TC ENERGY PUMP STORAGE PLANT

Strategic Environmental Assessment

Report prepared for:

Department of National Defence
4th Canadian Division Training Base
Meaford, Ontario

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1.0 Introduction

TC Energy Corporation, formerly TransCanada Pipeline, (TC Energy) proposes to build a 1,000 megawatt (MW) hydroelectric pumped storage plant (the proposed project) on the shore of Georgian Bay on Department of National Defence (DND) land, at the 4th Canadian Division Training Base (the base), in Meaford, Ontario.

The following report is issued by Save Georgian Bay – a group of concerned residents of the Georgian Bay community, with a core membership centered in Meaford. Section 2.0 provides further information regarding our mission and membership.

The report is issued in response to the DND's request for public comment relating to TC Energy's proposed project. It is presented as a screening level environmental assessment to address the various environmental concerns associated with the proposed project as raised by the community.

It is recognized that the DND must adhere to directives on Environmental Stewardship, as further discussed in Section 3.0. These directives require that the DND consider the environment early in the planning process before any irrevocable decisions are made. Since neither the DND nor TC Energy has prepared or publicly released any form of environmental assessment, Save Georgian Bay has taken the liberty to do so.

The report provides a brief overview of the proposed project in Section 4.0, and a discussion of project rationale in Section 5.0. TC Energy publicly states that the project is needed to provide Ontario with needed electrical capacity, to reduce electricity costs and greenhouse gas emissions, to drive local economic benefits and growth, and to store excess baseload generation. In reality, corporate profit is believed to be the only rationale for the project.

TC Energy has proposed a pumped storage plant located on the DND base without considering alternatives, yet alternatives do in fact exist, as discussed in Section 6.0. A lot has happened in the energy sector since TC Energy started this process at least 5 years ago. Energy storage technologies and management strategies have progressed significantly over the past few years, and will continue to do so. Pumped storage is a produce from the 1960's. It is proven technology, but also proven to cause significant adverse environmental impacts.

TC Energy commissioned a study to evaluate the electricity production and consumption for the proposed project. Section 7.0 summarizes the main findings. The DND directive requires DND operations to reduce energy use. The proposed project will not help the DND achieve that objective. The proposed project will increase energy use since it is a net consumer of electricity.

The report challenges the claim of TC Energy that this project is *"One of Canada's largest climate change initiatives"*. The proposed project will not reduce carbon levels in earth's atmosphere as claimed. In fact, it will likely increase carbon levels, as discussed in Section 8.0. Accordingly, it is recommended that the DND undertake a critical, independent expert review of TC Energy projected carbon savings before making any decision to advance this proposed project. Our research concludes a net increase in carbon emissions when all factors are taken into consideration. Furthermore, others have proposed viable alternatives that achieve the purpose of off-peak energy utilization, while reducing carbon emissions, and not harming the environment or posing a risk to human life.

Save Georgian Bay has engaged with the community to inform them of this project and to share our findings, as discussed in Section 9.0. The overwhelming message we receive from the community is one of opposition. They express concerns about how the proposed project will affect their community, and how it will impact the environment. We trust the DND have heard many of these concerns and will hear more as the comment period comes to a close.

The Municipality of Meaford issued a document to the DND, dated 1st June 2020, expressing their concerns regarding the potential impacts to the community. These concerns reflect many of the messages we hear from the community, as discussed in Section 10.0. Meaford's Official Plan establishes an *'environment-first'* philosophy in the municipality. This means that protecting significant natural heritage features and functions shall take precedence over development.

TC Energy's proposed project has the potential to cause significant adverse environmental impacts to terrestrial and aquatic environments, as discussed in Section 11.0. TC Energy did not adopt a proactive approach towards the environment. Instead, they've taken a reactive approach – propose the simplest and cheapest option and then react to public pressure as it arises. They've changed their original conceptual design because, in their words, *'we listened"*. If the community has to tell a proponent that their design will kill fish, then the proponent has failed in their prime objective of protecting the public, the community and the environment.

The proposed project includes the construction of a reservoir on top of the Niagara Escarpment immediately adjacent to the administrative buildings and barracks on the DND base. A perimeter rock filled dam will hold 23 million cubic meters of water that will tower over the heads of several hundred families. As discussed in Section 12.0, failure of dams is rare, but when they occur, the consequences are catastrophic. It's not a question of *"do dams fail?"*, although the record shows they do. It's a question of *"what are the consequences if the dam does fail?"* Dams that fail within residential areas most likely cause fatalities.

The proposed project includes the construction of a new transmission corridor between Meaford and the connect point at Hydro One's Essa Transmission Station. Both overland and subsea options are being consider, as discussed in Section 13.0. The Municipality of Meaford has declared their preference for the subsea option considered all of the other impacts the municipality will experience as the host.

The DND's directive on environmental protection and stewardship requires the DND to meet or exceed the letter and spirit of all federal laws, including the *Impact Assessment Act*, the *Species at Risk Act*, and the *Fisheries Act*. The *Impact Assessment Act* declares an authority cannot proceed with a project on crown land that may cause a significant adverse environmental effect. The *Species at Risk Act* declares that a project cannot harm the habitat of threatened or endangered species. The *Fisheries Act* declares a project cannot cause mortality of fish or destroy fish habitat. Both the original and revised conceptual designs do not comply with the requirements of these Acts. The project has the potential to cause significant adverse environmental effects, cause death of fish, and destroy fish habitat. The DND, as per their directive, should therefore reject the proposed project outright.

In the event the DND is not prepared to reject the project at this time, DND must hold TC Energy to the highest standard of care possible. The importance of this expectation is presented throughout this Strategic Environmental Assessment. Section 14.0 includes information from a project review provided by Save Georgian Bay to the Mayor and Council of Meaford on 17th March 2020. These conditions were appended to the 1st June 2020 submission from the municipality to the DND. The expectation defined by Meaford Council was clear, if DND does not reject the proposal, then DND must require TC Energy to prove it can meet the requirements, commit to meeting the requirements, and follow through on that commitment. The sum of this report will demonstrate the damage this project would do to the environment, to the land, water and wildlife and to the community, and show that the proponent does not show the capability or will to effectively meet the standards, particularly in a first time effort to design and build a pumped storage facility.

2.0 Save Georgian Bay

Just over one year ago, in July of 2019, several Meaford residents learned about the proposed project – a massive power generation facility to be located at the end of a residential road, towards the northern end of the municipality of Meaford.

The proponent, TC Energy, claimed they selected an isolated area for their project. Little did they know, hundreds of families live in the area, the nearest of which resides within 100 meters from the site.

The base, also known as the Meaford Tank Range, is an 18,000-acre area, with Georgian Bay to the north and east. It is in the northern most geography of the municipality of Meaford.

After learning about the proposal, several of the residents met with TC Energy representatives Sara Beasley and John Mikkelsen. TC Energy identified, during the discussion and in their presentation information, that the conceptual design for their proposed project would be similar to the pump storage plant in Ludington, Michigan. Sara and John invited comment on the proposal. The discussion was educational, constructive and concluded with a resident providing a boat ride to view the area where TC Energy was proposing the project.

Following the meeting the residents collectively studied the proposal and the literature regarding the Ludington pumped storage plant. Several alarming elements of the Ludington plant were discovered:

- The plant had a record of an enormous fish kill from the draw of Lake Michigan water into its turbines.
- The release of water back into Lake Michigan created turbidity which affected the quality of water for a large area surrounding the plant.
- The operation of the plant changed the eco-system surrounding the plant.
- Large towers carrying high tension lines ran from the plant to connect into the Michigan power grid many miles away.
- The plant's operation on the shore for the intakes was apparent and loud even when you were hundreds of meters away from the plant.

These findings caused the residents to facilitate a meeting to discuss the project with many other local residents. Approximately 70 people attended the meeting on 31st August 2019. The initial group presented the information provided by TC Energy, and shared views and other information discovered about the Ludington plant and other pumped storage plants.

Participants in the meeting were asked if they had concerns about such a facility on the base. Over 90% of the participants expressed concerns. Since this affected many more people in Meaford and Georgian Bay, a group of residents agreed to join together and form a study group.

The group expanded as the word started to spread. It was soon evident, many people shared common concerns about TC Energy's proposed project. So the group incorporated as a non-profit organization, and called itself "Save Georgian Bay". The declared mission of the group was to:

- study the project and its implications for the land, water and communities around Georgian Bay; and
- share our findings with the broader community so that they were informed and able to comment on the project.

The Save Georgian Bay team is comprised of a large group of volunteers, many with unique and relevant expertise with large-scale industrial projects. The team includes specialists in the energy sector, engineering (electrical, civil, environmental), geology, archeology, wild-life, aquatic biology, communications, and media. Many members are long term full or part time residents of the community. This report details their concerns.

During the past year, Save Georgian Bay has:

- Provided over a dozen community information meetings about the proposal in the broader community, including Meaford, Thornbury, Leith and Collingwood.
- Organized hundreds of volunteers to share information about the project.
- Created web sites and social media to extend the information on the project.
- Organized several petitions, one of which on Change.org has gathered over 40,000 signatures opposing the project.
- Met with local elected municipal officials and staff in various jurisdictions about the project, in several surrounding municipalities. The Save Georgian Bay team members have also met with provincial and federal elected representatives.
- Prepared a research document sharing specific concerns about the impact of the project on the environment, community, ecosystem, wild-life, water and land. This document included standards and expectations should the project proceed. The Save Georgian Bay report was included in full in the Municipality of Meaford Report regarding TC Energy's proposal that was sent to the Department of National Defence for their review. The Meaford Council resolution stated their expectations

that DND confirm those standards would be met before granting permission for the proposal to proceed

- Collaborated with other environmentally conscious organizations who have also shared concerns about the project. These include:
    - Georgian Bay Association
    - Georgian Bay Forever
    - Ontario Clean Air Alliance
    - Kiowana Beach Association
    - Sunnyside Beach Association
    - All Nations Water Protectors Project

The proposed pumped storage project by TC Energy:

- Threatens to cause significant disruption and permanent changes to the existing natural habitat
- Will cause fish mortality, water turbidity, water and air pollution during the several years of construction phase and then during operation of the plant
- Will require the installation of high-tension power lines from Meaford to Essa Township
- Is not adequately justified as needed to support Ontario's energy needs over the next 40 years, does not contemplate changing energy demand and alternative methods to meet the demand profile, if a need were to exist
- Has inaccurately portrayed the reduction in global CO_2 emissions, claiming a 490,000 tonnes reduction per year, when in fact it could create a 1,000,000 tonnes increase in CO_2 released into the atmosphere
- Would contribute to long term damage to the relationship with community members, particularly those living below the proposed dam and reservoir. Further many community members who were touched by the expropriation of the tank range property in the 1940s are seeing this as a second expropriation
- Recognize this is the TCE's first PSP project, and that TCE has a record of pipeline breaks and poor environmental performance, contributing to deep concerns about the safety of people in proximity to the proposed location, and risks to the wildlife, water and lands of Georgian Bay.

This report from the Save Georgian Bay team will provide background on these various concerns and more, and show there are many better alternatives that should be considered in place of this TCE proposal.

3.0 DND Directives on Environmental Stewardship

3.1 DAOD 4003-0, Environmental Protection and Stewardship

The DND and the CAF are accountable for the impact that defence activities have on the environment. Defence Administrative Orders and Directives, DAOD 4003-0, defines these accountabilities. The intent of the policy is to ensure DND employees and CAF members respect the environment, exercise environmental stewardship, and protect public and non-public properties and assets held in trust.

As part of this objective, the DND and the CAF adopted a code of environmental stewardship that declares, amongst other requirements, that the DND and the CAF shall:

- integrate environmental concerns with other relevant concerns including those from operations, finance, safety, health and economic development in decision-making;
- meet or exceed the letter and spirit of all federal laws;
- acquire, manage and dispose of lands in a manner that is environmentally sound, including the protection of ecologically significant areas.

Their policy statement declares, amongst other requirements, that the DND and the CAF shall adhere to the code of environmental stewardship. The DND and CAF must therefore abide by the letter and spirit of federal laws, including:

- *Fisheries Act* – as discussed in Section 11.2.1, the proposed pumped storage plant will cause death of fish, and cause harmful alteration, disruption or destruction of fish habitat. TC Energy did not avoid these sensitive habitats nor design effective mitigations to minimize the potential effect. Therefore, they have not complied with the requirements of the Fisheries Act.
- *Species at Risk Act* – as discussed in Section 11.1.2and Section 11.2.1, the areas proposed for development include habitats for several terrestrial and aquatic species at risk. TC Energy made no attempt to avoid these sensitive habitats. Instead, site selection was based purely on operational considerations without regard for species at risk.
- *Impact Assessment Act* – Article 82 declares that an authority cannot permit a project to be carried out on federal lands unless the authority determines that the project is not likely to cause a significant adverse environmental effect. The spirit of this article is to protect federal lands and waters from activities that may harm the environment and impact health, social or economic conditions. TC Energy's

proposed pumped storage plant will forever change the environment of Georgian Bay and the Niagara Escarpment within its vicinity.

3.2 Defence Energy and Environment Strategy (DEES)

The *"Defence Energy and Environment Strategy"* (DND, 2017) describes the role of the DND in energy and environmental management, with a vision to:

> *"… become leaders in contributing to the sustainable development goals of Canada through the effective and innovative integration of energy and environmental considerations into activities supporting the Defence mandate".*

The words below, taken from page 20 of DEES, shows great wisdom on the part of our DND:

> *"Strategic environmental assessments are conducted early in the planning process before any irrevocable decisions are made in order to avoid, minimize or mitigate adverse effects and to promote actions that will have a positive effect on the environment".*

These words reflect the environmental strategy of all forward-thinking government agencies and corporations. Environmental considerations come first. They inform the decision-making process *"before any irrevocable decisions are made"*.

Unfortunately, TC Energy does not follow such wisdom. They have been engaged with this project for at least 5-years yet haven't started the environmental process. They have made decisions regarding the site location and conceptual design that will forever change the environment, yet they based these decisions on operational needs without consideration of environmental constraints.

Recently, TC Energy revised their conceptual design in reaction to environmental concerns expressed by the community, particularly Save Georgian Bay. But the revised design only introduces new environmental concerns that TC Energy continues to be unaware of.

Although the DEES requires a *"strategic environmental assessment…before any irrevocable decisions are made…"*, the DND has yet to prepare or publicly release such a report. The DND may not be the proponent, but they remain accountable for the environmental harms caused by TC Energy.

In the absence of such a report, Save Georgian Bay has taken the liberty of preparing a screening assessment to serve as a strategic environmental assessment to inform the DND's decision.

4.0 Project Description

TC Energy proposes to develop the pumped storage plant at the existing Department of National Defence (DND) Canadian Force's 4th Canadian Division Training Center north of Meaford, Ontario. The plant will generate 1,000 megawatts (MW) of electricity to Ontario's electricity system.

A pumped storage plant involves pumping water from a low-lying reservoir during periods of low demand for electricity, typically at night, to a higher-elevation reservoir. When electricity demand is greater, and therefore more expensive, operators release water back to the lower reservoir through turbines that generate electricity, similar to hydropower from dams. TC Energy proposes Georgian Bay as the lower reservoir and a constructed reservoir on top of the Niagara Escarpment as the upper reservoir.

The sections below describe the conceptual design and site location. Section 13.0 discusses the transmission corridor.

4.1 Conceptual Design

4.1.1 Original Concept

TC Energy originally modelled the conceptual design after a plant built in Ludington, Michigan. Figure 4-1 shows a drawing of the original design (left) along with an aerial photograph of the Ludington plant during construction (right).

Figure 4-1: Pumped Storage Plant – Original Conceptual Design

The original design included a constructed reservoir located on top of the Niagara Escarpment, a 1.7 km long penstock extended from the reservoir to the shoreline of Georgian Bay, and a massive intake structure located at the shoreline. Large rock wingwalls and offshore breakwalls (not shown) to protect the intake from waves.

The Ludington plant was approved for construction in the 1960's. After a 12-year court battle, the Ludington plant was required to construct a 2-kilometer net and to pay millions in compensation to mitigate for the impacts it caused. The plant still kills millions of fish each year because of the enormous volume of water that it draws from the lake.

TC Energy did not consider environmental impacts in their original design. The issues associated with the Ludington plant are well documented in court proceedings, published literature, and regulatory monitoring reports. It should have come as no surprise to TC Energy that their original design would kill fish. Further, the offshore breakwalls and intake structure were located on known spawning habitat for various species of fish. Place of these structures directly over such habitat would destroy them forever.

