

Appendix A

Niagara Falls WTP Intake Relocation Class
Environmental Assessment Study (Class EA
Study) Conducted & Completed by Hatch Mott
MacDonald in 2008



Regional Municipality of Niagara

Niagara Falls Water Treatment
Plant Intake Relocation

Environmental Assessment Report

230179

November 21, 2008



Hatch Mott
MacDonald

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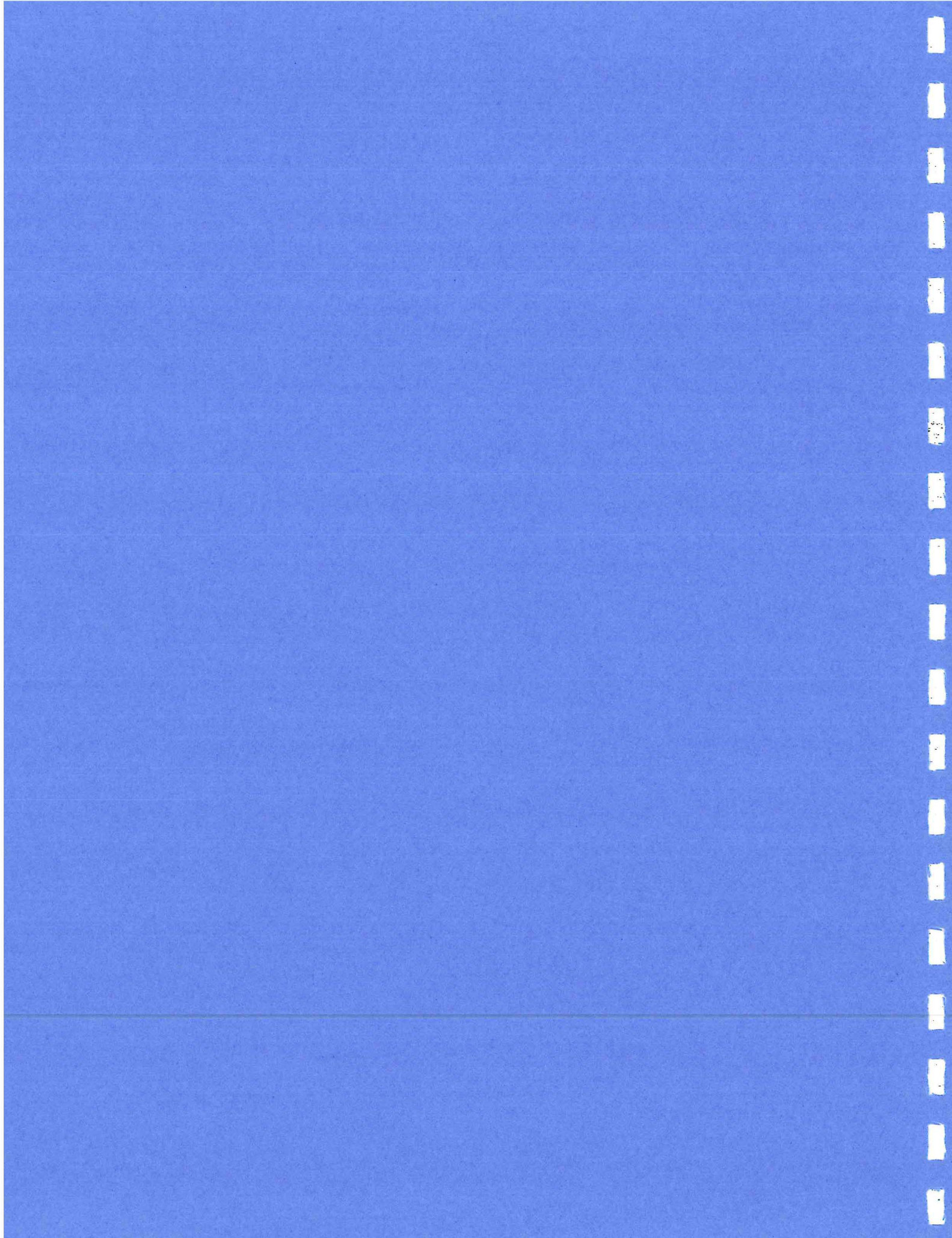
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1 Introduction and Study Area



1 Introduction and Study Area

1.1 Introduction

This is the Environmental Study Report documenting the MEA Class Environmental Assessment (Class EA) Study addressing Phases 1 through 4 of the Class EA process for the proposed relocation of the intake at the Niagara Falls WTP in the City of Niagara Falls, Ontario. This report identifies alternative solutions and evaluates their environmental and social impact on the community and surrounding area. The publication of this Environmental Study Report satisfies the requirements of the "Municipal Engineers Association Municipal Class Environmental Assessment for Water and Wastewater Projects" (June 2000, as amended in 2007) and the Environmental Assessment Act.

1.2 Background and Study Area

The Regional Municipality of Niagara (the Region) is proposing to modify the intake of the Niagara Falls Water Treatment Plant (WTP) in the City of Niagara Falls. This proposed work is intended to ensure an adequate and high-quality raw water supply for the plant in the event that Ontario Power Generation (OPG) shuts down their Queenston-Chippawa Power Canal on the Welland River for maintenance, at some future date.

As illustrated in Figure 1.1, the study area is located in the City of Niagara Falls and areas of Niagara-on-the-Lake (NOTL), north of the Niagara Parkway, southeast of the International Niagara Control Works (INCW), and comprises the junction of the Welland River and the Niagara River.

The Niagara Falls WTP services the City of Niagara Falls and portions of the City of Thorold and the Town of Niagara-on-the-Lake. It is located along the Welland River (Chippawa Creek) on Macklem Street across from Kingsbridge Park in the City of Niagara Falls. It has a rated capacity of 145.5 ML/d and has recently undergone a series of upgrades including an increase in storage capacity and the addition of UV disinfection.

The Welland River is one of the most complex rivers in Ontario, due to navigation, hydro-generation, urbanization and agricultural land use activities over the past 50 years. It has a total drainage area of approximately 1,023 km², depending on the outlet definition. The lower Welland River (Chippawa Creek), which is where the study area is located, has been modified for major infrastructure including the old and new Welland Canals and OPG facilities along the Niagara River. The regulated diversion of water to the Queenston-Chippawa Power Canal near the QEW in the lower Welland River creates a pattern of regular diurnal fluctuations in water levels that extends approximately 60 km upstream of the diversion.



The Niagara River flows to the north from Lake Erie. It serves as part of the border between the Province of Ontario and the State of New York. It is approximately 56 km long including Niagara Falls, and the total drop in elevation along the river is 99 m. The Niagara River and its tributaries, Tonawanda Creek and the Welland River, formed part of the last section of the Erie Canal and the Welland Canal, respectively.

1.3 Purpose and Rationale for the Undertaking

The purpose of this study is to undertake a Schedule C Class Environmental Assessment under the guidelines of the Municipal Engineers Association Municipal Class Environmental Assessment (EA) document dated June 2000, as amended in 2007, pursuant to the requirements of the Ontario Environmental Assessment Act. The study identifies and assesses alternatives for the relocation of the water intake at the Niagara Falls WTP.

Completion of this Environmental Study Report is part of the Class EA process which, when it is approved, will allow the the Region to proceed with preparation of the detailed design for the WTP intake, obtaining other environmental permits and approvals required to implement the project and, once these tasks have been completed and when necessary, relocation of the water intake.

1.4 Environmental Assessment Process

The Municipal Class EA process includes five phases of a planning and design process. The full process is described in Part A of the Municipal Class EA document. The five phases of the Municipal Class EA are summarized below are shown in Figure 1.2.

The Municipal Class EA establishes an approved planning process for municipalities to follow to satisfy the requirements of the Environmental Assessment Act for specified projects. Projects, which come under the Class EA process, have a predictable range of environmental effects and are recurring, usually similar in nature, limited in scale and respond to mitigating measures.

Municipal water and wastewater projects are routinely reviewed under the Class EA process. Municipal infrastructure projects are classified as Schedule A, B or C projects in the Class Environmental Assessment. These schedules correspond to the potential of the project to cause environmental impact.

A municipal water project may include any activities or improvements that solve a specific deficiency or problem in a municipality's water system.

Schedule A projects have minimal adverse effects, are limited in scale and include the majority of municipal maintenance and operational activities. These are preapproved without following the Class EA planning process.

Schedule B projects have the potential for some adverse environmental effects. The municipality is required to undertake a screening process. This process includes contact with directly affected members of the public and with relevant government agencies to ensure that they are aware of the project and that their concerns are addressed. The proponent may implement the project, if there are no concerns.

Schedule C projects have the potential for significant environmental effects and must proceed under the planning and documentation procedures specified in the Class EA. Schedule C projects require preparation of an Environmental Study Report and public review.

For Schedule B or C projects, an objector may request that the Minister of the Environment issue a "Part II Order". Such a Minister's order could require a municipality to conduct additional work such as an individual Environmental Assessment in accordance with the Environmental Assessment Act. This step would only arise where concerns are not adequately addressed or resolved by the municipality.

1.4.1 Determination of Class EA Schedule for Proposed Works

Prior to commencing this Class EA study the proposed undertaking was compared to the Project Schedules in Appendix 1 of the Municipal Class EA document to confirm the appropriate Schedule. The proposed undertaking is covered on the following activities listed in Appendix 1 – Project Schedules – Municipal Water and Wastewater Projects.

The proposed relocation of the intake for the Niagara Falls WTP was initially considered as a Schedule B project, since it appeared to be covered under Schedule B – Water Projects – Item 3, which states "Expand existing water treatment plant including intake up to existing rated capacity where land acquisition is required." However, since the preferred alternative could involve moving the intake from the Welland River to the Niagara River, the project may be covered under Schedule C - Water Projects - Item 3 which states "Establish a new surface water source." Therefore, it was determined that this project should be conducted as a Schedule C and follow Phases 1 through 4 of the Municipal Class EA process.

1.5 Project Team

The Region retained Hatch Mott MacDonald (HMM) to complete this Schedule C Class Environmental Assessment Study.

Project team members include:

Sunil Sharma, P.Eng – Region of Niagara
Robin Young, P.Eng. – Region of Niagara
Carl Bodimeade, P.Eng – Hatch Mott MacDonald
Eugene Chajka, P.Eng – Hatch Mott MacDonald
Jason Shaw, P.Eng – Hatch Energy.



Figure 1.1
Niagara Falls WTP Intake Relocation
Study Area

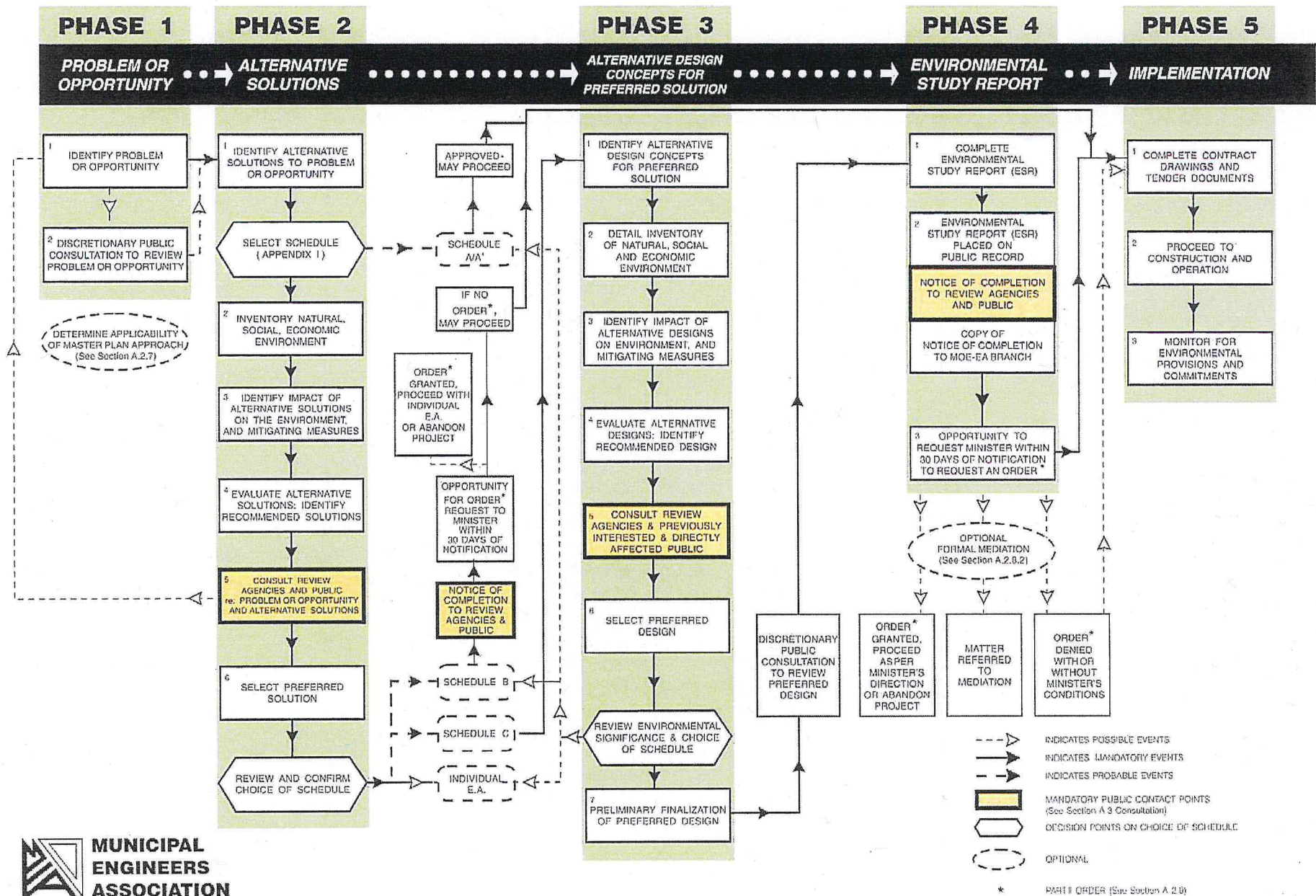
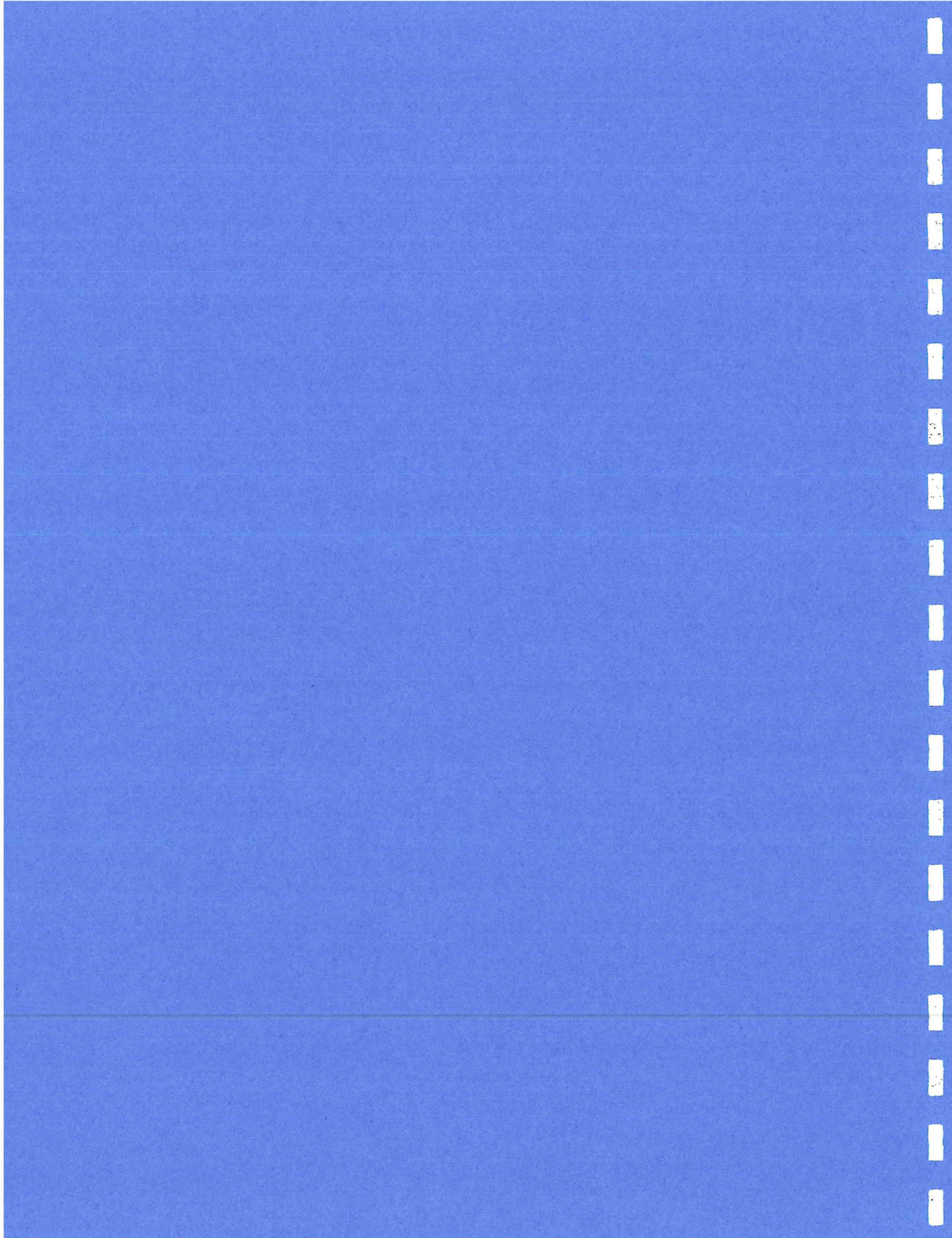


Figure 1.2
Niagara Falls WTP Intake Relocation
Municipal Class EA Process

2 Problems and Opportunities Addressed by the Study



2 Problems and Opportunities Addressed By the Study

2.1 Problem Statement and Opportunities

The Niagara Falls WTP plant currently draws water from the lower Welland River, known as Chippawa Creek, west of its point of confluence with the Niagara River, located just upstream of the Horseshoe Falls. At this point, the Welland River normal flow has been artificially reversed due to the Queenston-Chippawa Power Canal. Since 1953, water has been diverted from the Niagara River, up the Welland River, and into the Power Canal. Therefore, the WTP's raw water is actually water that has come from the Niagara River, originating in Lake Erie. The current intake is located 150 m west of the confluence with the Niagara River, and 5 to 6 km east from the entrance of the Queenston-Chippawa Power Canal. The existing intake is 139 m long and 1200 mm in diameter; this includes an intake structure consisting of a timber apron and sheet piling sides.

