of 2021, a municipal yard waste collection program for bagged leaves was also offered on two occasions.

The industrial, commercial and institutional (IC&I) sector within the MSB's boundary is responsible for managing its own waste and recycling through use of private waste management service providers. Private service providers haul waste to disposal facilities outside the MSB. Waste of relevance to municipal services is that generated by residential households, and not the IC&I sector.

3.2.6 Electrical Power

Residents and businesses in the Study Area are serviced by HONI or WPI depending on location.

HONI owns and operates 44 kilovolt (kV) distribution infrastructure on County Roads 4 and 9 which brings electricity into the area from transformer stations in Wingham, Hanover and Douglas Point. Lower voltage distribution infrastructure services Formosa and the rural parts of the Study Area. HONI also owns and operates 230 kV transmission lines which run north-south through the Study Area, approximately 2.9 km east of County Road 4. There are no connections from these transmission lines within the Study Area. HONI indicated that there are currently no capacity concerns or notable service gaps within the Study Area.

Teeswater and Mildmay are serviced by WPI owned and operated distribution networks, which receive electricity from HONI 44 kV infrastructure.

Exhibit 1 (Appendix C) illustrates the locations of the existing infrastructure.

HONI has an ongoing demand forecasting process which informs technical planning for the distribution system. Alongside population growth, current trends which have a significant impact on demand forecasts include:

- Development of large-scale agricultural greenhouses for cannabis growth (although relatively few projects have actually been constructed to date)
- EPCOR Southern Bruce Project (conversions from electric to natural gas heating are anticipated)
- Increasing electric vehicle charging demands (though impacts in South Bruce are likely lag significantly behind urban centres)

HONI regularly services new medium-scale residential developments (e.g., 50 to 150 subdivision lots). The distribution system typically has sufficient capacity to service development on this scale without immediate off-site upgrades. Larger developments, such as a 1,400-lot subdivision currently under development in Port Elgin, are likely to require infrastructure upgrades, and therefore a 5-year or longer planning process should be anticipated.

No significant electrical infrastructure upgrades or expansions are currently underway or planned within the Study Area.

3.2.7 Natural Gas

Following the acquisition of Union Gas in 2018, Enbridge holds the franchise for natural gas servicing in the MSB (refer to **Exhibit 1** in **Appendix C**). Enbridge natural gas infrastructure provides services in the settlement areas of Mildmay, Teeswater and Formosa. Information regarding the exact geographic extent of natural gas servicing was not made available by Enbridge.

Until recently natural gas service was not available in the regions north and west of the Study Area, such as Chesley, Paisley, Tiverton, Kincardine, Point Clark and Lucknow. The Southern

Bruce Project recently completed by EPCOR has extended natural service to these previously un-serviced areas.

Enbridge indicated that they will continue regular rate customer growth connections to the natural gas system. Information regarding specific existing infrastructure expansion plans and needs was unavailable from Enbridge.

EPCOR's Southern Bruce Project pipeline has capacity to service additional populations (i.e., growth in existing service areas and/or extension to new service areas). EPCOR is actively seeking and obtaining Ontario Energy Board (OEB) changes to the 'Certification of Public Convenience and Necessity' to extend service to locations that are within Enbridge's franchise area but are not currently serviced by Enbridge. For example, EPCOR is extending service to un-serviced areas of Brockton.

3.2.8 Telecommunications

Wired telecommunications services in the Study Area are provided by Wightman Telecommunication and Rogers Communications. Wightman is a family-owned company with a 155-year history of servicing the South Bruce area. The region is relatively unique in Ontario, in being serviced by several smaller privately-owned firms such as Wightman, Bruce Telecom and Hurontel. These firms were established to satisfy a local demand for telephone services, at a time when Bell was focused on servicing major urban centres. Legislation under the Competition Act now largely precludes acquisition of these firms by national providers, and the high cost of infrastructure prevents others from establishing competing wired services in rural areas.

Wired telephone and basic wired internet services are available along most rights-of-way throughout the Study Area. High-speed internet[9] is limited to locations with fibre-to-the-home (FTTH) infrastructure. Wightman began installing FTTH in Teeswater in approximately 2017 and has recently extended this service to Formosa with the first customer connected in February 2022. FTTH installation in Mildmay is expected in spring/summer 2022 and is being completed through the Southwestern Integrated Fibre Technology (SWIFT) project.

Rogers also provides FTTH services within Teeswater.

Fixed wireless and satellite internet services are available from providers such as Hurontel and Xplornet provide an alternative to wired services with moderate (not high-speed) service.

Other than along fibre-optic cable routes between communities, rural areas do not currently have access to high-speed internet. **Exhibit 2** in **Appendix C** illustrates internet speeds currently available across the Study Area.

Federal and provincial funding programs such as Connecting Canadians have been developed to encourage further expansion of high-speed internet, in particular to rural populations. Near-term further expansion of high-speed internet infrastructure in the Study Area is likely to be primarily via fixed wireless and satellite infrastructure.

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[9] Typically considered to be a minimum of 50 megabits per second (Mbps) download and 10 Mbps upload (Innovation, Science and Economic Development Canada)

4 RELEVANT ADAPTIVE PHASED MANAGEMENT PROJECT CHARACTERISTICS

4.1 Project-associated Population Growth

The Project will require a locally based workforce from the pre-construction phase onwards. The NWMO's projected workforce requirement (October 2021) is summarized in **Table 4-1**.

Table 4-1: Project Workforce Projection

Phase	Total Workforce (Full Time Equivalent)
Pre-construction (2023 - 2032)	200
Construction (2033 - 2042)	640
Operations (2043 - 2088)	700

The *South Bruce and Area Growth Expectations* (metroeconomics, 2022) presents expected population growth within the Study Area resulting from the Project. These expectations consider direct, indirect and induced population growth. **Table 4-2** indicates the expected population growth (additional to the baseline growth described in **Section 3.1**) and **Table 4-3** indicates the associated number of new homes required in the Study Area.

Table 4-2: Expected Impact of Project on MSB Population

Year	Phase	Base Case	Impact Case		
		Population in MSB, total	Additional population in MSB	Population in MSB, total	New population in MSB, cumulative
2021	Current	6,250	0	6,250	0
2031	Pre-construction	7,420	200	7,620	+1,370
2041	Construction	8,400	640	9,040	+2,790
2046	Operations	8,760	780	9,540	+3,290

Table 4-3: Expected Impact of Project on MSB Dwellings

Year	Phase	Base Case	Impact Case		
		Dwellings in MSB, total	Additional dwellings required in MSB	Dwellings in MSB, total	New dwellings in MSB, cumulative
2021	Current	2,360	0	2,360	0
2031	Pre-construction	2,850	70	2,920	+560
2041	Construction	3,200	200	3,400	+1,040
2046	Operations	3,300	250	3,550	+1,190

Figure 4-1 illustrates the resulting population growth in the Study Area. A notable impact of the Project is that full build-out of the existing settlement areas is projected to occur in 2041, approximately five years earlier than would otherwise be the case.

For the purposes of this Report, it has been assumed that new housing development will continue beyond the full build-out scenario. Whether this occurs through intensification or expansion of settlement areas does not significantly affect the conclusions of this study.

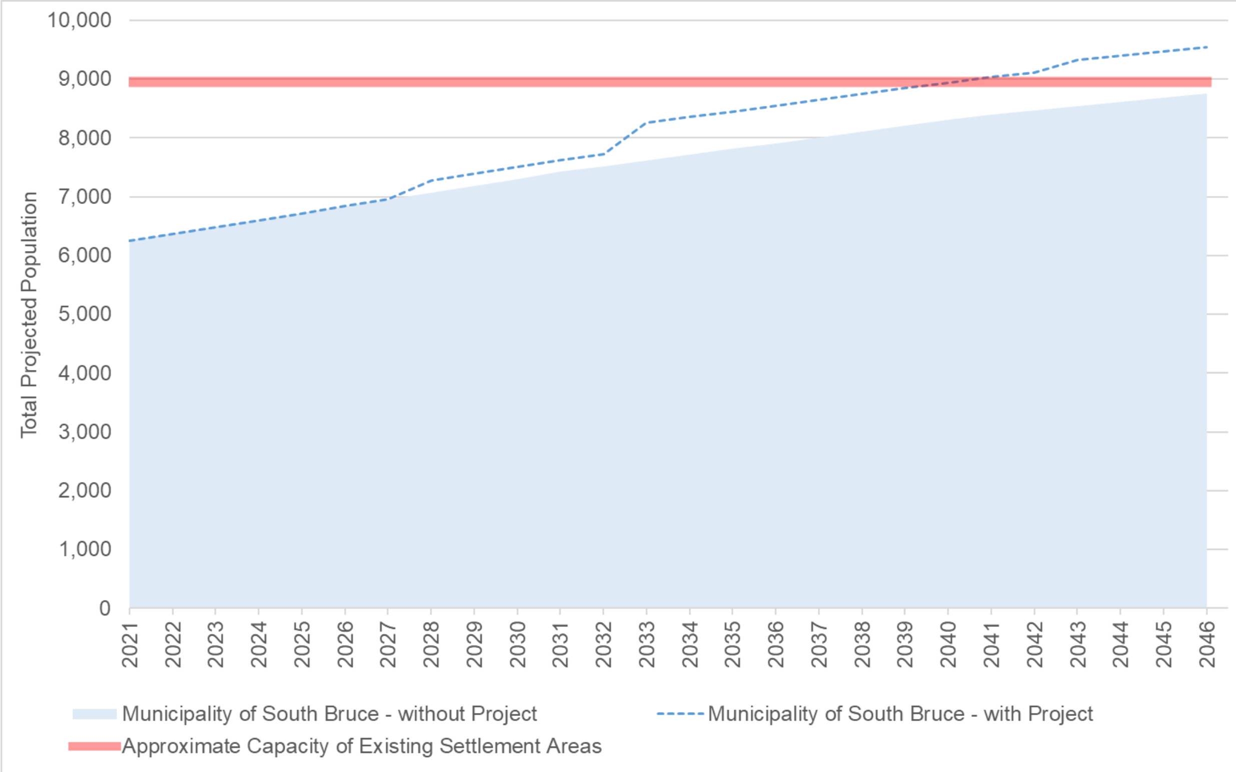

Figure 4-1: Expected Population in the MSB (with Project)

4.2 Centre of Expertise

In addition to the on-site DGR Facility, the NWMO intends to develop a Centre of Expertise. NWMO (October 2021) estimates that a portion of the total workforce (**Table 4-1**) will work at the Centre, as indicated in **Table 4-4**:

Table 4-4: Centre of Expertise Projected Workforce

Phase	Total Workforce (Full Time Equivalent)
Pre-construction (2022 - 2033)	180
Construction (2033 - 2043)	170
Operations (2043 - 2089)	120

The Centre of Expertise is envisaged to be an office building or small campus. The exact location for the Center of Expertise has not yet been determined, however it will be located in MSB. The Centre of Expertise could be located on the potential Project site, in the rural area or within one of the three settlement areas in MSB. The Centre will require normal building services (electrical power, water, sanitary sewage, natural gas, solid waste collection and telecommunications including high-speed internet).