4.1.2 Revised Concept

In view of the concerns expressed by the public, Save Georgian Bay in particular, TC Energy decided in May 2020 to revise their conceptual model. There is no certainty that this eliminates the original concept from further consideration. As such, we cautiously assume both concepts remain viable options.

Figure 4-2 shows the revised conceptual design for the pumped storage plant. Table 4-1 summarizes the design components (TC Energy, 2020). The revised concept still includes a constructed reservoir located on top of the Niagara Escarpment, but the intake structure has been relocated offshore and into deep water (greater than 20 m). The power station will be placed deep underground beneath the Niagara Escarpment, and two 11 m diameter underground tunnels will connect the power station to the offshore intakes.

Figure 4-2: Pumped Storage Plant – Revised Conceptual Design (May 2020)

Table 4-1 List of Design Components

1.	Upper Reservoir: A new reservoir constructed adjacent to the Base administrative complex approximate surface area of 375 acres, depth of 20 meters.
2.	Upper Inlet/Outlet: Controls the flow of water in and out of the upper reservoir.
3.	Primary Spillway: Essentially a large funnel-shaped drain a failsafe in the unlikely event the upper reservoir is nearing capacity.
4.	Secondary Spillway: a back-up drain for the upper reservoir which acts as an additional failsafe to the Primary spillway engineered for a controlled release of flow.
5.	Access Tunnel: Provides personnel access to the powerhouse for construction, operations and maintenance.
6.	Maintenance Access: Contains an access shaft to the tailraces and a divider that can be used to isolate the tailraces.
7.	Lower Inlet/Outlet: A manifold used to divert water each port would be screened and raised off the lakebed to avoid aquatic habitat and organisms, reducing the potential impacts on fish and turbidity.
8.	Switchyard: The electrical connection between the pumped storage facility and the provincial electricity system.
9.	Offices & Control Room: Workplace for day-to-day operations and maintenance of the facility.
10.	Ring Road: A new roadway around the perimeter of the upper reservoir for safety and maintenance.
11.	Ventilation Shafts: Enables air circulation.

4.2 Site Location

It is our understanding that alternative locations within the base were considered by TC Energy and others before arriving at the current proposal. Figure 4-3 through Figure 4-5 illustrate three alternative locations, as described in the points below.

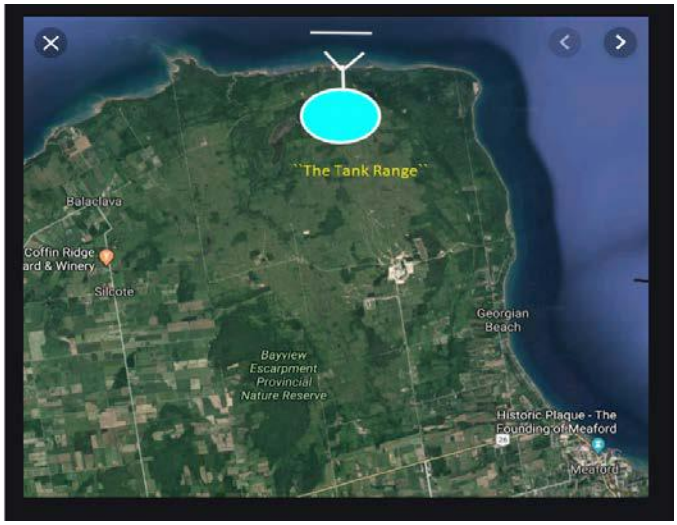


Figure 4-3: Alternative Location #1 – North End of the Base

- Alternative #1, North end of the base – We understand that at one time a proponent (perhaps not TC Energy) proposed the development of a pumped storage plant along the north end of the base near the clay banks. This location would likely interfere with DND training operations on the base. It would have similar environmental effects as other possible locations that involve Georgian Bay as the lower reservoir and the Niagara Escarpment as the location for the upper reservoir. However, from community and safety perspectives, this location has the advantage of being remote with no residents nearby. A failure of the reservoir in this location would cause the least damage and have the least potential for mortality of the three options considered.

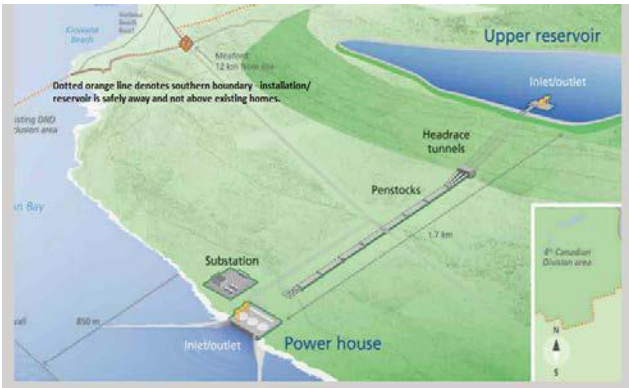


Figure 4-4: Alternative Location #2 – East Side of the Base

- Alternative #2, East side of the base – In earlier depictions of the conceptual design, TC Energy showed the pumped storage plant positioned along the east side of the base, centered between the southeast corner of the base and Cape Rich. It is uncertain how this location would impact DND operations on the base. The potential environmental impacts would be comparable to the other locations considered. However, from community and safety perspectives, this location has the advantage of being remote with no residents nearby. A failure of the reservoir in this location would cause limited damage and potential mortality.

- Alternative #3, Southeast corner of the base – In the most recent depiction of the revised conceptual design, TC Energy shows the pumped storage plant positioned towards the southeast corner of the base. The reservoir would be positioned immediately adjacent to administrative buildings and barracks on the base, and displace training grounds, ranges and access roads. This location may cause the greatest potential disruption to DND training operations on the base. From an environmental perspective, the nearshore area is known spawning grounds for various fish species, so this location has the greatest potential to impact the environment. From community and safety perspectives, the site is directly adjacent

and above a residential area impacting approximately 300 homes. This location poses the greatest risk of property damage and mortality should the reservoir fail. Section 12.0 provides further details about dam safety.

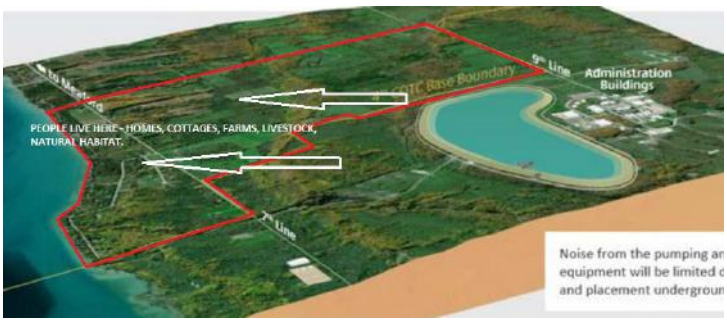


Figure 4-5: Alternative Location #3 – Southeast Corner of the Base

Presumably TC Energy selected the site they did because of the elevation difference between the top of the escarpment and Georgian Bay. Presumably they did not consider anything else in their decision – DND operational needs, the environment, the community, or public safety.

Since the DND are the stewards of these lands, the DND will be held responsible for the decision of site selection. They must weigh the implications of this decision on their operational needs, as well as concerns for the environment, community and public safety.

5.0 Project Rationale

TC Energy claim their proposed pumped storage plant is required to:

- Provide needed capacity;
- Reduce electricity costs and greenhouse gas emissions;
- Drive local economic benefits and growth;
- Provide storage for Ontario's excess baseload generation.

TC Energy claims Ontario needs additional capacity considering the anticipated closure of the Pickering Nuclear Station in 2024. But the Pickering Nuclear Station provides baseload generation. It serves a different purpose than that intended for the proposed pumped storage plant. The proposed Darlington New Nuclear Station already has an approved Environmental Assessment and Site Preparation Licence. It represents a more viable option to replace the baseload generation from the Pickering Nuclear Station. Small Modular Reactors are also gaining recognition as a viable option for baseload generation. As a net consumer of electricity, the proposed pumped storage plant is not a viable option for baseload generation. That's not its intended purpose. The proposed project is a net consumer of electricity, and is intended to store energy during off-peak periods for release during on-peak periods.

TC Energy claims reduced electricity costs. They *boast "…the net benefit to the ratepayer after paying for the cost of the facility is $8.5 billion over the first 40 years of operation"*. Given a current population of 14.5 million people in Ontario, and a projected population of 18.8 million over the next 40 years, the potential savings to ratepayers is approximately $11 per year per person. That's equivalent to the savings of replacing one incandescent bulb with an LED bulb.

TC Energy also claims reduced greenhouse gas emissions, although we can find no evidence to support this claim, as further discussed in Section 8.0.

TC Energy claims this project will drive local economic benefits and growth. Yet the Official Plan for the Municipality of Meaford clearly states *"environment first"*. These words represent the voice of the constituents of Meaford. They mean that protecting the natural heritage and environment shall take precedent over development. This voice is also reflected in the 40,000 signatures on the petition opposing this project, as further discussed in Section 9.0.

TC Energy also claims this project provides storage for Ontario's excess baseload generation. But this is not the only option available to store baseload generation. It's just the only option that TC Energy considered. Section 6.0 reviews these various options.

The truth is, TC Energy has proposed the pumped storage plant to maximize profit. TC Energy owns a 48.4% interest in Bruce Power. The Bruce Nuclear Station provides baseload generation. During off-peak periods, Bruce Power earns less for the energy generated than they do during on-peak periods. The purpose of the proposed pumped storage plant is to store electricity during the off-peak period so that they can sell it during the on-peak period at a higher price. The proposed project will help TC Energy maximize their profit on their combined investment in Bruce Power and the proposed pumped storage plant.

Save Georgian Bay does not take issue with a private corporation seeking profit on their investment. But seeking corporate profit does not justify harming the pristine environment of Georgian Bay and the Niagara Escarpment, or putting a community at risk.

6.0 Alternatives

TC Energy decided to build a pumped storage plant near Meaford, based on three considerations:

- The site provided 150 m of elevation difference between the upper reservoir and Georgian Bay;
- The site is located within 100 km of the power grid; and
- The source of water (Georgian Bay) is available at no cost to TC Energy.

TC Energy has not provided any information to demonstrate they considered other locations or other alternatives. Instead, they react to comments and questions regarding potential alternatives.

The fact is, there are other alternatives that TC Energy could have considered. Perhaps when they started this process at least 5-years ago, some of these alternatives were less developed. But a lot has happened in the energy sector over the past 5-years, and more is yet to come.

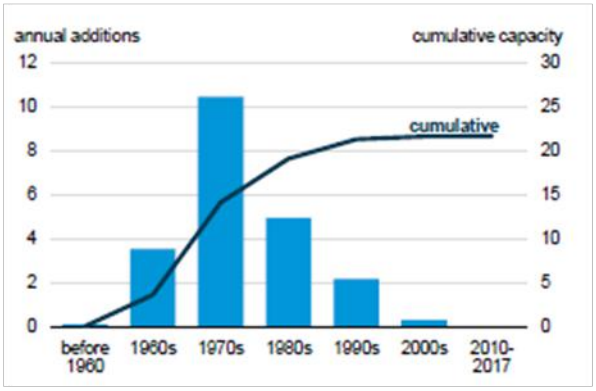
The following sections review several of the alternatives to what TC Energy has proposed. This is not meant as an exhaustive review of alternatives, but merely to demonstrate a wide range of alternatives exist that should have been evaluated in detail before proposing one option that could forever change Georgian Bay and the Niagara Escarpment.

6.1 Hydroelectric Pumped Storage

TC Energy propose the development of a pumped storage plant. This is a form of battery. Essentially, it will utilize electricity generated at off-peak times (generally at night) to pump water uphill from Georgian Bay to a constructed reservoir on top of the Niagara Escarpment. This converts electrical energy into potential energy, since the water is now stored at a higher elevation. During the on-peak times (generally during the day), the water stored in the reservoir is released through a series of turbines to generate electricity. The potential energy of water stored in the reservoir is converted to electrical energy. This process captures approximately 72% of the energy used to pump the water uphill, as discussed further in Section 7.0.

As shown in Figure 6-1, pumped storage plants were popular from the 1960s through 1980s. Few have been built since. The cause of the decline is unclear, although the timing

aligns with new environmental laws in the United States targeted at reducing fish kills associated with large water intakes, such as required for a pumped storage plant.



Source: U.S. Energy Information Administration, Form EIA-860M, *Preliminary Monthly Electric Generator Inventory*

Figure 6-1: U.S. Hydroelectric Pumped Storage Capacity (1960 to 2017)

There are two basic types of pumped storage plant – open-looped and closed-loop.

6.1.1 Open-Looped System

TC Energy has proposed an open-loop system. In an open-looped system, there is an ongoing hydrologic connection to a natural body of water, in this case, Georgian Bay. This type of pumped storage plant reduces capital cost since the lower reservoir already exist. However, this type of system maximizes the potential environmental harm since it causes an enormous cycling of water to and from the natural bode of water. This cycling of water impacts the aquatic environment, as discussed in Section 11.2.

TC Energy did not consider the alternative.

6.1.2 Closed-Looped System

For a closed-loop system, the reservoirs are not connected to an outside body of water. Both upper and lower reservoirs are constructed.

Northland Power is constructing a closed-loop pumped storage plant in an abandoned open pit mine near Peterborough, Ontario. The Marmora Pumped Storage project will generate 400 MW of electricity over 5 hours. The plant repurposes the abandoned mine site without harming the natural environment.

The Australian Renewable Energy Agency provides a mapping application that identifies potential sites for closed-loop pumped storage plants. This application identifies three potential locations within proximity to Collingwood and Stayner, as shown in Figure 6-1. Granted, the capacities of these potential sites are less than 1,000 MW, but the point is, there are suitable locations for closed-loop systems that avoid the potential environmental harm caused by the open-looped system proposed by TC Energy.

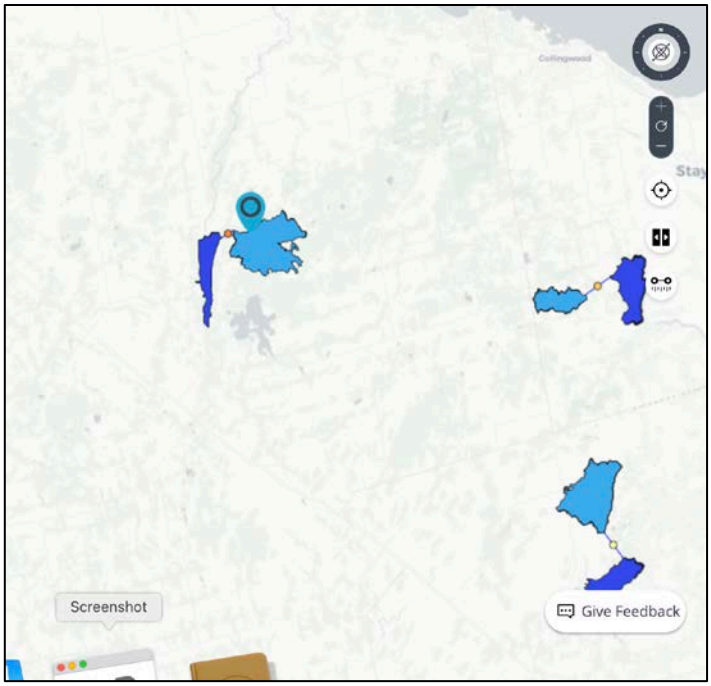


Figure 6-2: Identified Sites for Potential Closed-Loop Pumped Storage Plants

Save Georgian Bay recommends that the DND requires TC Energy to require a third-party expert to undertake a comprehensive assessment of alternative potential sites for the project, including, but not limited to, prospective sites identified by AREMI. The merits of such sites should be compared to the merits of the DND site. This report should assess the best alternative sites with the least environmental impacts relative to the DND site.

6.2 Battery Storage

Energy storage is the capture of energy produced at one time for use at a later time. A device that stores energy is commonly called a battery.

In 2010, large scale battery storage barely existed. Today, battery storage represents the future. The capacity continues to increase and the cost continues to decrease as the technology advances.

Figure 6-2 shows the change in storage capacity for large-scale batteries in the United States over the period 2010 to 2018 (EIA, 2020). In 2010, seven battery storage systems accounted for only 59 MW of power capacity. By 2015, 49 systems accounted for 351 MW of power capacity. The total number of operational battery storage systems has more than doubled to 125 for a total of 869 MW of installed power capacity by the end of 2018.