In the event that OPG shuts down the Queenston-Chippawa Power Canal on the Welland River for maintenance, flow in the Welland River will reverse between the Niagara River and the Queenston-Chippawa Power Canal. The water in the Welland River is of lower quality in that it has a higher turbidity than that in the Niagara River, particularly following spring runoff or rainfall. Accordingly, reversal of flow in the lower reaches of the Welland River will result in lower quality water from the upper reaches of the Welland River being drawn into the existing water intake. The lower water quality, will affect the water treatment process performance at the WTP, primarily due to its higher turbidity. OPG has recently conducted an evaluation of the condition of the Power Canal and advises that a shutdown for maintenance is not anticipated within the next 5 years (i.e., circa 2013).

Therefore, the problem being addressed by this study is the ability to maintain an adequate and high quality raw water supply to the Niagara Falls WTP in the event of raw water quality changes resulting from an operation change by OPG or other influence on the source water.

The alternatives examined to address this problem include:

- Do nothing
- Move the intake from the Welland River to the Niagara River
- Provide pretreatment of raw water at the WTP
- Provide temporary pumping from the Niagara River during maintenance shutdowns of the Queenston-Chippawa Power Canal.

Addressing this problem also creates some opportunities, these include:

- Ability to increase security of intake
- Ability to have a back up intake if the new one was taken out of service



- Ability to improve efficiency of the WTP.

2.2 Needs and Justification

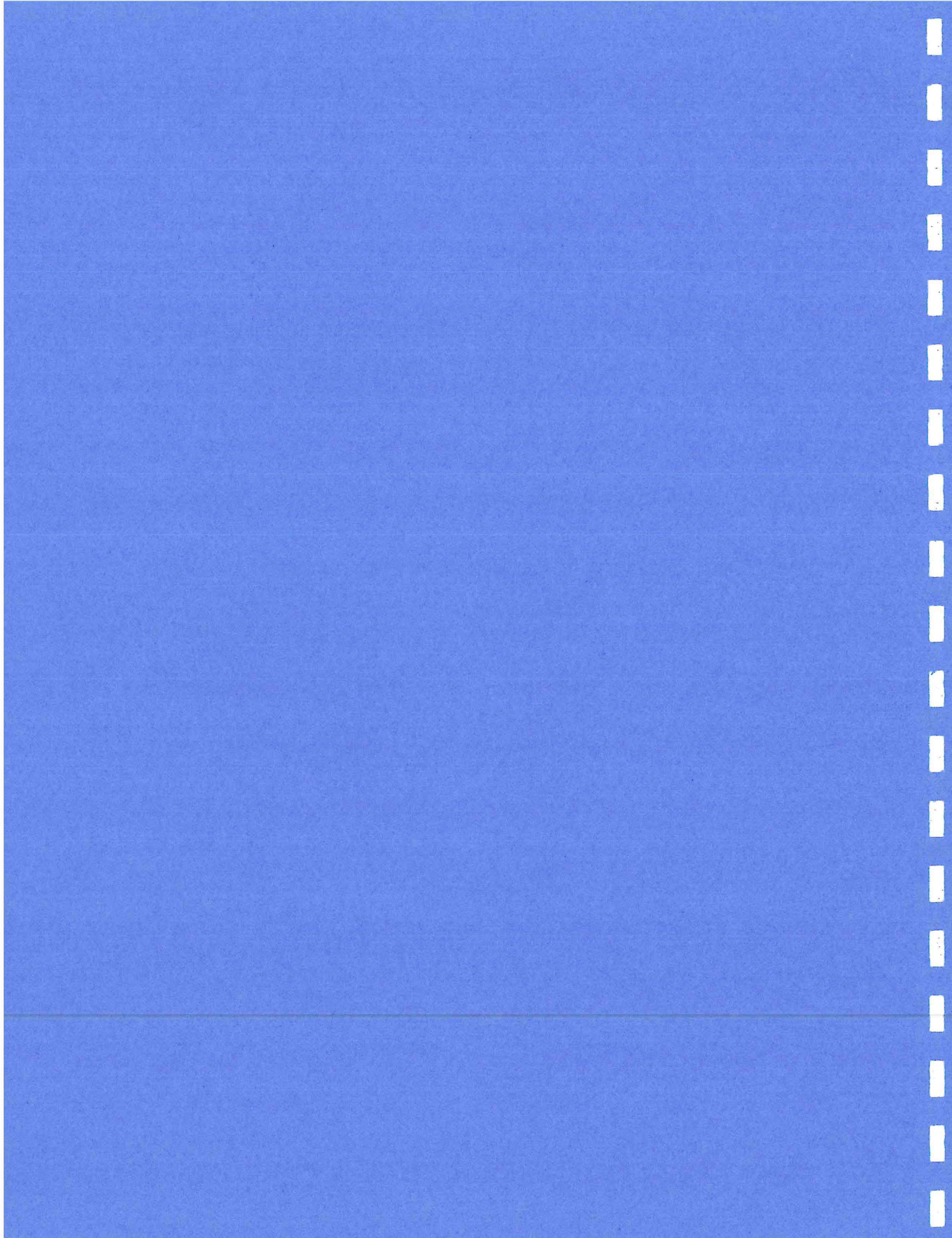
The Niagara Falls WTP intake is currently on the lower Welland River/Chippawa Creek and is very close to shore. With the operations of OPG and the construction of the new intake tunnel, the The Region has chosen to examine the impact that these operations will have on the raw water quality and available supply to the WTP. The future shutdown of the Queenston-Chippawa Power Canal will have negative impacts on the current raw water supply to the plant prompting the investigation of the relocation of the intake to the Niagara River where the raw water quality is consistent and more favorable.

2.3 Stakeholder and Public Consultation

At the outset of this study, a list of potentially affected agencies were identified and a consultation program undertaken to involve the agencies. The Public was consulted by means of advertisements in the Niagara Falls Review and St. Catherines Standard.

A complete description of the agency and public consultation is included in Section 7. Notices, mailing lists, correspondence, stakeholder and public consultation materials are located in Appendices A and B.

3 Existing Conditions



3 Existing Conditions

3.1 Natural Environment

3.1.1 Surface Water Resources

3.1.1.1 *Niagara River*

The 58-km long Niagara River is the main connecting channel between Lake Erie and Lake Ontario. The 52-m high Niagara Falls, which is located approximately halfway along the length of the river, separates the 'upper' and 'lower' sections of the river. The Niagara River has an annual mean discharge of 5,692 m³/s (Cudmore-Vokey and Crossman, 2000).

OPG operates the International Niagara Control Works (INCW), located approximately 1.3 km downstream from the mouth of Welland River/Chippawa Creek and 1.7 km upstream from the crest of Niagara Falls. The purpose of the INCW is to control flows over the Falls and water levels in the upstream reach, called the Grass Island Pool (GIP), and subsequently flow through Chippawa Creek and into the Queenston-Chippawa Power Canal.

3.1.1.2 *Welland River/Chippawa Creek*

The 132-km long Welland River is the largest tributary of the Niagara River, with an overall watershed size of 880 km² (Yagi, 1997). The headwaters are located south of the City of Hamilton and the river flows in an easterly direction through the City of Welland towards the Niagara River. Historically, the Welland River drained into the Upper Niagara River, approximately 3 km upstream from Niagara Falls in the Grass Island Pool area. However, in order to facilitate development of the hydroelectric potential of Niagara Falls in the early 1920s, the Queenston-Chippawa Power Canal was constructed to divert water from above Niagara Falls to the Sir Adam Beck (SAB) hydroelectric generating station, located approximately 8 km downstream from Niagara Falls. The head of the Queenston-Chippawa Power Canal is located on the Welland River, 6.5 km upstream from the Welland River mouth on the Niagara River. As part of this work, the mouth of the Welland River, downstream from the canal intake, was widened and deepened. This resulted in flow in the Welland River being reversed, flowing from the Niagara River to the Queenston-Chippawa Power Canal. The portion of the Welland River between the Queenston-Chippawa Power Canal and the Niagara River is formally called Chippawa Creek.

Regulation of Chippawa Creek flows for hydroelectric power production results in water level fluctuation in the Welland River, extending for a distance of approximately 60 km upstream of the Queenston-Chippawa Power Canal (Phillips Engineering Limited, 2004). Water levels in the Grass Island Pool typically decrease during the day as hydroelectric power production and

flow over the falls for aesthetic purposes are occurring, while water levels increase at night, as water is stored in the Grass Island Pool. The maximum daily fluctuation in the Grass Island Pool is 0.46 m (Phillips Engineering Ltd., 2004).

3.1.2 Existing River Flows and Current

Daily average discharge values for the Niagara River for a 75-year period (1926-2000) were used in assessing the 5-year low flow. A Weibull distribution was fit to the annual minimum flows, as shown in Figure 3.1. This yielded a 5-year low flow of 3,980 m³/s. The 2-year low flow, estimated by the same method, is 4,566 m³/s.

The Niagara Peninsula Conservation Authority estimates the 5-year flood flow for the Welland River at the Old Siphon to be about 178 m³/s¹. This was prorated based on drainage area to represent the discharge at the confluence of the Welland and Niagara Rivers. The discharge in the Welland River was modeled as the 5-year flow of 208 m³/s. The 2-year flood, estimated by the same method, is 170 m³/s.

3.1.2.1 River Modeling of Future Flows

When the direction of the Welland River near the Niagara River is reversed, any suspended solids in the Welland River will be carried into the Niagara River. A numerical model of the confluence of the two rivers was used to predict the extent of this turbidity plume in the Niagara River and assist in determining an appropriate placement for the re-located intake. The modeling report is included in Appendix C.

The software package chosen for this project is FLOW-3D, developed by Flow Science Incorporated of Santa Fe, New Mexico, USA. FLOW-3D is a general purpose computer program for the numerical simulation of fluid flow and heat transfer using computational fluid dynamics (CFD) techniques. CFD methods transform Navier-Stokes equations of fluid dynamics into algebraic equations that are suitable for solving with a computer. FLOW-3D is a well-tested, reliable CFD software product developed and supported by Flow Science, Inc. It is designed to assist in investigation of the dynamic behavior of liquids and gases in a very broad range of applications. FLOW-3D has been designed for the treatment of time-dependent (transient) problems in one, two and three dimensions.

In 2005, Hatch Energy created a two dimensional FLOW-3D model of this section of the Niagara River for Ontario Power Generation (OPG). OPG granted permission for this model to be modified and used by Hatch Energy to assist in determining the extent of the turbidity plume that results from the reversal of the Welland River in the area of the Niagara River.

¹ Fax from Steve Miller, Jan 11, 2007, 'Rating Curve at Old Siphon'

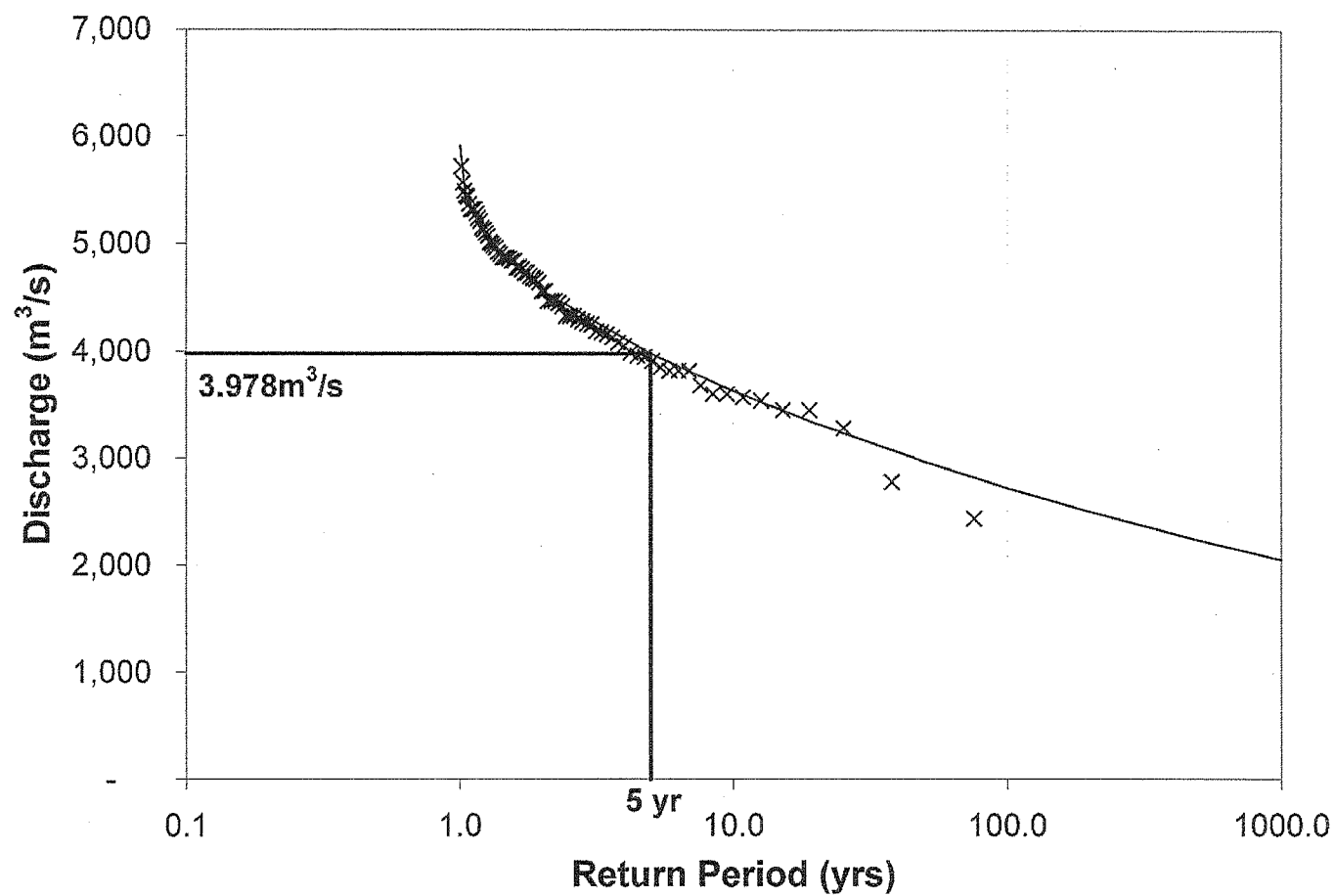


Figure 3.1
 Niagara Falls WTP Intake Relocation
 Weibull Distribution of Annual Daily Minimum Flows in the Niagara River, 1926 - 2000

The extent of the flow domain modeled includes the Grass Island Pool (GIP) from the INCW to the west and downstream end, to approximately 6 km upstream of the INCW. This covers an area of about 15 km² and consists of the key influential flow components in the domain; namely,

- inflow through the east and west channels around Grand Island
- inflow from the reversed Welland River
- intakes to the Robert Moses/Lewiston complex (NYPA) and Sir Adam Beck stations (SAB) (OPG) (including the new tunnel)
- outflow through and around INCW.

Figure 3.2 shows the extent of the model area as well as the locations of the various inflow and outflow boundaries.

CFD models rely on a grid system to define the area being modeled; the equations of fluid dynamics are solved at the boundaries of the cells. In FLOW-3D, a system of variable rectangular mesh blocks composed of individual cells are used to define the system. Each face of each mesh block has one boundary condition associated with it.

Two sets of model runs were performed: large and small scale, as shown in Figure 3.2.

The large scale model was calibrated and run with a fairly coarse resolution. A series of 5 mesh blocks making up of a total of almost 200,000 cells was used to define the study area. Individual cells ranged in size from 30 m x 30 m in upstream areas furthest from the Welland River to 10 m x 10 m near the confluence of the Welland and Niagara Rivers. This coarse resolution reduces the run time but also limits the accuracy of the model. General flow patterns are correct, but detailed analysis of specific locations cannot be performed.

Once the large scale model was calibrated and the large scale flow patterns in the GIP were established, a small scale model was set up in the area of concern. This model used the flow field calculated by the large scale model as boundary conditions and allows for more precise analysis of the area modeled. A single mesh block was used with a 5 m x 5 m grid and a total of almost 300,000 cells. This fine resolution allowed for more detailed analysis of the confluence of the two rivers.

The critical scenario in this study is the largest likely turbidity plume in the Niagara River. A large turbidity plume would limit the flexibility in siting a new intake and could potentially rule out some alternatives. When specifying the flow scenario to be used in the model, conditions were chosen such that a conservatively large turbidity plume would be simulated.

The largest turbidity plumes would be generated when the Welland River has a high discharge and the Niagara River has a low discharge. The flows in the



Welland and Niagara Rivers are not dependant upon one another and can therefore be specified independently. Events with a 5-year return period were used in the simulation.

The distribution of flows in the Niagara River (flow over Niagara Falls, diverted to the Sir Adam Beck generating stations, diverted to the Moses Power Plant) is strictly regulated and varies by time of year and time of day. As well as having a generally lower flow in the Niagara River, the non-tourist flow distribution is thought to yield a larger turbidity plume. The flow distribution representative of non-tourist times was therefore used.

The large-scale flow patterns in the GIP are illustrated in Figure 3.3. The background is coloured by velocity magnitude with velocity vectors superimposed to illustrate the flow patterns. The discontinuities in the background colour occur at the edges of the mesh blocks and do not represent discontinuities in the model, only in the visualization.

The velocity in the Welland River is very small with respect to the rest of model. This is accurate. When the Queenston Chippawa Power Canal (QCPC) is operating, the reversed section of the Welland River has a discharge of up to $700 \text{ m}^3/\text{s}$. The discharge modeled in this study is $208 \text{ m}^3/\text{s}$ (the 5-year flood); therefore velocities in the river can be expected to be much lower than they are when the QCPC are in operation.

As the flow from the Welland River enters the Niagara River, there is a small recirculation zone upstream of the confluence and a much larger one downstream. The bulk of the flow from the Welland River appears to be directed downstream, around this large recirculation zone, and eventually down the ice acceleration channel toward the SAB tunnels.

Detailed flow patterns in the area of the confluence of the Welland and Niagara Rivers are illustrated in Figure 3.4. This model confirms the initial observations from the large scale model results, namely a small zone of recirculation is set up to upstream of the confluence and a much large one downstream.

The small upstream recirculation zone is weak and intermittent. Very little flow from the Welland River appears to propagate upstream in the Niagara River. The bulk of the Welland River flow is directed around the large recirculation zone downstream of the confluence, into the ice acceleration channel and downstream towards the SAB tunnel intakes. This flow trajectory brings the water from the Welland River about 200 – 400 m from the shore before entering the SAB tunnels.