4.3 Industrial, Commercial and Institutional (IC&I) Growth

The per-capita water demands and sanitary sewage flow rates, and other infrastructure requirements discussed in **Section 3** incorporate the existing IC&I contribution to infrastructure requirements. Where IC&I growth is proportional to population growth, application of existing per capita water demands and sanitary sewage flow rates to future populations is sufficient to account for future IC&I infrastructure requirements. Examples of proportional growth would be a new school servicing a catchment area within the municipality, or stores that open to serve the residents of new housing developments. However, it is anticipated that the Project will be accompanied by significant efforts to attract and promote the growth of supporting industries and commercial enterprises to the Study Area. If realized, this growth may be disproportionate to the population growth anticipated by the *South Bruce and Area Growth Expectations* (metroeconomics, 2022), and could result in additional infrastructure demands.

IC&I infrastructure needs vary greatly depending on the type of operation. For example, office-based enterprises have moderate water, sanitary sewage and electrical demands, but provision of high-speed internet is typically critical. Warehouse facilities typically have minimal infrastructure demands unless heated or chilled. Industrial operations may have high demands for gas, electricity or water.

Because the extent, location and nature of IC&I growth (beyond proportional growth) is unknown at this time, and because of the variability in potential infrastructure needs, it is not possible establish the effects of such growth in this report. Further study will be needed as more information regarding potential IC&I growth becomes available.

5 PRELIMINARY ANALYSIS/EFFECTS ASSESSMENT

5.1 Analysis of Infrastructure Capacity

5.1.1 Introduction

The following **Sections 5.1.2** to **5.1.8** discuss the potential effects of project-related population and IC&I growth, including the Centre of Expertise, on infrastructure within the study area. **Sections 5.2** and **5.3** discuss the infrastructure requirements of the DGR Facility, and potential options for provision of this infrastructure.

In preparing this Report it has generally been assumed that as demands on infrastructure increase, the infrastructure service providers will either take the necessary measures to expand/upgrade the infrastructure, or housing development will stall until such time as the infrastructure is ready. This aligns with the normal development approval processes, whereby urban land development is not approved if municipal services are not in place, and utilities cannot be connected if there is insufficient capacity. Potential effects of overloading infrastructure (blackouts, low water pressure, etc.) are therefore not considered realistic scenarios and are not discussed.

It is anticipated that all new housing will be provided with municipal services (water, wastewater and solid waste collection), with the possible exception of water servicing in Formosa as discussed in **Section 5.1.2**.

5.1.2 Water

Based on actual per capita water consumption and peak factors for the period 2018 to 2020, the maximum serviceable population has been calculated for each DWS:

Table 5-1: DWS Serviceable Population

		Mildmay	Teeswater
2021 Serviced Population (Est.)		1,277	1,004
Maximum Serviceable Population	PTTW Limit (Max. Day Demand)	1,710	1,955
	Peak Hour Demand	Not applicable because Elevated Treated Water Storage Provided	1,476 *No longer a limiting factor if elevated tank constructed*
	Treated Water Storage Limit	1,450	0 *1,877 if proposed elevated tank constructed*
Population increase that can be serviced by existing infrastructure		173	472 (without fire service) *873 (with fire and drinking water service) if proposed elevated tank constructed*

The Mildmay DWS has capacity for an approximate additional 173 residents before additional treated water storage will be required. The metroeconomics (2022) growth expectations suggest that in the base case the entire Study Area will initially see population increases of 120 persons per year, gradually falling to 70 persons per year later in the study period. Considering the Noeckerville Hill Subdivision currently under development in Mildmay, in the short-term much of the Study Area growth is likely to be realized in Mildmay. Therefore, the DWS could reach capacity as soon as 2024, well before the Project begins to impact populations. The additional treated water storage required could be sized to allow for Project-related growth as well as baseline growth.

The Teeswater DWS currently has capacity for approximately an additional 472 residents, but in the absence of larger pumps or elevated storage can only be considered to provide drinking water service, not fire service. Construction of an elevated tank has previously been recommended to improve the redundancy and capacity of the Teeswater DWS (BM Ross, 2019). If the elevated tank is constructed, the DWS would have capacity for approximately an additional 873 residents. Considering the population expectations described above, this is likely to be sufficient for approximately 8 to 10 years of baseline population growth (i.e., to 2032 to 2042).

The Project is expected to impact populations from the start of the Pre-Construction period in 2028 onwards, starting with an additional 200 residents in the MSB, increasing to an additional 780 residents by 2046. The scale of this growth is sufficient that, depending on the proportion of it that occurs in Teeswater, it would likely reduce the period prior to a further DWS upgrade by a number of years.

The average water demand associated with the Centre of Expertise is estimated to be 13 m³/day. This estimate assumes water consumption of 70 litres per capita per day (L/c.d), typical for office workers, and is equivalent to the water demand of 32 new residents. As such, provision of water servicing to the Centre of Expertise is expected to be feasible without major impact to the DWS, assuming that the Centre of Expertise is located in Teeswater or Mildmay.

It has been assumed that the DGR Facility will be designed and constructed to avoid any impact on the aquifers that provide drinking water to residents of the Study Area. Investigation of this subject is beyond the scope of the current study. The potential for municipal potable water to be supplied for use within the DGR Facility is discussed in **Section 5.3.3** below.

5.1.3 Sanitary Sewage

Table 5-2 provides an estimate of the population that can be serviced by each WWTP. This simplified analysis assumes that Rated Capacity (in terms of average flow) is the only constraint on the capacity of the WWTP's. Peak flows, BOD loading and other factors also impact the ability of a WWTP to achieve effluent objectives and may require minor or major upgrades earlier than indicated by this analysis.

Table 5-2: WWTP Serviceable Population

	Mildmay	Teeswater-Formosa
2021 Serviced Population (Est.)	1,237	1,358
Maximum Serviceable Population (based on average flow only)[1]	2,723	2,877 *4,034 (equivalent population) after proposed 30% flow capacity upgrade*

[1] Likely higher than the actual maximum flow that can be serviced, because operation of a WWTP at 100% capacity is typically not feasible.

The following assumptions have been made:

- Flow from the existing serviced population is calculated using the recorded per capita flow rates (**Table 3-7**), which include the influence of existing IC&I contributors (most significant in Teeswater)

- Flow from the future population is calculated using an industry-standard per capita flow rate of 350 L/c.d

The Mildmay WWTP has capacity to service almost an additional 1,500 residents. This would be sufficient to accommodate all of the population growth expected in the Study Area over the next decade, including Project-related growth. Inflow and infiltration causing high wet weather peak flows (described in **Section 3.2.3**), may need to be addressed to enable the entire theoretical capacity of the WWTP to be utilized.

Despite flows significantly lower than the Rated Capacity, the Teeswater-Formosa WWTP is currently close to capacity due to BOD loading. It is understood from MSB that the original 1350 m^3/d Rated Capacity was intended to provide approximately 800 m^3/d capacity for non-industrial flows, with the remaining capacity allocated to industrial flows. Of the 800 m^3/d capacity intended for non-industrial flows, the MSB estimates that only approximately 250 m^3/d is currently utilized by non-industrial flows. All other flows are industrial.

The currently proposed upgrade will address BOD loading constraints, as well as increasing the Rated Capacity by 30%. This is intended to reinstate the original non-industrial allocation as well as providing an additional allocation for industry. The upgrade has been planned with a horizon of 20-25 years.

Assuming that the expansion provides (or reinstates) approximately 550 m^3/d of capacity for new non-industrial flows, it is estimated that the WWTP will have capacity to service a population increase of 1,500. Similar to the Mildmay WWTP, this would be sufficient to accommodate all of the population growth expected in the Study Area over the next 15 to 20 years, including Project-related growth. Considering that it is unlikely that growth would be solely limited to Teeswater and Formosa, this indicates that the sizing of the proposed expansion is in line with best practices: the Design Guidelines for Sewage Works (MECP, 2008a) recommend that WWTPs should be designed to accommodate 20 years of population growth. This recommendation considers the typical outcome of capital budgeting analysis (the trade-off between the better value of a larger WWTP expansion verses the increased cost of borrowing) and the typical lifecycle of WWTP components.

The average sewage flow from the Centre of Expertise is estimated to be 13 m^3/day. This estimate assumes sewage flow of 70 L/c.d, typical for office workers, and is equivalent to the sewage flow of 36 new residents. As such, provision of sanitary sewage servicing to the Centre of Expertise is expected to be feasible without major impact to the Teeswater WWTP.

As described above, specific allocations have been made for industrial flows to the Teeswater WWTP. Other IC&I contributions (such as schools, community facilities, shops, offices, small-scale industry, etc.) are not expected to significantly affect WWTP capacity, provided that IC&I growth is not disproportionate to population growth (refer to discussion in **Section 4.3** above).

The existing flow to the main sewage pumping station in each community has also been calculated and is presented in **Table 5-3**. The assumptions used in this analysis are similar to those noted above, plus:

- Inflow and infiltration allowance of 0.28 L/ha
- Service area pro-rated for increasing population
- Peak factor of 2.0 assumed for flows from Gay Lea Food Co-operatives Limited to Teeswater Main pumping station

- Peak factor estimated using Harmon Equation for all other flows

This analysis is preliminary and was not calibrated using existing pumping station performance/monitoring data.

Table 5-3: Main Sewage Pumping Station Serviceable Population

	Mildmay	Formosa	Teeswater
2021 Serviced Population (Est.)	1,237	380	979
Maximum Serviceable Equivalent Population	1,301	688	1,643

The analysis suggests that the Mildmay main pumping station will require an upgrade in the near future.

Considering baseline growth expectations of 70 to 120 people per year in the Study Area, the Teeswater main pumping station likely has sufficient capacity to accommodate at least 5-10 years of growth. This could be reduced by Project-related growth, including the Centre of Expertise and potential conveyance of DGR Facility wastewater via this pumping station as described in **Section 5.3.4**.

The scope of pumping station capacity upgrades varies depending on the existing equipment and the scale of upgrade needed. Work required can range from simply replacing pump impellers, to pump replacement, electrical equipment upgrades, installation of a larger wet well, or piping changes. Forcemains may also require capacity upgrades, often completed by installing a new 'twin' forcemain.

5.1.4 Stormwater/ Drainage

Drainage systems will be expanded incrementally as new lands are developed. The Project will increase the pace of development but will not otherwise impact requirements for new drainage infrastructure.

New subdivision-type development will require stormwater management facilities in accordance with current regulatory requirements. Stormwater management facilities are often designed and constructed to service individual subdivisions, though there can be economic and land use benefits to developing drainage and stormwater management master plans which facilitate sharing of facilities between subdivisions.

5.1.5 Solid Waste

5.1.5.1 Waste and Recycling Collection

As described in **Section 3.2.5.2**, the MSB provides municipal curbside collection for garbage recycling to residents living within MSB's urban areas. Rural area residents, which make up almost half of the current population, are required to drop off waste and recycling at the municipal landfills.

Regardless of whether the Project moves forward, MSB's growing population will require expanded collection services, such as more equipment (e.g., trucks) to continue the service at current levels. This need is projected to increase as residential growth continues in urban areas.