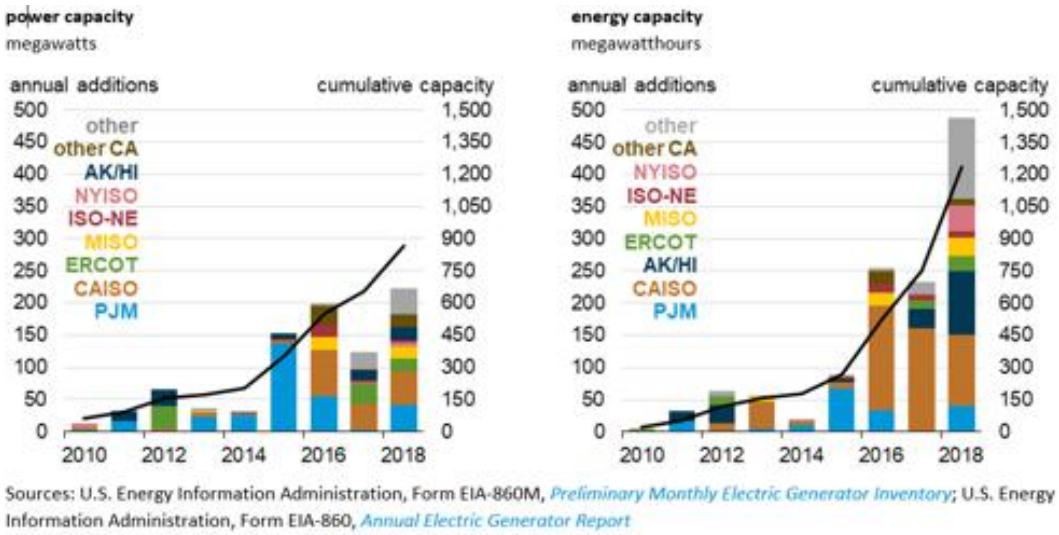


Figure 6-3: U.S. Large-Scale Battery Storage Capacity (2010 to 2018)

According to Bloomberg NED (2020), energy storage installations around the world will multiply exponentially, from a modest 9,000 MW in 2018 to 1,095,000 MW by 2040. Figure 6-3 shows their projections. This is made possible by the sharp decline in the cost of lithium-ion batteries. Bloomberg predicts a further halving of lithium-ion battery costs in the next decade.

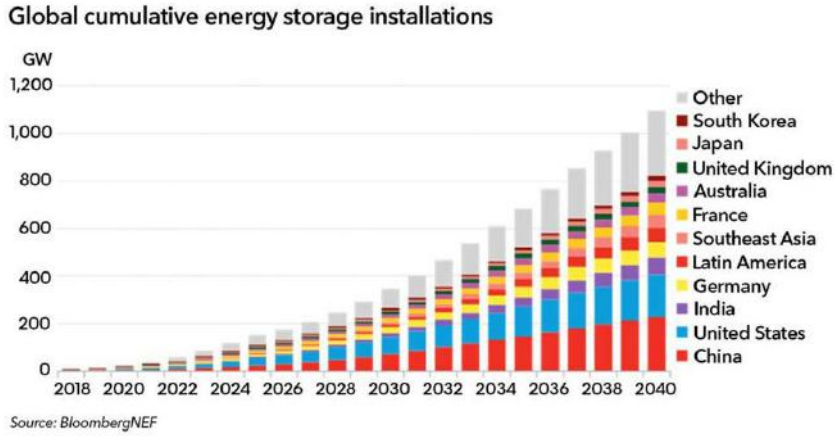


Figure 6-4: Global Cumulative Energy Storage Installations (2018 to 2040)

In 2019, New York approved a 316 MW battery plant (Spector, 2019). The batteries would replace old combustion turbines at the Ravenswood plant in Long Island City, Queens, as shown in Figure 6-4. This project aligns with the goal of 1,500 MW of storage installed by 2025 and 3,000 MW by 2030 as part of the New York's green energy program. This will coincide with the commissioning of TC Energy's 1960's design for a pumped storage plant.

Figure 6-5: New York Approves 316 MW Battery Plant

6.3 Other Forms of Energy Storage

There are other ways of storing electrical energy. Energy comes in many forms, such as radiation, chemical, gravitational potential, thermal, kinetic. As such electrical energy can be stored in any of these forms of energy for later use. For example, a common house hold battery stores electrical energy as chemical energy for later conversion back to electrical energy.

Other examples of energy storage devices include; compressed air storage; chemical storage; flywheel energy storage; redox flow batteries; liquid metal batteries; sodium ion batteries; nickel-cadmium batteries; rail energy storage; superconducting magnetic energy storage; electrochemical capacitors; hydrogen fuel cells; thermal energy storage; gravity storage.

6.4 Alternative Solution from the OSPE

The Ontario Society of Professional Engineers (OSPE) have published several research papers on Ontario's electrical system.

The overwhelming message in these reports is that electrical storage is not only expensive but it does not address Ontario's electrical needs, nor does it address climate change in Ontario in any meaningful way. Ontario should be incenting a wide range of sectors within the province, to switch from use of hydrocarbon fuels (such as natural gas) to using off peak, emission-free electricity in their processes instead of seeing this power exported to neighboring states or curtailed (wasted). Sectors in the manufacturing and heating business are examples of industries that would benefit from off peak, emission free electricity.

The OSPE identify that Ontario wastes a significant amount of surplus emission-free electricity. They see this as an opportunity for the province. The Government of Ontario can implement electricity price reform that will allow consumers to use this surplus to reduce their annual energy bill and, at the same time, reduce carbon emissions without imposing additional costs on the electricity system.

In 2016 and 2017 enough emission-free electricity for 840,000 and 1.1 million households respectively was curtailed (wasted) in Ontario.

This occurred because our low-emission electrical system produces a significant amount of surplus emission-free electricity, however, consumers are currently unable to purchase or use it to displace their fossil fuel use because of the high energy rate in our retail electricity price plans.

Ontario's current retail electricity price plans charge too much for energy use and too little for fixed system costs.

The OSPE made the following recommendations:

1. The Ministry of Energy, Northern Development and Mines should revise current legislation and regulations which prevent consumers from purchasing surplus emission-free electricity (interruptible electricity) at its wholesale market energy price.

   When surplus emission-free electricity is available, the preferred order of energy use should be:

   a) Make surplus emission-free electricity available to all Ontario ratepayers for displacing fossil fuels, especially heating oil and propane used for thermal energy needs, and to industrial consumers to displace natural gas for the production of hydrogen gas.

   b) Export the balance of the surplus electricity that cannot be used in Ontario.

   c) Curtail any residual surplus amounts that cannot be used within Ontario or exported.

2. The Ministry of Energy, Northern Development and Mines, in collaboration with the Ontario Energy Board and Local Distribution Companies (LDCs), should deploy voluntary smart price plans for various consumer groups. These plans should include the following features:

   a) Retail price components should align with the actual fixed and variable electricity system costs.

   b) Retail prices should encourage peak power demand reduction via load shifting/levelling, conservation and energy efficiency.

   c) Retail prices should encourage use of surplus emission-free electricity for fossil fuel displacement.

   d) The design of these voluntary smart price plans should take into account the state of technological capability of the LDCs' metering and communication infrastructure.

The OSPE estimates that there will be sufficient surplus emission-free electricity in the long term to displace 36% of the fossil fuel use in 1.3 million homes.

The OSPE further estimates that the annual total energy bill savings that a typical fuel oil residential consumer can expect using OSPE's proposed Energy Plus Peak Demand Smart Price Plan would be approximately $800/year with a carbon price of $50/tonnes CO_2 and $720/year with no carbon price.

Before considering electrical storage as part of any solution for Ontario's power, we must choose to reform the retail electricity price. If retail electrical price reform were to be implemented, then electrical storage would become less of a consideration and Ontario's climate change goals may be reachable.

If smart meters were introduced in Ontario, the grid operator could turn off appliances in your house that don't need to be running during peak power demand, often while we are at work thus relieving the pressure on the grid. Air conditioners, heat and water heating could be cycled on and off at times when we are not home.

Solar power generated in Ontario conveniently pushes power into the grid during daytime hours, exactly at the time it's needed most, so this emission free solar power does not need to be stored.

Electric cars are mostly charged at night. As the number of electric cars increases, the nighttime power currently wasted will be used to charge your car's battery.

7.0 Energy

Navigant (2020) prepared an economic analysis of the proposed pumped storage plant for TC Energy. Table 7-1 summarizes their estimates of electricity production and consumption over the period 2027 (assumed start-up year) to 2040.

Table 7-1: Electricity Production (Generation) and Consumption (Pumping) Facility

Year	Generation (GWh)	Pumping (GWh)	Year	Generation (GWh)	Pumping (GWh)
2027	1,290	1,788	**2034**	1,526	2,116
2028	1,349	1,870	**2035**	1,553	2,153
2029	1,319	1,829	**2036**	1,570	2,176
2030	1,422	1,971	**2037**	1,547	2,144
2031	1,360	1,886	**2038**	1,553	2,153
2032	1,446	2,004	**2039**	1,574	2,182
2033	1,501	2,081	**2040**	1,627	2,256

7.1 Electricity Production

According to Navigant, the pumped storage plant will produce 1,474 GWh of electricity per year, on average.

TC Energy states:

> *"This facility would not use fuel in the generation of electricity."*

This statement is misleading. The plant may not use fuel during the generation phase of the pump storage process, but it consumes electricity to pump water from Georgian Bay to the artificial reservoir located on top of the Niagara Escarpment. The generation of this electricity requires fuel; therefore, the overall operation of the plant requires fuel.

7.2 Electricity Consumption

To generate this amount of electricity, the pumped storage plant will consume 2,044 GWh of electricity per year, on average, to pump water uphill from Georgian Bay to the artificial reservoir located on top of the Niagara Escarpment.

Most of this electricity will come from nuclear, hydro, wind and natural gas. During 2019, approximately 63% of the total off-peak power in Ontario came from nuclear, and approximately 5% came from natural gas. The portion of power sourced from natural gas will generate approximately 58,000 tonnes of CO_2 per year.

TC Energy state that the pumped storage plant:

> *"…would capture a third of the forecasted excess power that would otherwise be exported or wasted".*

TC Energy considers these exports *"wasted electricity"*, but the Independent Electricity System Operator states:

> *"…exports provide additional revenue that reduces costs that otherwise would have had to be paid for by Ontario consumers. In 2018, exports contributed about $300 million towards meeting Ontario's electricity system costs."*

The Ontario Society of Professional Engineers has proposed a different strategy to address excess power. They did not recommend construction of a pumped storage facility. Instead, they recommend:

- *"…reducing residential and commercial rates by approximately 25%..."*, and
- establishing a market that *"…would allow businesses and residents to access surplus clean power at the wholesale market price – less than $0.02 per KWh"*.

These recommendations would lower the average cost of energy to all consumers, and the proposed market would be accessible to all residents and businesses, not just TC Energy.

7.3 Net Loss of Electricity

According to Navigant, the pumped storage plant will cause a net loss of 569 GWh of electricity, on average (the difference between electricity production and electricity consumption).

Assuming the average Ontario household uses approximately 9,500 kWh of electricity per year, this net loss of 569 GWh could serve the needs of approximately 60,000 households, or a large city with a population of 175,000 (assuming 2.9 people per household). It will use more electricity than Barrie, Guelph or 16 towns the size of Meaford.

8.0 Carbon Emissions

TC Energy claims this project is *"One of Canada's largest climate change initiatives"*. But this project will not reduce carbon levels in earth's atmosphere. In fact, the project will likely cause carbon levels to increase. This is not a *"climate change initiative"* at all. It's TC Energy's attempt to greenwash a project that will cause significant adverse environmental impacts.

If the DND factors carbon emissions and energy into their decision, then then the DND needs to be absolutely certain they have complete and accurate information from which to base their decision. TC Energy tells only part of the story – the part that favours their position. They don't tell the full story.

The sections below present our analysis of the proposed project in terms of carbon emission. Our research draws a very different conclusion from what TC Energy claim. The proposed project will not reduce carbon emission to earth's atmosphere. In fact, it has the potential to increase carbon emissions. More so, others have proposed an alternative strategy that achieves the same benefit of off-peak energy utilization that reduces carbon emissions and does not harm the environment or pose a risk to human life.

8.1 TC Energy's Total Corporate Carbon Emissions

TC Energy's primary business involves the piping and burning of fossil fuels to the tune of 13,500,000 tonnes/year of CO_2 emissions (TC Energy , 2020). This equates to the emissions from 4,100,000 cars, equivalent to every car in Montreal, Toronto and Vancouver combined. TC Energy is not in the business of climate change. They are in the business of making money from the very thing that causes climate change.

8.2 TC Energy's Claim

TC Energy claims this project will reduce CO_2 emissions by 490,000 tonnes/year (TC Energy, 2020; Navigant, 2020).

8.3 Reasons to Question TC Energy's Claim

TC Energy's claim regarding CO_2 emission reductions is questionable. It's unlikely the pumped storage plant will reduce carbon emissions to earth's atmosphere. In fact, it's more

likely the pumped storage plant will cause an increase in carbon emissions to earth's atmosphere.

Navigant provided the estimate based on model predictions. Complexity of the model aside, the simple mathematics work out to:

490,000 tonnes/year = 1,474 GWh/year * 370 tonnes/GWh * 90% efficiency

Where 490,000 tonnes/year is the estimated CO_2 emissions reduction; 1,474 GWh/year is the total annual electricity production; 370 tonnes/GWh is the CO_2 emission intensity for gas-fired generation (Navigant, 2020).

The 90% efficiency accounts for the fraction of consumed electricity sourced from gas-fired generation during the pumping phase of the cycle. The plant consumes 2,044 GWh/year of electricity to pump water uphill from Georgian Bay to the reservoir. Approximately 7% of this electricity is sourced from gas-fired generation, which emits 370 tonnes/GWh of CO_2.

The level of emission reduction attributed to the pumped storage plant is almost equivalent (90%) to the CO_2 emissions from a 1,000 MW gas-fired generating station.

This implies the pumped storage plant could displace 1,000 MW of generation from Ontario's existing gas-fired plants. But TC Energy claims the project is necessary to meet Ontario's electricity capacity needs. Therefore, the pumped storage plant is not intended to displace existing capacity.

Instead, the pumped storage plant is intended to create new capacity.

If this new capacity comes from a 1,000 MW gas-fired plant, such as TC Energy is currently building in Nappanee, then the new capacity would cause CO_2 emissions to increase by approximately 490,000 tonnes/year. But since this new capacity may come from a pumped storage plant instead, it may emit less CO_2. TC Energy is claiming credit for the full CO_2 reduction simply because they decided to build a pumped storage plant instead of a gas-fired plant. But in reality, the plant will not reduce CO_2 emissions, nor will it reduce carbon levels in earth's atmosphere.

But this does not tell the full story.

We've identified several means by which TC Energy's proposed pump storage plant could increase CO_2 emissions, and hence increase the carbon levels in earth's atmosphere.

- TC Energy will increase emissions of CO_2 during construction of the pump storage plant. At this time, we don't have a defensible estimate of these emissions, nor has TC Energy provided this information. Carr (2020) estimated emissions of

approximately 300,000 tonnes/year of CO_2 based on the original conceptual design. The emissions are expected to be higher with the revised conceptual design.

- TC Energy states they will *"capture a third of the forecasted excess power that would otherwise be exported"*. The Ontario Society of Professional Engineers recommend a different plan for this excess power (OSPE, 2016; OSPE, 2019). Their plan will lower the average cost of energy to all consumers, and reduce carbon emissions by 2,100,000 tonnes/year CO_2 for water and space heating alone. Greater reductions in carbon emissions are possible if this surplus electricity is used for charging of electric cars and production of hydrogen for fuel cells. TC Energy's pumped storage plant will reduce the carbon reduction benefit of the Ontario Society of Professional Engineers' plan by 438,000 tonnes/year of CO_2.

- Recognizing that climate change is a global issue, we also need to consider what happens to the so called *"waste electricity"* that would no longer be exported to the United States if TC Energy proceeds. Most of the export goes to states that source 50% to 70% of their energy from coal and natural gas (IESO, 2020; USDE, 2015; USDE, 2016). They will have to increase generation to offset the loss of emission-free electricity from Ontario. This will increase CO_2 emissions by 700,000 to 1,400,000 tonnes/year depending on whether the energy was sourced from natural gas or coal.

TC Energy will not reduce CO_2 emissions as claimed. Instead, the evidence shows that TC Energy will increase CO_2 emissions both directly through construction and operation, and indirectly through the lost benefit of the Ontario Society of Professional Engineers plan and the addition generation of electricity required in the United States. This will increase CO_2 levels in earth's atmosphere, and thereby compound the climate change issue.

8.4 Reduced Benefit of the OSPE Carbon Reduction Plan

TC Energy states they will *"capture a third of the forecasted excess power that would otherwise be exported"*.