When flow direction in the Welland River is reversed, any turbidity present will be carried into the Niagara River. The size and extent of this



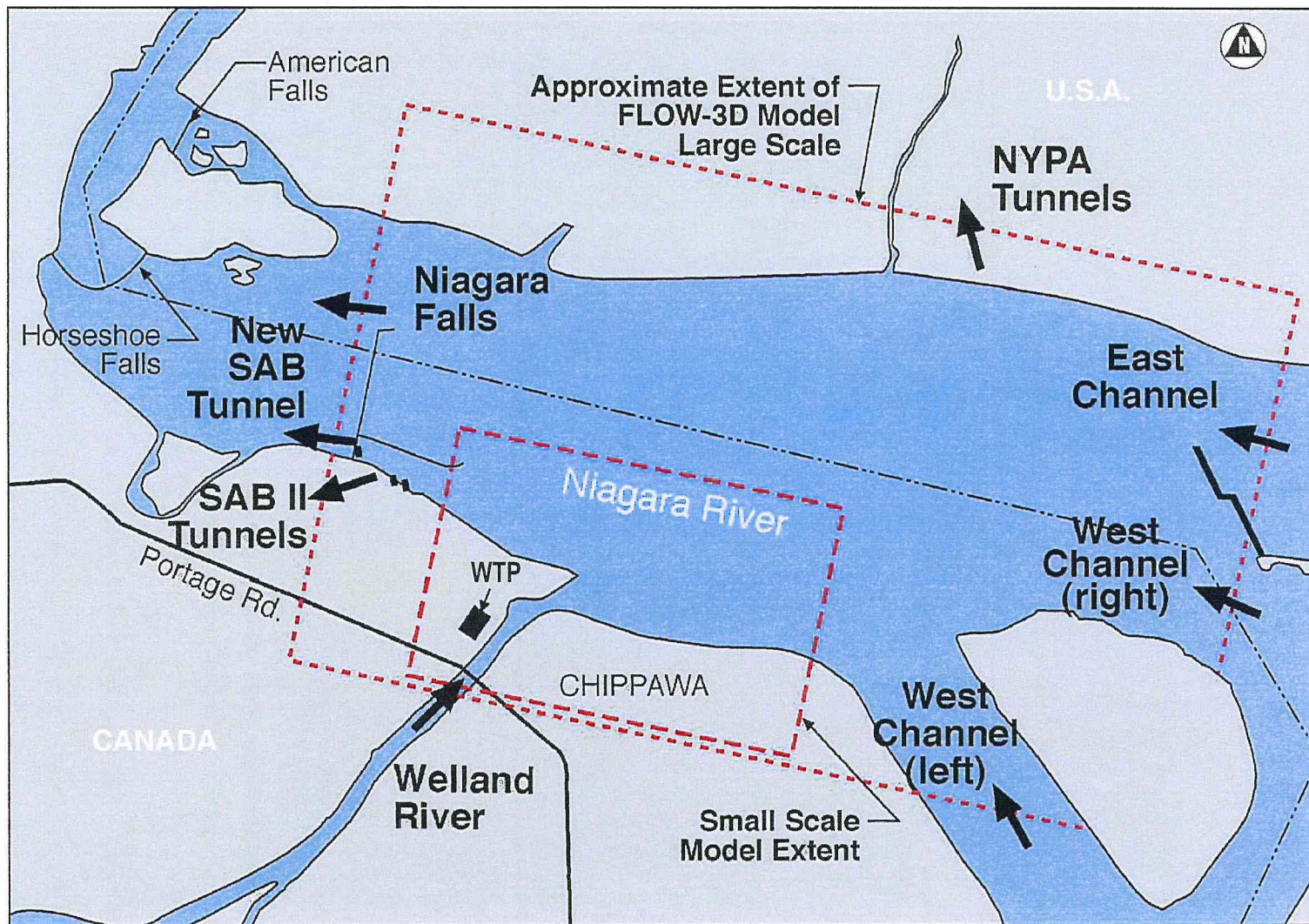


Figure 3.2
Niagara Falls WTP Intake Relocation
Flow Model Extent

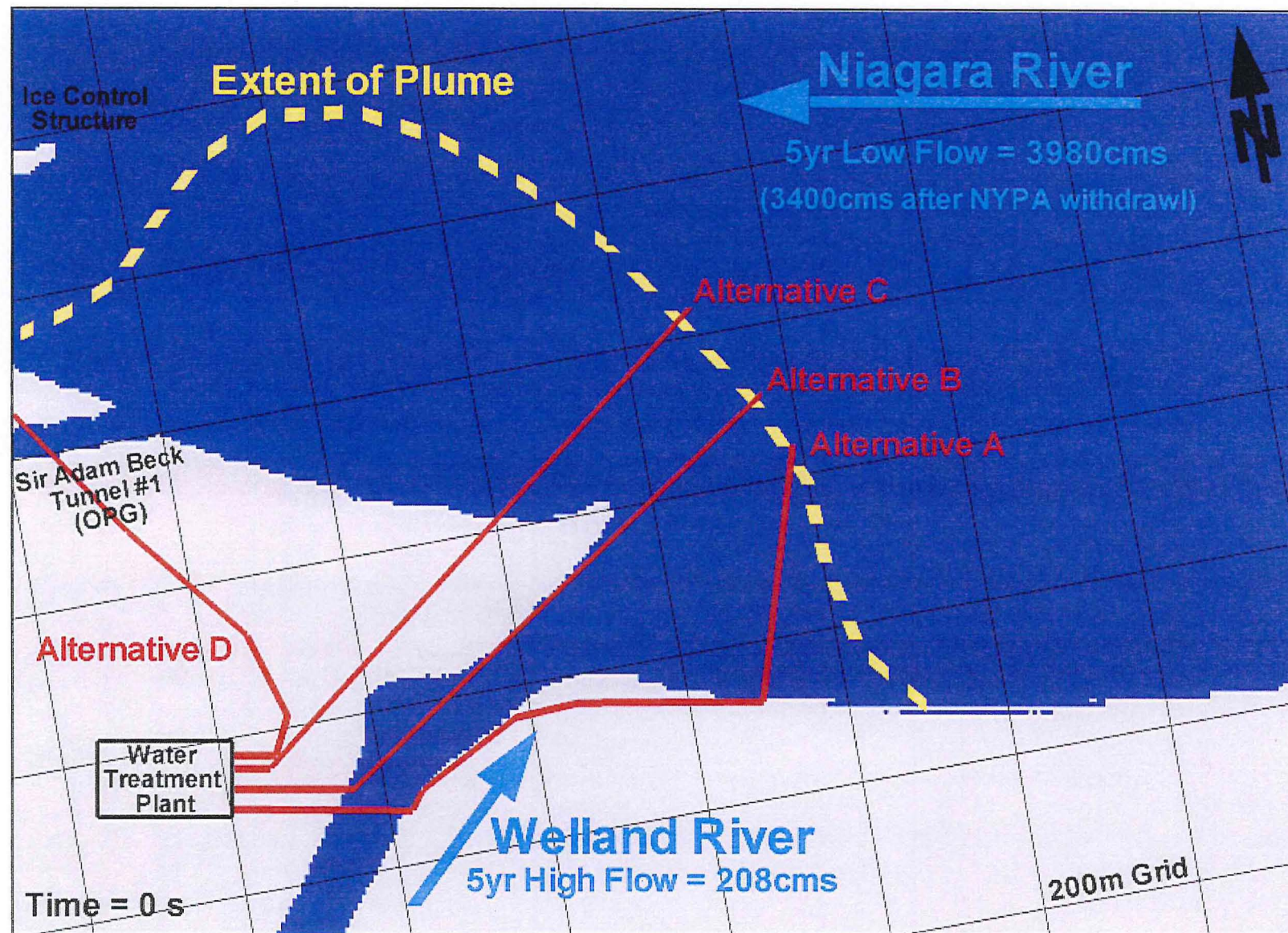


Figure 3.3
 Niagara Falls WTP Intake Relocation
 Extent of Plume

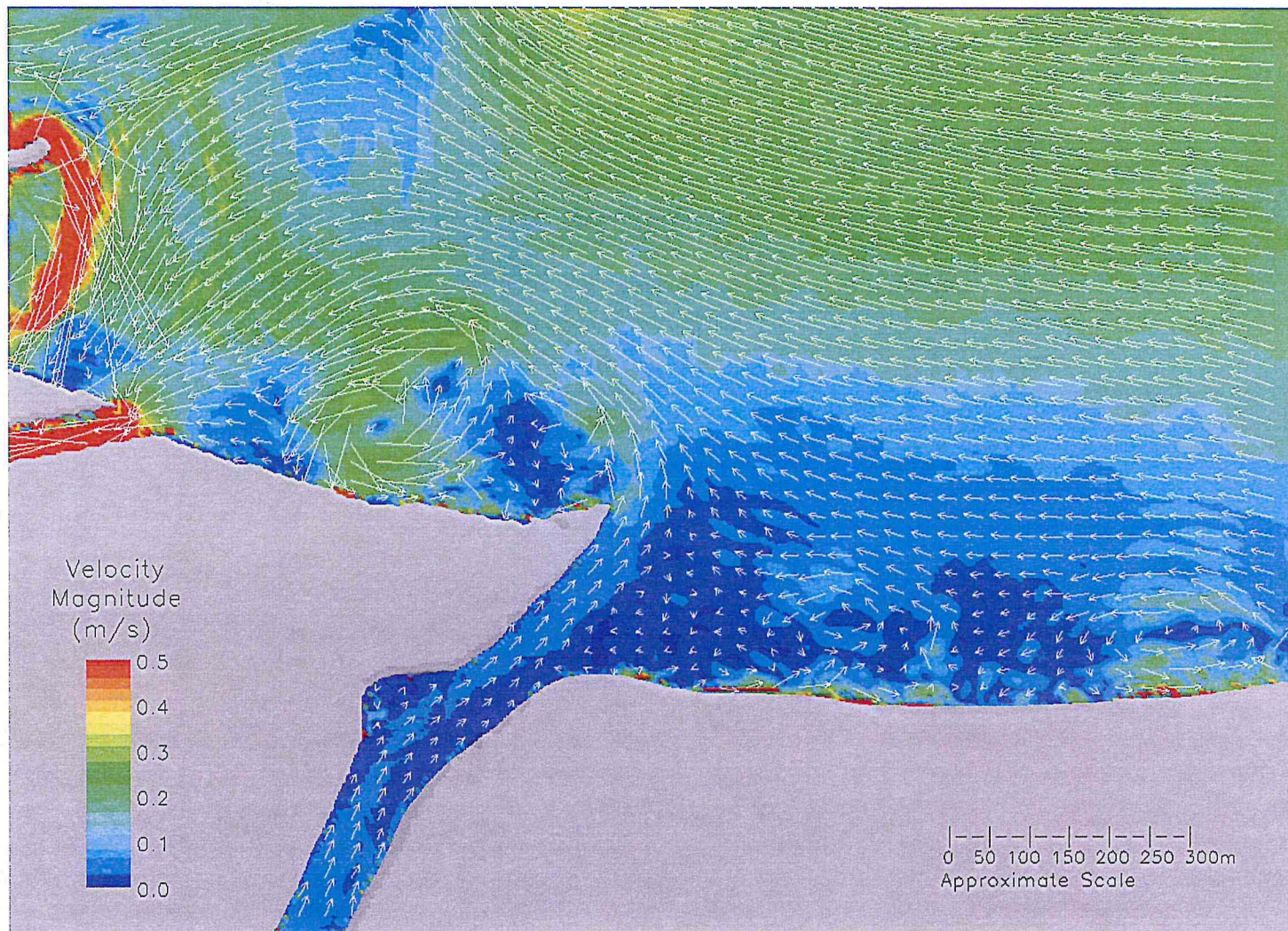


Figure 3.4
Niagara Falls WTP Intake Relocation
Detailed Flow Patterns

turbidity plume is highly variable, with the potential to fluctuate significantly in both size and concentration. The estimated maximum extent of the turbidity plume is illustrated in Figure 3.3. Due to the sensitivity of the plant capacity to turbidity loading, it is recommended that any relocated water intake structure be completely outside of this zone.

3.1.3 Aquatic Environment

3.1.3.1 Aquatic Habitat

Upper Niagara River

The 4.5-km long Grass Island Pool, into which the Welland River flows, is located in the Niagara River, between the INCW and the downstream end of Grand Island. The pool covers a surface area of approximately 540 ha. Average water depth in the pool is approximately 1.5 to 4 m (Aquatic Science Associates Inc. and E/PRO Engineering & Environmental Consulting, LLC, 2005). Oceans Survey (1991; cited in Aquatic Science Associates Inc. and E/PRO Engineering & Environmental Consulting, LLC, 2005) indicated that the bottom composition of the majority of the Grass Island Pool is comprised of smaller substrates (small cobble, gravel and finer material) with a relatively flat bottom.

Significant fish habitats in the Upper Niagara River occur in the vicinity of Grand Island, where several shoals, inflowing tributaries and extensive wetlands likely provide spawning, nursery and foraging habitat for a variety of species (Acres International Limited, 1990). A suspected rainbow trout spawning area is located downstream from the INCW (Acres International Limited, 1990).

Welland River/Chippawa Creek

The Welland River/Chippawa Creek area has undergone extensive alteration over the past 180 years. The mouth of the Welland River at the Niagara River was the eastern terminus (i.e. upstream end) of the first Welland Canal, which entered operation in 1829. Construction of the Welland Canal required dredging of a naturally created sandbar at the mouth of the Welland River. An approximately 300-m long channel was cut into the east bank of the Welland River, creating an Island at the mouth, known as Hogg Island. Following this dredging, flow in the lower Welland River was reversed, flowing from the Niagara River to Twelve Mile Creek. Use of this section of the Welland River as the main Welland Canal ceased in 1933, when the second version of the Welland Canal was opened, joining it up with Port Colborne (Niagara Falls Thunder Alley, 2007).

In the 1920's, construction of the Queenston-Chippawa Power Canal required extensive dredging in the Chippawa Creek portion of the Welland River (Yagi, 1997). This dredging was conducted to again allow flow to travel in an upstream direction from the Niagara River to the power canal and to ensure



that adequate flow passage capacity was present in Chippawa Creek. Dredge material from the canal was placed in one of the channels around Hogg Island to create a barrier across the natural mouth of the river (Niagara Falls Thunder Alley, 2007).

Additional dredging and improvement/repair work was conducted in Chippawa Creek between 1964 and 1996 in order to increase the hydraulic capacity of the channel from 453 m³/s to 637 m³/s (Phillips Engineering Ltd., 2004).

Chippawa Creek is characterized by an approximately 9-m deep central flow channel, flanked by 10-m wide submerged ledges on one or both banks, likely a result of dredging or submergence of a former bank (Phillips Engineering Limited, 2004).

Acres International Limited (1990) conducted a limited aquatic habitat survey in Chippawa Creek between the Niagara River and the Queenston-Chippawa Power Canal, as part of the baseline environmental investigations for the OPG's Niagara Tunnel Project. The following description of habitat conditions is paraphrased from Acres International Limited (1990). No significant habitat features (e.g. spawning or nursery areas) were noted in the reach of Chippawa Creek between the Niagara River and the existing Niagara WTP intake, located approximately 520 m upstream from the Niagara River.

The mouth of Chippawa Creek is highly developed for a number of land use purposes. Kings Bridge Park, owned and operated by the Niagara Parks Commission (NPC) is located on the north shore of the river. Shorelines on both north and south shores of the river between its mouth and the Niagara Parkway Bridge on Portage Road, which spans the river approximately 700 m upstream from its mouth, are protected by rip rap shore protection. This protection is likely required to prevent erosion due to the daily water level fluctuations occurring as a result of variable intake of flow for hydroelectric power production. Backshore areas, which are topographically flat to rolling, are dominated by manicured parkland, with mown grass and scattered trees and shrubs.

An indentation of the shoreline (creating a small embayment approximately 45 m deep) is located approximately 300 m upstream from the concrete control structure at the river mouth. Acres International Limited (1990) noted that a sand beach is located at the back of this small embayment. However, the current shoreline is comprised of riprap to protect from erosion. The embayment does appear to be relatively shallow compared to the main channel of Chippawa Creek.

The area between the Niagara River and the existing Niagara WTP intake appears to be relatively devoid of in-stream structure that would provide

refuge habitat for fish in this section of the river. Past dredging has likely resulted in a relatively uniform bottom composition. Flow hydraulics (velocity and water level fluctuation) have prevented the establishment of littoral submerged or emergent aquatic vegetation. The shoreline rip rap may provide some habitat for small fish in this area. Overall, the reach does not appear to provide any significant critical fisheries habitat function. Water level fluctuation also limits the diurnal availability of aquatic habitat and would prevent successful spawning in shallow water areas that may be dewatered on daily basis.

Acres International Limited (1990) found potentially significant spawning areas, primarily comprised of emergent and submergent aquatic vegetation along Chippawa Creek in the reach upstream of the Stanley Avenue Bridge, located approximately 4 km upstream from the Niagara River.

The Provincially Significant Lyon's Creek Wetlands, located at the confluence of Lyon's Creek and Chippawa Creek, approximately 2.2 km upstream from the Niagara River may also provide significant spawning, nursery and foraging habitat for a variety of species. The 150.5 ha wetland is comprised of 85.6% marsh vegetation communities, dominated by a variety of emergent and submergent vegetation species (Moraal and Smith, 1984; cited in MNR, 1998a).

The Provincially Significant Grassy Brook Wetland, located near the head of the Queenston-Chippawa Power Canal, may also provide some significant spawning, nursery and foraging habitat. The 7.9 ha wetland is comprised of 22.8% marsh communities dominated by emergent meadow and aquatic vegetation with some submergent plants (Kwicinski et al., 1988; cited in MNR, 1998b).

The Welland River upstream from the Queenston-Chippawa Power Canal is relatively low gradient, with a channel bed material consisting of predominantly a soft to firm mixture of silt and clay with minor amounts of sand and gravel (Phillips Engineering Ltd., 2004).

Sediment Quality

Pope et al. (1993) conducted a sediment-sampling program throughout the Welland River, including two stations in Chippawa Creek. Most of the chemical parameters of the Chippawa Creek sediments were at or below the provincially designated Lowest Effect Level (LEL)². Cadmium and copper slightly exceeded the LEL at one of the two stations, but copper was well below the Canadian Sediment Quality Guidelines (CCME, 1999) value. Nickel, total phosphorus, kjeldhal nitrogen and total organic carbon were also slightly above the LEL at the second sampling location.