The Project will result in population increases that will impact existing municipal waste and recycling collection service. The MSB population is assumed to primarily increase in urban areas, where current collection service would require expansion. Collection services can typically be adjusted by optimizing collection routes, procuring more equipment (e.g., collection trucks), or by revising collection contracts to cater for population growth. As there is limited capital infrastructure involved in waste and recycling collection, the impacts on this municipal service are likely to be manageable. The need for more municipal collection equipment has already been identified by the MSB in the Corporate Strategic Plan 2021 – 2025.

5.1.5.2 Municipal Landfills

Figure 5-1 illustrates the anticipated impacts of MSB's population growth, both with and without the Project, on the two municipal landfills. The increasing population will consume the landfill airspace at a greater rate due to the higher volumes of waste disposed. This increase in disposal will shorten the combined landfill capacity by approximately one year.

However, Morrison Hershfield has included a third scenario assuming the MSB has improved the landfill compaction rate to 600 kg/m^3. The increase in waste compaction density will increase landfill capacities and can offset the potential Project impacts to the landfill lifespans. The scenario "with the Project" for the landfills includes demands associated with the Centre of Expertise.

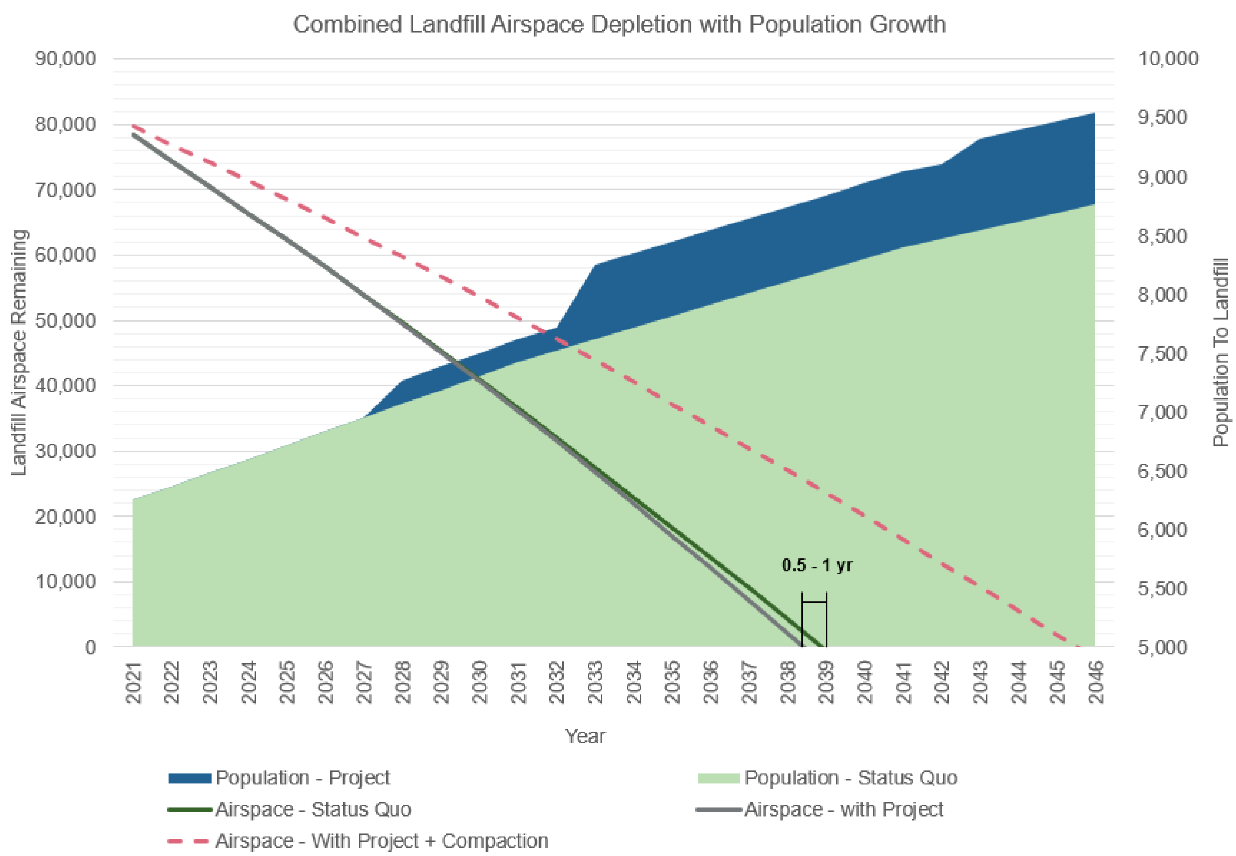

Figure 5-1: Landfill Airspace Depletion with Population Growth with and without the Project

The MSB is likely to manage Project-related demands by expanding current curbside collection services and improving waste compaction rates when waste is disposed to landfill. Landfills are a significant asset for small communities like MSB and the airspace should be managed as efficiently as possible to preserve the landfill resources. Creating new landfills or transferring waste to other communities often results in significantly increased costs over the long term. The MSB's landfill capacity can be increased by purchasing and effectively applying compaction equipment at the municipal landfills. This can help to offset any capacity decrease caused by the Project.

5.1.6 Electrical Power

The Project is anticipated to result in an additional 10 homes per year being constructed in the Study Area (**Table 4-2**). This is well within the scale of development that HONI indicated that they are able to service, typically through incremental expansion of their infrastructure. The modest pace of development will allow HONI time to plan and implement larger upgrades as needed.

Electrical servicing of the Centre of Expertise may require local infrastructure upgrades. Based on typical timeframes indicated by HONI during the knowledge holder interview, it is anticipated that this servicing will be feasible provided that HONI can be provided with three to five years notice.

The DGR Facility will require a new overhead line branching off from the regional high voltage power grid to supply the anticipated 28.7 megawatt (MW) power load. During the interview conducted in November 2021, HONI indicated that new servicing in the 20-40 MW range would require significant advance planning, likely requiring over five years' notice. Considering that that power will likely need to be in place early in the construction phase, it would be preferable to have HONI commence planning work prior to the start of the 5-year pre-construction phase.

At this time, it is unknown where the new overhead line will originate, and whether the alignment will be along existing rights-of-way or on easements over private land. Depending on the alignment, construction may have a range of environmental, social and other impacts. The new overhead line will likely also offer opportunities for HONI to increase the capacity and redundancy of electrical infrastructure in South Bruce and immediate surrounding area.

5.1.7 Natural Gas

Information regarding the ability of the natural gas infrastructure to be expanded to service new housing, the Centre of Expertise and the DGR Facility was unavailable from Enbridge.

EPCOR expressed interest in servicing the DGR Facility in the event that Enbridge is unable to do so. EPCOR's Southern Bruce Project pipeline passes within 10 km of the potential Project site.

It is anticipated that new natural gas infrastructure would generally be installed within existing rights-of-way, which would limit negative impacts and temporary disruption during construction.

5.1.8 Telecommunications

An advantage of fibre optic telecommunications systems is the ability to accommodate very high levels of growth in usage, without the need to replace the linear infrastructure (cables). With FTTH infrastructure already in place, or soon to be in place, in the three communities within the Study

Area that are expected to see growth, it is anticipated that Wightman will have ample capacity to provide high-speed internet access to all new homes.

Wightman confirmed that servicing the DGR Facility is feasible and provided a budgetary cost of $280,000 (at 2022 prices) for a new buried cable from their nearest existing fibre optic line to the potential Project site. Installation of this new fibre optic line would benefit residents and businesses along the route (likely County Road 4 or Concession Road 8), who would be able to install FTTH and receive high-speed internet service.

Wightman has a policy of installing only buried fibre optic lines. Similar to natural gas infrastructure, the new line (or lines, depending on redundancy requirements) will generally be installed within existing rights-of-way, limiting negative impacts.

5.2 DGR Site Servicing Requirements

5.2.1 Introduction

The on-site DGR Facility will require power, water and other services during the construction and operations phases. The servicing requirements outlined in this section were established by NWMO based on the DGR Conceptual Design Report (‘Conceptual Design Report’, Naserifard et. al., 2021).

5.2.2 Water

Anticipated water demands for the DGR Facility are summarized in **Table 5-4** below.

Table 5-4: DGR Water Demands

Phase	Peak Daily Water Demand (m^3/d)		
	Surface Facilities	Underground	Total
Construction (2033 - 2043)	To be determined	190	To be determined
Operations (2043 - 2089)	134	51	185

The Conceptual Design Report anticipates raw water being sourced from a local river, water body or well, and treated on-site to the required standard for each use (i.e. service/fire water, or potable water). Water will be distributed through three separate systems: service water for process use, fire water supplied to fire hydrants, and potable water for supply to faucets within buildings and other domestic uses.

Potable water will be treated to meet applicable Provincial and/or Federal standards (depending the authority having jurisdiction over the site) and will be distributed through systems designed and operated in accordance with applicable guidelines, standards and legislative requirements for potable water infrastructure (e.g. Ontario Ministry of Environment, Conservation and Parks guidelines and Ontario Building Code, or federal equivalents).

Service water will be treated and distributed to meet the required standards for use in each process, and will not be considered suitable for drinking.

5.2.3 Sanitary Sewage

The Conceptual Design Report indicates that the peak sanitary sewage flow is expected to equal the total potable water production with a peak factor of four, plus sewage waste from below-ground operations.

Based on the breakdown of anticipated water demands provided in the Conceptual Design Report, the estimated sanitary sewage flows are summarized in **Table 5-5**. To establish these sanitary sewage flows using the water demands provided in the Conceptual Design Report, the following assumptions have been made:

- Peak factor of two applied to service water uses
- All service water is ultimately discharged as sanitary sewage other than water used for dust control, drilling and lateral development (which is either consumed or recycled)
- Surface facility requirements during construction assumed to be 50% of requirements during operations

Table 5-5: DGR Sanitary Sewage Flows

Phase		Average (m^3/day)	Peak (L/s)
Construction (2033 - 2043)	Potable	32	1.5
	Service	44	1.0
	Total	76	2.5
Operations (2043 - 2089)	Potable	60	2.8
	Service	69	1.6
	Total	130	4.4

The Conceptual Design Report anticipates an on-site wastewater treatment plant. However, the NWMO intends to consider all alternatives as part of detailed site characterization.

5.2.4 Stormwater/ Drainage

Stormwater will be managed on-site and drained to a nearby watercourse. To minimize environmental impacts to receiving watercourses, quality and quantity control will be provided by on-site stormwater management ponds.

5.2.5 Solid Waste

Waste from the Project site and the Centre of Expertise is assumed to be managed as IC&I waste through use of private waste service providers. This IC&I waste would not impact local municipal waste services as it ends up at sites outside of the region. Waste of relevance to municipal landfill infrastructure is that generated by new households.

5.2.6 Electrical Power

The facility will require a power supply as indicated in **Table 5-6**. The Conceptual Design Report anticipates a high voltage electrical overhead line branching off from the regional power grid.

Table 5-6: DGR Electrical Power Requirement

Phase	Peak Power Requirement
Construction (2033 - 2043)	To be determined
Operations (2043 - 2089)	28,700 kW

5.2.7 Natural Gas

The Conceptual Design Report does not explicitly indicate a need for natural gas servicing. However, the report does discuss the potential for natural gas fired heaters to be used to heat air supplied via the underground ventilation system. In addition, it is anticipated that natural gas will be considered as an option for heating the surface facilities. The potential natural gas demand is not known at this time.