The Ontario Society of Professional Engineers recommend a different plan (OSEP, 2016; OSPE, 2019). They did not recommend construction of a pumped storage facility. Instead, they recommend:

- *"…reducing residential and commercial rates by approximately 25%..."*, and

- establishing a market that *"…would allow businesses and residents to access surplus clean power at the wholesale market price – less than $0.02 per KWh"*.

These recommendations would lower the average cost of energy to all consumers, and the proposed market would be accessible to all residents and businesses, not just TC Energy. The low cost of surplus clean electricity will displace the use of natural gas by consumers, thereby reducing carbon emissions by 2,100,000 tonnes CO_2 per year, as per Table 8-1.

Table 8-1: CO_2 Emission Reductions from OSPE's Plan

Potential GHG Emission Reductions from Natural Gas Displacement By Surplus Emission-Free Electricity		
	Surplus Emission-Free Electricity Available TWh	Reduction if Natural Gas is Displaced tonnes CO_2
2020-2035 Annual Average	9.8	2,100,000
2020-2035 Total	157.0	33,400,000

This reduction in carbon emissions is achievable if the 9,800 GWh/year of surplus emission-free electricity is used to displace natural gas for water and space heating alone. Greater reductions in carbon emissions are possible if this surplus electricity is used for charging of electric cars and production of hydrogen for fuel cells.

The Ontario Society of Professional Engineers' plan truly represents *"One of Canada's largest climate change initiatives"*. It will actually reduce CO_2 levels in earth's atmosphere, and thereby help address climate change.

But TC Energy requires 2,044 GWh/year of this surplus electricity to pump water from Georgian Bay to the top of the Niagara Escarpment. This will reduce the carbon reduction benefit of the Ontario Society of Professional Engineers' plan by 438,000 tonnes/year of CO_2.

Not only is TC Energy not reducing CO_2 emissions as claimed, they are reducing the effectiveness of an alternative plan that actually provides a net reduction in CO_2 emissions.

8.5 Increase in Carbon Emissions in the United States

Recognizing that climate change is a global issue, we also need to consider what happens to the so called *"waste electricity"* that would no longer be exported to the United States if TC Energy proceeds.

TC Energy states that by reducing exports, they are *"…reducing greenhouse gas emissions"*. But reducing exports of emission-free electricity to the United States will actually increase CO_2 emissions and increase carbon levels in earth's atmosphere.

In 2019, Ontario exported 9,566 GWh of emission-free electricity to Michigan, 520 GWh to Minnesota, and 6,318 GWh to New York. Michigan generates 49% of its energy from coal, Minnesota generates 44% of its energy from coal, and New York generates 44% from natural gas (IESO, 2020). Overall, these three states source 50% to 70% of their energy from coal and natural gas (IESO, 2020; USDE, 2015; USDE, 2016). Coal produces 1,000 tonnes of CO_2 per GWh of electricity plus an additional 0.15 tonne/MWh for production and transport of the coal. The CO_2 emissions from natural gas are less than half that of coal.

If these states cannot source emission-free electricity from Ontario, they will make up the difference from energy sourced from coal and natural gas. The generation of this additional electricity could emit 700,000 to 1,400,000 tonnes/year of CO_2, depending on the fuel type. This will increase CO_2 levels in earth's atmosphere, and thereby compound the climate change issue.

9.0 Community Engagement

As discussed in Section 2.0, the declared mission of Save Georgian Bay is to: study the proposed project and its implications for the land, water and communities; and to share our findings with the broader community so that they are informed and able to comment on the proposed project.

The community had not been engaged on this $3.3 billion proposal until the Save Georgian Bay team chose to take action. The Mayor of Meaford chose not to inform her constituents, even though she was aware of the proposed project as of 12th December 2018. The Mayor was asked by TC Energy to remain silent, and to not even inform the Deputy Mayor and Councilors. Councilors didn't learn of the proposed project until 17th June 2019, as we learned from documents obtained through a Freedom of Information request.

TC Energy had not engaged the broader public until their first community meeting on 11th December 2019, and only in reaction to our efforts to inform the public.

The DND declares they have a responsibility to consult with the public, yet the DND has still not held a public meeting as they stated they would. Their comment period opened on 27th May 2019, yet there was no education for the public to be aware of the project until Save Georgian Bay held their first community meeting at the Meaford community center on 12th October 2019.

Save Georgian Bay has taken our role with community engagement seriously. We have worked collaboratively with and through various groups of people affiliated by geographic proximity, special interest, or similar situations to address issues affecting the well-being of the broader community of Georgian Bay.

We have reached out to many communities within the southern Georgian Bay, including Meaford, Owen Sound, Thornbury, Collingwood and Wasaga Beach. We have reached out to other organizations, including Georgian Bay Association, Georgian Bay Forever, All Nations Water Protectors Project, FOTTSA and GBGLF. We have also reached out to First Nations.

Our methodology to engage the communities has been multi-faceted.

- Awareness: Interpersonal discussion (Verbal, nonverbal, written & visual), poster campaigns, flyer distribution, lawn signs and social media (Facebook/ Instagram/Webpage) and petitions.

- Educate: Through pubic presentations, printed articles, pamphlets and radio spots and interviews.

- Collaborate: Engage with surrounding communities/committees, special interest groups, businesses, associations and indigenous leaders as well as municipalities/councils and elected officials.

- Action: Develop an action plan that promotes awareness of the compile concerns and goals and coordinate with resources.

The numbers show our progress to date:

3	The number of Council members who toured the “Impact Zone”
6	The number of community information sessions Save Georgian Bay held
11	The number of community demonstrations held (all peaceful)
115	The number of “SAY NO” Covid-19 face masks sold
425	The number of “SAY NO” yard signs distributed
865	The number of followers on Save Georgian Bay Facebook page
1,400	The number of people who signed the door-to-door paper petition
1,750	The average number of weekly posts to the Facebook page
1,966	The number of Save Georgian Bay Group members on Social Media
2,282	The number of people who signed the House of Common petition
4,500	The number of brochures distributed
21,000	The number of people from Canada who signed the change.org petition
40,000	The number of people who signed the change.org petition

We have held multiple meetings and written countless emails to the Mayor, Deputy Mayor, Councilors and staff of the municipality. We issued a report to the Mayor and Council that outlines 31 conditions that we believe essential to ensure TC Energy is held to the standard of care expected by the community. Our report was appended to the Municipalities 1st June 2020 submission to the DND.

We also held numerous meetings with Provincial and Federal government officials to share our concerns and to hear their perspective.

We reached out to First Nations on numerous occasions. Saugeen Ojibway Nation listened to our concerns but preferred to work within their own governance and community. We met with Metis Nation of Ontario Owen Sound chapter in December 2019 to present the proposal and to hear their concerns. We met with members of Beausoleil First Nations, Christian Island reached out to share their opposition and help spread awareness. Members of Chippewas of Nawash Unceded First Nations reached out to us to share their concerns. They shared their family history and how their lands were unfairly expropriated in 1942 to make way for the military training base.

The overwhelming message we receive from the community is one of opposition. They express concerns about how the proposed project will affect their community, and how it will impact the environment. We trust the DND have heard many of these concerns and will hear more as the comment period comes to a close.

We've heard from a few who support the proposed project, as we're sure the DND have as well. They are concerned about the economic future of their community. They see the prospect of jobs as being most important.

Save Georgian Bay accepts both points of view. Community, environment and economic growth are all essential for our community to prosper. Our point is merely that one is not favoured at the expense of all others. Environment should not be compromised in favour of economic growth, just as economic growth should not be compromised over environment. Both can be achieved.

This is the very reason why the DND's Defence Energy and Environment Strategy declares that *"strategic environmental assessments are conducted early in the planning process before any irrevocable decisions are made"*. This ensures that all factors are consider – community, environment and economic – before a decision is made.

10.0 Community Impacts

The Municipality of Meaford (the municipality) issued a document to the DND, dated 1st June 2020. The document was prepared by Mr. Rob Armstrong, CAO/Director of Development Services and was ratified by the Council of the Municipality following a public review period. The community impacts described in this section draw from municipality's report.

10.1 Policy Direction

The municipality normally draws from the following documents: Provincial Policy Statement; other Provincial Policy (e.g., The Niagara Escarpment Plan); applicable land use designations of the County of Grey Official Plan; and the Municipality of Meaford's Official Plan (the Official Plan).

According to Section B2.8 of the Official Plan, the proposed project will reside on Federal Lands and under the jurisdiction of the Government of Canada. If these lands cease to be under the jurisdiction of the federal government, an Amendment to the Plan will be required to ensure the use of these lands is consistent with the vision, principles and policy framework contained in the Official Plan.

That said, the proposed project could have impacts on lands that are affected by the Official Plan, and therefore the proposed project should be evaluated in accordance with the goals and objectives and other policies of the Official Plan.

The municipality has a number of significant environmental and topographical features that contribute to the 'sense of place' felt by many of the residents within the community. These features include the Georgian Bay shoreline, the Niagara Escarpment, the Meaford Harbour, the Big Head River and its tributaries, the Bruce and Georgian trails and the large forest tracts, valleylands, smaller woodlots and wetland areas that support diverse wildlife and plant communities.

The protection of these attributes is a key underlying principle in this Official Plan and for this reason, the Official Plan establishes an *'environment-first'* philosophy in the municipality. This means that protecting significant natural heritage features and functions shall take precedence over development.

The various goals and objectives outlined in the Official Plan focus on the protection and enhancement of natural heritage features and functions; maintain and enhance the open space character of the rural area; and provide opportunities of economic development and job creation.

10.2 Socio-Economics

The Municipality of Meaford (2020) expresses concerns over the anticipated labor demands during construction. This will place a significant burden on the municipality, businesses and residents who seek contractors since the current labour market is already limited. Shortages of experienced and available construction companies is expected if this project proceeds.

The current state of housing within the municipality and larger region will not support the influx of workers into the area. There will be an interim need for housing in the vicinity of the proposed project.

The economic review completed for TC Energy by ERM (2020) has not been peer reviewed nor evaluated in terms of the Official Plan and other economic opportunities within the region. Further study is required to understand the potential impacts of the proposed project on other economic opportunities, such as tourism, recreational fishing, and other economic opportunities that align with the current objectives of the Official Plan.

The proposed project will have a significant adverse effect on municipal roads. In particular, the 7th Line provides direct access to the site, yet it is essentially a residential road used by the local residents for transport, biking, cycling andwalking. It is not suited for transport of heavy industrial equipment or hauling large quantities of material to and from. The proposed project will also impact the intersection of the 7th Line and Highway 26, Grey Road 112, and the intersection of the base road and Highway 26.

10.3 Community Concerns

Many who studied and become familiar with TC Energy's history have found a company with a culture that has a disregard for the environment. TC Energy CEO Russ Girling wrote in the TransCanada Corporate Responsibility Report (2017) *"at TransCanada we have always strived to be a leader when it comes to safely delivering the energy millions of people rely on in an environmentally and socially responsible manner".*

This written word is inconsistent with TC Energy's environmental history. From the Polaris Institute report titled *"Unplugging the Dirty Energy Economy"*, dated June 2015:

> *"According to the National Energy Board, 17 of the 39 major pipeline accidents in Canada (from 1992 to 2014) were on pipelines owned by TransCanada or its subsidiary NGTL. TransCanada-owned pipelines thus account for almost half of the serious breaches reported by the NEB on federally regulated pipelines in over two decades."*

Certainly, it would be easy to judge this volume of incidents as a casual disregard for the environment, however it could also be a bias in favor of mitigation, fixing problems when they occur. Or it could be that TC Energy does not have a quality management system which enables them to build in a way that meets the requirement of the system, of even the CEO of TC Energy. What is certain is that they are unable or unwilling or both, to meet the standard expressed it the words of Mr. Girlling: *"safely delivering the energy millions of people rely on in an environmentally and socially responsible manner"*.

Here are some news reports worth review:

- Keystone pipeline spill is biggest onshore crude spill in a decade. November 1 2019. Liz Klaman, Fox Business.

  This report shared how the TC Energy managed and owned Keystone Pipeline had leaked 383,000 gallons of crude oil in North Dakota.

- Oil spill in North Dakota is Keystone pipeline's 2nd in 2 years.

  "In November 2017, the Keystone pipeline ruptured near Amherst, S.D., spilling 407,000 gallons of oil, though initial estimates pegged the leak at 210,000 gallons".

  "The probable cause of that spill was a "fatigue crack" from mechanical damage during the pipeline's construction, the National Transportation Safety Board concluded last year. A metal-tracked vehicle likely caused the crack, which grew over time until the pipeline ruptured."

  "It's a valid question, two cracks on a fairly new pipeline — geez what's going on?" said Richard Kuprewicz, president of Accufacts, a Washington state-based pipeline safety consulting firm.

- TransCanada dismissed whistleblower. Then their pipeline blew up.
  By Mike De Souza in Canada's National Observer News | February 5th 2016.

  A report on TC Energy's disregard for the warning of an employee about a quality problem.

These reports indicate an ongoing problem. The inability or unwillingness to put in place a quality system that meets environmental and social expectations.

So, when the community is asked for their input on TC Energy's proposed pumped storage plant, we are concerned. We don't see a company we believe we can trust. We don't believe their past warrants our trust.

Whereas TC Energy has built and managed thousands of miles of oil pipelines and still cannot build and manage their lines so that they do not leak or fail on a regular basis. Their performance is consistent, producing the results the Polaris Institute report describes, "*TransCanada-owned pipelines thus account for almost half of the serious breaches reported by the NEB on federally regulated pipelines in over two decades*". Consistent poor performance.

TC Energy has never built a pumped storage plant. If they can't build leakproof crude oil pipelines after decades of experience, what expectation should the community and the DND have for their ability in a first effort, to build a leakproof 23 million cubic meter dam/reservoir? A reservoir that will tower over the heads of hundreds of families.

11.0 Environmental Impacts

The DND's "Defence Energy and Environmental Strategy" requires that *"strategic environmental assessments are conducted early in the planning process before any irrevocable decisions are made"*.

To our knowledge, the DND has not prepared or publicly disclosed a *Strategic Environmental Assessment* to support the decision they are about to make. Considering the DND have been notified of this proposal since at least July 2016, such an assessment should have been prepared by now. DND policy requires its preparation *"early in the planning process and before any irrevocable decisions are made"*.

In the absence of such a strategic environmental assessment from either the DND or TC Energy, Save Georgian Bay has undertaken the preparation of such an assessment.

11.1 Terrestrial Environment

11.1.1 Niagara Escarpment Plan

The site of the proposed project is not included within the Niagara Escarpment Plan, likely for the same reason that the Official Plan does not apply to Federal Lands. Background mapping for the initial Niagara Escarpment Plan for the 1970's does, however, indicate that the site traverses the escarpment, as shown in Figure 11-1. Further, the proposed reservoir would be located on top of the escarpment. According to Municipality of Meaford (2020), these locations became the Escarpment Natural designation which garnered the highest level of protection under the Niagara Escarpment Plan.

The objectives of the Escarpment Natural Designation are as follows:

1. To recognize, protect and where possible enhance the natural heritage and hydrological systems associated with the Niagara Escarpment Plan area.
2. To protect the most natural Escarpment features, valleylands, wetlands and related significant natural areas.
3. To conserve cultural heritage resources, including features and areas of interest to First Nations and Métis communities.
4. To encourage compatible recreation, conservation and educational activities.
5. To maintain and enhance the scenic resources and open landscape character of the Escarpment.