² LEL refers to the concentration at which impacts on benthic organisms may begin to occur (Persaud et al., 1993).



Statistical analysis of the results showed that sediment quality at the two Chippawa Creek stations was significantly different from stations on the Welland River upstream from the Queenston-Chippawa Power Canal. Primary differences included significantly lower sediment concentrations of aluminum, arsenic, chromium, copper, lead, mercury and zinc in the Chippawa Creek sediment.

3.1.3.2 Aquatic Ecology

Fish

Table 3.1 summarizes the fish communities of the Upper Niagara River, overall Welland River watershed and the portion of the Welland River east of the Welland Shipping Canal (WSC).

Table 3.1 Fish Species of the Upper Niagara River and Welland River				
Common Name	Scientific Name	Welland R. ¹	Welland R. East of WSC ¹	Upper Niagara R. ²
American brook lamprey	<i>Lampetra appendix</i>			X
Sea Lamprey	<i>Petromyzon marinus</i>			X
Lake Sturgeon	<i>Acipenser fulvescens</i>			X
Longnose gar	<i>Lepisosteus osseus</i>			X
Bowfin	<i>Amia calva</i>	X	X	X
Mooneye	<i>Hiodon tergisus</i>			X
American Eel	<i>Anguilla rostrata</i>			X
Alewife	<i>Alosa pseudoharengus</i>	X		X
Gizzard Shad	<i>Dorosoma cepedianum</i>	X		X
Central stoneroller	<i>Camptostoma anomalum</i>			X
Rainbow smelt	<i>Osmerus mordax</i>	X		X
Coho salmon	<i>Onchorynchus kisutch</i>			X
Rainbow trout	<i>Onchorynchus mykiss</i>			X
Chinook salmon	<i>Onchorynchus tshawytscha</i>			X
Brown trout	<i>Salmo trutta</i>			X
Lake trout	<i>Salvelinus namaycush</i>			X
Trout-perch	<i>Percopsis omiscomaycus</i>			X
Burbot	<i>Lota lota</i>			X
Northern pike	<i>Esox lucius</i>	X	X	X
Muskellunge	<i>Esox masquinongy</i>			X
Grass pickerel	<i>Esox americanus</i>			X
Central mudminnow	<i>Umbra limi</i>	X	X	X
Quillback	<i>Carpionodes cyprinus</i>			X
White sucker	<i>Catostomus commersonii</i>	X	X	X
Lake chubsucker	<i>Erimyzon sucetta</i>			X ³
Bigmouth Buffalo	<i>Ictiobus cyprinellus</i>	X		X
Northern hogsucker	<i>Hypentelium nigricans</i>			X
Silver redhorse	<i>Moxostoma anisurum</i>			X
Black redhorse	<i>Moxostoma duquesnei</i>			X

Table 3.1
Fish Species of the Upper Niagara River and Welland River

Common Name	Scientific Name	Welland R. ¹	Welland R. East of WSC ¹	Upper Niagara R. ²
Golden redhorse	<i>Moxostoma erythrurum</i>			X
Shorthead redhorse	<i>Moxostoma macrolepidotum</i>	X	X	X
Greater redhorse	<i>Moxostoma valenciennesi</i>	X	X	X
Goldfish	<i>Carassius auratus</i>	X	X	X
Lake chub	<i>Couesius plumbeus</i>			X
Satinfin shiner	<i>Cyprinella analostana</i>			X
Spotfin shiner	<i>Cyprinella spiloptera</i>			X
Common carp	<i>Cyprinus carpio</i>	X	X	X
Redfin shiner	<i>Lythrurus umbratilis</i>			X
Golden shiner	<i>Notemigonus crysoleuca</i>	X	X	X
Emerald shiner	<i>Notropis atherinoides</i>	X	X	X
Bridle shiner	<i>Notropis bifrenatus</i>			X
Blackchin shiner	<i>Notropis heterodon</i>			X
Blacknose shiner	<i>Notropis heterolepis</i>			X
Spottail shiner	<i>Notropis hudsonius</i>	X	X	X
Sand shiner	<i>Notropis stramineus</i>			X
Mimic shiner	<i>Notropis volucellus</i>	X		X
Bluntnose minnow	<i>Pimephales notatus</i>	X	X	X
Fathead minnow	<i>Pimephales promelas</i>	X		X
Creek chub	<i>Semotilus atromaculatus</i>	X		X
Striped shiner	<i>Luxilus chrysocephalus</i>	X	X	X
Common shiner	<i>Luxilis cornutus</i>			X
Hornyhead chub	<i>Nocomis biggutatus</i>			X
River chub	<i>Nocomis micropogon</i>			X
Blacknose dace	<i>Rhinichthys atratulus</i>			X
Longnose dace	<i>Rhinichthys cataractae</i>			X
Rudd	<i>Scardinius erythrophthalmus</i>			X
Fallfish	<i>Semotilus corporalis</i>			X
Black bullhead	<i>Ameiurus melas</i>	X		X
Yellow bullhead	<i>Ameiurus natalis</i>	X		X
Brown bullhead	<i>Ameiurus nebulosus</i>	X	X	X
Channel catfish	<i>Ictalurus punctatus</i>	X		X
Stonecat	<i>Noturus flavus</i>			X
Tadpole madtom	<i>Noturus gyrinus</i>	X		X
Brindled madtom	<i>Noturus miurus</i>			X
Banded killifish	<i>Fundulus diaphanous</i>	X	X	X
Brook stickleback	<i>Culaea inconstans</i>			X
Threespine stickleback	<i>Gasterosteus aculeatus</i>			X
Ninespine stickleback	<i>Pungitius pungitius</i>			X
Mottled sculpin	<i>Cottus bairdi</i>			X
White perch	<i>Morone americana</i>	X		X
White bass	<i>Morone chrysops</i>			X
Rock bass	<i>Ambloplites rupestris</i>	X	X	X
Green sunfish	<i>Lepomis cyanellus</i>	X	X	X
pumpkinseed	<i>Lepomis gibbosus</i>	X	X	X
bluegill	<i>Lepomis macrochirus</i>	X	X	X
Smallmouth bass	<i>Micropterus dolomieu</i>	X		X

Table 3.1
Fish Species of the Upper Niagara River and Welland River

Common Name	Scientific Name	Welland R. ¹	Welland R. East of WSC ¹	Upper Niagara R. ²
Largemouth bass	<i>Micropterus salmoides</i>	X	X	X
White crappie	<i>Pomoxis annularis</i>	X	X	X
Black crappie	<i>Pomoxis nigromaculatus</i>	X	X	X
Yellow perch	<i>Perca flavescens</i>	X	X	X
Greenside darter	<i>Etheostoma blennoides</i>			X
Rainbow darter	<i>Etheostoma caeruleum</i>			X
Iowa darter	<i>Etheostoma exile</i>			X
Fantail darter	<i>Etheostoma flabellare</i>			X
Johnny darter	<i>Etheostoma nigrum</i>	X	X	X
Logperch	<i>Percina caprodes</i>	X		X
Blackside darter	<i>Percina maculate</i>	X		
Sauger	<i>Sander canadensis</i>			X
Walleye	<i>Sander vitreus</i>			X
Blue pike	<i>Sander vitreus glaucas</i>			X ⁴
Brook silverside	<i>Labidesthes sicculus</i>	X	X	X
Freshwater drum	<i>Aplodinotus grunniens</i>	X		X
Lepomis cyanellus X hybrid	n/a	X		
Hybrid carp X goldfish	n/a			X
Round goby	<i>Neogobius melanostomus</i>			X
Species Richness		42	25	93

Legend:¹ Source - Yagi, 1997² Source - Carlson, 2001 (cited in Acres International Corporation, 2005)³ Last recorded circa 1927⁴ Extinct from Canadian waters**Upper Niagara River**

The Upper Niagara River supports a diverse migrant and resident fish community comprised of cool and warm-water species, including northern pike, bass and muskellunge, and to a lesser degree, cold-water species including several types of salmon and trout, often present in the fall, winter and spring periods (Kleinschmidt Associates, 2002; cited in Acres International Corporation, 2005). The most recently available complete fish species account for the Upper Niagara River notes the potential species diversity to be approximately 93 species (Carlson, 2001; cited in Acres International Corporation, 2005).

A fish community survey conducted in the Upper Niagara River in 2001 captured a total of 46 species, with emerald shiner, rainbow smelt and sucker species accounting for 80% of the catch (Kleinschmidt Associates, 2002; cited in Acres International Corporation, 2005).



No fish community information is known to be available for the Grass Island Pool, near the mouth of Chippawa Creek. However, Acres International Corporation (2005) speculated that, given average flow velocity in excess of 0.60 m/s, fish communities in the area are likely dominated by riverine benthic species such as dace, sculpin, darter and suckers. It was also predicted that in-water structure (e.g. rock piles, shoals, rip rap shoreline protection) would attract other species such as rock bass and smallmouth bass and that pelagic species, such as alewife, would likely be uncommon except in isolated areas or as drift in the Niagara River (Acres International Corporation, 2005).

Welland River/Chippawa Creek

A total of 42 different fish species have been documented in the Welland River (Yagi, 1997b). A 1997 fish community survey throughout the Welland River resulted in the capture of 38 of these species, with 26 of these species being recorded in the Welland River between the Welland Shipping Canal and the Queenston-Chippawa Power Canal.

The Ontario Ministry of Natural Resources (MNR) conducted a fish community survey (via boat electrofishing) at one sampling location in Chippawa Creek (immediately east of the Queenston-Chippawa Power Canal) in 2004. Fish species and numbers captured are identified in Table 3.2.

Table 3.2	
Fish Species Captured in Chippawa Channel	
Species	Number
Black crappie	2
Bluntnose minnow	75
Common shiner	37
Creek chub	1
Emerald shiner	80
Fathead minnow	3
Green sunfish	11
Johnny darter	7
Largemouth bass	11
Logperch	1
Mottled sculpin	2
Moxostoma sp.	5
Rainbow darter	4
River redhorse	1
Rock bass	60
Round goby	81
Smallmouth bass	4
Spottail shiner	113
White sucker	28
Yellow perch	1

Source: MNR (2006)

The fish community at this location appears to be typical of relatively large, slow flowing warm water rivers in southern Ontario. Spottail shiner

and emerald shiner, both pelagic species preferring open water habitats (Scott and Crossman, 1973) accounted for 21.8% and 15.4% of the catch, respectively. Round goby, an introduced species that prefers rocky or gravelly nearshore habitats (Environment Canada, 1999), accounted for 15.6% of the catch.

Lewies (1990; cited in Acres International Limited, 1990) reported that baitfishing was known to occur at the mouth of the Welland River (i.e. Chippawa Creek) and that baitfish were known to migrate from the Niagara River up the Welland River to spawn from ice breakup in the spring to early June. Watson (1990; cited in Acres International Limited, 1990) reported that the primary baitfish harvested in the Upper Niagara River were emerald shiner, with suckers, chubs and spottail shiners also being harvested.

Acres International Limited (1990) conducted a summer creel survey on the Welland River/Chippawa Creek between the Niagara River and the Queenston-Chippawa Power Canal. Table 3.3 identifies the fish species captured and the estimated catch (based on results of 38 interviews).

Table 3.3 1990 Creel Survey Results – Welland River	
Species	Estimated Catch
Rainbow trout	10
Yellow perch	30
Smallmouth bass	109
Rock bass	150
Pumpkinseed	9
White sucker	21
Channel catfish	27
Common carp	17
Freshwater drum	77

Benthic Invertebrates

Pope et al., (1993) sampled benthic invertebrates at two locations on Chippawa Creek, including one at the mouth of Grassy Brook (immediately downstream from the Queenston-Chippawa Power Canal) and the other approximately 5 km upstream from the Niagara River. The benthic invertebrate community found in Chippawa Creek was generally characteristic of slow-moving waters, soft sediment and a shallow littoral zone with aquatic vegetation. Shannon-Weaver and Brillouin Diversity Index values indicated a relatively diverse community representative of relatively unpolluted conditions.

3.1.4 Terrestrial Environment

3.1.4.1 Vegetation

The study area north of Chippawa Creek consists of open parkland owned and maintained by the Niagara Parks Commission (NPC). As such, vegetation in the park area is dominated by manicured lawn with scattered urban trees. The lawns of the park are mown periodically from spring to fall. Due to the high degree of disturbance and predominance of dense lawn grass, it is unlikely that any significant vegetation species exist in the park area. A similar vegetation community exists on the south side of Chippawa Creek within a narrow band separating the watercourse from the adjacent residences.

3.1.4.2 Wildlife

Several common, urban tolerant mammal species may reside in the park area. Due to the highly disturbed nature of the park and industrial and residential development in the surrounding area, significant animal movements into and out of the park are not likely to occur. Mammal species potentially residing in or temporally utilizing the area may include eastern grey squirrel (*Sciurus carolinensis*), raccoon (*Procyon lotor*) and small rodents such as mice or voles.

A variety of bird species may temporally utilize the parklands for residence, nesting or foraging habitat. This likely includes common urban bird species such as American robin (*Turdus migratorius*), European starling (*Sturnus vulgaris*) and house sparrow (*Passer domesticus*). These species may forage among the open lawns or in the woody vegetation. Limited nesting may occur in the larger trees within the park as well.

The Niagara River corridor, from Lake Erie to Lake Ontario, is identified as an Important Bird Area (IBA) in Canada. The river hosts globally significant concentrations of Bonaparte's Gull (*Larus philadelphia*), Herring Gull (*Larus argentatus*), Canvasback (*Aythya valisineria*) and Common Merganser (*Mergus merganser*), as well as one of the largest and most diverse gull populations in the world (Niagara River Corridor IBA Working Group, 2002). However, the study area is unlikely to provide any significant habitat for these species. The most important areas of the Niagara River Corridor IBA include roosting areas such as the rocks above Niagara Falls, the river mouth at Lake Ontario and in the Queenston Reservoir, and foraging areas such as the base of the falls and the discharges from SAB and Robert Moses Generating Stations (Niagara River Corridor IBA Working Group, 2002). In addition, 11 species of waterfowl breed in the Niagara River and surrounding area and a total of 28 species are known from the area during migration periods (Niagara River Corridor IBA Working Group, 2002), although the parklands are unlikely to support any significant use by waterfowl.

Given the high flow velocities in Chippawa Creek and the highly disturbed nature of the surrounding area, it is unlikely to support any amphibian or reptile species.

3.1.5 Soils

A geotechnical investigation was conducted along the Alternative C and D intake alignments (see Section 4) by Trow Associates. A total of 4 boreholes (BH A through D) were advanced on July 6, 2007 to a maximum depth of 5 m. The general stratigraphy consisted of 100 to 130 mm of topsoil, underlain by up to 2 m of fill (BH A to C), underlain by silty clay/clayey silt native soils (all boreholes). Groundwater was reported to be encountered at BH A and B at 2.1 and 1.5 m below ground level, respectively. Soil samples were submitted to an independent analytical laboratory for petroleum hydrocarbon, metals, inorganics, pH, and sulphates. The results indicated that the fill and native soils tested meet the Ontario Regulation 153/04 Table 1 and Table 2 (Petroleum Hydrocarbons). Therefore, excess soil could be disposed of at a site permitted to accept such soils.

The report found that the fill soils, which consist of silty sand, are considered Type 3 soils with respect to trench excavations. Reuse of the excavated materials is possible if these soils are not mixed with topsoil or organics, and the soil is not wet. The fill and native soil are not suitable for use as engineered backfill.

A copy of the geotechnical investigation report is located in Appendix D.

3.2 Social Environment

3.2.1 Existing Land Use

This area is a mature and fully developed neighbourhood. Since it is located along the Niagara Parkway/Macklem Street it is surrounded by a variety of land uses and zoning. Adjacent to the WTP to the northwest is the Inn on the Parkway, this land is zoned as Tourist Commercial Zone. Across from the WTP to the northeast adjacent to the Welland and Niagara Rivers is Kingsbridge Park. This park is owned by the Niagara Parks Commission and is zoned as Open Space. Behind the WTP Rapids View Drive, and Keller Street is a residential area. This area is zoned as single family residential. On the east bank of the Welland River, the land use is primarily residential mixed with some open space. There is additional commercial property south of the WTP the corner of Macklem Street and Portage Road there is a restaurant, which is zoned as Tourist Commercial Zone. Describe the lands north of Kingsbridge Park (OPG intakes, NPC maintenance operations centre). The study area is fully developed; there is no future development that is expected to take place in this area.

3.2.2 Archaeological Assessment

The Stage 1 archaeological assessment was conducted by Archaeological Services Inc. (ASI) in April 2007. The report is included in Appendix E. Background research was completed to identify any archaeological sites previously registered within the study area and to assess its archaeological site potential. The study corridor is situated within the

Haldimand Clay Plain physiographic region of southern Ontario (Chapman and Putnam 1984: 156-159). The Haldimand Clay Plain, which includes all of the Niagara Peninsula south of the Niagara Escarpment, is a large, predominantly flat region of glacial lake sediment deposits. The majority of the surface material is lacustrine clay, although sand deposits do occur in places, and there are areas where glacial till protrudes above or is imbedded with the clay. The study corridor is located within a large region covered by near-shore and outwash deposits of sand and silt, associated with glacial Lake Lundy. The study area is located along the Niagara River near the mouth of the Welland River.

The Ontario Archaeological Sites Database (OASD) maintained by the Ministry of Culture indicates that 33 sites have been registered within approximately two kilometers of the study area (ASI 2007: Table 1). Among these sites are numerous Aboriginal sites and Euro-Canadian sites. Included in the Aboriginal sites are lithic scatters dating from the Early Archaic to the Early Woodland period, as well as an Archaic/Early Woodland burial. Although none of the registered sites are within the study area, their close proximity indicates that there is potential for the identification of Aboriginal archaeological remains on the property. The assessment for historic site potential indicated that preferred Alternative D alignment crosses over Lots 191 and 192, formerly owned by the Macklem family, in the former Township of Willoughby (Page 1876). Furthermore, the study area is located adjacent to the historic village of Chippawa, an important town in the Niagara frontier during the War of 1812. Based on the historic assessment, the study area has potential for the discovery of historic Euro-Canadian archaeological remains.

A field review of the study area was conducted on April 9, 2007, and it confirmed that the study area for the Niagara Falls WTP Intake Relocation Class Environmental Assessment has archaeological site potential for the study area.