5.2.8 Telecommunications

The Conceptual Design Report indicates that the facility will require internet and telephone facilities. It is anticipated that wired high speed internet will be required, as well as wired and cellular telephone service. Requirements for redundancy are not identified by the Conceptual Design Report. For similar facilities a robust level of telecommunications redundancy is typically required, either via secondary wired connections (following a different route) or via backup wireless connections.

5.3 Site Servicing Options and Analysis

Note to Reader

This section provides an overview of possible options to mitigate negative consequences or to enhance positive outcomes associated with servicing the potential Project site/DGR Facility. They are presented by the authors to foster discussion only. They do not represent commitments or actions for the NWMO, the Municipality of South Bruce, or other parties. The final decisions on actions and commitments will be made at a future date.

5.3.1 Electrical Power and Telecommunications

The installation of new electrical power and telecommunications infrastructure to service the DGR Facility is a necessity of the Project and is therefore discussed in **Section 5.1** above. Any options associated with the new infrastructure will be assessed by the utility providers as they develop servicing plans following site selection in 2023.

5.3.2 Natural Gas

It is anticipated that a natural gas pipeline could be laid to the site by Enbridge from the closest point of the existing network. Alternatively, as discussed in **Section 5.2.7**, EPCOR may be able to service the site.

Following site selection in 2023, the NWMO should approach Enbridge to confirm the feasibility of natural gas servicing as soon as approximate gas demands are known.

5.3.3 Water Supply

As described in **Section 5.2.2**, the DGR Facility will require both potable and service water. While the Conceptual Design Report anticipates raw water being sourced and treated locally to the site, it is also conceivable that water could be conveyed to the DGR Facility via a pipeline from the Teeswater DWS.

In both cases it is assumed that service water would be treated and stored on-site (due to the potential for recycling and requirement for on-site fire water storage). Top-up of this system could be either via on-site wells, from municipal conveyance, or a combination of the two.

Table 5-7 provides a comparison of the on-site potable water production, and municipal conveyance of potable water to the site.

Table 5-7: Comparison of On-Site and Municipal Water Supplies

	On-Site	Municipal
Municipal Infrastructure	None.	Conveyance pipeline, possible re-chlorination facility immediately upstream of DGR Facility.
NWMO Infrastructure	On-site wells, treatment and disinfection systems, pumps, treated water storage (separate for potable and service/ fire water.	Service water treatment, pumping, and storage. Possible on-site service water wells.
Complexity of On-site Potable Water Infrastructure	Relatively complex, requiring continuous monitoring and regular testing. Likely to require significant periodic maintenance (e.g. tank cleaning) as well as on-demand equipment repairs. Work on systems can be carried out by Certified drinking water operators only.	Simple infrastructure: distribution piping and possible booster pumps. Similar to domestic/potable water systems in any large building. Work on systems can be carried out by qualified plumbers.
Regulatory Requirements	NWMO responsible for licensing of system under Safe Drinking Water Act, 2002, including meeting all applicable documentation, reporting, operational, monitoring and inspection requirements.	Municipality responsible for licensing as an extension of existing Teeswater Drinking Water System. Service water system would not require Drinking Water licensing.
Quality of Potable Water	Maintained in accordance with regulatory standards by NWMO (or NWMO's operations contractor).	Maintained in accordance with regulatory standards by Municipality (or Municipality's Drinking Water System operations contractor, currently Veolia).
Reliability of Potable Water supply	Assuming dual-redundant systems (minimum two of each component, two wells, etc.), back-up power and adequate maintenance, reliable operation can be expected. Due to the small scale of the system, and likely absence of a full-time operator, interruptions to operations may occur but would typically be quick to rectify.	Water production and treatment in Teeswater would be highly reliable, due to the larger scale of the system including the increased treated water storage volume. The supply to the DGR Facility would be vulnerable to any failures of the long conveyance pipeline, which may require several hours to repair.

To further assess the feasibility of water conveyance from the Teeswater DWS, two routes have been considered. Both routes assume a destination at the intersection of Sideroad 25 and

Concession Road 8. The routes are illustrated in **Exhibits 3** to **6** (**Appendix C**) and described in **Table 5-8**. The destination is at an elevation approximately 20 m lower than the municipal well site in Teeswater, and neither route crosses any significantly higher terrain. Depending on the eventual design flow rate, the watermain could likely be sized to limit pressure losses due to friction sufficiently to provide acceptable residual pressures[10] along its length without booster pumping, while still being of small enough diameter to maintain acceptable water age. In this case the watermain could be extended directly from the Teeswater distribution system and would not require a dedicated feed from the elevated tank, or new pumps. (Analysis would be required to confirm any need for upsizing of existing distribution system watermains.)

Table 5-8: Potential Water Conveyance Routes

	Route 1	Route 2
Description	County Road 6 & Sideroad 25	County Road 4 & Concession Road 8
Length of new pipes	5.4 km	5.3 km
Distribution watermain / feedermain[11]	Distribution watermain	Distribution watermain
Challenges	Potential tree removals on Sideroad 25. Easement required. Crossing of Teeswater River.	
Ability to extend water servicing to properties along route	Approximately 20-25 properties may benefit	Approximately 20-25 properties may benefit
Estimated length requiring special construction (e.g., trenchless, or mounted on bridge)	200 m	None
Estimated construction cost	$6.6M	$4.9M

The estimated construction costs presented in **Table 5-8** assume that it will be possible to install the majority of each watermain on the road shoulder (minimizing asphalt reinstatement). Costs are at current (2022) prices and include a contingency of 40%.

Both routes appear feasible. If conveyance of water from the Teeswater DWS is considered preferable to on-site potable water production, further analysis should consider:

- Required water demand (potable water demand and any service water demand to be met via this system), including average and peak flows

[10] Minimum of 276 kPa (40 psi) under maximum hourly demand conditions, *Design Guidelines for Drinking Water Systems (MECP, 2008b)*

[11] A distribution watermain provides water at suitable pressure and chlorine residual to enable service connections to be made at any point along its length. A feedermain is designed for the bulk conveyance of water from one location to another. Typically service connections cannot be made directly from a feedermain.

- Potential water demand from properties along the route (including identification of any potential IC&I customers), and any other opportunities to maximize potential positive socio-economic effects in line with Guiding Principle #10.
- Hydraulic analysis to determine whether booster pumps can be avoided, and whether acceptable residual pressures for distribution can be maintained along length of watermain
- Hydraulic analysis to determine whether any upsizing of existing watermains in Teeswater would be required
- Water age analysis including determination of any requirement for additional disinfection facility
- Capacity of existing Teeswater DWS to supply sufficient water (including consideration in the resulting reduction in the planning horizon for the currently proposed upgrades)
- Actual required destination of watermain within the DGR Facility

This preliminary analysis assumes that the Centre of Expertise will be located in Mildmay or Teeswater rather than on the DGR Facility site. If located on site, the increased water demand, the presence of more visitors (who may have a lower comfort level than regular staff with potable water from a private supply) and potential liabilities should be considered in the choice of potable water source.

5.3.4 Sanitary Sewage

Due to the complexities and costs of installing and operating an on-site wastewater treatment facility, it may be beneficial to convey wastewater from the site to the nearest municipal WWTP, in Teeswater.

Domestic sewage from office buildings and other facilities on the site could be conveyed directly to the Teeswater WWTP. Depending on content, some process wastewater may require pre-treatment prior to conveyance to meet the influent standards for which the Teeswater WWTP is designed. These influent standards are defined by the Municipality's *Sewer Use Bylaw* (#2012-51), and define limits on parameters such as BOD, suspended solids, metals, hydrocarbons and radioactive substances. For the DGR Facility, as with other significant industrial contributors to the municipal WWTP's, the Municipality would establish a Wastewater Agreement identifying specific sewage volume allocations, sampling and monitoring requirements, any additional or site-specific sewage quality criteria, payment, and remedies in the event of non-compliance.

Although the expected wastewater flows from the site (**Table 5-5**) are relatively modest, representing a maximum of 10% of the existing capacity of the Teeswater WWTP, the anticipated WWTP upgrade has been planned considering specific industrial flow allocations and anticipated residential development. Therefore a further WWTP upgrade may be needed to avoid limiting the available capacity for industry and residential development.

To assess the feasibility of wastewater conveyance to the Teeswater WWTP, two routes have been considered. Both routes assume a start point at the intersection of Sideroad 25 and Concession Road 8. The routes are illustrated in **Exhibits 3** to **6** (**Appendix C**) and described in **Table 5-9**.

Table 5-9: Potential Wastewater Conveyance Routes

	Route 1	Route 2
Description	Sideroad 25 & County Road 6, discharging to existing sewers in Teeswater	Concession Road 8 & Sideroad 10A, direct to Teeswater WWTP
Length of new pipes	5.4 km	7.1 km
Gravity/Forcemain	Forcemain	Forcemain
Challenges	Potential tree removals on Sideroad 25. Easement required. Crossing of Teeswater River. Existing sewers in Teeswater may require upsizing.	Wetland area on Concession Road 8
Ability to extend sanitary sewer servicing to homes along route	None (unable to connect individual properties to forcemain)	None (unable to connect individual properties to forcemain)
Estimated length requiring special construction (e.g., trenchless, or mounted on bridge)	200 m	None
Estimated construction cost (forcemain only)	$5.8M	$6.7M

The estimated construction costs presented in **Table 5-9** assume that it will be possible to install the majority of each forcemain on the road shoulder (minimizing asphalt reinstatement). Costs are at current (2022) prices and include a contingency of 40%.

Both routes appear feasible. If conveyance of wastewater to the Teeswater WWTP is considered preferable to on-site treatment, further analysis should consider:

- Actual proposed location of wastewater pumping station at DGR Facility
- Capacity of existing Teeswater sewers, pumping station and forcemain to convey additional flow (applies to Option 1 only)
- Ability to use existing Formosa conveyance piping on Sideroad 10A or combine new infrastructure with upsizing of Formosa conveyance pipe.
- Other possible routes, such as Concession Road 8 & County Road 4, discharging to existing sewers in Teeswater
- Need for pre-treatment to meet Teeswater WWTP influent standards
- Need for further upgrade to Teeswater WWTP capacity
- Measures to prevent sewage becoming septic due to long conveyance time

5.4 Strengths / Weaknesses / Opportunities / Threats (SWOT) Analysis

The following sections summarize the most significant strengths and weaknesses of municipal infrastructure in the Study Area, as well as the opportunities and threats facing the infrastructure.

5.4.1 Strengths

All three communities where growth is anticipated are fully serviced (power, water, wastewater, solid waste collection, natural gas, high-speed internet), with the exceptions of municipal water in Formosa, and fire protection via municipal watermains in Teeswater.

The electrical power transmission and distribution infrastructure has adequate capacity for existing needs, and HONI does not expect population growth to present significant challenges.

Servicing the DGR Facility with wired high-speed internet is feasible.

Servicing the DGR Facility with natural gas is likely to be feasible.