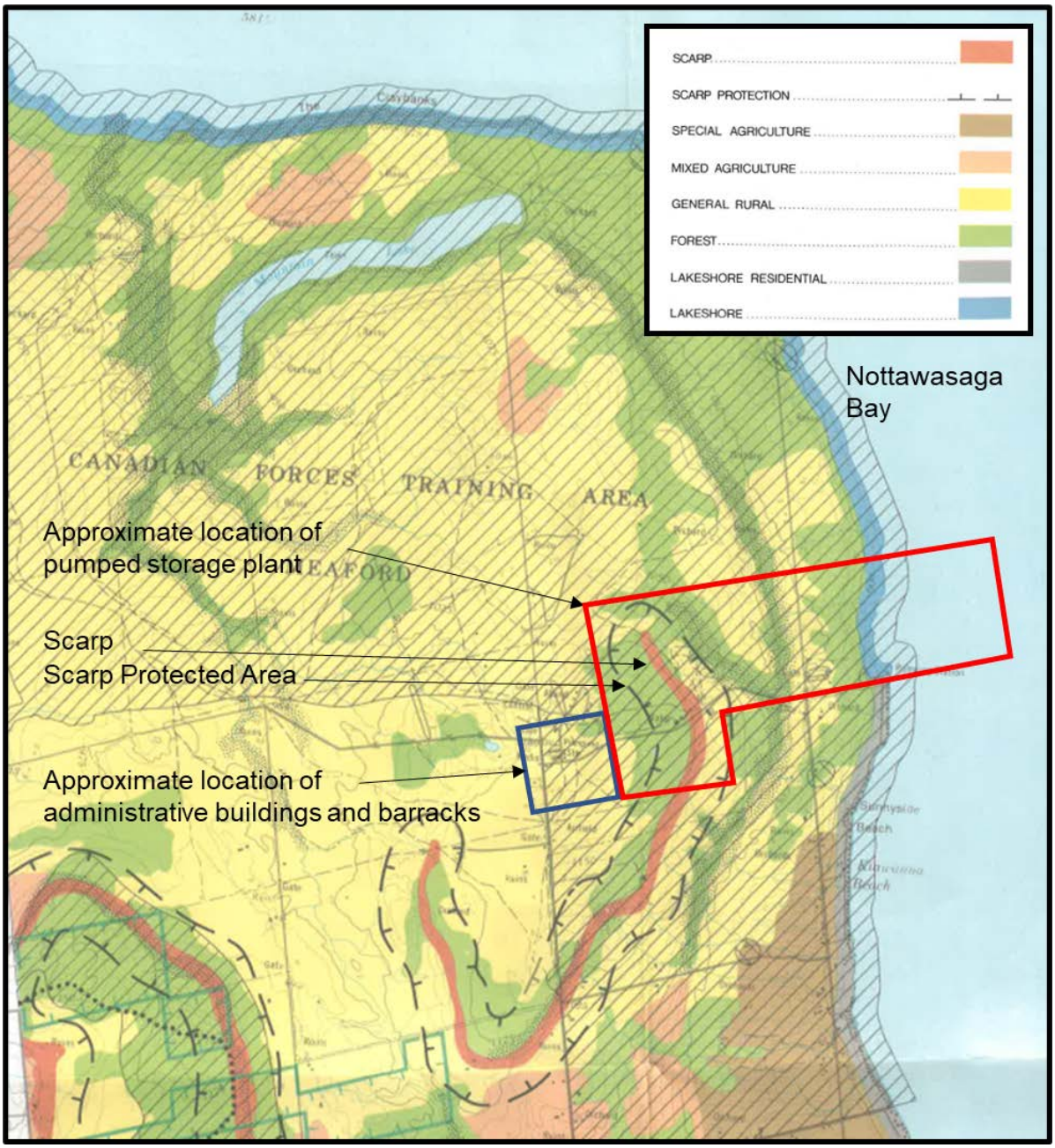


Figure 11-1: Site Location Map Showing Relationship to the Niagara Escarpment

Save Georgian Bay shares the concern stated by the Municipality of Meaford (2020) regarding the visual impact of the proposed project. We support the municipalities request for a peer reviewed Visual Impact Assessment in accordance with the NEC Visual Assessment Guidelines.

We do not accept the claim of TC Energy that the site is isolated, nor do we accept the artistic renderings of the site that TC Energy presents at community meetings and on their website. These claims and renderings are intended to deceive.

11.1.2 Species at Risk

TC Energy's proposed project presents a serious threat to wildlife habitat. Considering the risk, the most common way to extinct a species is by eradicating or by disturbing their habitat.

In the Action Plan of the Federal Sustainable Development Strategy, the federal government has committed to protect wildlife species at risk and also the federal government has committed to implement the new Pan-Canadian approach to wildlife health.

According to the DEES, under protecting flora and fauna section, DND has specifically committed to protecting wildlife species on its working federal land and planning to protect wildlife and plants that are particularly at risk.

Permitting TC Energy's proposed project to go forward and protecting our local wildlife habitat at the same time are in conflict. We cannot have both! Either you are going to protect the wildlife or you are going to allow this project to happen.

We have personally witnessed the habitat of the following endangered species and species at risk located in the area of the proposed plant:

Butternut Tree, Red-headed Woodpecker, Little Brown Myotis Bat, Northern Long-Eared Myotis Bat, Western Chorus Frog, Eastern Meadowlark, Bobolink bird, Canadian Warbler, Wood trash and Monarch butterfly.

Butternut Tree

Little Brown Myotis Bat

Northern Long-Eared Myotis Bat

Red-headed Woodpecker

Canada Warbler

Eastern Meadowlark

Bobolink

Western Chorus Frog

Monarch Butterfly

11.2 Aquatic Environment

11.2.1 Species of interest

Preliminary investigations identify that at least 23 species utilize the aquatic environment of Georgian Bay within the vicinity of the Project. Several of these species are listed as threatened by COSEWIC.

TC Energy's proposed project will affect aquatic habitats within Georgian Bay. As with terrestrial environments, the most common way to extinct a species is by eradicating or by disturbing their habitat.

The original conceptual design for the proposed project included construction of a massive breakwall and wingwalls directly on known spawning habitat for Lake Whitefish, Trout and Carp. Such structures placed on top of such habitat destroys the habitat forever – it's that simple. The intake placement at the shoreline would entrain fish and anything or anyone else that happened to stray by. We know this from experience at the Ludington plant. That plant continues to kill millions of fish each year even after mitigation.

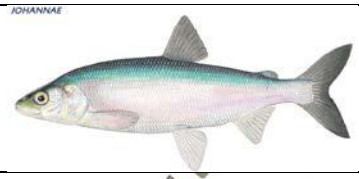
TC Energy reacted to our concerns and decided to revise their conceptual design. The revised concept removes the breakwalls and shoreline intake, and replaces them with eight offshore intakes. This shifts the focus from the nearshore aquatic environment to the offshore aquatic environment. The design remains a concept. We have no assurance TC Energy will not resume the original concept or propose something completely different yet again.

Moving to the offshore aquatic environment introduces a new concern – Cisco. Cisco are salmonid fish of the genus *Coregonus*. They were once plentiful within the Great Lakes but have declined in recent years with several species now extinct.

Table 11-1 summarizes the status of major forms of Cisco in Lake Huron/Georgian Bay (GLFC, 2016). Of the six major forms of Cisco within the basin, two are extinct, and three have introgressed into a hybrid swarm. These are considered to be extirpated/extinct, although elements of their morphology may persist.

Concerns regarding these species of interest are discussed below in the context of the Fisheries Act.

Table 11-1: Status of Major Forms of Cisco in Lake Huron (Georgian Bay)

Scientific name: Common name: Status:	*C. artedi* Cisco Extant	
Scientific name: Common name: Status:	*C. hoyi* Bloater Introgressed	
Scientific name: Common name: Status:	*C. johannae* Deepwater Cisco Extinct	
Scientific name: Common name: Status:	*C. kiyi* Kiyi Introgressed	
Scientific name: Common name: Status:	*C. nigripinnis* Blackfin Cisco Extinct	
Scientific name: Common name: Status:	*C. zenithicus* Shortjaw Cisco Introgressed	

11.2.2 The Fisheries Act

The Fisheries Act is one of Canada's oldest, strongest and most important pieces of environmental legislation. It provides a framework for the proper management and control of fisheries, and the conservation and protection of fish and fish habitat, including by preventing pollution.

The Fisheries Act will form a significant part of the regulatory process associated with TC Energy's proposed pump storage plant.

The Fisheries Act declares:

- A proponent shall not cause death of fish,
- A proponent shall not cause harmful alteration, disruption or destruction of fish habitat, and
- A proponent shall not discharge or cause the release of a deleterious substance.

The hierarchy of steps required to comply with the fish and fish habitat protections of the Fisheries Act include:

- Step #1 – Avoidance
- Step #2 – Mitigation
- Step #3 – Offset

A proponent should first avoid sensitive environmental features or resources. They then mitigate potential effects that remain after avoidance. Offsets apply only after every effort has been made to avoid and mitigate as a means to counterbalance the residual effect.

TC Energy's proposed pump storage plant, as proposed, does not comply with the Fisheries Act. They claim they will follow these three steps but we have not seen evidence of this. They have already made irrevocable decisions, such as site selection and conceptual design, that did not consider environmental constraints. Avoidance did not factor into their decision-making process. They claim mitigation will resolve all issues, but they have yet to demonstrate they understand the issues, let alone know how to mitigate them. More so, not all impacts can be mitigated. You can't mitigate actions that destroy sensitive fish habitat or further threaten endangered species.

The text below is not intended as an exhaustive discussion of the Fisheries Act, but rather to identify several of the important aspects of the Act relevant to TC Energy's proposal. The text should also not be interpreted as to imply fish and fish habitat are the only environmental consideration of relevance. TC Energy's proposal will cause many environmental issues, too many to list here.

11.2.3 Step #1 – Avoidance

Avoidance means 'to keep away from'.

The Fisheries Act requires proponents to keep away from sensitive environmental features or resources. This is the first step in the environmental process.

It begins with site selection.

TC Energy selected the site based on three requirements: 150 m of elevation difference; source of free water; and located within 100 km of the power grid.

TC Energy did not consider environmental constraints in their site selection. Their first conceptual design placed large breakwalls directly over known spawning habitat for Lake Whitefish, Trout and Carp, and the shoreline intake design would repeat the mistakes made at a similar plant at Ludington, Michigan, that continues to cause fish mortality as documented in court transcripts and regulatory monitoring reports.

It was only after the community (via Save Georgian Bay) took issue that TC Energy decided to modify their conceptual design. TC Energy's primary responsibility should be to protect the public, the community and the environment. If the community tells them that their design will kill fish, then they failed in the primary responsibility because they should have known.

The revised conceptual design relocates the intake/outfall further offshore into deeper water. This resolves potential effects to the nearshore environmental only to create new potential effects to the offshore environment. The intake/outfall structures are now located within rearing habitat for juvenile Lake Whitefish and habitat for Cisco.

A strategic environmental assessment should identify a long list of potential sites, and then conduct a screening evaluation of each based on potential environmental constraints. Sensitive aquatic habitat or the presence of an endangered species, such as Cisco, would be considered an environmental constraint.

Had TC Energy done this screening evaluation, they would have rejected this location due to the sensitivity of the aquatic environment. But now that they have invested years in the design and assessment of this site, they are committed. They made an irrevocable decision years ago without proper information, and now they will react to the issues and concerns as they arise.

Knowing that the site contains sensitive environmental features and resources, TC Energy should have avoided the site all-together. Rather than selecting a 'green-field' site, they could have selected a 'brown-field' site, such as an abandoned mine or quarry as others have done. They could also consider a closed-looped system with a lower reservoir placed in-land from the shoreline to avoid the aquatic environmental altogether. Alternatively, they could have selected a different technology to store electricity, or endorsed the strategy proposed by the OSPE as discussed in Section 6.0.

They claim the project is 'green', yet they will destroy a pristine 'green-field' site in the process.

The DND's directive on environmental protection and stewardship requires the DND to meet or exceed the letter and spirit of all federal laws, including the *Impact Assessment Act*, the *Species at Risk Act*, and the *Fisheries Act*. The *Impact Assessment Act* declares an authority cannot proceed with a project on crown land that may cause a significant adverse environmental effect. The *Species at Risk Act* declares that a project cannot harm the habitat of threatened or endangered species. The *Fisheries Act* declares a project cannot cause mortality of fish or destroy fish habitat. Both the original and revised conceptual designs do not comply with the requirements of these Acts. The project has the potential to cause significant adverse environmental effects, cause death of fish, and destroy fish habitat. The DND, as per their directive, should therefore reject the proposed project.

In the event the DND is not prepared to outright reject the project at this time, it is advised that DND require TC Energy to conduct appropriate investigations to properly and fully characterize the aquatic habitats and resources within the areas potentially affected by the project, and that the results of these studies be reviewed by independent experts. The selection of site and design should be based on the findings of these studies so as to avoid potential adverse environmental effects. Section 14.1 further discusses these requirements.

11.2.4 Step #2 – Mitigate

Mitigate means 'to make less severe, serious, or painful'.

Avoidance alone will not prevent harm to sensitive environmental features. So, the Fisheries Act requires the proponent to make less severe, serious or painful the potential harm. This is the second step in the environmental process taken after all efforts are made to avoid sensitive environmental features or resources.

For certain design features, mitigation may not be possible. You can't mitigate the loss of a species or the destruction of sensitive habitat. Cause and effect, these are forever.

For other design features, mitigation may lessen the severity of the effect, such as ear plugs can mitigate the potential effect of noise. For these design features, the proponent should first make every effort to avoid causing environmental harm. They then assess the potential harm, and identify how best to lessen the severity of the effect.

The proponent must consider Best Available Technology Economically Achievable (BATEA). BATEA is the technology approved by regulators to meet the current standard of care for a particular process. It is a moving target, since developing societal values and advancing techniques change what is currently regarded as 'best available' or 'economically achievable'. The standard of care from the 1960's does not achieve the standard of care in 2020.

The Department of Fisheries and Oceans (2019) approved the design of the intake for the Darlington New Nuclear Plant. In their case, the Department of Fisheries and Oceans

required the intake to be placed far offshore, in deep water, and away from biologically active areas. The intake design had to achieve an approach velocity of 6 cm/s so as to enable schooling fish to swim away from the intake. This design should define BATEA since it establishes precedent as the latest intake approved for construction by DFO.

The revised conceptual design proposed by TC Energy will achieve an approach velocity of 20 cm/s. Fish cannot swim away from such a high approach velocity. The target for mitigation should be an approach velocity closer to 6 cm/s, as required in DFO's recent approval at Darlington.

The nature of TC Energy's revised conceptual design also does not allow for the use of proper screening and fish return mechanisms to return entrained fish safely back to Georgian Bay. The screens shown on the conceptual drawing presumably prevent large objects from being entrained but not small objects or fish.

11.2.5 Step #3 – Offset

Offset means *"a consideration or amount that diminishes or balances the effect of a contrary one"*.

Even with the most effective avoidance and mitigation, some fish mortality and loss of habitat are likely – referred to as the residual effect. So, the Fisheries Act requires the proponent to pay a consideration or amount that diminishes or balances the residual effect.

After all efforts to avoid and mitigate, the DFO determines the magnitude of residual effect and associated consideration or amount owed to offset the effect. The proponent then proposes how best to achieve the required offset.

An offset can take many forms. Ideally, the objective is to counterbalance the residual effect through rehabilitation or creation of fish habitat.

Offsets can be applied anywhere within the basin of the impacted water body. Ideally, the offset is applied within the affected area, but this is not required to achieve the objectives of the Fisheries Act.

Offsets aren't intended as a substitute for avoidance and mitigation – these come first and second. Offset comes third. DFO should enforce a high standard of care for avoidance and mitigation before any discussion of offsets.

TC Energy has been in discussion with Saugeen Ojibway Nation (SON) regarding a partnership agreement. Both parties refuse to share the details of their discussions. It is likely they discussed offsets that compensate for the residual effects of the project – and compensate SON for their potential loss. These offsets could be applied anywhere within

the traditional territorial waters claimed by SON, which extend from Goderich to Tobermory to Collingwood.

TC Energy should assess the residual effects and work with DFO, SON and the community of Meaford to determine appropriate offsets that ensure no net loss of fish stocks or fish habitat within the local area most affected by the project.

Given DND's relationship within the community of Meaford, it would be appropriate for the DND to advocate on behalf of the municipality that they have a role in deciding offsets and that these offsets apply to the local area most affected by the project. Section 14.1.2 further discusses offsets.

11.3 Surface Water Quality

The proposed project has the potential to impact the pristine waters of Georgian Bay. Water quality impacts can occur during construction from deforestation, site clearing, movement of equipment and materials, and construction of the reservoir and associated dam. Water quality impacts can also occur during operations from the high velocities induced from the movement of water into and from the intake/outfall structure.

Local residents describe an incident at the DND base where construction activities resulted in the release of sediment to a creek. This relatively small construction project caused turbidity of the water in the creek and a sizable turbidity plume extending along the shoreline of Georgian Bay. It affected habitat within the creek and nearshore, and impacted the source waters for the residents along the shore who have shoreline wells.

If this small construction project caused such an effect, the potential impact from TC Energy's proposed project will be many times greater and will persist throughout the multi-year construction phase.

The constant ebb and flow of water from and to the plant has the potential of mobilizing the fine silts and clays that characterize the substrate. This will cause turbidity of the pristine waters affecting aquatic habitat, the quality of potable water, and impair the pristine nature Georgian Bay.

The storage of water within the reservoir also has the potential to alter the temperature of the water. Granted, the change in temperature may be small in absolute terms, but even a small change in temperature alters the density of water, and hence affects the mixing of the water when released back to the Bay.