In accordance with this determination of archaeological site potential, a Stage 2 archaeological assessment of the Niagara Falls WTP Intake Relocation was undertaken in accordance with Ministry of Culture Standards and Guidelines for Consulting Archaeologists (final draft) (2006) on May 15, June 19 and 20, 2007. The area designated Alternative D alignment was assessed by test pit survey. One Aboriginal sub surface lithic scatter was identified in the study area. The site has been registered as P1 (AgGs-320). No other archaeological remains were found in the remainder of the study area. Preliminary results suggest that the sub-surface lithic scatter identified in P1 (AgGs-320), may represent a significant archaeological resource that demonstrates potential to provide insight into the land-use patterns and cultural knowledge of Aboriginal people in the Niagara Region.

It is therefore recommended that:

1. A Stage 3 archaeological assessment should be conducted on P1 (AgGs-320) to further investigate the site's cultural heritage value in accordance with the draft Standards and Guidelines for Consulting Archaeologists (2006).

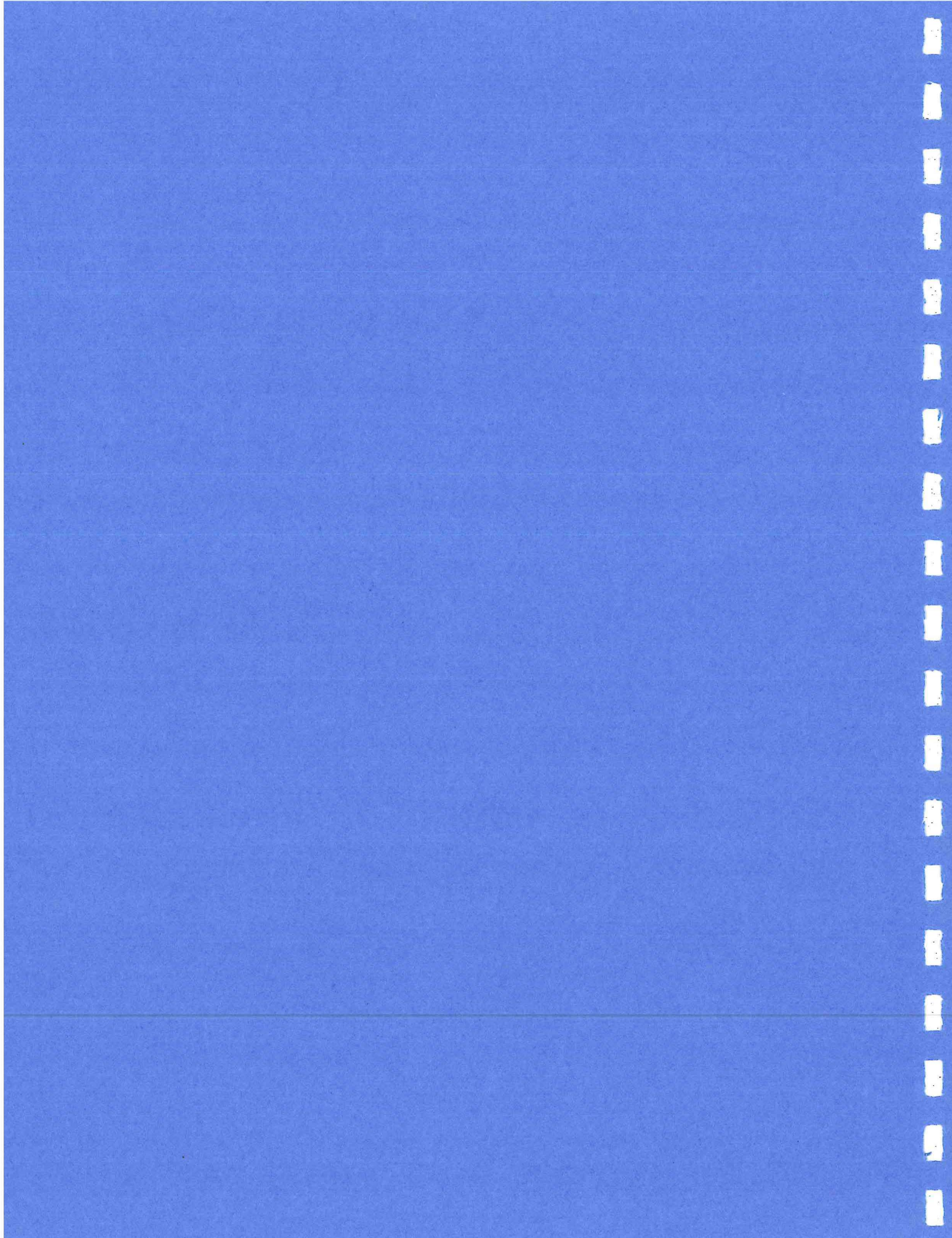


2. No additional archaeological work is recommended for the remainder of Alternate D. The area can be considered clear of further archaeological concern.
3. If any additional areas beyond the limits of the detail design are required for the construction of temporary roadway, parking lots, storm water management ponds, staging areas, etc., it is recommended that these lands be subject to a Stage 2 archaeological assessment prior to disturbance.

The above recommendations are subject to Ministry approval, and it is an offence to alter any archaeological site without Ministry of Culture (MCL) concurrence. No grading or other activities that may result in the destruction or disturbance of any of the archaeological sites documented by this assessment are permitted until notice of MCL approval has been received.

The documentation related to the archaeological assessment will be curated by ASI until such a time that arrangements for their ultimate transfer to Her Majesty the Queen in right of Ontario, or other public institution, can be made to the satisfaction of the The Region, the Ministry of Culture, and any other legitimate interest groups.

4 Alternative Solutions



4 Alternative Solutions

4.1 Identification of Possible Alternative Solutions

The purpose of this Class Environmental Assessment Study is to address solutions for the relocation of the Niagara Falls WTP intake. The identification of alternatives was conducted in two phases. Firstly, four possible alternative solutions were identified as different means to address the problem statement. The second phase was looking at possible alignments.

4.1.1 Alternative 1 - "Do Nothing" Alternative

The "Do Nothing" alternative involves leaving the existing intake in its current location and continuing to operate it and the Niagara Falls WTP as usual, and dealing with changing water quality as it occurs with current plant processes.

4.1.2 Alternative 2 - Relocate the Intake to the Niagara River

This possible solution requires the examination of a series of alternative locations for a new intake to the Niagara Falls WTP. Potential locations for a new intake are as follows:

Alternative A

Alternative A takes advantage of drawing water from Niagara River upstream of the future confluence of the Welland River flows. There are a number of alignment variations possible to convey flows to the WTP. The intake pipe could follow Niagara Parkway alignment on the south side of the Welland River and cross the river in the proximity of the existing intake. It may also be feasible to follow the Welland River bottom by constructing a submerged pipe with ballast along the riverbed, but this will depend on a number of factors including river current velocities and interference to navigation. The connection point may be at a new chamber at the WTP, allowing for the continued use of the existing intake in the future as a "backup" system, or the connection could be from the end of the existing 1200-mm diameter intake, depending on head loss and capacity requirements.

Alternative B

Alternative B has two alternative intake points; Alternative B1 would draw water upstream of the Welland River confluence, similar to the previous alternative, but would cross the river at the mouth of the Welland River. Consideration will be given to supporting the pipe on the existing ice control structure, or submerge it on the riverbed. The pipe would either follow the river back to the existing intake as a submerged installation or be placed along the north bank in conventional trench techniques. This alternative could also be either connected to the existing intake or be extended to the treatment plant. Alternative B2 has a similar alignment to Alternative B1, but the intake point is further north. The feasibility of this will be examined using the river modeling to determine if adequate water quality can be expected at this point.

Alternative C

Alternative C will have the shortest length, as it would run directly from the Niagara River, through the NPC lands to the WTP and draw water from the Niagara River upstream of the OPG tunnels. As with Alternative B2, the distance that this intake would have to be projected into the Niagara River will depend on the extent of the Welland River turbidity plume where it enters the Niagara River and the resulting water quality.

Alternative D

Alternative D would have its intake downstream of the second SAB intake. The river modeling identifies that the expected water quality at this intake point, and verifies that the expected flow pattern will draw Welland River water pollutants past the first OPG tunnel but that the remaining plume will be drawn down the second intake structure upstream of this intake point. This alignment requires crossing over the OPG tunnel structure and following the Niagara Parkway alignment back to the WTP.

The possible alternative locations are shown schematically in Figure 4.1.

4.1.3 Alternative 3 - Addition of a Pretreatment Process to the Plant

This alternative solution is intended to be added onto the existing plant processes ahead of the WTP. It is intended to reduce water turbidity levels to <30 NTU prior to treatment. This alternative would not require relocating the intake, rather improving the existing intake and extending it into the center of the Welland River for increased security.

Alternative A - Actiflo™ (Temporary and permanent)

Actiflo™ is a high rate settling process with a small footprint. It can provide a removal efficiency exceeding 90% for turbidity, color, algae and arsenic. It uses micro-sand as a seed for floc formation and as ballast to increase floc density and give a high settling velocity. It also utilizes plate settling to reduce the clarifier surface. For this installation, 3 units would be required at 49,500 m³/d each.

With this alternative the Actiflo™ units would either be temporary or permanent installations depending on the expected duration of maintenance of the Queenston-Chippawa Power Canal. In the case of temporary installation the required utilities and infrastructure would be prepared in advance of commissioning the temporary units.

Alternative B - Pre-sedimentation tank and polymer dosing system

This alternative would provide a tank or impoundment to provide pre-sedimentation, and the addition of a polyelectrolyte to cause fairly rapid settling and a reduction in suspended solids to a more 'normal' level, thereby allowing the treatment plant to function and perform as usual.

To maintain a plant capacity of 145,000 m³/day, the pre-treatment sedimentation process would consist of two cells, each 5 m deep, 15 m wide, and 45 m long. A valve/diversion

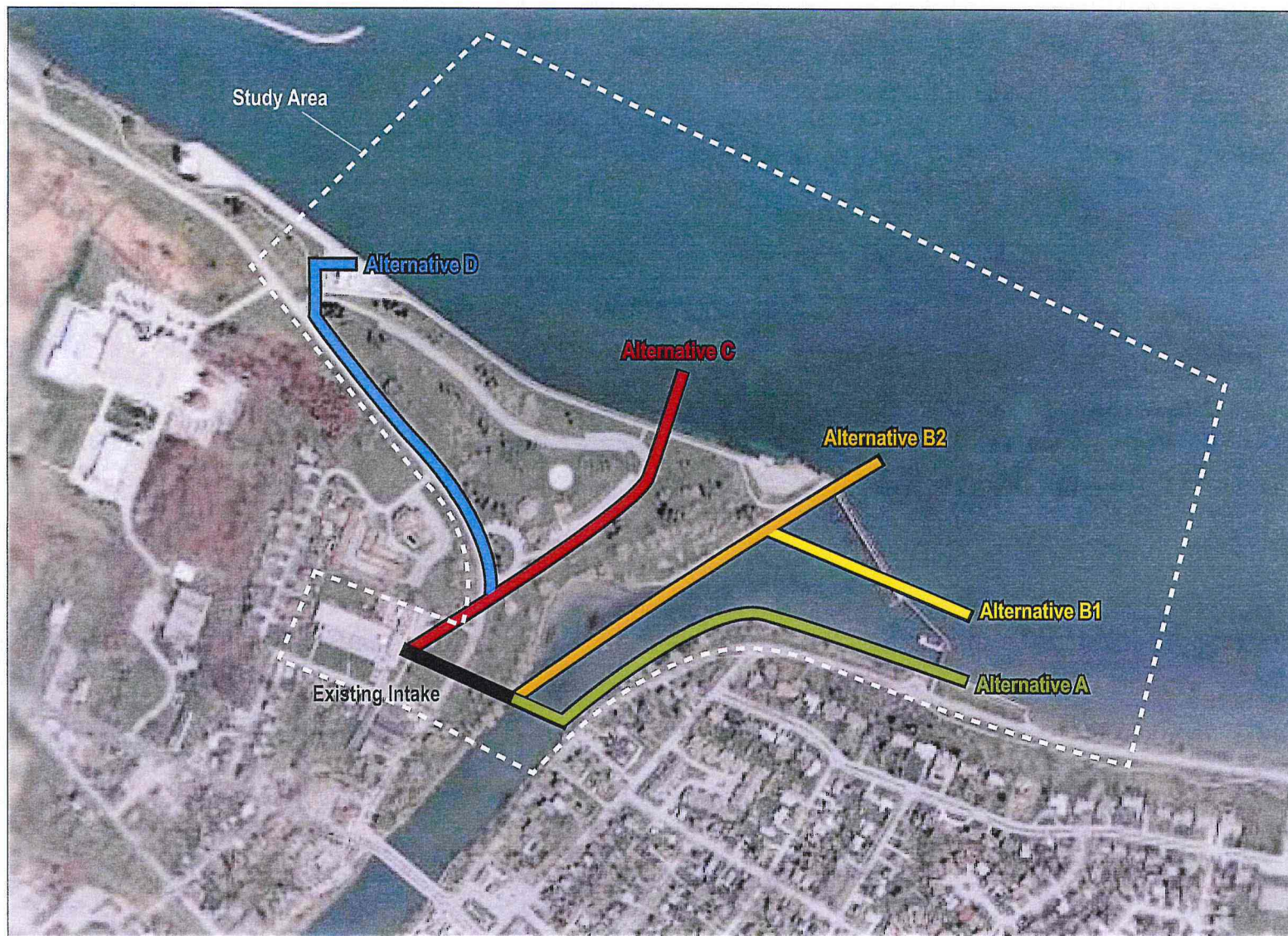


Figure 4.1
Niagara Falls WTP Intake Relocation
Alternative Locations

chamber on the intake line will allow high quality raw water to bypass the pre-sedimentation cells; a polymer feed system would be introduced, and powdered activated carbon could be applied to handle the possible higher organic loads resulting from the influx of Welland River water with a higher organic or minor turbidity loading.

4.1.4 Alternative 4 - Temporary Pumping

This alternative solution requires raw water to be pumped from the Niagara River for the duration of the Queenston-Chippawa Power Canal (QCPC) maintenance activities which are estimated to last between 3 - 7 months. Either electric or diesel powered critically silenced pumps would be utilized, and six operating pumps would be required with one stand-by pump. The pipeline for this alternative would follow Niagara Parkway from a temporary intake downstream of the two existing OPG intake tunnels to the WTP.

Maintenance activities were initially expected to commence after the completion of the third OPG intake tunnel in 2009. However, OPG's recent (2007) evaluation of the QCPC has indicated that maintenance may not be required until 2018.

4.2 Evaluation of Alternatives

4.2.1 Environmental Impacts

All the alternative solutions have the potential to impact the environment, evaluating these potential impacts is a critical step in their evaluation. Table 4.1 identifies the net adverse effects of the alternative solutions and then provides a rating based on a High, Medium, or Low Impact potential. These ratings are then carried forward into the overall evaluation of all the alternative solutions.

4.2.2 Evaluation Method

As required by the Class Environmental Assessment Study Process, each alternative solution for the intake was analyzed in terms of impacts on the natural and socio-economic environments including the following factors, as well as technical merits:

- Engineering and Public Safety
- Social environment
- Cultural environment
- Natural environment
- Economic environment.

Table 4.2 provides a summary of the perceived advantages and disadvantages of all the identified alternatives. The table shows the evaluation of the alternatives based on the High to Low Impact potential identified in Table 4.1.

- Natural Environmental Impact (Terrestrial Environment, Aquatic Environment including impacts to fish community and habitat). An alternative and a site should allow for the construction and operation without significant impact on existing natural features.

Table 4.1 Evaluation of Alternatives								
Criteria		"Do Nothing" Alternative	"Relocate Intake to Niagara River" Alternative			Temporary Pumping Alternative	Pre-Treatment Alternative	
			Alternatives A, B and C		Alternative D			
			Trenching	Tunneling			Actiflo™	Pre-Sedimentation Tank
Natural Environment Impacts	Construction	NOT A VIABLE OPTION	High	Moderate	Low	Low	Moderate	Moderate
	Operations		Low	Low	Low	Low	Low	Low
Social Environment Impacts	Construction		Moderate	Moderate	Moderate	Low	Moderate	Moderate
	Operations		None	None	None	Moderate	None	None
Technical & Operational Concerns	Construction		High	Moderate	Low	Low	Low	Low
	Operations		Low	Low	Low	Moderate	Low (During normal operation, large sludge volume when turbidity high)	Low (During normal operations, large sludge volumes when turbidity is high)
OPG Concerns	Construction		High	High	High	Low	None	None
	Operations		High	High	High	Moderate	None	None
Cost	Construction		High	High	Low	Moderate	Moderate	Moderate
	Operations		None	None	None	High	Moderate	Moderate

Table 4.2
Net Adverse Impacts of Alternatives

Environmental Component		Net Adverse Impacts of Alternatives											
		Do Nothing		Relocate Intake to Niagara River				Temporary Pumping		Install Pre-Treatment Facilities			
		Net Adverse Impacts	Magnitude of Impact	Trenching		Tunneling		Net Adverse Impacts	Magnitude of Impact	Package Plant		Settling Basin	
				Net Adverse Impacts	Magnitude of Impact	Net Adverse Impacts	Magnitude of Impact			Net Adverse Impacts	Magnitude of Impact	Net Adverse Impacts	Magnitude of Impact
Natural Environment Impacts	Construction	no construction required – no net adverse impact	None	- significant short-term disruption to aquatic habitat - potential fish mortality due to blasting for trench - loss of habitat due to intake structure footprint – compensation may be required - significant potential for sediment movement during construction - minor disruption to terrestrial habitat and wildlife - potential for tree removal	High	- minor disruption and loss of aquatic habitat due to intake structure – compensation may be required - minor potential for fish mortality if blasting required at intake - minor potential for sediment movement during intake construction - very minor disruption to terrestrial habitat at tunnel starting point	Moderate	- Disruption and temporary impact on aquatic habitat if temporary pipe laid across Chippewa Creek - Temporary disruption of terrestrial environment during pipe installation and removal	Low	- Minor disruption and loss of aquatic habitat at existing intake location – compensation may be required - Minor localized disruption of terrestrial habitat and wildlife at construction site	Moderate	- Minor disruption and loss of aquatic habitat at existing intake location – compensation may be required - Minor localized disruption of terrestrial habitat and wildlife at construction site	Moderate
	Operations	no net adverse impacts	None	potential for some fish entrainment into intake structure	Low	potential for some fish entrainment into intake structure	Low	potential for some fish entrainment into intake structure	Low	potential for some fish entrainment into intake structure – may be improved over existing structure	Low	potential for some fish entrainment into intake structure – may be improved over existing structure	Low
Social Environment Impacts	Construction	no construction required – no net adverse impacts	None	- significant disruption to NPC parklands (outside of main tourist season) - noise emissions during construction - potential impacts on navigation	Moderate	- minor disruption to localized area of parklands - noise emissions during construction - potential impacts on navigation	Low	minor disruption to park land use during installation of forcemain	Low	- minor disruption to localized area of parklands - noise emissions during construction - potential impacts on navigation due to relocated intake structure	Moderate	- minor disruption to localized area of parklands - noise emissions during construction - potential impacts on navigation due to relocated intake structure	Moderate
	Operations	potential impact on drinking water quality or plant equipment if source water is excessively turbid – not a viable option	High	no net adverse impacts	None	no net adverse impact	None	significant noise emissions during operation	Moderate	no net adverse impact	None	no net adverse impact	None
Technical and Operational Concerns	Construction	no construction required – no net adverse impact	None	Construction of pipe and intake are difficult due to location in Niagara River, depending on alignment, and the river velocity.	High	Construction of intake is difficult due to location in Niagara River, depending on alignment, and the river velocity.	Moderate	- Installation of the force main to temporary pump station is along parkway. - Installation and removal of the temporary intake only prior to pumping.	Low	Minimal disruption to operations during construction	Low	Minimal disruption to operations during construction	Low