5.4.2 Weaknesses

The lack of municipal water service will likely discourage higher density development in Formosa, which will be needed to accommodate the anticipated population.

The lack of fire protection capacity in Teeswater's drinking water system may restrict growth.

High-speed internet is generally not available outside Mildmay, Teeswater and Formosa, and is unlikely to become available in the near future. However, this is unlikely to affect Project-related growth, which is expected to be concentrated in the three communities.

5.4.3 Opportunities

The proposed upgrade to the Teeswater WWTP offers sufficient capacity to accept wastewater flows from the DGR Facility.

The Mildmay WWTP has sufficient capacity to accommodate all anticipated population growth over the study period. Soon-to-be-required upgrades to the Mildmay main sewage pumping stations provide opportunities to allow for Project-related growth.

The required upgrade to the Mildmay treated water storage facility (elevated tank) provides an opportunity to allow for Project-related growth.

Telecommunications servicing of the DGR Facility will enable rural residents along the fibre-optic cable route to receive high-speed internet.

The proximity of the DGR Facility to Teeswater provides an opportunity to convey wastewater to Teeswater for treatment, which would maximize utilization of the planned WWTP expansion and provide revenue for the MSB.

5.4.4 Threats

Water and wastewater infrastructure expansion typically requires large capital investments recovered through user fees or rates over the life of the infrastructure (20–50 years). Infrastructure planning requires a delicate balance to avoid undersizing for growth (resulting in a shorter operational life before another expansion) and oversizing for growth (resulting in lower revenue than planned). Sizing infrastructure for Project-related growth adds increased risk in this regard, though the impact of this risk should be considered in the context of already significant variation in baseline population projections.

Significant capital investment is required in the very near future to expand the WWTP and construct an elevated water storage tank in Teeswater. Sewage pumping station and treated water storage upgrades are also expected to be needed in Mildmay. The potential Project adds considerable uncertainty to the sizing of these facilities.

Much of the infrastructure discussed in this Report is vulnerable to the impacts of climate change. Without appropriate and timely adaptation / resilience measures, climate change may impact reliability and available capacity. For example, the intensity and duration of heatwaves are expected to increase, which may increase peak electrical loads, and water consumption (for residential irrigation). Stronger winds may impact overhead telecommunications and power lines, and more intense rainfall may impact drainage infrastructure, increase peak flows to sewage treatment plants, and increase the risk of flooding of the existing Teeswater DWS wells, given their location within the existing floodplain.

6 OPTIONS ASSESSMENT

Note to Reader

This section provides an overview of possible options to mitigate negative consequences or to enhance positive outcomes. They are presented by the authors to foster discussion only. They do not represent commitments or actions for the NWMO, the Municipality of South Bruce, or other parties. The final decisions on actions and commitments will be made at a future date.

6.1 Ongoing Infrastructure Expansion

Existing infrastructure in the Study Area will generally require expansion in response to population growth as described elsewhere in this Report. Types of expansions will include:

- Geographic expansion of linear infrastructure (pipes, cables): typically incremental and implemented in parallel with construction of new subdivisions
- Upgrades and expansion of drinking water wells, treated storage facilities, WWTP's, pumping stations and existing pipes: typically prompted by regular infrastructure planning cycles, and sized to provide capacity for 20-50 years of growth
- Upgrades and expansion of existing private utility linear infrastructure (pipes and cables) and vertical infrastructure (substations, network equipment, etc.): typically prompted by regular infrastructure planning cycles

The Analysis/Effects Assessment presented in **Section 5** indicates that most infrastructure will require upgrades over the study period to respond to baseline growth. The Project will increase the pace of population growth, and therefore increase the scale and frequency of upgrades, but is not currently expected to require any major interventions to existing or proposed infrastructure. The Project will not, for example, exhaust an existing local water source and require water conveyance from a distant location.

However, there are opportunities to implement strategies that will help to facilitate the expected Project-related growth. Such strategies would be aligned with Guiding Principle #29. The following options or strategies are suggested if the Project is to be located in South Bruce:

6.2 Installation of Municipal Drinking Water System in Formosa

Need	Expected population increases in the MSB are likely to require new housing in all three main communities, including Formosa. The Project further increases the need for new housing. Higher density housing than currently exists in the Formosa may be required. A municipal DWS in Formosa is likely to become necessary both to attract developers and residents, and to facilitate the density required.
Alternatives	Do nothing: may limit growth in Formosa DWS comprising wells, pumps and treated water storage: anticipated to be feasible

Conveyance from Formosa or Teeswater: should be studied as an alternative – may be economical especially if combined with a DWS capacity expansion needed anyway in Teeswater.

Ease of Implementation — This would be a major project for the MSB requiring a significant capital investment and planning studies, design and permitting. However, the process and technologies are well understood and similar projects have been completed in many municipalities across Ontario and Canada.

Effectiveness — Directly under the control by the MSB, subject to obtaining the support of residents who may be required to pay connection charges and rates.

Alignment with Guiding Principles (**Section 1.3.1**)

Potential community benefit (Principle #10). Could potentially form part of a future infrastructure strategy (Principle #29). Should be considered in preparation of a future housing plan (Principle #27)

Cost — Unknown (requires dedicated study)

6.3 Early Engagement with Private Utilities

Need — Private utilities shared a range of experiences from similar projects within their service areas. A particular positive experience was noted by Bruce Telecom in relation to Bruce Power's Major Component Replacement (MCR) Project. Bruce Power arranged quarterly meetings with Bruce Telecom which facilitated excellent communication and coordination, and enabled Bruce Telecom to plan infrastructure expansion with ample lead time.

Other utilities spoke about challenges of trying to plan in the context of unpredictable growth (e.g., HONI in relation to anticipated cannabis greenhouses which largely failed to materialize).

Regular communication and information-sharing through a working group with private utilities will benefit both the NWMO and the MSB by enabling utility infrastructure plans to be developed to help attract and encourage new housing development.

Alternatives — Do nothing: private utilities will respond to development, but there is potential for a time lag in infrastructure readiness. A lack of clear plans for servicing may discourage housing development.

Ease of Implementation — The MCR Project example above suggests that this strategy is likely to be beneficial.

Effectiveness — Relatively low effort for the NWMO to seek regular engagement with HONI, Enbridge and Wightman. Whether or not these utility providers choose to engage is beyond the NWMO's control (this may improve once a decision on site selection is made in 2023).

Alignment with Guiding Principles (**Section 1.3.1**)
Should form part of a future infrastructure strategy (Principle #29). Supports development of a future housing plan (Principle #27) as well as provision of sufficient community services and amenities (Principle #32).

Cost
Unknown

6.4 Municipal Infrastructure Master- Planning

Need
During the last decade of stagnant or slow population growth in the Study Area, the approach of responding to infrastructure capacity shortfalls on a case-by-case basis has been appropriate. The increasing pace of growth, wide range of growth expectations, and potential Project impacts (including potential IC&I growth) now warrant a more proactive approach. The MSB is currently undertaking a servicing study applicable to specific development lands. An Infrastructure Master Plan, completed through the Municipal Class Environmental Assessment process and updated on a 5-year basis, would identify infrastructure expansion and upgrade needs, provide a roadmap for water, sanitary sewer and stormwater/ drainage servicing of new residential and IC&I development, and would enable design and construction to be initiated at the appropriate time. A Master Plan would take a wholistic view of all water and sewer infrastructure needs in the Municipality, extending to questions such as the expansion of water servicing to Formosa.

Alternatives
Status Quo: Risk of time lag in infrastructure readiness, which could force the MSB to delay new housing development. Lack of a roadmap for servicing of new development typically results in inefficient infrastructure layouts with higher operational costs (e.g., additional pumping stations; sewers not sized to service future neighboring developments).

Ease of Implementation
Regularly updated infrastructure master plans are a best-practice approach employed by growing municipalities.

Effectiveness
Directly under the control of the MSB.

Alignment with Guiding Principles (**Section 1.3.1**)
Required to develop a future infrastructure strategy (Principle #29). Supports a future housing plan (Principle #27) as well as provision of sufficient community services and amenities (Principle #32).

Cost
Modest in comparison to capital cost of infrastructure. Can be combined with a Development Charges Background Study, should the MSB seek to implement development charges in future.

6.5 Flexible Expansion of Municipal Infrastructure

Need	Until the Project site selection is complete in 2023, and Project-related population growth begins to materialize starting in the pre-construction phase, it will be challenging to size municipal infrastructure upgrades. In some cases, alternative infrastructure designs provide for greater flexibility, allowing capacity to be maximized if growth materializes, or operational and upfront capital costs to be minimized if growth is delayed. The initial construction of these alternatives is typically slightly (but not excessively) more expensive, but lifecycle cost risk is greatly reduced. Examples include at-grade (pumped) treated water storage rather than elevated tanks, and twin rather than single forcemains.
Alternatives	Selection of infrastructure designs based on lowest capital cost for best available growth projection.
Ease of Implementation	Will require case-by-case assessment of lifecycle costs for a range of growth rates.
Effectiveness	Directly under the control of the MSB.

Alignment with Guiding Principles (**Section 1.3.1**)

Mitigates risks of potential negative socio-economic impacts (Principle #10). Should be considered within a future infrastructure strategy (Principle #29). Supports a future housing plan (Principle #27) as well as provision of sufficient community services and amenities (Principle #32).

Cost	Additional cost to implement flexible alternatives will vary by project.

7 SUMMARY

7.1 Infrastructure Summary

Table 7-1 describes all infrastructure assessed within the scope of this study, and summarizes the existing level of services, planned expansion and upgrades, and any potential effects of the Project. The potential for extension of services to the potential Project Site is also discussed.