Water quality can also be affected by the materials used to line the tunnels and reservoir, and operations of the power station, although further information is required to assess these potential effects.

As stated by the Municipality (2020), it is imperative that the proposed project not result in any impacts on water quality including turbidity issues affecting the pristine waters of Georgian Bay. The municipal intake for the Meaford Water System is located approximately 6.6 km south of the proposed outfall and this intake must not be impacted in anyway. Further, a large number of residents along the Nottawasaga Bay shoreline receive their water from shoreline wells. Unlike a Municipal Water Plant, which has advanced filtration, many homes only have basic UV filtration systems, which can be severely impacted by poor water quality and high turbidity.

Section C4 – Water Resource Management of the Official Plan identifies required studies in support of major applications with an outline of criteria that must be addressed including:

- how to maintain or enhance the natural hydrological characteristics of the water resource;
- how to minimize or eliminate the effect of the proposed use on the groundwater recharge function;
- how to minimize or eliminate the effect of the proposed use on the quality and quantity of drinking water in adjacent private and municipal wells;
- how to maintain or enhance sensitive groundwater recharge/discharge areas, aquifers and headwater areas;
- whether it is required to monitor water budgets for groundwater aquifers and surface water features;
- how to ensure that the quality of the watercourses affected by the development are maintained; and,
- how to ensure that there will be no negative impacts on the water quality of Georgian Bay.

As stewards of the lands and waters in their care, the DND will be held responsible for holding TC Energy to the highest standard of care. Both federal and provincial governments publish water quality criteria to which they hold proponents accountable to. We expect no less from the DND. Section 14.1.1 provides further details of these criteria.

11.4 Groundwater

TC Energy's revised conceptual design includes the excavation of a shaft and tunnels to convey water to and from Georgian Bay, and the excavation of a cavern deep below the Niagara Escarpment to house the generating station and other works.

The dewatering of these installations will cause a depression of the local and perhaps regional groundwater table. This would affect the hydrology within the local and perhaps regional watershed, causing creeks, ponds and wetlands to dry up. It may also reduce the capacity of wells within the affected area.

The DND should require TC Energy to undertake an investigation of the potential effects of their proposed project on groundwater resources. The results of this study should be reviewed by an appropriate independent expert.

11.5 Air Quality

TC Energy's proposed project has the potential to impact air quality during the construction phase in particular. Sources of air emissions include: cement processing plant, deforestation, site clearing, earth movement required to create the reservoir, earth movement required to construct the shaft and tunnels, and diesel exhaust from industrial equipment, trucks, bulldozers, etc. Air pollutants include sulfur dioxide, carbon dioxide, nitrogen oxides, ozone, lead and various forms of particulate matter. These pollutants are deemed harmful to human health, and have the potential to cause significant adverse environmental impacts.

Section D9.2.2 of Meaford's Official Plan notes that:

> *Air quality can impact us as individuals (health effects), as a society (health care costs) and on a global scale (climate change), but there are many ways to improve and maintain air quality. It is a policy of the Municipality to:*
>
> > *a) ensure that municipal operations and facilities meet or exceed applicable Provincial regulations with respect to air quality and support incremental reduction of greenhouse gas emissions and air pollutants;*

In this regard, details are requested on how this will be addressed.

Particulate matter is of particular concern given the proposed on-site cement plant, and the massive amount of earth movement and hauling for excavation of the reservoir, shaft and tunnels. Particulate matter comprises two kinds of microscopic particles, mineral (silica and other minerals from rock processing), and hydrocarbon and soot from diesel exhaust of

industrial equipment. The particulate matter of interest in terms of health risks are those that are small, invisible to the naked eyes (much smaller than the human hair) are easily carried in wind currents, can remain airborne for long period of time, and can be carried up to 50 km and more depending of the size from the source.

These particles penetrate the delicate lining of the respiratory system following inhalation. The health effects of inhalation are well documented. Health risks are due to exposure over both the short term (hours, days) and long term (months, years). Short term exposure can result in coughing, shortness of breath, tightness in the chest and irritation of the eyes. Long term exposure can result in reduced lung function, and respiratory diseases such as asthma, chronic obstruction pulmonary disease (COPD), lung cancer, emphysema, and aggravation of existing lung disease. Long term exposure is also associated with increased risk of allergies, cardiovascular disease, autoimmune disease.

11.6 Light, Noise and Vibrations

The proposed project will impact light and noise levels within the surrounding areas. Such impacts will occur during both construction and operations. The site for the project is located immediately adjacent to administrative buildings and barracks within the DND property, and near farms and private properties along the southern boundary. There is limited buffer between the project site and adjacent developments.

With regard to light, Section D9.2.5 of the Official Plan states the policy of the municipality in terms of responsible lighting practices. TC Energy states they have reconfigured their conceptual design to minimize impacts associated with light. These changes may address concerns during operations, but it is unclear how they will address concerns during construction unless they limit construction activities to daylight hours.

With regard to noise, construction and operations could impact the quiet enjoyment of resident’s homes. Noise pollution, is any form of sound that disrupts a natural ecosystem or causes a person’s property to become unusable or unpleasant. Noise can also have an adverse impact on human health, including loss of sleep, increased stress levels, and hearing loss in some cases.

Noise is considered as any unwanted sound that is clearly audible and of such volume so as to disturb the local residents. It could be caused by any number of sources, including deforestation, site clearing, earth movement, drilling, blasting, vehicles, heavy equipment.

It is acknowledged that DND operations on the base are already a source of noise. But this does not establish a benchmark for the proposed project to compare against. The noise

from the base is intermittent, and part of the character of the area, and the relationship between the DND and the community.

With regard to vibrations, the revised conceptual design involves considerable drilling, blasting and excavation to construct the reservoir, shaft, tunnels and below ground power station. These activities will create vibrations that could travel significant distances.

Further information on light, noise and vibration is required to evaluate these potential impacts.

12.0 Dam Safety

12.1 Conceptual Design

TC Energy proposes the construction of a new reservoir adjacent to the administrative complex for the base. The reservoir would have a surface area of 375 acres with a length, width and depth of 1,700 m, 900 m and 20 m, as shown in Figure 12-1.

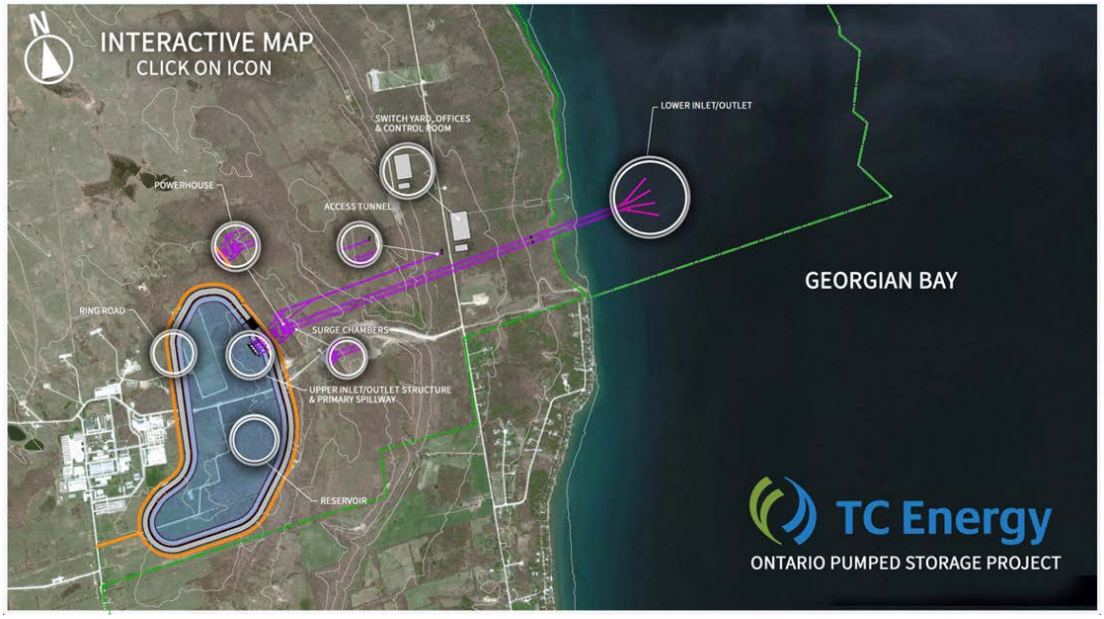


Figure 12-1: Conceptual Drawing of the Proposed New Reservoir

As shown in Figure 12-2, TC Energy proposes to construct the reservoir above grade with a rock filled dam around the perimeter of the reservoir.

Figure 12-2: Artist Conceptual Rendering of the Proposed New Reservoir

12.2 Elevation Profiles

The reservoir will be located on top of a segment of the Niagara Escarpment. As shown in Figure 12-3 and Figure 12-4, the elevation rises from approximately 176 m at the shoreline of Georgian Bay to approximately 350 m on the escarpment, and then slopes downward towards the base (Google, 2019).

The northern, eastern and southern edges of the reservoir follow the edge of the escarpment. The existing ground elevation around the perimeter of the reservoir varies from approximately 342 m to 352m.

The crest elevation of the dam has not been specified by TC Energy. If TC Energy seek to maximize the elevation difference between the escarpment and Georgian Bay, they might place the reservoir on top of the escarpment without excavating into the escarpment (other than site clearing). This would place the crest elevation of the dam above 370 m, and would require the construction of a dam greater than 20 m height around the entire perimeter of the reservoir. In low lying areas, the dam height could be greater than 30 m.

Alternatively, they could reduce the crest elevation of the dam by excavating into the escarpment whereby placing the reservoir below grade. This would minimize, if not eliminate, the need for a constructed perimeter dam. In such case, the cap rock of the escarpment would serve as the perimeter dam.

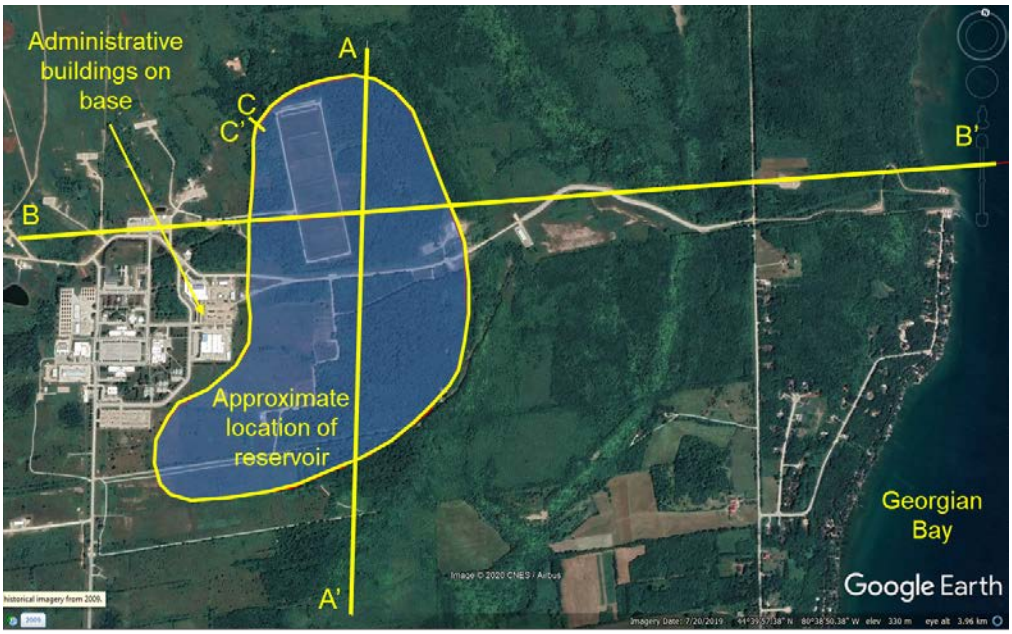


Figure 12-3: Artist Conceptual Rendering of the Proposed New Reservoir

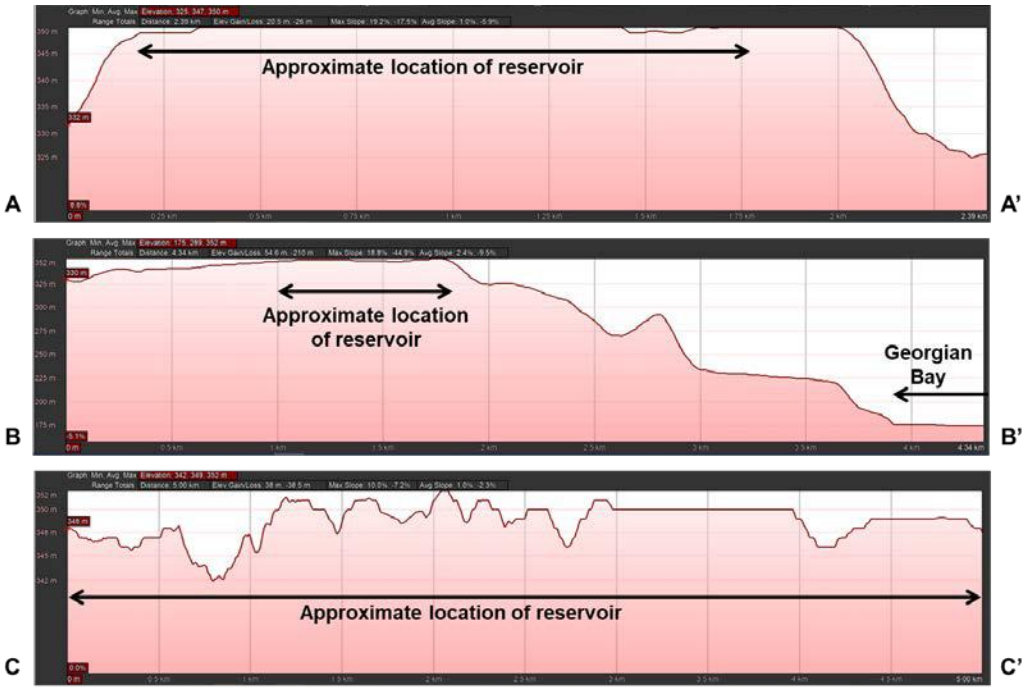


Figure 12-4: Elevation Profiles Along, Across and Around the Reservoir

12.3 Inundation Zone

Dam failures are rare, but when they occur, the failure is sudden, rapid, and cause an uncontrolled release of impounded water that causes immense damage and potential loss of life. It's not so much a question of *"do dams fail?"* History has shown that they do in fact fail for a variety of reasons, as discussed in Section 12.4. It's a question of *"what are the consequences if the dam does fail?"*

If the dam fails, the uncontrolled release of impounded water will cascade downgradient. The areas impacted by these waters is referred to as the inundation zone. (Those residing within the inundation zone referred to it as the *"Impact Zone"*).

The inundation zone for TC Energy's proposed reservoir will extend in all directions from the reservoir since the reservoir is located on a high point along the escarpment. As illustrated in Figure 12-5, the inundation zone will include operational areas of the base, including barracks and administrative buildings. Towards the east, the inundation zone will impact approximately 300 families that live downgradient from the reservoir.

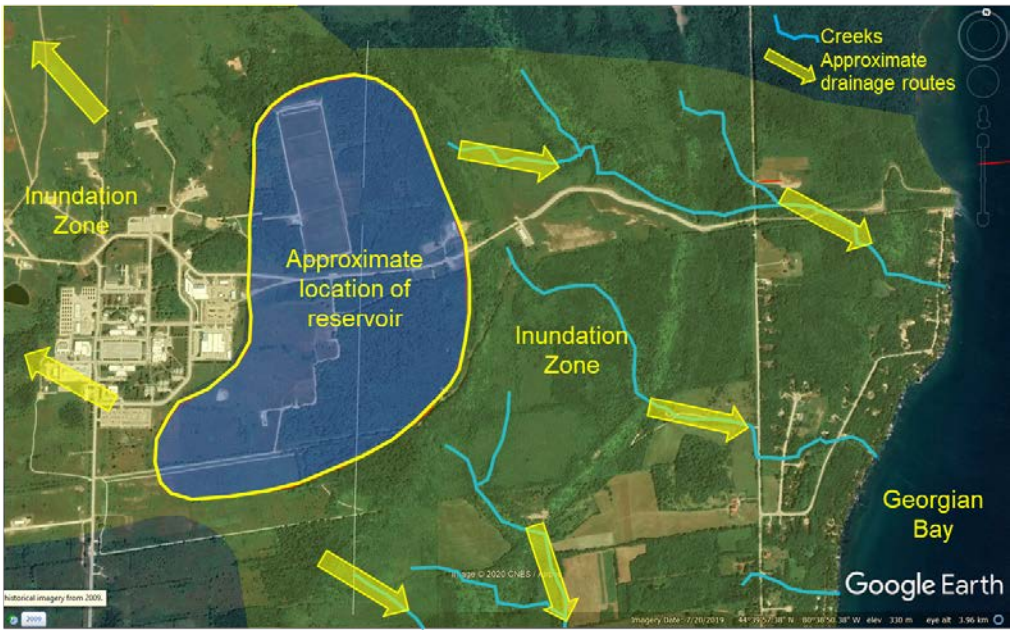


Figure 12-5: Inundation Zone

The areas impacted by a dam failure will depend on the location of the breach and on the natural drainage patterns within the watershed. Topographic maps from the Ontario Ministry of Natural Resources and Forestry show three drainage routes (creeks) towards the east

that would be the most likely flow path for a breach along the eastern face of the reservoir. These drainage routes pass through residential areas.