Table 4.2
Net Adverse Impacts of Alternatives

Environmental Component		Net Adverse Impacts of Alternatives											
		Do Nothing		Relocate Intake to Niagara River				Temporary Pumping		Install Pre-Treatment Facilities			
		Net Adverse Impacts	Magnitude of Impact	Trenching		Tunneling		Net Adverse Impacts	Magnitude of Impact	Package Plant		Settling Basin	
				Net Adverse Impacts	Magnitude of Impact	Net Adverse Impacts	Magnitude of Impact			Net Adverse Impacts	Magnitude of Impact	Net Adverse Impacts	Magnitude of Impact
	Operations	no net adverse impacts	None	Maintenance of intake is complicated by the location of the intake, depending on the alignment, and the flow velocity in the Niagara River.	Low	Maintenance of intake is complicated by the location of the intake, depending on the alignment, and the flow velocity in the Niagara River..	Low	Maintenance of pumps during operations	Moderate	During normal operations the impact is low, but when turbidity is high large sludge volumes occur.	Low	During normal operations the impact is low, but when turbidity is high large sludge volumes occur.	Low
OPG Concerns	Construction	no construction required – no net adverse impact	None	Depending on the preferred route there is a potential for significant impact to construction of OPG Tunnel 3	High	Depending on the preferred route there is a potential for significant impact to construction of OPG Tunnel 3	High	Temporary disturbance to OPG during force main installation and temporary pumping station preparations	Low	no net adverse impacts	None	no net adverse impacts	None
	Operations	no net adverse impacts	None	Depending on the preferred route there is a potential for significant impact to the operation of the OPG intake tunnels during long-term operations.	High	Depending on the preferred route there is a potential for significant impact to the operation of the OPG intake tunnels during long-term operations	High	- Temporary disturbance to OPG during installation and removal of intakes - Possible disruption to OPG intakes during pumping.	Moderate	no net adverse impacts	None	no net adverse impacts	None

- Social Impact (Disruption to parklands, Noise, Impacts on Navigation, Aesthetics):
 - An alternative should result in the least amount of impact to the existing residents, both during the construction phase and the future operation.
 - An alternative should not be obtrusive both in terms of appearance and operation.
- An alternative should not impede navigation.
- Technical and Operations (Future site access, ability to maintain good raw water quality):
 - An alternative should ensure maintains high quality raw water.
 - An alternative and a site should provide Region operations staff safe access for working in and around the alternative during future site visits.
- OPG Concerns (Interruption of power generation, security):
 - An alternative should minimize the possibility of disruption to of power generation activities.
 - An alternative should have low security risk to OPG infrastructure.

4.3 Evaluation of Alternatives

Investigation and evaluation of all the potential alternatives was completed according to the criteria above.

4.3.1 Alternative 1 - Do Nothing Alternative

The Do Nothing Alternative does not satisfy project objectives with respect to ensuring that relatively clean source water is available during periods when OPG shuts down the Queenston-Chippawa Power Canal. Therefore, this alternative by itself is not feasible and would likely precipitate other actions by the Region to ensure security of clean drinking water. However, this alternative has been assessed to provide a baseline with which the other options could be compared and to assess the impacts of doing nothing.

Environmentally, this alternative would not have any adverse impact since operations would continue as existing.

Socially, doing nothing is not a feasible alternative because of the potential for adverse impacts on public drinking water quality and/or WTP equipment and operations due to excessive turbidity and suspended solids.

4.3.2 Alternative 2 - Relocate the Intake to the Niagara River

This alternative involves relocating the existing intake from its current location in Chippewa Creek out into the Niagara River. There are several ways of implementing this alternative with respect to alignment and construction methodology. The alternative alignments all result in similar short-term and long-term environmental impacts since they all involve relocating the intake to the Niagara River. However, there are also



several construction methodologies that could be employed to implement installation of the intake pipe. These include trenching (through blasting and/or excavation of the bottom material) or tunneling. These alternative methodologies result in substantially different environmental impacts during the construction period, as discussed in the following sections. The operational impacts of relocating the intake to the Niagara River are discussed in Section 4.3.2.3 since they would be similar regardless of the installation methodology.

4.3.2.1 Trenching Construction Impacts

Aquatic Impacts

Trenching may involve some combination of blasting and excavation of the substrate in the Niagara River and/or Chippewa Creek, depending on the alignment selected. Trenching the intake pipe would result in significant disruption to the aquatic environment during the approximately 2-month long construction period.

Blasting has the potential to result in injury or mortality of fish and would require approval from DFO under Section 32 of the Fisheries Act. Blasting would also temporarily exclude fish from the area of impact and result in temporary adverse impacts to fish habitat within the blast zone. To mitigate the potential impacts of blasting, the contractor would be required to adhere to the provisions of DFO's Guidelines for the Use of Explosives in or near Canadian Fisheries Waters (Wright and Hopky, 1998).

Excavation of bottom sediments would be required whether or not blasting is conducted. Excavation would involve the use of a barge-mounted excavator or clamshell, depending on the water depth. Excavation of bottom sediments would also result in adverse disruption to aquatic habitat within the construction zone and downstream areas.

To prevent adverse impacts on the reproductive activities of fish during blasting and excavation activities, MNR timing restrictions with respect to in-water works would be followed. Therefore, no in-water work would be conducted between March 1 and July 15 in order to avoid disrupting the reproductive periods of warm water species known to inhabit the Niagara River and Chippewa Creek.

Control of sediment during blasting and/or excavation activities would be technically challenging in the fast flowing waters of the Niagara River and Chippewa Creek. Installation of sediment curtains to contain the work area would not be possible due to the high flow velocities that occur in the area. Therefore, it is likely that the trenching alternative would result in downstream transport of fine sediments during blasting and excavation activities. This could potentially impact local water quality through increases

in turbidity and result in adverse impacts to downstream aquatic habitats if sedimentation were to occur.

Once the trenching is complete and the intake pipe has been installed within the trench, the excavation will be backfilled and topped with rip rap to prevent erosion of the fill material. In order to mitigate long-term impacts on fish habitat, existing channel bottom grades will be maintained to the extent possible. The rip rap covering may provide some benthic invertebrate and fish habitat among the interstices of the rip rap material. Approval from DFO under Section 35 of the Fisheries Act would likely be required.

Installation of the intake structure will result in an adverse impact on fish habitat due to the loss of habitat associated with the intake structure footprint. It is not thought that any of the proposed intake locations provide any significant habitat (i.e. critical spawning or nursery habitat). However, approval under Section 35 of the Fisheries Act may also be required for the intake structure. Fish habitat compensation may be required to prevent long-term impacts on productivity of fish habitat. Compensation could be in the form of enhancing existing substrates in the GIP area through placement of low cobble or boulder shoals that could be used as residence habitat for small fish and invertebrates or spawning habitat for larger species.

Terrestrial Impacts

Trenching of the intake pipe will result in stripping of surficial vegetation and topsoil and excavation of subsoil. Removal of trees along the alignment route may also be required. However, the alignment will be selected to minimize impacts on trees. Approval of tree removal and any planting to be conducted to mitigate tree removal would be required from the NPC. Topsoil should be stockpiled and reused where possible during site restoration. Site restoration will be conducted to the satisfaction of the NPC. Erosion and sediment control measures will be implemented to prevent off site movement of disturbed soils.

If tree removal is required on land owned by the City of Niagara Falls, the provisions of the municipal tree By-law (2004-173) will be followed and a permit would be required from the City.

Cutting of trees would have the potential to adversely impact bird nesting activities. The federal Migratory Birds Act prohibits adversely affecting migratory birds or their nests. In order to prevent adverse impacts, tree clearing will not be conducted during the nesting period (i.e. April to July).

Some short-term wildlife disturbance may occur during construction, due to noise and increased human presence, although the impacts on the local urban-tolerant wildlife are not anticipated to be significant.



Social Impacts

If trenching were to be conducted along the on-land portion of the intake alignment, it would result in significant disruption to local land use activities, particularly those associated with the park (e.g. recreation, local aesthetics). Niagara Parks Commission has indicated that construction should occur outside the summer period to limit adverse impacts on park use. In order to ensure public safety during the construction period, a fenced work zone would be established to prevent unauthorized access to the construction area.

Construction will also result in noise emissions due to use of heavy equipment. Residential receptors are located west and north of the WTP and south on the opposite side of Chippewa Creek. In order to mitigate impacts due to noise, the City of Niagara Falls Noise Control By-Law (2004-105) will be adhered to³. The By-law prohibits the use of construction equipment between 7:00 pm and 7:00 am during weekdays and 7:00 pm to 9:00 on weekends and holidays. The By-law also prohibits use of construction equipment without effective exhaust, intake muffling or sound attenuation devices.

The proposed construction activities may also have an impact on navigation in Chippewa Creek and the Niagara River. The project will require review by Transport Canada pursuant to the Navigable Waters Protection Act. The majority of the Niagara River within the study area is designated as a restricted navigation zone due to proximity to the INCW, the OPG intakes and Niagara Falls. Therefore, construction in this area would have a minimal impact on navigation. However construction in Chippewa Creek or the Niagara River outside the restricted navigation zone may require approval under the Navigable Waters Protection Act. Adequate clearance over the crest of the intake structure would likely be required to prevent impacts on navigation.

Technical and Operations Concerns

From the technical and operations perspective construction of the intake pipe and intake structure are difficult due to location in Niagara River. Depending on the selected alignment the river velocity will play a large role in the difficulty of construction.

OPG Concerns

Depending on the preferred route there is a potential for significant impact to construction of OPG SAB Tunnel 3. This impact could be the disruption of the OPG contractor or damage to the temporary cofferdam structure constructed for the SAB Tunnel 3 intake.

³ Schedule 4 of Noise Control By-law (2004-105) exempts all activities of the The Region from the provisions of By-law. However, in order to mitigate impacts due to construction noise, the Region will attempt to adhere to these provisions.

4.3.2.2 *Tunnelling Construction Impacts*

Aquatic Impacts

Tunneling would result in significantly less disruption to the aquatic environment than would the trenching technique. Tunneling can, for the most part, be conducted without any impact on channel bottom substrates along the majority of the alignment.

Installation of the intake structure will result in an adverse impact on fish habitat due to the loss of habitat associated with the intake structure footprint. It is not thought that any of the proposed intake locations provide any significant habitat (i.e. critical spawning or nursery habitat). However, approval under Section 35 of the Fisheries Act may be required for the intake structure. Fish habitat compensation may be required to prevent long-term impacts on productivity of fish habitat. Compensation could include enhancing existing substrates in the GIP area through placement of low cobble or boulder shoals that could be used as residence habitat for small fish and invertebrates or spawning habitat for larger species.

Adherence to MNR's timing restrictions for in-water works would be required during installation of the intake structure. As such, intake structure installation would have to be conducted between July 16 and March 31.

If blasting is required at the intake structure location, potential impacts and required mitigation would be similar to those discussed in Section 6.2.1. However, impacts would likely be lower in magnitude (compared to that required for trenching) due to the relatively small size of the area where blasting would be required.

Terrestrial Impacts

Tunneling would minimize the impacts on the terrestrial lands along the intake alignment. Impacts would likely occur only at the starting point of the tunnel adjacent to the WTP. In this area, stripping of vegetation and topsoil would be required. It is not likely that any tree removal would be required with this alternative. Topsoil would be stockpiled and re-used during site restoration activities, which would be completed to the satisfaction of NPC. Erosion and sediment control measures will be implemented to prevent off site movement of disturbed soils.

Some short-term wildlife disturbance may occur during construction, due to noise and increased human presence, although the impacts on the local urban-tolerant wildlife are not anticipated to be significant.

Social Impacts

Social impacts associated with the tunneling alternative would also be significantly less than those that would occur with trenching alternative.

There would be less disturbance to NPC parkland, since tunneling could be conducted with only minimal ground disruption. Short-term public access to the park along the alignment route may be required due to public safety concerns during the construction period. It is likely that NPC would request that tunneling activities also be conducted outside the summer period to prevent impacts on public use of the park during this high use period.

Some construction noise will be experienced during tunneling, primarily associated with intake construction and preparation at the starting point of the tunnel. Noise emissions may be lower than those occurring under the trenching alternative, since tunneling activities will not be audible at nearby residential receptors. To mitigate impacts due to noise emissions, the City Noise Control By-law will be followed.

The proposed construction activities may also have an impact on navigation in Chippewa Creek and the Niagara River. The project will require review by Transport Canada pursuant to the Navigable Waters Protection Act. The majority of the Niagara River within the study area is designated as a restricted navigation zone due to proximity to the INCW, the OPG intakes and Niagara Falls. Therefore, construction in this area would have a minimal impact on navigation. However construction in Chippewa Creek or the Niagara River outside the restricted navigation zone may require approval under the Navigable Waters Protection Act. Adequate clearance over the crest of the intake structure would likely be required to prevent impacts on navigation.

Technical and Operations Concerns

From the technical and operations perspective construction of the intake pipe and intake structure are difficult due to location in Niagara River. Depending on the selected alignment the river velocity will play a large role in the difficulty of construction.

OPG Concerns

Depending on the preferred route there is a potential for significant impact to construction of OPG SAB Tunnel 3. This impact could be the disruption of the OPG contractor or damage to the temporary cofferdam structure constructed for the SAB Tunnel 3 intake.

4.3.2.3 Operational Impacts

Natural Environment Impacts

Operation of the relocated intake would have the potential to result in fish entrainment into the intake flow. If entrained, fish would likely travel with the intake flow to the WTP pump house where they would be impinged on the facility's traveling screens. Fish that do become impinged on the screens are disposed of.



As discussed in Section 3.1.3.2, fish use of the GIP area, where the intake would be installed, is thought to be limited due to relatively high flow velocities (e.g. >0.60 m/s). However, bait fish that are able to find refuge among the bottom substrate or larger fish that are able to maintain position within the current may utilize the area. Therefore, in order to mitigate fish entrainment into the intake flow, intake flow velocities will be kept low (0.85 m/s), which is only slightly higher than average flow velocity in the GIP. In addition, the intake will be set off the bottom of the channel so any fish moving along the bottom will be unaffected by the intake flow.

There would be no terrestrial impacts associated with operation of the relocated intake.

Social Impacts

There would be no incremental social impacts associated with operation of the relocated intake structure compared to operation of the existing structure.

Technical and Operations Concerns

From the technical and operations perspective maintenance of the intake structure is difficult due to location in Niagara River. Depending on the selected alignment the river velocity will play a large role in the difficulty of access to the intake.

OPG Concerns

Depending on the preferred route there is a potential for significant impact to operations of the OPG SAB tunnels. This impact may be a result of reducing tunnel flows during intake maintenance or decrease physical security of the OPG infrastructure through access created by the Region's infrastructure.

4.3.3 Alternative 3 - Addition of a Pre-treatment Process to the Plant

The pre-treatment option has two potential alternatives including installation of a package treatment plant or installation of a settling tank to encourage deposition of suspended solids. However, for the most part, environmental impacts associated with both alternatives are similar.

4.3.3.1 *Aquatic Impacts*

Relocating and reconfiguring the existing intake on the bank of Chippewa Creek may result in an adverse impact on fish habitat due to the loss associated with the intake footprint. A short-term loss of habitat would occur if a temporary cofferdam is installed around the work area during construction. It is unlikely that this would have a significant impact on fish habitat productivity since this area is unlikely to provide any critical fish habitat function. However, an authorization under Section 35 of the Fisheries Act would likely be required to implement this alternative. Compensation to replace lost fish habitat may be necessary. Conceptually, this could include



installation of small submerged cobble/boulder groynes along the shoreline of Chippewa Creek. These groynes would create a velocity refuge on the downstream side of the structure and may provide some habitat for small baitfish and benthic invertebrates among the interstices of the rock material. Implementation of such a compensation alternative would be contingent upon ensuring that any in-water works do not adversely affect flow characteristics in Chippewa Creek.

To prevent adverse impacts on the reproductive activities of fish during installation of the new intake, MNR timing restrictions with respect to in-water works would be followed. Therefore, no in-water work would be conducted between March 1 and July 15 in order to avoid disrupting the reproductive periods of warm water species known to inhabit the Niagara River and Chippewa Creek.

Long-term operation of the reconfigured intake has the potential to result in fish entrainment into the intake flow and consequently, mortality of fish. However, given that flow velocities in Chippewa Creek are on the order to 1.5 to 2 m/s, it is unlikely that fish congregate in the area of the proposed intake. In addition, the intake will be located off the bottom of the channel bed to ensure that any fish moving along the bottom would be unaffected by intake flow. This intake configuration may be less susceptible to entraining fish than the existing structure, since the existing intake is situated within the bank, an area which may experience more fish movement.

The pre-treatment facilities themselves would not likely have an impact on the aquatic environment.

4.3.3.2 Terrestrial Impacts

Some terrestrial habitat disturbance would be required in the area of the proposed pre-treatment facility, which would likely be located between the existing intake and the WTP. In addition, if a new intake line is installed, additional ground disturbance would occur. This will include stripping of vegetation (sod) and topsoil and removal of any trees, if required. Once construction is complete, the area will be restored to the satisfaction of the NPC, likely including re-sodding and replanting of trees. Erosion and sediment control measures will be implemented to prevent off site movement of disturbed soils.

This will result in a temporary disruption of terrestrial habitat and wildlife, but due to the highly disturbed nature of the existing habitat in the parkland and the urban tolerant nature of the wildlife that may utilize the area, it is unlikely that this would have a significant impact.