Table 7-1: Infrastructure Summary

Water		**Ref.**
Provider	Municipality of South Bruce	3.2.1
Existing Service Areas	Mildmay and Teeswater	3.2.2
Existing Infrastructure	Mildmay: two wells supply water to an elevated tank from which water is distributed to approximately 1,300 residents via approximately 12 km of distribution watermains. Teeswater: water is pumped into approximately 12 km of distribution watermains from a single well. The system supplies approximately 1,000 residents.	3.2.2
Existing Level of Service	Mildmay: adequate capacity for current domestic and fire demands. Teeswater: adequate capacity for current domestic demands. Due to absence of treated water storage and limited pumping capacity cannot be considered to provide adequate municipal fire protection. Location of well within flood plain presents threat to water quality and reliability.	3.2.2
Planned Expansions and Upgrades	Funding has recently been secured for the construction of two new wells and an elevated tank in Teeswater.	3.2.2
Effect of Project	Mildmay: key components of the existing DWS are likely to reach capacity even before the Project begins to influence populations. Upgrades could therefore be sized to accommodate Project-related population growth. Teeswater: Project-related growth (2028 onwards) would reduce the period until further DWS upgrades are required. Formosa: lack of a municipal DWS may restrict development.	5.1.2
Potential Project Site Servicing	Supply of potable water to the potential Project Site via a new watermain extended from the Teeswater DWS is technically feasible. Benefits would include the ability to service 20-25 properties along the conveyance route.	5.3.3
Sanitary Sewage		
Provider	Municipality of South Bruce	3.2.1
Existing Service Areas	Mildmay, Teeswater and Formosa	3.2.3
Existing Infrastructure	Mildmay: an Extended Aeration WWTP receives sewage from a collection network that includes approximately 14 km of gravity sewer and two pumping stations, and services approximately 1,200 residents. Formosa: approximately 400 residents are served by a total of 5 km of low pressure forcemains and gravity sewers. Sewage is pumped from Formosa to the Teeswater WWTP. Teeswater: approximately 14 km of sewers and five pumping stations collect sewage from approximately 1,000 residents as well as a large flow from the Gay Lea industrial facility. The Teeswater Sequencing Batch Reactor WWTP provides treatment.	3.2.3

Existing Level of Service	Mildmay: the existing WWTP operates well within its design capacity and in compliance with its effluent quality objectives and limits. Inflow and infiltration to the collection system is significant. Mildmay's main sewage pumping station operates close to capacity. Formosa and Teeswater: although inflows are within the hydraulic capacity of the WWTP, high biological loading from the industrial contributions has resulted in exceedances of effluent quality objectives and limits in recent years.	3.2.3
Planned Expansions and Upgrades	The MSB intends to commence construction of an upgrade to the Teeswater WWTP in fall 2022. The upgrade will see hydraulic capacity increased by 30% and BOD loading capacity increased by 100%.	3.2.3
Impact of Project	The anticipated baseline population increases will require upgrades to most major components of the sanitary sewage infrastructure within the study period. Project-related growth will require these upgrades to be made sooner, but will not fundamentally change their scope or scale.	5.1.3
Potential DGR Site Servicing	Conveyance of sanitary sewage from the Site via a new forcemain to the Teeswater WWTP is technically feasible, and provides an alternative to the installation of an on-site wastewater treatment facility.	5.2.3
Stormwater / Drainage		
Providers	Municipality of South Bruce and Bruce County	3.2.1
Existing Service Areas	Urban drainage systems: Mildmay, Teeswater and Formosa Stormwater management (quantity and/or quality control): Provided for a small number of newer developments in Mildmay and Teeswater.	3.2.4
Existing Infrastructure	Urban drainage systems in the main population centres comprise catch basins and sewers. In rural areas drainage is provided by ditches and culverts. Stormwater management facilities (including one oil/grit separator and two dry ponds) have been installed within newer developments.	3.2.4
Existing Level of Service	Existing drainage is understood to be generally adequate. Stormwater management (quantity and/or quality control) is provided for approximately 15% of developed lands in Mildmay and 5% of developed lands in Teeswater.	3.2.4
Planned Expansions and Upgrades	None	3.2.4
Effect of Project	No significant impact is expected. Current regulatory requirements require stormwater management to be provided for most new developments.	5.1.4
Potential Project Site Servicing	Not applicable (stormwater will be managed on-site).	5.2.4
Solid Waste		
Provider	Municipality of South Bruce (residential garbage collection) Bruce Area Solid Waste Recycling Association (residential recycling collection) Private waste management providers (IC&I sector)	3.2.1 3.2.5
Existing Service Areas	Municipality of South Bruce	3.2.5
Existing Infrastructure	Teeswater-Culross Landfill Mildmay-Carrick Landfill	3.2.5
Existing Level of Service	Curbside garbage and recycling collection in main communities. Teeswater-Culross Landfill remaining landfill life: 18.5 years Mildmay-Carrick Landfill remaining landfill life: 29.7 years	3.2.5
Planned Expansions and Upgrades	Use of improved compaction equipment has been recommended.	3.2.5

Effect of Project	Reduction in landfill life of 0.5 to 1 year.	5.1.5
Potential DGR Site Servicing	Not applicable (IC&I waste is not accepted at Municipal Landfills)	5.2.5
Electrical Power		
Provider	Hydro One Networks Inc, HONI (transmission and distribution infrastructure, and direct servicing to customers in Formosa and rural areas) Westario Power Inc, WPI (direct servicing to customers in Mildmay and Teeswater)	3.2.1
Existing Service Areas	Throughout the Municipality of South Bruce	3.2.6
Existing Infrastructure	230 kV transmission lines which cross the MSB (no connections within MSB) 44 kV distribution infrastructure which carries power into the MSB from transformer stations in Wingham, Hanover and Douglas Point. Lower voltage distribution infrastructure	3.2.6
Existing Level of Service	HONI indicated that there are currently no capacity concerns or notable service gaps within the Study Area, and that the existing infrastructure has capacity for near-term anticipated development.	3.2.6
Planned Expansions and Upgrades	No significant electrical infrastructure upgrades or expansions are currently underway or planned within the Study Area. Medium-scale developments can typically be serviced without immediate upgrades. HONI requires 5 years or more of advance notice of larger developments (e.g., more than 150 subdivision lots) to plan and implement upgrades.	3.2.6
Effect of Project	HONI anticipates no challenges in servicing all Project-related residential and IC&I development.	5.1.6
Potential Project Site Servicing	The DGR Facility will require a new overhead line branching off from the regional high voltage power grid to supply the anticipated 28.7 MW power load. HONI has indicated that over five years' notice is likely to be required to implement this servicing.	5.2.6
Natural Gas		
Provider	Enbridge	3.2.1
Existing Service Areas	Mildmay, Teeswater and Formosa	3.2.7
Existing Infrastructure	Natural gas distribution infrastructure services homes within the service areas.	3.2.7
Existing Level of Service	No information was available from Enbridge.	3.2.7
Planned Expansions and Upgrades	Enbridge indicated that they will continue regular rate customer growth connections to the natural gas system.	3.2.7
Effect of Project	Insufficient information was available from Enbridge to determine whether additional growth associated with the Project will impact gas servicing.	5.1.7
Potential Project Site Servicing	It is anticipated that a natural gas pipeline could be laid to the site by Enbridge from the closest point of the existing network. Alternatively, EPCOR (who have recently installed new infrastructure west of the study area) may be able to service the site.	5.2.7
Telecommunications		
Provider	Wightman Telecommunication (wired) Rogers Communications (wired) Hurontel, Xplornet (fixed wireless and satellite)	3.2.1
Existing Service Areas	Throughout study area	3.2.8

Existing Infrastructure	Fibre-to-the-home (FTTH) infrastructure exists (or is soon to be completed) in Teeswater, Mildmay and Formosa. Other areas are served by copper wired infrastructure.	3.2.8
Existing Level of Service	High speed (50 Mbps+) internet services is available in the areas with FTTH infrastructure. Other than along fibre-optic cable routes between communities, rural areas do not have access to high-speed internet. Fixed wireless and satellite internet services an alternative to wired services with moderate (not high-speed) service	3.2.8
Planned Expansions and Upgrades	Further expansion of fixed wireless and satellite internet services is likely.	3.2.8
Effect of Project	Existing FTTH infrastructure has adequate capacity for increased populations within the study area.	5.1.8
Potential Project Site Servicing	Servicing the DGR Facility with high-speed internet is feasible and would required a new fibre optic line to the site from the nearest existing fibre optic line.	5.2.8

7.2 Conclusions

The main communities in the Study Area (Mildmay, Teeswater and Formosa) have well-established servicing infrastructure, which continues to be upgraded to maintain good levels of service. Recent and planned improvements include high-speed internet in Mildmay and Formosa, and WWTP upgrades in Teeswater.

Weaknesses in the existing infrastructure provision include the lack of municipal drinking water service in Formosa, lack of fire protection capacity in Teeswater's drinking water system, and lack of high-speed internet in most rural locations.

Significant population growth is expected over the next 25 years, regardless of the Project. This will require expansion and upgrades of most municipal infrastructure and private utilities. No constraints to these upgrades have been identified.

The Project will result in increasing demand on existing infrastructure. However, the impact of the expected population growth is generally small in comparison to the impact of baseline growth. For example, the project is expected to have a combined 2-year decrease in landfill lifespan which is a minor impact.

However, the Project is likely to be accompanied by significant efforts to attract and promote the growth of supporting industries and commercial enterprises to the Study Area. If realized, this IC&I growth may have significant infrastructure needs. As the locations, scale and nature of likely IC&I growth become clear, further study should be carried out to determine the impact on existing and planned infrastructure, and needs for additional expansion.

At this stage, the most significant impacts of the Project are expected to be:

- Electrical power supply to the DGR Facility: this will require extensive new infrastructure. HONI should be engaged to commence planning prior to the start of the pre-construction phase (2023 – 2032)
- Increased uncertainty in infrastructure expansion planning: particularly for infrastructure upgrades required prior to the Project site selection decision

While the level of infrastructure service in the MSB is generally good, several critical municipal systems are at or approaching capacity (Teeswater WWTP, Teeswater and Mildmay DWS, Mildmay main sanitary pumping station). Developers may see this as a risk when considering projects in the MSB, since projects could be stalled while waiting for municipal infrastructure upgrades to be completed.

This report provides several options to help mitigate the impacts of the Project and maximize the potential benefits, in alignment with the Community Study Guiding Principles (**Section 1.3.1**). These are described in **Section 6** but can be summarized as:

- Installation of a Municipal Drinking Water System in Formosa
- Early Engagement with Private Utilities
- Municipal Infrastructure Master-Planning
- Flexible Expansion of Municipal Infrastructure

These options could, in future, be incorporated in an infrastructure strategy and funding arrangements that would be developed to satisfy MSB's Guiding Principle #29 as part of a draft hosting agreement. Development of such an infrastructure strategy provides an opportunity for the NWMO and MSB to jointly work towards maximizing overall benefits through collaboration of infrastructure decisions to meet both baseline and Project-related growth. In particular, and with the understanding that population and/or IC&I growth may accelerate beyond current expectations as the Project takes shape, a suitable strategy will enable the NWMO and MSB to take advantage of opportunities to improve infrastructure provision, and to mitigate potential adverse Project effects.

Planning for infrastructure improvements should be coordinated with other related construction. In particular any road improvements required in support of the Project or Project-related growth should be coordinated with infrastructure improvements.

Provision of municipal services to the DGR Facility was assessed. Both potable water servicing from the Teeswater DWS and conveyance of sanitary sewage to Teeswater's WWTP for treatment are feasible as alternatives to on-site water production and sewage treatment. Further future study to assess these options should include wholistic assessment of the technical factors, costs and socio-economic impacts (positive and negative) of each option. In both cases (potable water servicing and sanitary sewage conveyance), connection to municipal infrastructure would not entirely eliminate the need for on-site infrastructure. Service and fire-fighting water infrastructure would remain on site, and some wastewater treatment would likely still be needed on-site to bring wastewater within the acceptable influent parameters for the Teeswater WWTP.