12.4 Dam Failures

Dams are considered *"installations containing dangerous forces"* under International humanitarian law due to the massive impact of a possible destruction of the civilian population and the environment.

Wikipedia identifies that more than 200 notable dam failures occurred worldwide between years 2000 and 2009. That equates to 20 notable dam failures each year, on average.

In 1975, the failure of the Banqiao Reservoir Dam in Henan Province, China, caused more casualties than any other dam failure in history. The disaster killed an estimated 171,000 people and 11 million people lost their homes.

Within the past year, three dams failed:

- The Edenville Dam failed on 19th May 2020 in Edenville, Michigan, USA, from heavy rainfalls that overtopped and breached the dam;
- The Sanford Dam failed on 19th May 2020 in Sanford, Michigan, USA, from large inflow from the failure of the Edenville Dam located immediately upstream;
- Tiware Dam failed on 2nd July 2019 in Ratnagiri District, India, from heavy rains that overtopped and breached the dam.

The two most recent dam failures fortunately did not result in any reported fatalities, but they did cause significant flooding and associated property damage. The third most recent dam failure resulted in 23 fatalities.

Canada is not immune from Dam failures. Bruemmer (2019) reported on the evacuation of residents from the Grenville-sur-la-Rouge area near Montreal. In 2015, Quebec's auditor general report found only 10 per cent of the province's 5,900 dams fulfilled security obligations.

Table 12-1 lists major dam failures over the last 100 years. The list includes 92 major dam failures, with reported fatalities of 184,699 (most attributed to the Banqiao Reservoir Dam failure). Over the past 20 years, 45 major dam failures occurred, with reported fatalities of 1,062.

Table 12-1: List of Major Dam Failures

Dam/Incident	Date	Country	Fatalities
Sanford Dam	May 2020	United States	None reported
Edenville Dam	May 2020	United States	None reported
Tiware Dam	Jul 2019	India	23
Spencer Dam Failure	Mar 2019	United States	?
Brumadinho dam disaster	Jan 2019	Brazil	270
Sanford Dam, Patricia Lake	Sep 2018	United States	0
Swar Chaung Dam	Aug 2018	Myanmar	4
Xe-Pian Xe-Namnoy Dam	Jul 2018	Laos	36
Panjshir Valley dam	Jul 2018	Afghanistan	10
Patel Dam	May 2018	Kenya	47
Maple Lake	Oct 2017	United States	0
Mariana dam disaster	Nov 2015	Brazil	19
Mount Polley tailings dam failure	Aug 2014	Canada	0
Tokwe Mukorsi Dam	Feb 2014	Zimbabwe	0
Dakrong 3 Dam	Oct 2012	Vietnam	0
Köprü Dam	Feb 2012	Turkey	10
Ivanovo Dam	Feb 2012	Bulgaria	8
Campos dos Goytacazes dam	Jan 2012	Brazil	0
Fujinuma Dam	Mar 2011	Japan	8
Kenmare Resources tailings dam	Oct 2010	Mozambique	1
Ajka alumina plant accident	Oct 2010	Hungary	10
Niedow Dam	Aug 2010	Poland	1
Delhi Dam	Jul 2010	United States	0
Testalinda Dam	Jun 2010	Canada	0
Hope Mills Dam	Jun 2010	United States	0
Kyzyl-Agash Dam	Mar 2010	Kazakhstan	43
Sayano-Shushenskaya Dam	Aug 2009	Russia	75
Situ Gintung Dam	Mar 2009	Indonesia	98
Algodões Dam	May 2009	Brazil	7
Kingston Fossil Plant	Dec 2008	United States	0
Koshi Barrage	Aug 2008	Nepal	250
Lake Delton	Jun 2008	United States	0
Gusau Dam	Sep 2006	Nigeria	40
Campos Novos Dam	Jun 2006	Brazil	0
Ka Loko Dam	Mar 2006	United States	7
Taum Sauk reservoir	Dec 2005	United States	0
Shakidor Dam	Feb 2005	Pakistan	70
Camará Dam	Jun 2004	Brazil	3
Big Bay Dam	Mar 2004	United States	0
Ringdijk Groot-Mijdrecht [nl]	Aug 2003	Netherlands	0
Hope Mills Dam	May 2003	United States	0
Silver Lake Dam	May 2003	United States	0
Zeyzoun Dam	Jun 2002	Syria	22
Vodní nádrž Soběnov	2002	Czechia	0
Martin County coal slurry spill	Oct 2000	United States	0
Shihgang Dam	Sep 1999	Taiwan	0
Doñana disaster	Apr 1998	Spain	0
Virgen Dam	1998	Nicaragua	?
Opuha Dam	Feb 1997	New Zealand	0
Saguenay Flood	Jul 1996	Canada	10
Meadow Pond Dam	Mar 1996	United States	1
Merriespruit tailings dam	Feb 1994	South Africa	17
Peruća Dam detonation	Jan 1993	Croatia	0

Belci dam failiure	Jul 1991	Romania	25
Upriver Dam	May 1986	United States	0
Kantale Dam	Apr 1986	Sri Lanka	180
Val di Stava dam	Jul 1985	Italy	268
Tous Dam	Oct 1982	Spain	8
Lawn Lake Dam	Jul 1982	United States	3
Wadi Qattara Dam	1979	Libya	0
Machchu-2 Dam	Aug 1979	India	5,000
Kelly Barnes Dam	Nov 1977	United States	39
Laurel Run Dam	Jul 1977	United States	40
Teton Dam	Jun 1976	United States	11
Banqiao and Shimantan Dams	Aug 1975	China	171,000
Canyon Lake Dam	Jun 1972	United States	238
Buffalo Creek Flood	Feb 1972	United States	125
Certej dam failure	Oct 1971	Romania	89
Sempor Dam	Nov 1967	Indonesia	138
Mina Plakalnitsa	May 1966	Bulgaria	107
Swift Dam	Jun 1964	United States	28
Spaulding Pond Dam	Mar 1963	United States	6
Vajont Dam	Oct 1963	Italy	2,000
Baldwin Hills Reservoir	Dec 1963	United States	5
Panshet Dam	Jul 1961	India	1,000
Kurenivka mudslide	Mar 1961	Ukrainian SSR	145
Malpasset dam	Dec 1959	France	423
Vega de Tera	Jan 1959	Spain	144
Taisho Lake Dam	1951	Japan	108
Tangiwai disaster	Dec 1953	New Zealand	151
Heiwa Lake Dam	1951	Japan	117
Xuriguera Dam	1944	Spain	8
Möhne Dam	May 1943	Germany	1,579
Edersee Dam	May 1943	Germany	70
Nant-y-Gro dam	1942	United Kingdom	0
Horonai Dam	1941	Japan	60
Secondary Dam of Sella Zerbino	1935	Kingdom of Italy	111
Granadillar Dam	1934	Spain	8
Castlewood Dam	1933	United States	2
St. Francis Dam	Mar 1928	United States	451+
Llyn Eigiau dam and Coedty reservoir	Nov 1925	United Kingdom	17
Gleno Dam	Dec 1923	Kingdom of Italy	356

12.5 Dam Failure at the Taum Sauk Pump Storage Plant

History has shown that the reservoirs for pump storage plants can fail. Take, for example, the 2005 failure of the upper reservoir for the Taum Sauk Pump Storage Plant.

The Taum Sauk Pump Storage Plant in Reynolds County, Missouri, was constructed by United Electric between 1960 and 1962. It was designed to provide generation during peak demand periods, the same as that of TC Energy's proposed project.

The upper reservoir for the plant is situated atop Proffit Mountain, and as such, it has no natural primary inflow of water. The upper reservoir receives all of its water through pumping from the lower reservoir via a 7,000-foot-long concrete and steel-lined tunnel that connects the two.

On 14th December 2005, a catastrophic failure of the upper reservoir dam occurred due to overtopping of the dam crest during the final minutes of one of its pumping cycles. As a result, the reservoir's 4,300 acre-feet volume of stored wide breach in 25 minutes, traveling down Proffit Mountain toward the Black River with a peak discharge of 273,000 cubic feet per second.

This failure did not occur because of an extreme weather event. It failed because of equipment failure and human error.

12.6 Common Causes of Dam Failures

Common causes of dam failure (Afework et al., 2019) include:

1. Overtopping: Failures occur as a result of poor spillway design, leading to a reservoir filling too high with water, especially in times of failure include settling of the crest of the dam or spillway blockage. Overtopping of a dam is often a precursor of dam failure. National inadequate spillway design, debris blockage of spillways, or settlement of the dam crest account for approximately 34% of all U.S. dam.

2. Foundation Defects: These failures occur as a result of settling in the foundation of the dam, instability of slopes surrounding the dam, foundation. All of these failures result in structural instability and potential dam failure. They cause about 30% of all dam failures.

3. Cracking: Caused by movements like the natural settling of a dam.

4. Piping: Seepage through a dam is not properly filtered and soil particles continue to progress and form sink holes in the dam. These failures caused by seepage and erosion along hydraulic structures such as the spillways. As well, erosion as a result of animal burrows and cracks failures. Another 20% of U.S. dam failures have been caused by piping (internal erosion caused by seepage).

5. Conduit and valve failure: These failures occur as a result of problems with values and conduits.

6. Use of Sub-standard Construction Materials: The use of improper construction materials is another primary cause of dam failures. During use the right construction

materials and in approved quantities. Inability to use quality construction materials often causes the dam to

7. Poor Maintenance: Dams require regular and frequent maintenance to ensure they are safe for the civilians living in the area and the safety demand that regular inspections and maintenance procedures are conducted by qualified professionals. The absence of such regular of the dams and therefore failure of the structure. The Val di Stava Dam in Italy collapsed in 1985 due to lack of proper maintenance. water due to massive sediment deposits. As a result, the dam failed due to inefficient drainage. The problem could have been identified was performed.

8. Design error: Design errors occur when essential factors are not incorporated into the design and construction of a dam. The Taum Sauk primarily due to a design flaw. The dam lacked a proper system for gauging the water level in its reservoirs, which resulted in an overflow 2007, and appropriate monitors were incorporated in the dam's structure to prevent future failure.

12.7 Community Concerns

Needless to say, members of the community who reside within the inundation zone are concerned about a dam holding 23 million cubic meters of water perched overhead. TC Energy has never built such a structure, and their track record of pipeline failures – a design element they should know best – does not provide them much comfort.

Several community members have approached their insurance companies to ask about coverage only to learn they cannot be insured for matters pertaining to TC Energy's proposed project. The details of these private communications between residents and their insurer have not been documented, although their questions to TC Energy are documented on TC Energy's web site.

As previously stated, it's not a question of *"do dams fail?"*, although the record shows they can fail. It's a question of *"what are the consequences if the dam does fail?"* Dams that fail within residential areas most likely cause fatalities.

That's a pretty good reason for people to be concerned.

DND, as the responsible authority over the land it occupies, is accountable for the actions of TC Energy. Ideally, the DND will reject the project outright because any potential for loss of life is not a risk worth taking.

In the event DND does not outright reject the project, the DND should hold TC Energy to the highest standard of care possible, as further discussed in Section 14.4.

13.0 Transmission Corridor

TC Energy presents two alternative routes to connect the proposed project to Ontario's electricity grid, as shown in Figure 13-1. The first option consists of an overland transmission corridor from Meaford to the connect point at Hydro One's Essa Transmission Station. The second option involves the placement of a subsea transmission cable along the bottom of Georgian Bay from Meaford to Collingwood, and then a land-based transmission corridor from there to the connection point.

TC Energy has publicly stated they are considering the second option, the subsea cable, in response to community pressures, however, they have not ruled out the overland transmission option.

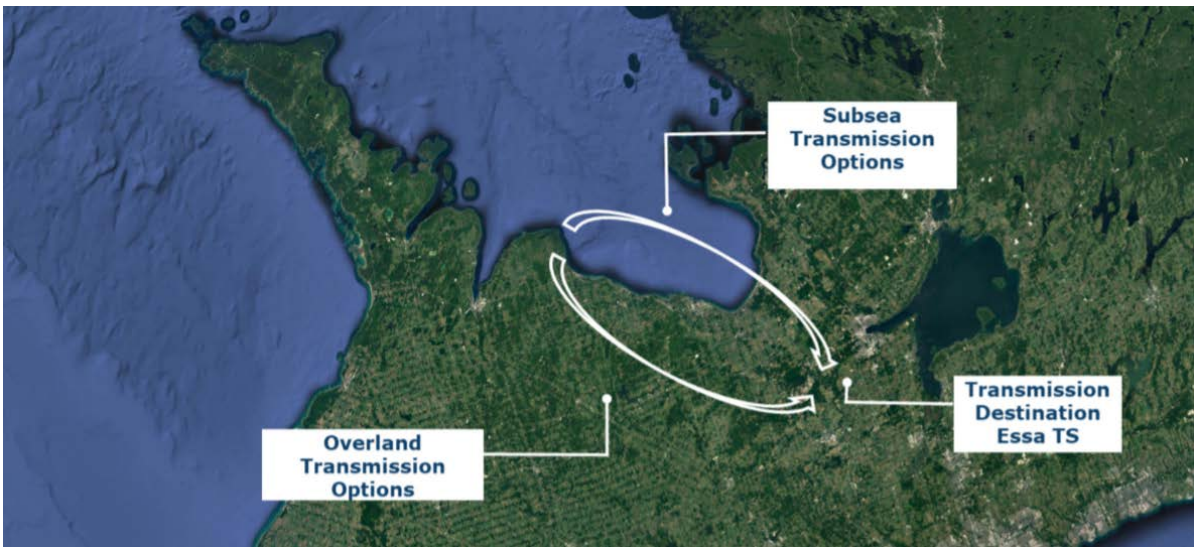


Figure 13-1: Alternative Transmission

Transmission lines carry large quantities of electricity from generating stations to the urban centres where the electricity is used. Transmission line voltages vary from 44,000 to over 765,000 volts. The higher the voltage, the more electricity the line can carry. Because they carry large quantities of electricity at a very high voltage transmission lines are not covered by an insulating sheath. Instead, the air around them provides insulation.

This transmission corridor, also called a right-of-way, maintains a safe distance between the high voltage lines and the surrounding structures and vegetation. This is especially important so that nothing can come close to cause an electrical arc and potential fire.

Transmission corridors can impact the environment in the following manners.

- Landscape – cause a visual deterioration of the skyline reducing its aesthetic appeal. In passing through populated areas this results in a loss of property values in the vicinity; and in less populated areas with a scenic, cultural or natural importance, this affects the tourism potential.

- Biodiversity – the main impact is avian collisions which is particularly significant in high risk areas such as wooded regions and bird migration corridors. It also includes disturbances of fish habitat at stream crossings.

- Land use – passing through agricultural lands may permanently reduce the area under cultivation and cause physical damage during construction and maintenance.

- Proximity effect – the “proximity effect” on human beings in the vicinity of transmission corridors encompasses a fear of the adverse health effects of electromagnetic fields, annoyance and noise. Many countries place restrictions on distance to human habitation as a precaution.

- Indirect emissions – energy losses during transmission cause indirect carbon emissions and air pollution in power generation plants which vary with the type of primary energy source. It is important to integrate these environmental impacts into the cost-benefit evaluation of hydroelectric projects in order to avoid decisions that may be biased towards less environment friendly solutions.

Either transmission option will disrupt countless private properties and destroy valuable farm and residential land.

One of the main goals of the Official Plan is to protect the rural landscape within the municipality. The overland option is contrary to this goal.

Save Georgian Bay shares the concern stated by the Municipality of Meaford (2020) regarding the transmission corridor. We support the municipalities preference for the subsea option through Collingwood.