Operation of the pre-treatment facility would not have any impact on terrestrial habitat or wildlife.

4.3.3.3 Social Impacts

Social impacts during construction will include noise emissions due to heavy equipment use and disruption of local park land use during the construction period. To mitigate impacts associated with noise emissions, the Region will adhere to the provisions of the City Noise Control By-law, as discussed above. Some increase in noise may be experienced at local receptors during the daytime.

NPC has requested that any construction within their parklands not occur during the summer months to minimize impacts on park users. The construction area will likely be fenced to restrict public access during the construction period. Following construction, this area will be restored to the satisfaction of NPC so there should be no long-term impact on park use.

Operation of the pre-treatment facilities would not have any adverse impact on the social environment.

4.3.3.4 Technical and Operations Concerns

From the technical and operations perspective construction installation of the pre-treatment process would have minimal disruption to operations during construction since the facility would be constructed off-line of the existing intake. During normal operations the pre-treatment process would have a low operations impact, but during periods of high turbidity the volume of sludge produced could be significant.

4.3.3.5 OPG Concerns

Use of a pre-treatment process would have no net adverse effect to OPG infrastructure or operations since the processes would utilize the existing intake on the Welland River.

4.3.4 Alternative 4 - Temporary Pumping

4.3.4.1 Aquatic Impacts

Impacts on the aquatic environment due to temporary pumping would differ depending on the alignment selected for the temporary pumping route. If the alignment were to remain north of Chippawa Creek, impacts on habitat would be minimal since the pump intake would be situated immediately adjacent to retaining wall along the shoreline with little or no disruption of the channel bottom.

However, if the intake location were to cross Chippawa Creek so that pumping could occur in the Niagara River upstream of Chippawa Creek, some impacts on aquatic habitat may occur at the crossing location. It is likely that the temporary pipe would be laid on the channel bottom and anchored with rip rap. This would result in a temporary disruption of aquatic habitat, but would not likely have any long-term impact on habitat productivity. It is anticipated



that temporary pumping would have to occur over a 3 to 7- month period, at the end of which, the pumps and intake structures would be removed. Due to hardened nature of the Chippawa Creek bottom, it is unlikely that any significant disturbance of fine sediment would occur, thereby preventing adverse impacts on water quality.

The temporary pumping has the potential to result in significant entrainment of fish into the intake flow, due both to the location of the pump intake and flow velocity of the intake flow. The temporary pump would likely be located along the shoreline. Shoreline littoral zone areas may be frequented more often by baitfish or larger foraging fish and therefore, there may be greater potential for entrainment and associated mortality. In addition, intake velocity would be significantly higher with this temporary alternative compared to any permanent intake. This higher velocity may result in increased potential for entrainment. Alternatives for screening the intake may have to be investigated to mitigate fish entrainment.

4.3.4.2 Terrestrial Impacts

It is anticipated that this option would involve laying the temporary intake in a shallow trench generally following the ground surface. This is unlikely to result in any significant terrestrial impacts, although there is the potential to impact trees in close proximity to the trench. Some localized wildlife disturbance may occur due to the noise associated with pumping activities but this is not anticipated to have a significant effect on local urban-tolerant wildlife.

4.3.4.3 Social Impacts

The primary social impact associated with temporary pumping would be noise emissions from the pumping equipment. It is likely that pumping would be required 24-hours a day, for an approximately 3 to 7-month period. Noise may be audible at nearby residential receptors, particularly if the pump is located south of Chippawa Creek. Noise may also impact park users. Mitigation could include installation of electricity driven pumps and installation of hoarding or an enclosure around the pumping equipment and installation of muffling devices on the pumping equipment. A Certificate of Approval for noise emissions may be required under the Environmental Protection Act to authorize use of pumping equipment.

In addition, the presence of the temporary pump line across parkland may result in temporary disturbance to park uses due to its physical presence and disturbed aesthetics. Temporary fencing may be required to restrict public accessibility in the vicinity of the pump line.

4.3.4.4 Technical and Operations Concerns

From the technical and operations perspective, installation of the temporary pumping forcemain would be along the road alignment along King's Bridge

Park. The intake structure for this solution would be installed only prior to pumping operations, and would be removed after the Chippawa Creek has resumed its normal flow direction. The primary concern is operations and maintenance of the pumps during the operating period.

4.3.4.5 *OPG Concerns*

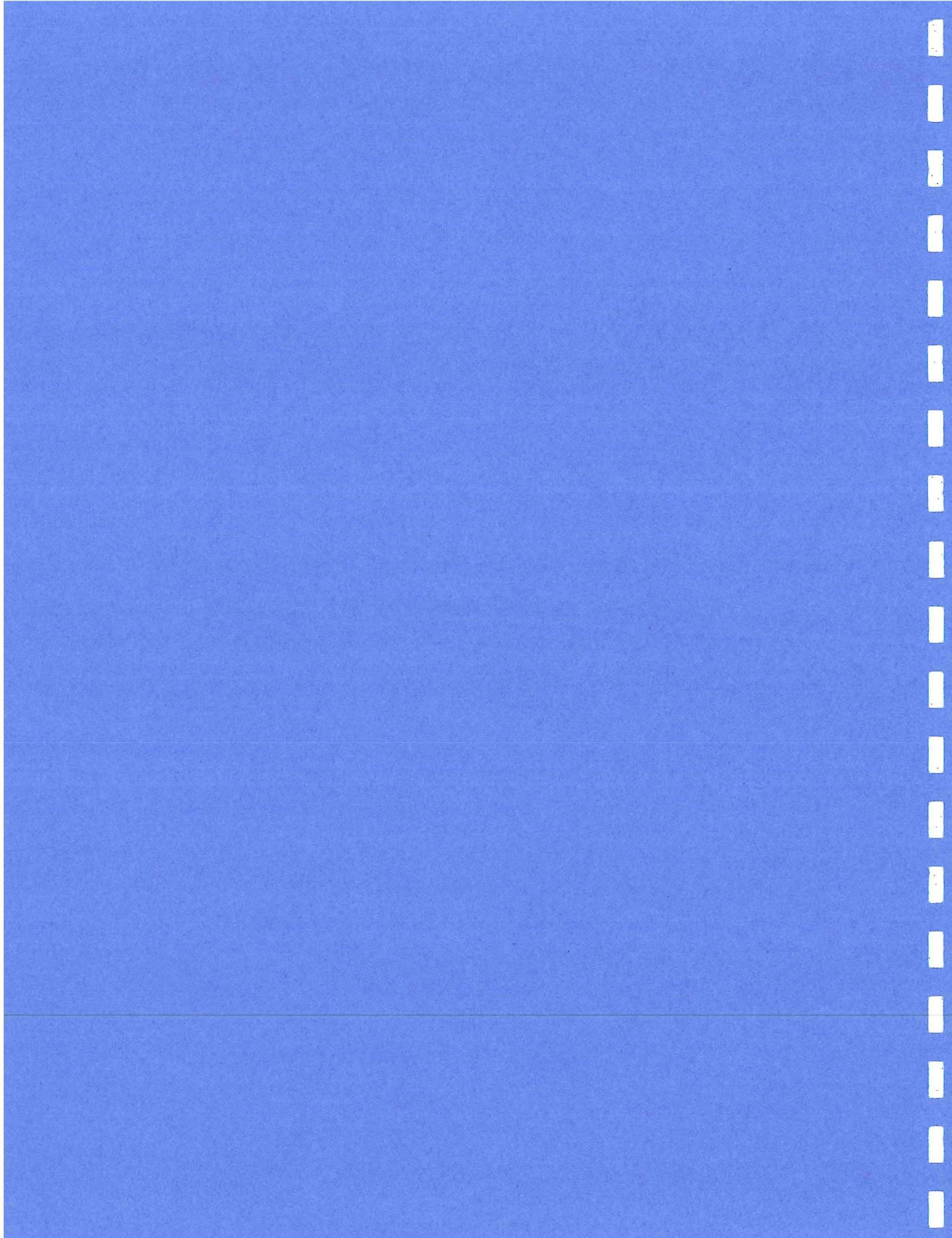
Use of temporary pumping would have minor disturbance to OPG during construction of the force main and pumping station infrastructure preparation. During operations there may be minor disruption to OPG operations through maintenance of the temporary intake structure.

4.4 Preliminary Recommendation of Preferred Solution

The recommended preferred alignment for the permanent intake was Alternative D; however, serious concerns were expressed by OPG about having a permanent facility operated by others in such close proximity to the SAB 2 and the new tunnel intakes. OPG considered that there was an unacceptable risk to safety and security with a permanent intake in this location. On the basis of that objection, the study team reevaluated the alternatives and recommended temporary pumping using alignment D1, which was more acceptable to OPG. This alternative has a lower capital cost than other alternatives and has only temporary environmental and social effects during its operation. This alternative also minimizes OPG's concerns during both construction and operations. The next step was preliminary design of the preferred solution as described in Section 5.



5 Selected Design, Environmental Effects
and Mitigation Measures



5 Selected Design, Environmental Effects and Mitigation Measures

The following section provides details on the design of the preferred alternative and expected environmental effects and respective mitigation measures.

5.1 Selected Design

The temporary pumping alternative consists of the following elements:

- Temporary intake installed prior to commencement of pumping
- Temporary pumping station consisting of 7 electric or critically silenced diesel pumps, with one stand-by pump
- Forcemain along Parkway between temporary pumping station and Niagara FallsWTP.

A drawing of this design is shown in Figure 5.1. Three sub alignments (D1 through D3) were prepared for review and comments by OPG. While alignment D1 was considered the worst alignment by OPG, all three alignments were rejected by OPG for a permanent installation. Alignment D3 was OPG's preferred alignment for a temporary installation.

The temporary intake will be designed to be lowered by crane into the Niagara River downstream of the SAB Tunnel 1 and 2 intakes. The discharge pipes from the intake structure will be connected to aboveground pipes leading to the temporary pumping station.

The temporary pumping station will consist of six pumps, powered either by electricity or diesel. In the case of electric pumps, the pumps will be located in the intake structure. A standby generator, powered by diesel, would be housed in a self-contained critically silenced enclosure. If diesel power is used, the standby generator would be provided in the pump station enclosure. The pumping station will include the piping, valves, and control system to operate the pumps. An aboveground storage tank for diesel fuel will be located at the pumping station. The station will be surrounded by a sound absorbent wall to provide noise attenuation, security and visual screening.

The raw water supply main will consist of a 900-mm diameter High Density Polyethylene (HDPE) pipe. The pipe will connect the pumping station at the north side of the SAB Tunnel 2 to the WTP, crossing over the tunnel, and will follow the Niagara Parkway. The pipe will run on the south side of the parkway, within the road allowance to the Niagara Falls WTP. The pipe will connect to the existing intake prior to entering the WTP. The main may be installed by conventional trench excavation.



5.2 Environmental Effects and Mitigation Measures

Pumping from the temporary intake may result in fish entrainment and mortality. The intake will include a trash and fish screen which will keep larger fish out of the intake. The intake will also be sized so that the intake velocity at the screen will be reduced as much as possible. The base of the intake structure will be raised above the bottom of the river floor to reduce the entrainment of bottom species.

The pumping station and the route of the forcemain/gravity water main will require protection of terrestrial and water resources. An erosion and sediment control plan will need to be prepared during detailed design to control the transport of sediment from the construction areas. Restoration of disturbed lands should consist of resodding grassed areas. If trees must be trimmed or removed for the main installation, then the timing of the work outside of the bird nesting season. The trees requiring removal will be reviewed prior to cutting to ensure that no active migratory bird nests will be affected.

Water resource will need protection from construction activities. A equipment fueling and spill control plan will be required for the construction work. It should include restriction of the minimum distance from water bodies and sewers from refueling activities; spill control supplies; and procedures for controlling and cleaning up spills. Dewatering during construction must be directed to either filter bags or settling basin, prior to release to the environment.

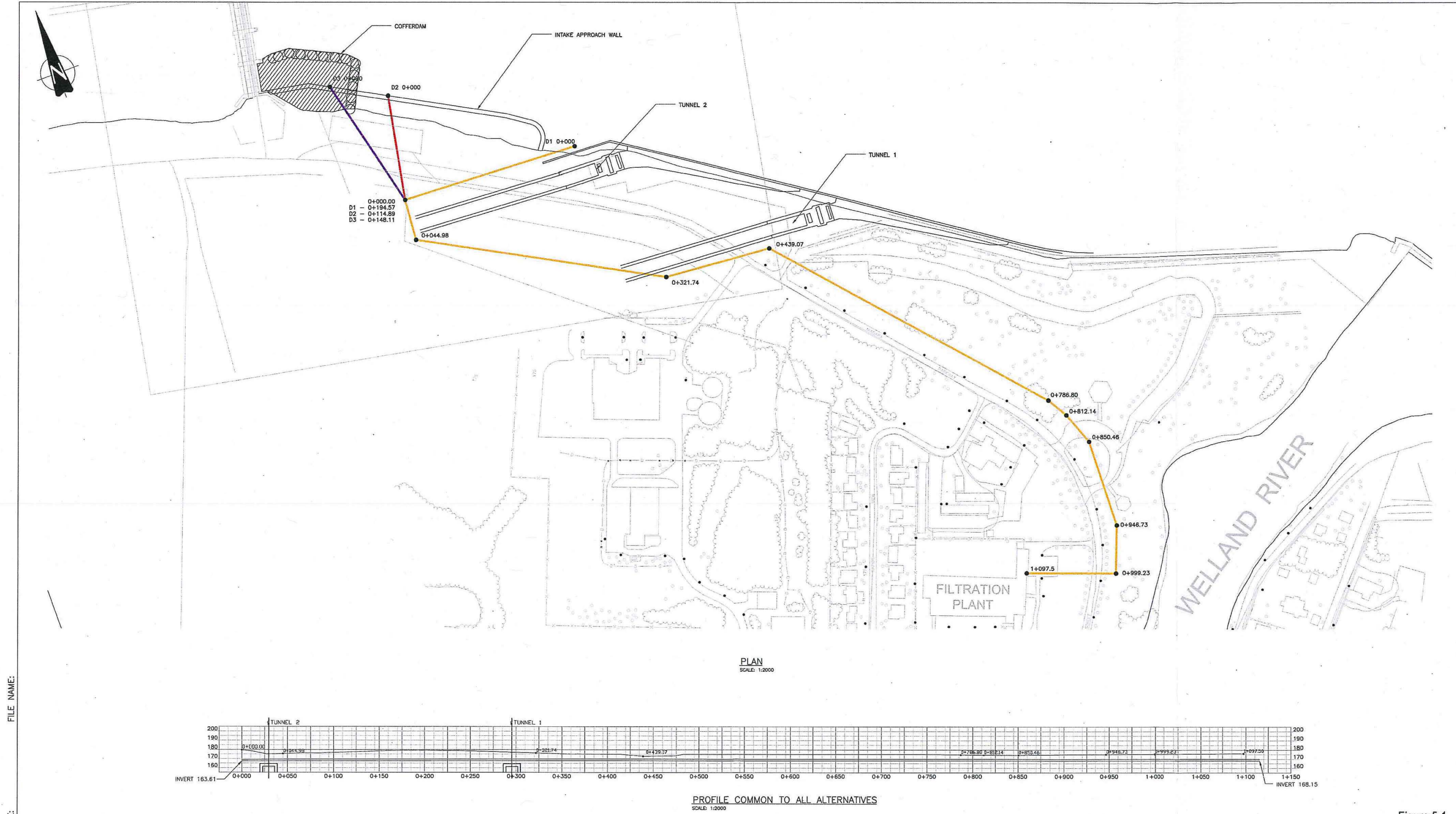


Figure 5.1
Plate 1
Preferred Alternative

FILE NAME:
USER NAME:
PLOT DATE:

ENGINEER STAMP:				CLIENT: Niagara Region	
		DESIGNED BY: D.A. DATE: 05/14/07		DRAWN BY: K.K. DATE: 05/14/07	
		CHECKED BY: DATE:		PROJECT MANAGER: DATE:	
		BAR SCALE: 		HMM PROJECT No: 230179	
		DWG SCALE(FULL SIZE): 1:2000		DWG No: 1	
REV. ISSUED FOR AUTH. BY DATE		ISSUE AUTHORIZATION		DWG No: 0	
				ANSI A1 (841mm x 594mm) FULL SIZE	