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APPENDIX A: List of Socio-Economic Community Studies

List of Socio-Economic Community Studies

Study Name	Study Proponent	Lead Consultant
Local Economic Development Study and Strategy	MSB	MDB Insight (now Deloitte LLP)
Economic Development Study on Youth	MSB	MDB Insight (now Deloitte LLP)
Local Hiring Effects Study & Strategy	MSB	MDB Insight (now Deloitte LLP)
Agriculture Business Impact Study	MSB	MDB Insight (now Deloitte LLP)
Fiscal Impact and Public Finance Study	MSB	Watson & Associates Economists
Tourism Industry Effects Study and Strategy	MSB	MDB Insight (now Deloitte LLP)
Housing Needs and Demand Analysis Study	NWMO, MSB	Keir Corp.
Labour Baseline Study	NWMO	Keir Corp.
Workforce Development Study	NWMO	Keir Corp.
Regional Economic Development Study	NWMO	Keir Corp.
Effects on Recreational Resources	MSB	Tract Consulting
Local/Regional Education Study	NWMO, MSB	DPRA
Land Use Study	NWMO, MSB	DPRA
Social Programs Study	NWMO, MSB	DPRA
Emergency Services Study	NWMO	DPRA
Vulnerable Populations Study	NWMO	DPRA
Community Health Programs and Infrastructure Study	NWMO	DPRA
Aggregate Resources Study	NWMO, MSB	Keir Corp.
Infrastructure Baseline and Feasibility Study	NWMO	Morrison Hershfield
Local Traffic Study	NWMO	Morrison Hershfield
Road Conditions Study	NWMO	Morrison Hershfield

APPENDIX B: Knowledge Holder Interviews

The table below includes an inventory of Knowledge Holders interviewed in 2021 and 2022 applicable to the *Infrastructure Baseline and Feasibility Study*. Names and titles have been excluded to respect the privacy of individuals.

Date	Knowledge Holder – Organization	Applicable Studies
01-Sep-21	MSB Public Works	*Infrastructure Baseline and Feasibility Study*
08-Sep-21	Bruce Telecom	*Infrastructure Baseline and Feasibility Study*
06-Oct-21	Hydro One Network Inc.	*Infrastructure Baseline and Feasibility Study*
15-Dec-21	EPCOR	*Infrastructure Baseline and Feasibility Study*
11-Feb-22	Wightman Telecom	*Infrastructure Baseline and Feasibility Study*

APPENDIX C: Exhibits

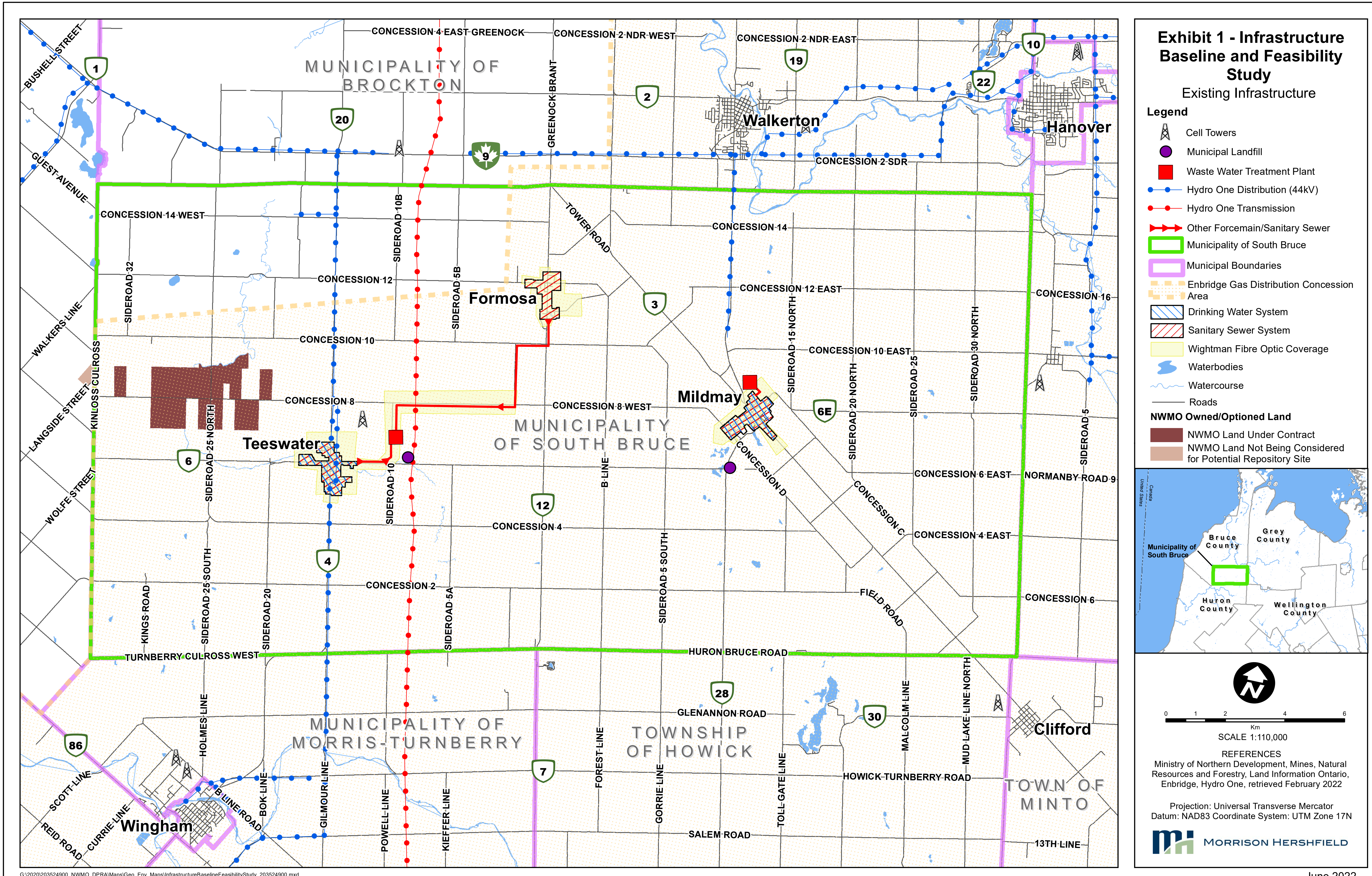
Exhibit 1 - Infrastructure Baseline and Feasibility Study
Existing Infrastructure
Legend
Cell Towers
Municipal Landfill
Waste Water Treatment Plant
Hydro One Distribution (44kV)
Hydro One Transmission
Other Forcemain/Sanitary Sewer
Municipality of South Bruce
Municipal Boundaries
Enbridge Gas Distribution Concession Area
Drinking Water System
Sanitary Sewer System
Wightman Fibre Optic Coverage
Waterbodies
Watercourse
Roads
NWMO Owned/Optioned Land
NWMO Land Under Contract
NWMO Land Not Being Considered for Potential Repository Site
Municipality of South Bruce
Bruce County
Grey County
Huron County
Wellington County
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Km
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REFERENCES
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Projection: Universal Transverse Mercator
Datum: NAD83 Coordinate System: UTM Zone 17N
MORRISON HERSHFIELD
June 2022
MUNICIPALITY OF BROCKTON
MUNICIPALITY OF SOUTH BRUCE
MUNICIPALITY OF MORRIS-TURNBERRY
TOWNSHIP OF HOWICK
TOWN OF MINTO
Walkerton
Hanover
Formosa
Mildmay
Teeswater
Clifford
Wingham
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CONCESSION 2 NDR WEST
CONCESSION 2 NDR EAST
CONCESSION 2 SDR
CONCESSION 14 WEST
CONCESSION 14
CONCESSION 12
CONCESSION 12 EAST
CONCESSION 10
CONCESSION 10 EAST
CONCESSION 16
CONCESSION 8
CONCESSION 8 WEST
CONCESSION 6 EAST
NORMANBY ROAD 9
CONCESSION 4
CONCESSION 4 EAST
CONCESSION 2
CONCESSION 6
CONCESSION D
CONCESSION C
FIELD ROAD
TOWER ROAD
GREENOCK BRANT
BUSHELL STREET
GUEST AVENUE
WALKERS LINE
LANGSIDE STREET
WOLFE STREET
KINLOSS CULROSS
SIDEROAD 32
SIDEROAD 25 NORTH
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SIDEROAD 10
SIDEROAD 5B
SIDEROAD 5A
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KINGS ROAD
TURNBERRY CULROSS WEST
HURON BRUCE ROAD
GLENANNON ROAD
HOWICK TURNBERRY ROAD
SALEM ROAD
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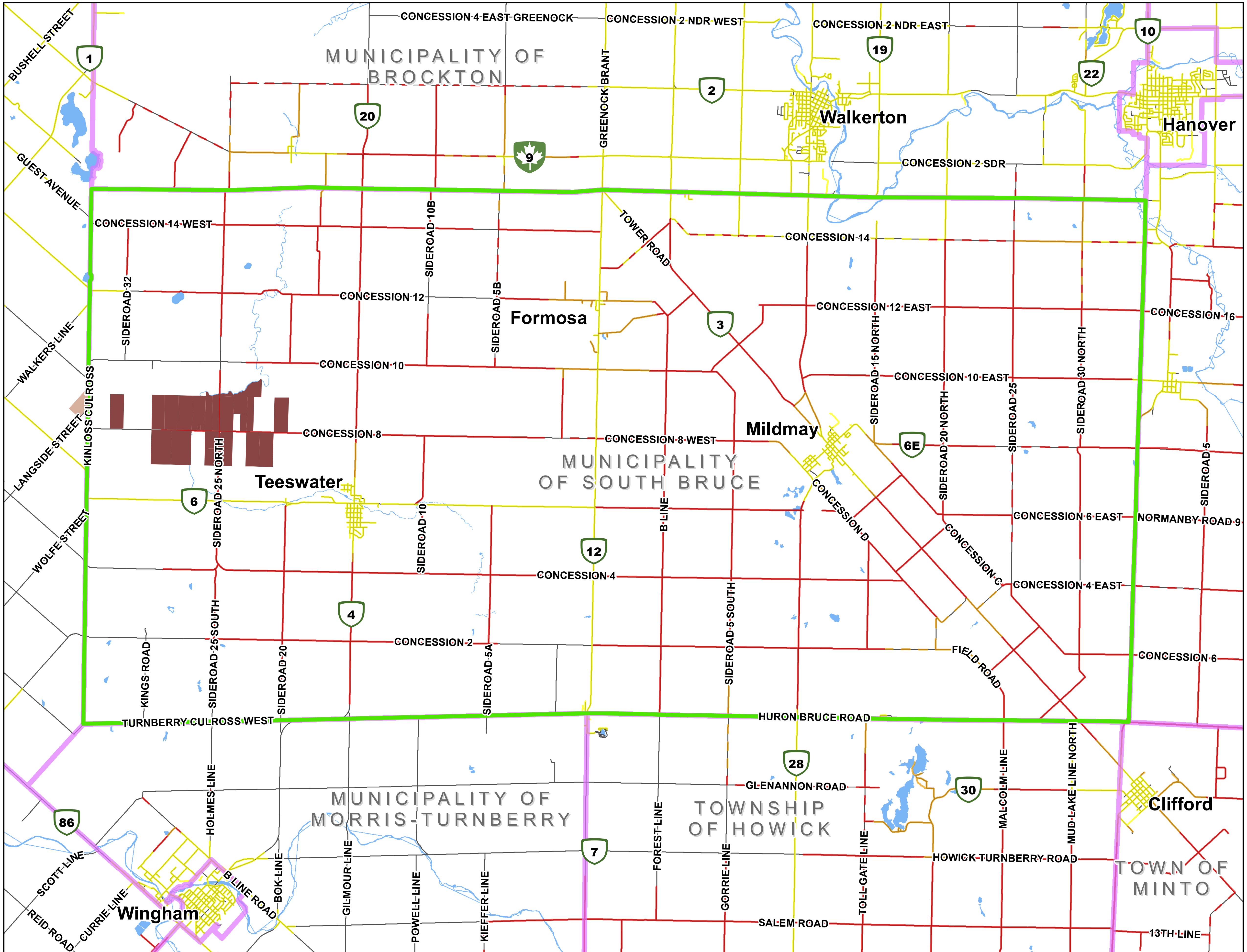