14.0 Conditions

The following sections outline a series of conditions that Save Georgian Bay believe essential, as a minimum, to hold TC Energy to account. These conditions were issued to the Mayor and Council of Meaford by Save Georgian Bay on 17th March 2020, and subsequently appended to the 1st June 2020 submission from the municipalities to the DND.

14.1 Environment

14.1.1 Water Quality

1. **Baseline water quality** – Currently the water quality of Georgian Bay within the vicinity of the Project site is considered pristine, and likely complies with water quality guidelines of the Canadian Council of Ministers of the Environment and the Provincial Water Quality Objectives. But available data are limited. Council requires TC Energy to implement and maintain a comprehensive surface water quality monitoring program starting immediately and spanning a minimum two-year period prior to submitting their impact assessment report. The monitoring program should provide sufficient spatial and temporal resolution to quantify the frequency and duration of clear flow periods from which background levels of turbidity and other water quality parameters will be defined. The monitoring program should also include such other parameters and meet such other requirements as stipulated by appropriate federal and provincial agencies. Data from this monitoring program will be made available to Council and the community on a quarterly basis through the monitoring period.

2. Turbidity – Turbidity has been identified as a water quality parameter of particular concern since: the waters of Georgian Bay are typically pristine with near zero turbidity; those living along the shoreline or within town source potable water from shore wells or from the bay; construction and operations will disturb the clay nearshore substrate causing turbidity; and construction activities on land will disturb soils causing turbidity. TC Energy claims “proper design and construction of the outlet and other project structures in Georgian Bay will result in a design that does not contribute to turbidity in Georgian Bay”. Yet TC Energy has not provided design details to support their claim, nor does TC Energy seem aware of local site conditions, as demonstrated during the three community meetings hosted by TC Energy in Meaford. Council requires TC Energy to submit a comprehensive assessment detailing: local site conditions, including borehole logs and appropriate geophysical investigations; loading rates of materials causing turbidity from all possible sources affected by the Project during site

preparation, construction, operation and decommissioning; design details, including mitigation strategy, monitoring plan, and response plan. This report is to be made available to Council and the community.

3. Water quality criteria – The Canadian Council of Ministers of the Environment and the Ontario Ministry of Environment, Conservation and Parks specify surface water quality objectives for the protection of aquatic life. Among other parameters, these objectives specify allowable limits for turbidity. Council requires TC Energy to comply with the applicable federal and provincial water quality objectives for all parameters. For clarity, the background level and natural state for turbidity shall be taken as the clear flow condition of calm winds, no waves and dry weather. In the event the federal or provincial authorities grant a mixing zone, this mixing zone shall be limited to 100 metres from the edge of the Project footprint, and must not result in toxic conditions or irreparable environmental damage including risk to ecosystem integrity and human health nor interfere with water supply, recreational or other water uses of the adjacent property owners.

4. Potable water – TC Energy's proposed project has the potential to impact the quantity, quality and safety of potable water for those communities along the shoreline or inland that source water from either shore wells or drilled wells. When asked about this potential concern at the 16th January 2020 community meeting hosted by TC Energy, representatives of TC Energy stated that TC Energy would construct a water supply main from Meaford to provide potable water to these communities. Council interprets such statements from TC Energy as commitments to the community, and thereby requires TC Energy to fulfil this commitment at no cost to the community.

14.1.2 Fish Habitat

5. Aquatic community characterization – Preliminary investigations identify that at least 23 species utilize the nearshore environment of Georgian Bay within the vicinity of the Project. Several of these species are listed as threatened by COSEWIC. But available data are limited. Council requires TC Energy to retain a third-party subject matter expert of Council's approval to undertake a comprehensive aquatic habitat and aquatic community monitoring program to characterize habitat and organisms prone to impingement and entrainment, and to support the optimization of siting of the intake/outfall, diffuser structures and other offshore structures. The monitoring program should focus on fish, ichthyoplankton, macrozooplankton and benthic invertebrates; extend from the shoreline out to 30 m depth; extend approximately 2 km along the Project site shoreline; and occur throughout the spring, summer and fall seasons. The monitoring program should also include such other requirements as stipulated by

appropriate federal and provincial agencies, and be approved by Council. Data and interpretive report from this monitoring program will be made available to Council and the community on a quarterly basis through the monitoring period.

6. Avoidance of sensitive habitat – TC Energy state they will avoid spawning and other sensitive aquatic habitat yet TC Energy has proposed a shore-based intake/outfall structure with offshore breakwalls located immediately within an area of known spawning habitat for Lake Whitefish, Lake Trout and Carp. Council requires TC Energy to locate the intake/outfall and diffuser structures beyond the nearshore habitat zone so as to avoid risk of adverse operational effects. Alternatively, Council requires TC Energy to consider an alternate location for the intake/outfall, or to redesign the plant as a closed loop system contained on land.

7. Mitigation of fish mortality – TC Energy states they will employ mitigation measures to further reduce the potential adverse environmental effects associated with the Project. For the case of the Ludington plant, mitigation was imposed following a 12-year legal challenge, and consisted of a 2 km long net during the open water seasons (April through November). This form of mitigation has limited effectiveness, causes incidental fish mortality, and poses a hazard to boaters. More appropriate mitigation measures include velocity caps or porous veneer structures to reduce the risk of impingement and entrainment. Council requires TC Energy to employ mitigation measures through means other than netting.

8. Fish habitat offsets – TC Energy suggests the use of fish habitat offsets to compensate for impacts associated with death of fish and destruction of fish habitat. As the community most impacted by the Project, Council requires TC Energy to apply fish habitat offsets within areas adjacent to the municipal boundaries of Meaford and in a form considered by Council as beneficial to the community of Meaford.

14.1.3 Species at Risk

9. Species at risk – Preliminary investigations identify that as many as 11 species listed as being at risk may utilize the lands and waters within the vicinity of the Project. But available data are limited. Council requires TC Energy to retain a third-party subject matter expert of Council's approval to undertake a comprehensive monitoring program to characterize habitat and flora and fauna within the area of influence. The monitoring program should start immediately, and include requirements as stipulated by appropriate federal and provincial agencies, and be approved by Council. Data and interpretive report from this monitoring program will be made available to Council and the community on a quarterly basis through the monitoring period.

10. Avoidance of habitat for species at risk – Council requires TC Energy to avoid all habitats associated with species at risk.

14.1.4 Light and Noise

11. Light and noise – TC Energy has acknowledged the plant will emit noise and light during construction and operations, yet they claimed during the 16th January 2020 community meeting hosted by TC Energy that local residents would not notice either. Given the nearest resident is located approximately 100 m from the proposed plant, Council requires TC Energy to provide evidence of how they intend to limit noise and light within such a proximus area during both construction and operations.

14.1.5 Coastal Processes

12. Shoreline erosion – The Project includes construction of offshore breakwalls that will impede the natural movement of sediments along the shoreline. Council requires TC Energy to retain a third-party subject matter expert of Council's approval to undertake a comprehensive assessment of coastal processes along the western shore of Nottawasaga Bay, including but not limited to, the potential effects on waves, alongshore currents, sediment transport, and potential erosion and accretion of sediments along the shoreline. This report will be made available to Council and the community. This report needs to project shoreline and current changes over the expected lifetime of the shoreline structures and impacts for the removal of those structures when the operating lifetime of the plant concludes.

13. Physical limnology – The Project as proposed draws and releases a large volume of water from and to the shores of Georgian Bay. This cycle of flows will alter the natural circulation patterns within Nottawasaga Bay and possibly throughout Georgian Bay. It could affect stratification, heat balances and ice formation over large areas, yet nothing is yet known about such potential significant adverse effects. Council requires TC Energy to retain a third-party subject matter expert of Council's approval to undertake a comprehensive assessment of the physical limnology of Georgian Bay and mathematical model predictions of the potential effects of construction, operations and decommissioning on circulation, stratification, heat balance, and ice formation. Further, Council requires TC Energy to take preventive measures to minimize potential disruption of the physical limnology of Georgian Bay.

14.2 Visual Impacts

14. Georgian Bay – TC Energy proposes the construction of an offshore breakwall and two wingwalls, plus a shore-based intake structure along the shore and nearshore of Georgian Bay. They show on their web site an artist rendering of what Georgian Bay will look like after the construction phase. This image is intended to deceive. The image shows from the perspective of someone on a boat in the middle of the bay. It does not show the proximity of these structures to the neighboring community. It does not convey the massive size of the structures, which will be amongst the largest man-made structures on Georgian Bay. Nor does it show what the facility will look like at night when all lights are on. Council requires TC Energy to provide a more representative image of what the site will look like, including its proximity to neighboring homes, and from the vantage point of a boater traveling along the waterfront, and under both night and day time conditions. Council also requires TC Energy to prepare a management plan for Council's approval of how they intend to minimize the visual impact of the Project during construction and operations.

15. Niagara Escarpment – TC Energy proposes to construct a 375-acre reservoir, 1.7 km long penstocks and other supporting infrastructure on the Niagara Escarpment and adjacent lands. The Escarpment is a UNESCO World Biosphere Reserve, and has the oldest forest ecosystem and trees in eastern North America. Many would argue these lands should be protect, yet, TC Energy intends to develop on these lands for their sole benefit. Council requires TC Energy to prepare a management plan for Council's approval of how they intend to minimize the disturbed area, and what options can be taken to avoid disturbance of the trees and forest ecosystem within area, such as the penstocks.

16. Transmission corridor – TC Energy proposed two possible routes to convey electricity to and from the grid – an overland option and an underwater option. The overland option may extend 80 to 100 km through forests, residential and agricultural lands, including parts of the Niagara Escarpment, Beaver Valley and a large portion of the township of Meaford. It will likely cause significant adverse effects to wildlife, terrestrial habitats and private properties. Council opposes this option and requires TC Energy to instead consider only the underwater option.

17. Public notification of transmission corridor – The public is largely unaware of the proposed transmission corridor. Council requires TC Energy to notify all municipalities, residents and business located within 2 kilometers of any prospective corridor so that those communities and stakeholders have an opportunity for input during the initial study phase of the feasibility of the project, with enough notice to fully participate in the DND comment period.

14.3 Economics

18. Economic evaluation – TC Energy declares the benefit to rate payers to be $250 million per year (approximately $17 per year per person), but they have not disclosed the full economic evaluation for the Project. TC Energy will provide a full pro forma projection, sharing the projection of costs and revenues, for review by Council and the community. For clarity, this shall include a projected regulatory return that TC Energy will earn on its estimated $3.3 billion investment, as this return will ultimately be paid for by the people of Ontario. This analysis must include anticipated ratepayer and provincial cost recovery over the lifetime of the facility through decommissioning.

19. Community housing – TC Energy declared its intent to construct housing units for 800 workers who will be temporarily employed during the four-year construction phase of the Project. TC Energy has offered these housing units to the community of Meaford after completion of the construction phase. They have also promised the same units to First Nations and other municipalities in exchange for their support. As the community most affected by the Project, Council requires TC Energy to allocate no fewer than 75% of the housing units to be constructed within the municipal boundaries of Meaford and to be constructed in locations and of such quality agreeable to Council and consistent with local building codes and municipal master planning.

20. Property taxation – The close proximity of the Project to neighboring communities will devalue homes and properties, causing a reduction in tax revenues to the town of Meaford. Council requires TC Energy to provide funding to the township so they can conduct their own independent assessment of this potential economic impact. This study will be made public.

14.4 Risk Analysis

21. Dam break analysis – The Project includes the construction of a 20 m high concrete dam to contain 23 million cubic meters of water within a reservoir located on the upper levels of the Niagara Escarpment. While the exact details of the design are not yet known, it is presumed it will consist of dams, excavations and impervious liner. Considering the reservoir is to be located upgradient from where many families live, Council requires TC Energy to retain a third-party subject matter expert of Council's approval to undertake a comprehensive dam break analysis to assess the potential loss of life should an unforeseen catastrophic failure of the reservoir occur. This report will be made available to Council and the community.

22. Environmental Site Assessment – It is understood the DND site contains various contaminants from past (and possibly present) operations on site. These contaminants may include Agent Orange, PHC, BTEX, other organics, metals, although no information has been provided to confirm or deny its presence. Given the potential health effects of such contaminants, Council requires TC Energy to retain a third-party expert to undertake a comprehensive environmental site assessment, and depending on the nature of the contaminants found, undertake a comprehensive remediation of the site.

23. Risk analysis – TC Energy will prepare a complete risk analysis of the project and its operation, including public health and safety, environmental health and safety, threats of water or fluid leakage, severe weather or other environmental risks, threats to the eco-system and habitats, water quality and any other risk areas; inclusive of risks and anticipated prevention actions.

14.5 Federal, Provincial Municipal Considerations

24. Alternative site locations – TC Energy proposed the current site based on the following criteria: the site provides approximately 150 m of vertical elevation difference between the Niagara Escarpment and Georgian Bay, Georgian Bay provides a source of water at no cost to TC Energy, and the site is located within 100 km of the power grid. TC Energy did not take community or environment into consideration in their site selection, as demonstrated during the 11th December 2019 community meeting hosted by TC Energy. The Australian Renewable Energy Mapping Infrastructure ("AREMI") has identified three prospective sites for pump storage plants within Southern Ontario, and other companies have identified abandoned mines and quarries for use as pump storage plants. Council requires TC Energy to retain a third-party expert of Council's approval to undertake a comprehensive assessment of all potential sites, including, but not limited to, the three prospective sites identified by AREMI and abandoned mines and quarries, considering them individually and in the aggregate. This report will rationalize the best sites with least environmental impacts and most acceptance by the community.

25. Alternative designs – TC Energy proposed the current design based on the Ludington plant. The Ludington plant was approved for construction in the 1960's, and is based on an open system that draws and releases water through a shore-based intake/outfall protected by armourstone breakwalls. The Ludington plant has since caused significant adverse environmental effects, including the destruction of fish habitat and the death of millions of fish per year. TC Energy has not considered alternative designs, as demonstrated during the community meetings hosted by TC Energy. Council requires TC Energy to retain a third-party expert of Council's approval to undertake a comprehensive assessment of

all possible design alternatives, including, but not limited to, closed systems, offshore intakes, velocity caps, energy dissipation structures. This report will rationalize the best design with least environmental impact and most acceptance by the community.

26. Alternative technologies – TC Energy proposed a pump storage plant as their preferred technology for energy storage. They have not considered any other technology, as demonstrated during the community meetings hosted by TC Energy. Yet other companies have used other energy storage technologies elsewhere in Ontario and throughout North America. These other technologies provide the same or improved total life cycle potential for carbon output reduction as what TC Energy claims for the Project yet they can be constructed on brownfields, near urban centers, without need of new transmission corridors, without causing death of fish, destroying fish habitat or habitat for species at risk. Council requires TC Energy to retain a third-party expert of Council's approval to undertake a comprehensive assessment of all possible energy storage technologies and/or load balancing methods, including, but not limited to, lithium-ion batteries, compressed air storage, home energy storage units, pumped thermal storage. This report will rationalize the best technology with least environmental impacts and most acceptance by the community.

27. Agreements with Saugeen Ojibway Nation and other First Nations – TC Energy declared its intent to enter into a partnership with Saugeen Ojibway Nation (SON) and possibly other First Nations and/or Metis Nations with respect to this Project. In the spirit of full transparency, Council requires TC Energy to publicly disclose the terms, conditions and financial arrangements of such partnerships. In the event such partnerships exist and to avoid any possible perception of conflict of interest, Council further requires TC Energy award contracts for monitoring and assessments associated with this Project only to fully independent third-party entities.

28. Site decommissioning – TC Energy declared a 50-year life span for the Project. Council requires TC Energy to submit a comprehensive decommissioning plan for the site, including costing, to restore the site to its current condition. Council does not accept TC Energy's position that decommissioning will be addressed in the future at the end of the project life. TC Energy will establish a bond or other payment mechanism acceptable to Council to fully fund future decommissioning of the site.

29. Carbon emissions – TC Energy declares the Project will result in a reduction in carbon emissions during operations. Council requires TC Energy to provide a carbon balance projection report for the entire project life cycle, including

construction and decommissioning, as well as the carbon emissions from the US market in the future when our clean energy is no longer available to them.

30. Planning regulations – It is understood TC Energy intends to lease the land from the DND. Consideration will need to be made in consultation with Council as to whether these lands, once developed, become subject to Meaford planning regulations.

31. Third party review – TC Energy agrees to provide funding to Council and the town of Meaford for legal representation and expert technical review throughout the process starting immediately and extended through the first two years of operation following commissioning of the plant. The estimate for this funding is $200,000 for 2020 and 2021 and will be adjusted as needed to meet unforeseen costs associated with the review.

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