Exhibit 2 - Infrastructure Baseline and Feasibility Study

High-Speed Internet Availability

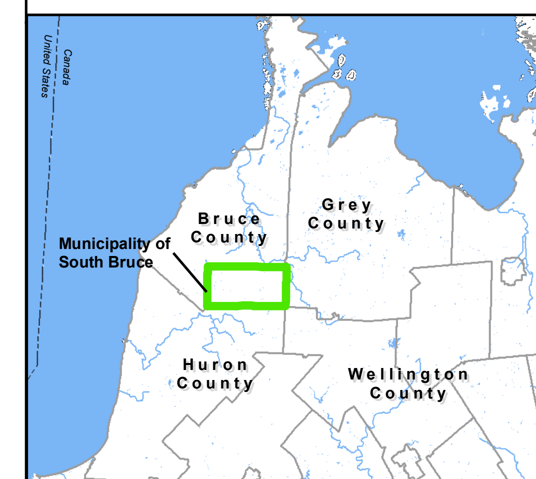
Legend

NWMO Owned/Optioned Land

- NWMO Land Under Contract
- NWMO Land Not Being Considered for Potential Repository Site

High-Speed Internet Availability, Wired

- 50/10 Mbps
- 5/1 Mbps
- <5/1 Mbps
- Municipality of South Bruce
- Municipal Boundaries
- Waterbodies
- Watercourse
- Roads



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Projection: Universal Transverse Mercator
Datum: NAD83 Coordinate System: UTM Zone 17N

MORRISON HERSHFIELD

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June 2022

Exhibit 3 - Infrastructure Baseline and Feasibility Study

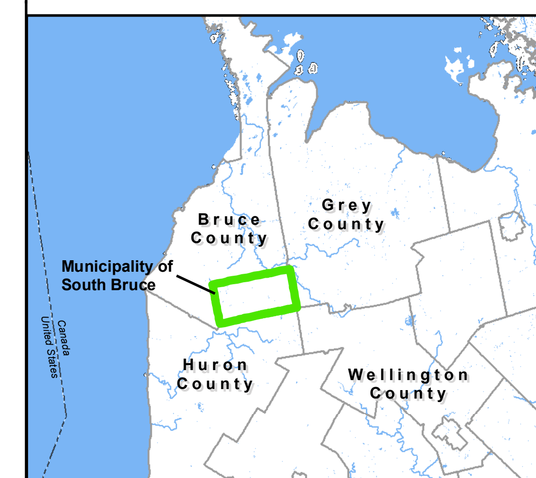
DGR Facility Water and Wastewater Servicing Option 1

Watermain/Forcemain Profile

Legend

- Existing gravity sewers
- Existing forcemain
- Proposed forcemain
- Proposed watermain
- NWMO Land Under Contract

Refer to Exhibit 4 for images of route



Source:
Google Earth Pro, retrieved February 2022

Morrison Hershfield

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June 2022

Exhibit 4 - Infrastructure Baseline and Feasibility Study

DGR Facility Water and Wastewater Servicing Option 1

Figure 1. Sideroad 25

Figure 2. Forested area - Forcemain/watermain installation may require tree removals

Figure 3. Private road - Easement required

Figure 4. Watercourse Crossing - Forcemain/ watermain to be installed using trenchless methods or supported on bridge

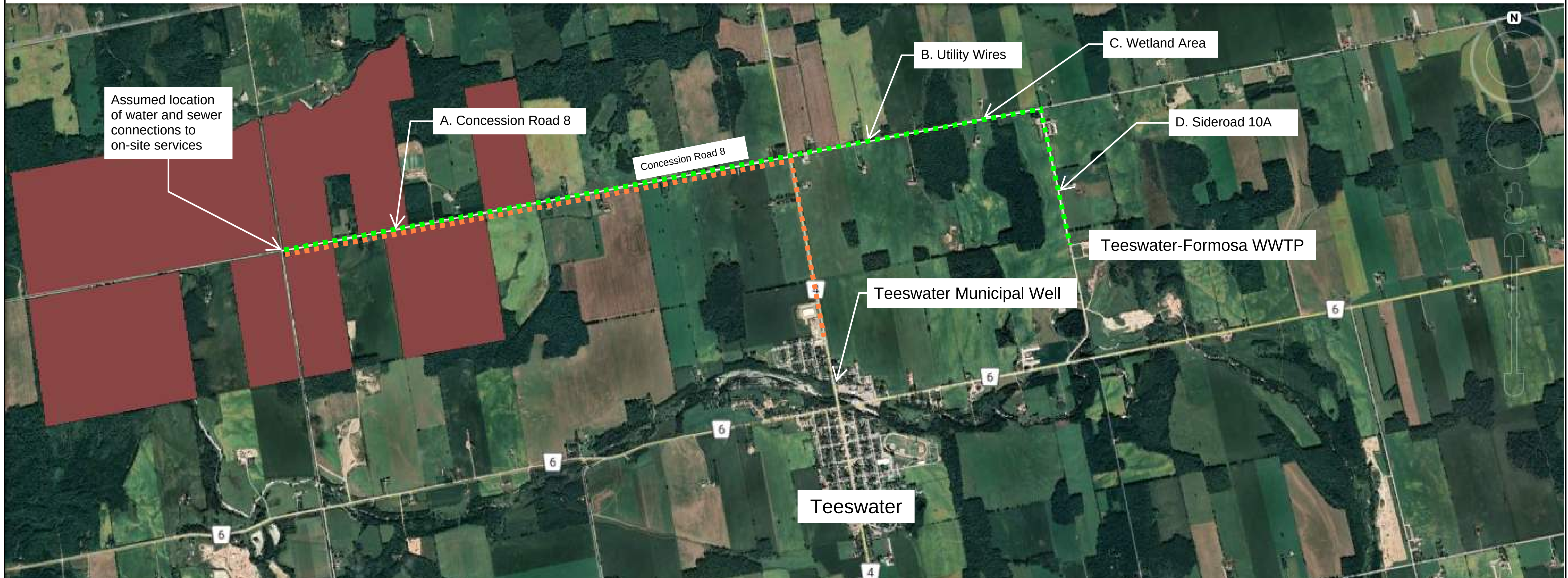
Refer to Exhibit 3 for image locations

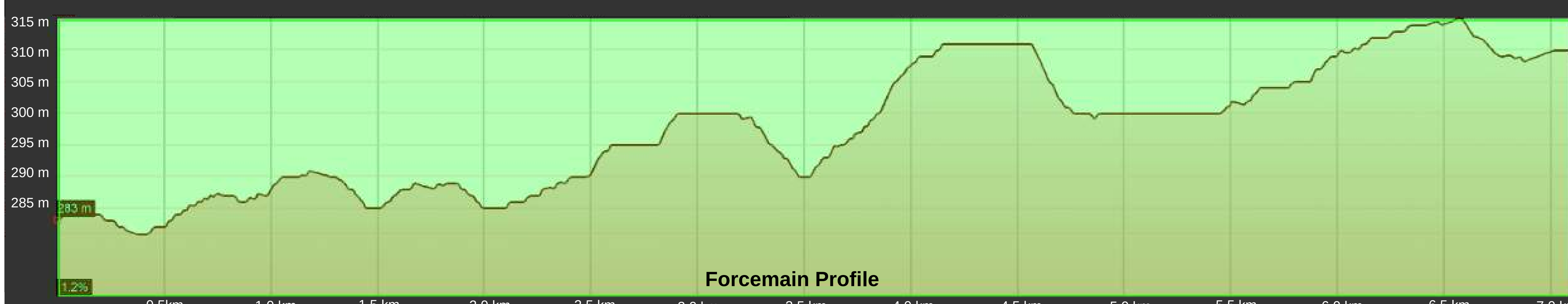
Source:
Google Earth Pro, retrieved February 2022

MORRISON HERSHFIELD

Exhibit 5 - Infrastructure Baseline and Feasibility Study

DGR Facility Water and Wastewater Servicing Option 2

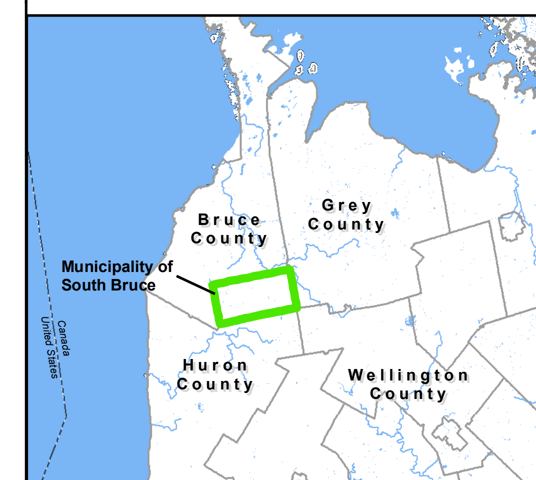




Legend

- Proposed forcemain
- Proposed watermain
- NWMO Land Under Contract

Refer to Exhibit 6 for images of route



Source:
Google Earth Pro, retrieved February 2022

MORRISON HERSHFIELD

June 2022

Exhibit 6 - Infrastructure Baseline and Feasibility Study

DGR Facility Water and Wastewater Servicing Option 2

Figure A. Concession Road 8

Figure B. Utility wires and mature trees may impact forcemain alignment

Figure C. Wetland area - may require mitigation measures to prevent environmental impacts

Figure D. Sideroad 10A - gravel surface minimized reinstatement cost

Refer to Exhibit 5 for image locations

Source:
Google Earth Pro, retrieved February 2022

MORRISON HERSHFIELD

APPENDIX D: List of Acronyms

APM	Adaptive Phased Management
BC	Bruce County
BOD	Biological Oxygen Demand
CBOD	Carbonaceous Biological Oxygen Demand
CS	Community Study
DGR	Deep Geological Repository
DWS	Drinking Water System
EA	Environmental Assessment
FTTH	Fibre-to-the-Home
HONI	Hydro One Networks Inc.
IC&I	Industrial, commercial and institutional
MCR	Major Component Replacement
MECP	Ministry of Environmental, Conservation and Parks
MSB	Municipality of South Bruce
NMWO	Nuclear Waste Management Organization
OEB	Ontario Energy Board
PTTW	Permit to Take Water
RCI	Rogers Communications Inc.
SWIFT	Southwestern Integrated Fibre Technology
SWOT	Strengths, Weaknesses, Opportunities and Threats
TSS	Total Suspended Solids
WHM	Wightman Telecom
WPCP	Water Pollution Control Plant
WPI	Westario Power Inc.
WWTP	Waste Water Treatment Plant