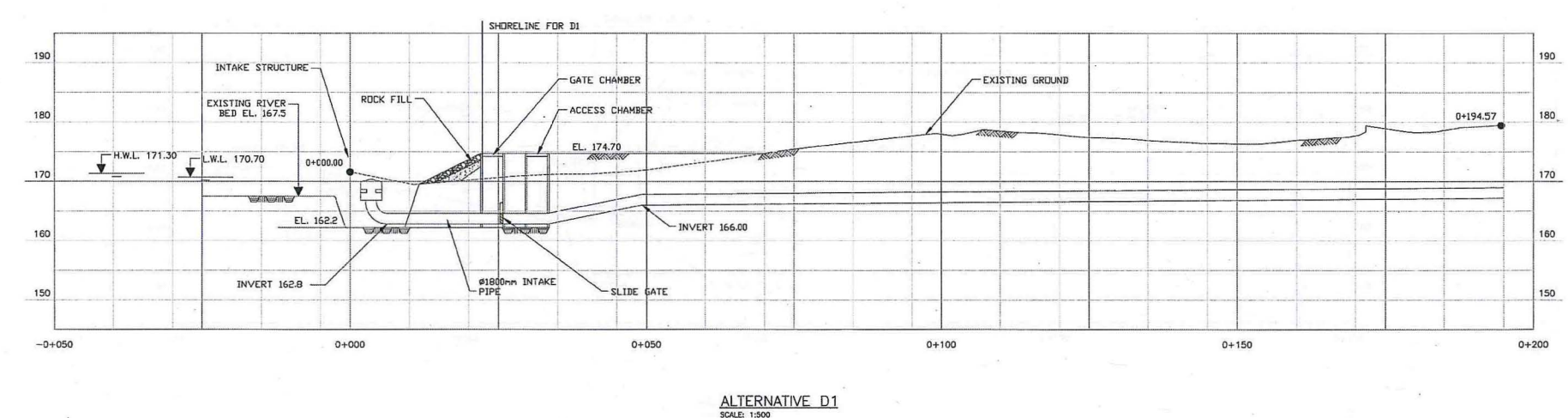
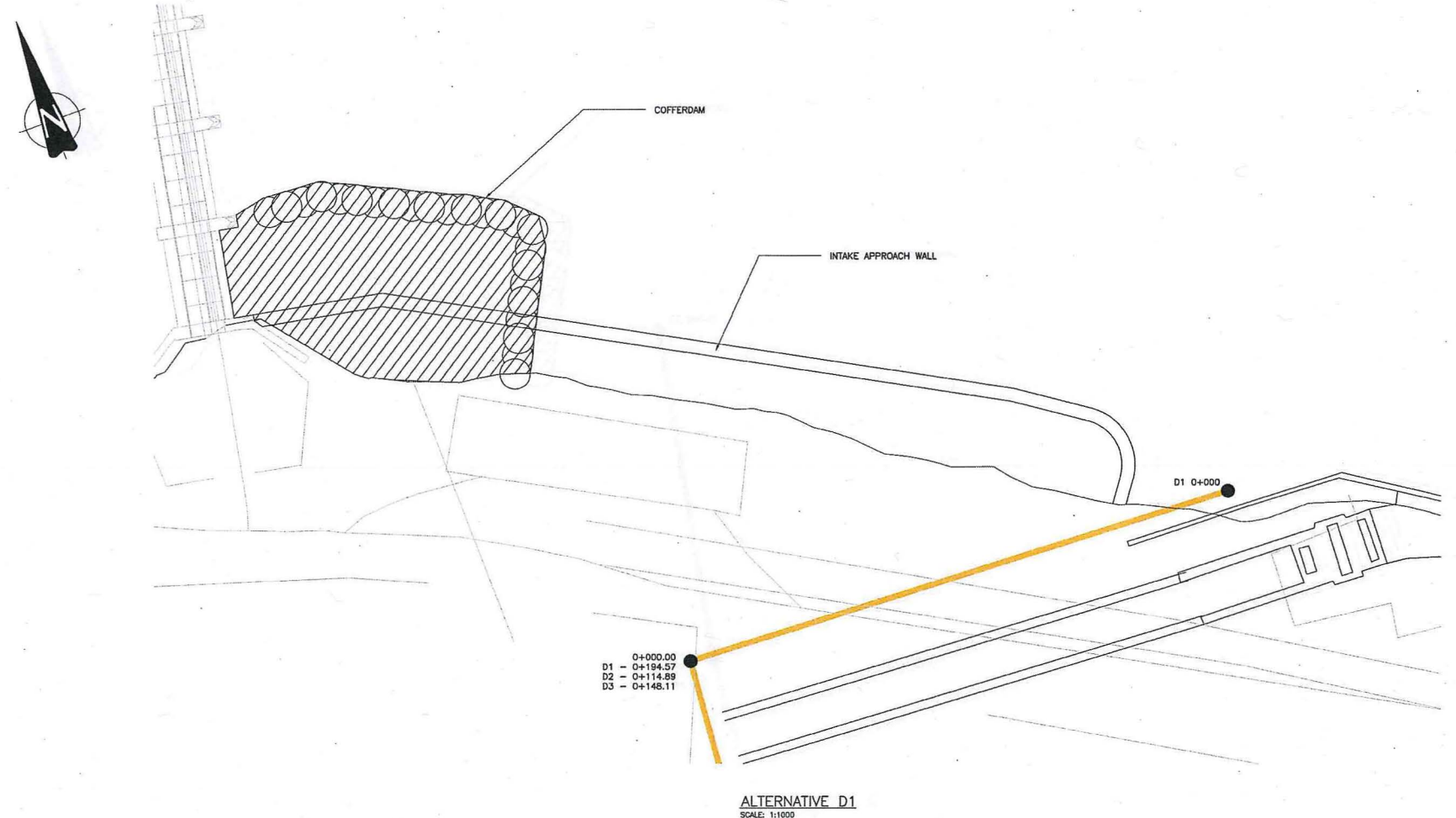


Figure 5.1
Plate 2
Preferred Alternative

FILE NAME:
USER NAME:
PLOT DATE:

ENGINEER STAMP:				CLIENT: 	
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REV.		ISSUED FOR		AUTH. BY	
		DATE		HMM PROJECT No:	
		230179		DWG No:	
		ISSUE AUTHORIZATION		ANSI A1 (841mm x 594mm) FULL SIZE	

NIAGARA FALLS W.T.P. INTAKE ALTERNATIVE D1 INTAKE ALTERNATIVES PLAN (FROM NIAGARA RIVER TO W.T.P. SCREEN ROOM)	
SHT No	REV No
1	0

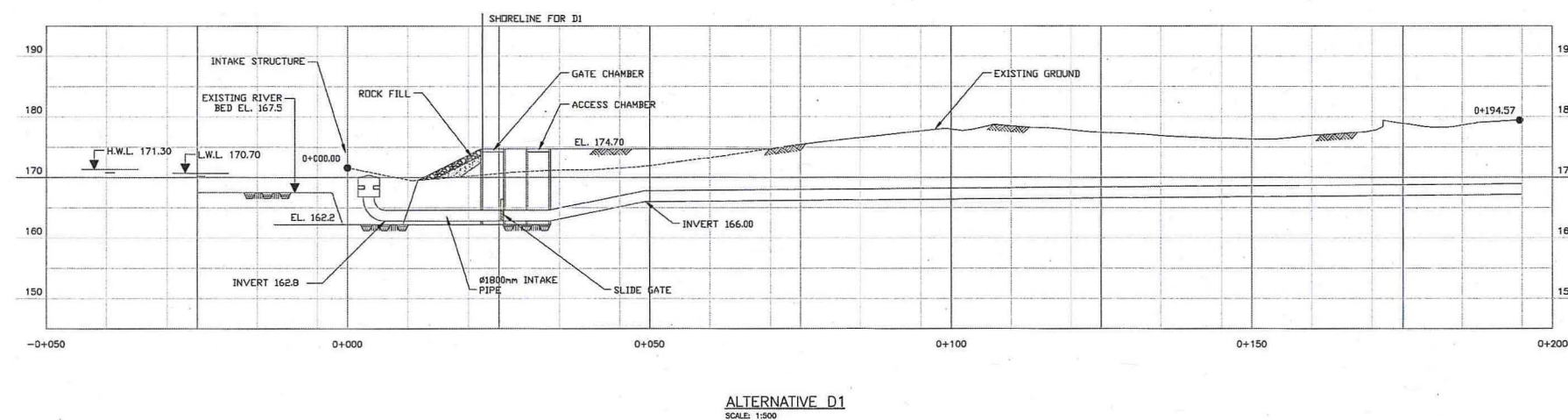
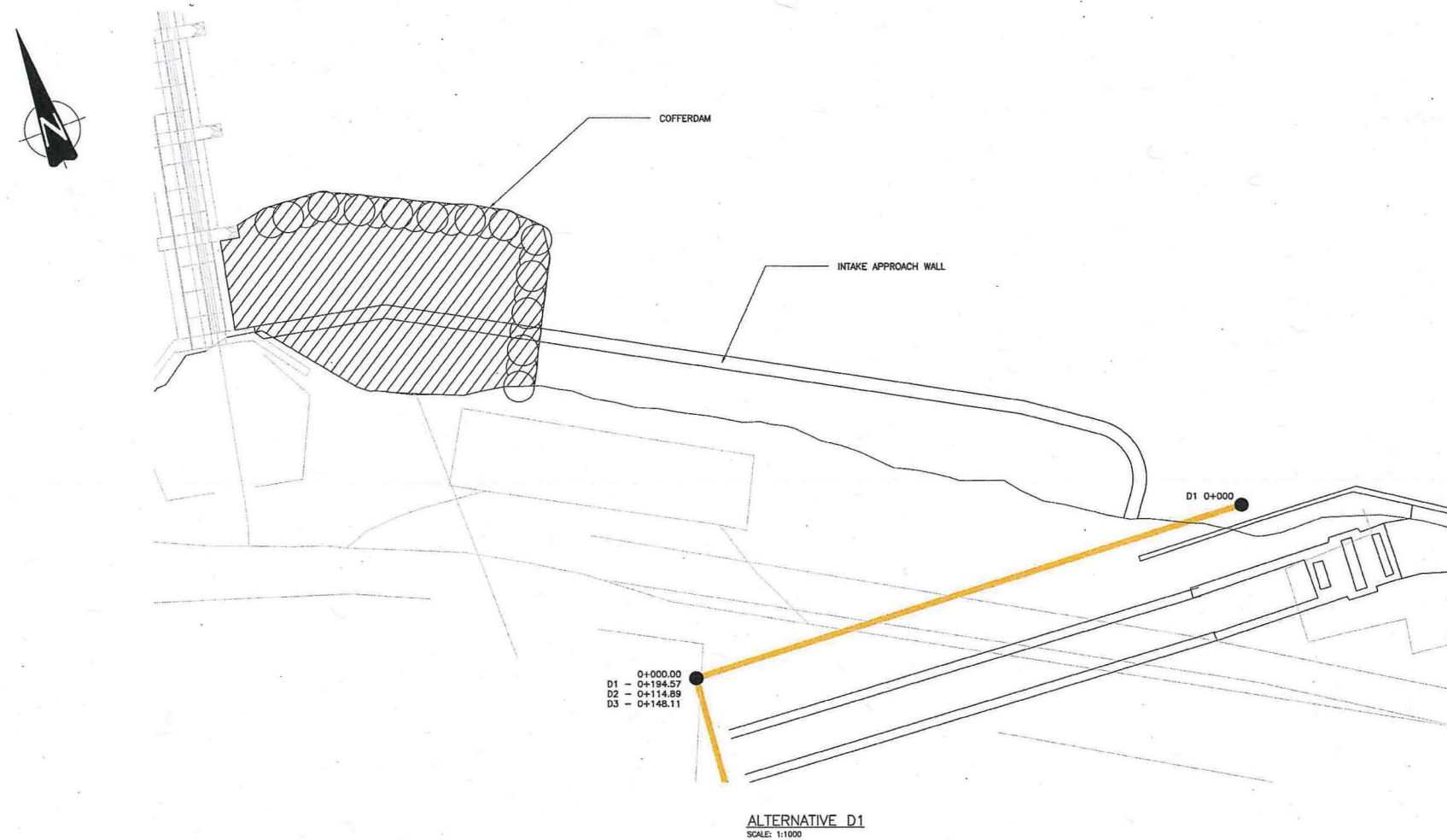


Figure 5.1
Plate 2
Preferred Alternative

FILE NAME:

USER NAME:

PLOT DATE:

ENGINEER STAMP:


**Hatch Mott
MacDonald**

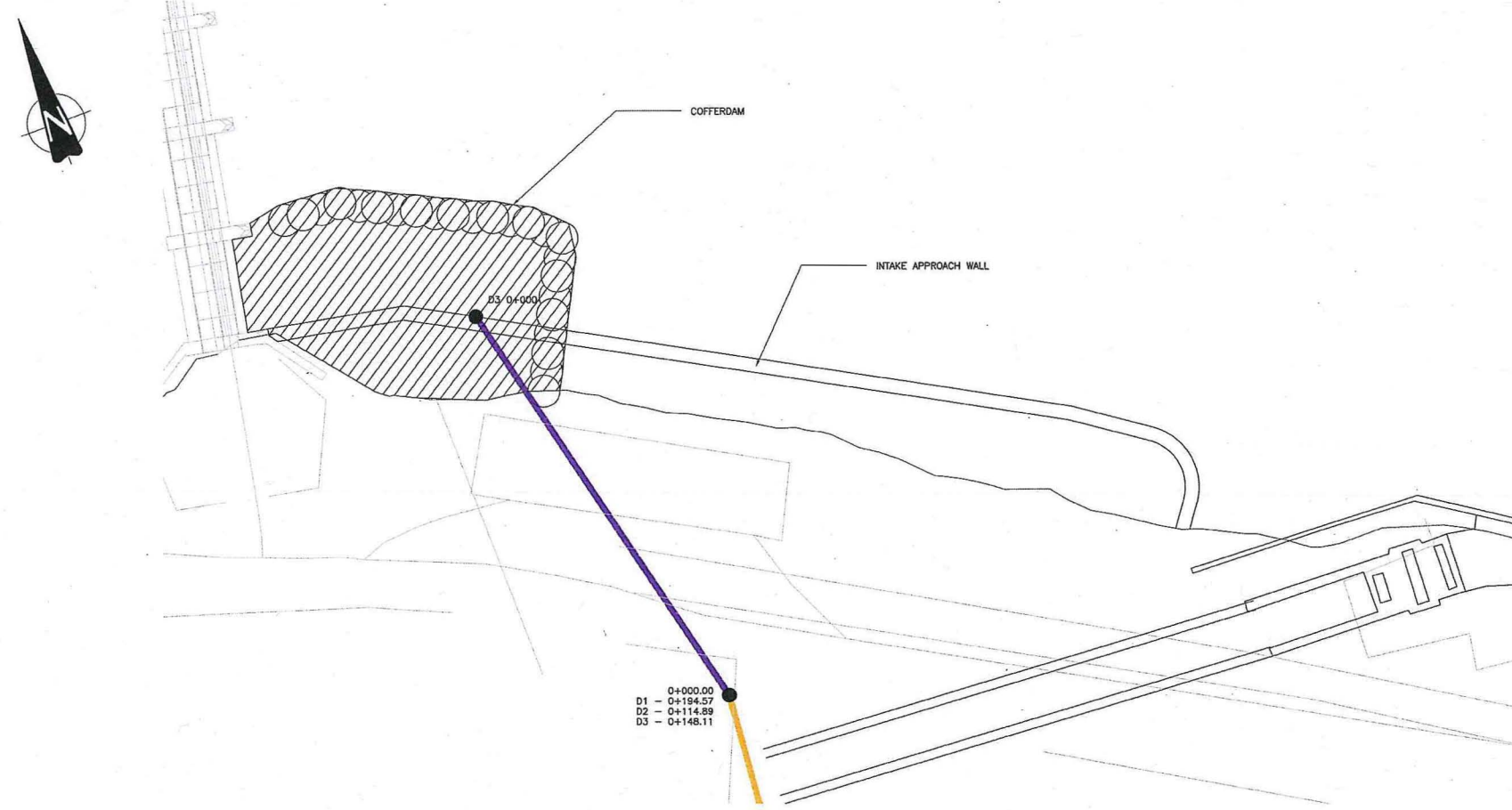
CLIENT: **Niagara Region**

DESIGNED BY: D.A. DATE: 05/14/07	DRAWN BY: K.K. DATE: 05/14/07
CHECKED BY:	PROJECT MANAGER:
DATE:	DATE:

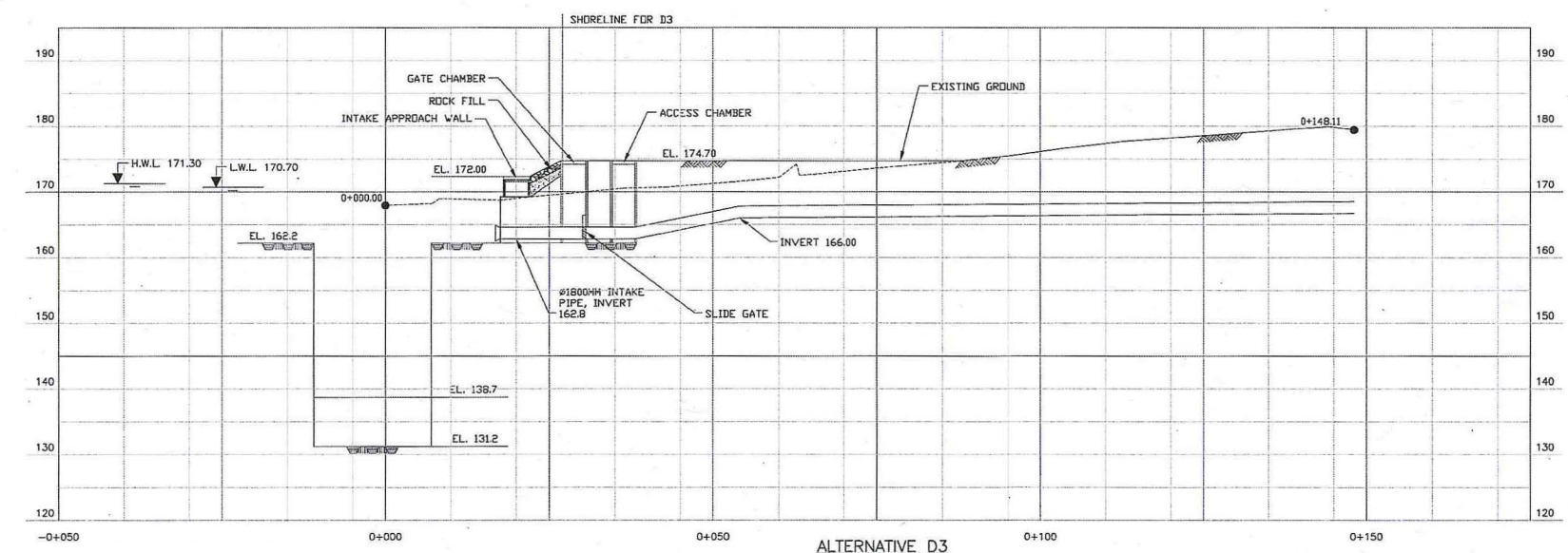
NIAGARA FALLS W.T.P. INTAKE
ALTERNATIVE D1
INTAKE ALTERNATIVES PLAN
(FROM NIAGARA RIVER TO W.T.P. SCREEN ROOM)

REV.	ISSUED FOR	AUTH. BY	DATE	HMM PROJECT No:	DWG SCALE(FULL SIZE):	DWG No:	SHT No	REV No
	ISSUE AUTHORIZATION			230179	AS NOTED		1	0

ANSI A1 (841mm x 594mm) FULL SIZE



ALTERNATIVE D3
SCALE: 1:1000



ALTERNATIVE D3
SCALE: 1:500

Figure 5.1
Plate 4
Preferred Alternative

FILE NAME:
USER NAME:
PLOT DATE:

ENGINEER STAMP:				CLIENT: 	
		DESIGNED BY: D.A. DATE: 05/14/07 CHECKED BY: DATE:		DRAWN BY: K.K. DATE: 05/14/07 PROJECT MANAGER: DATE:	
REV. ISSUED FOR ISSUE AUTHORIZATION		AUTH. BY DATE		HMM PROJECT No: 230179 DWG SCALE(FULL SIZE): AS NOTED DWG No:	
				NIAGARA FALLS W.T.P. INTAKE ALTERNATIVE D3 INTAKE ALTERNATIVES PLAN (FROM NIAGARA RIVER TO W.T.P. SCREEN ROOM)	
				SHIT No 1 REV No 0 ANSI A1 (841mm x 594mm) FULL SIZE	

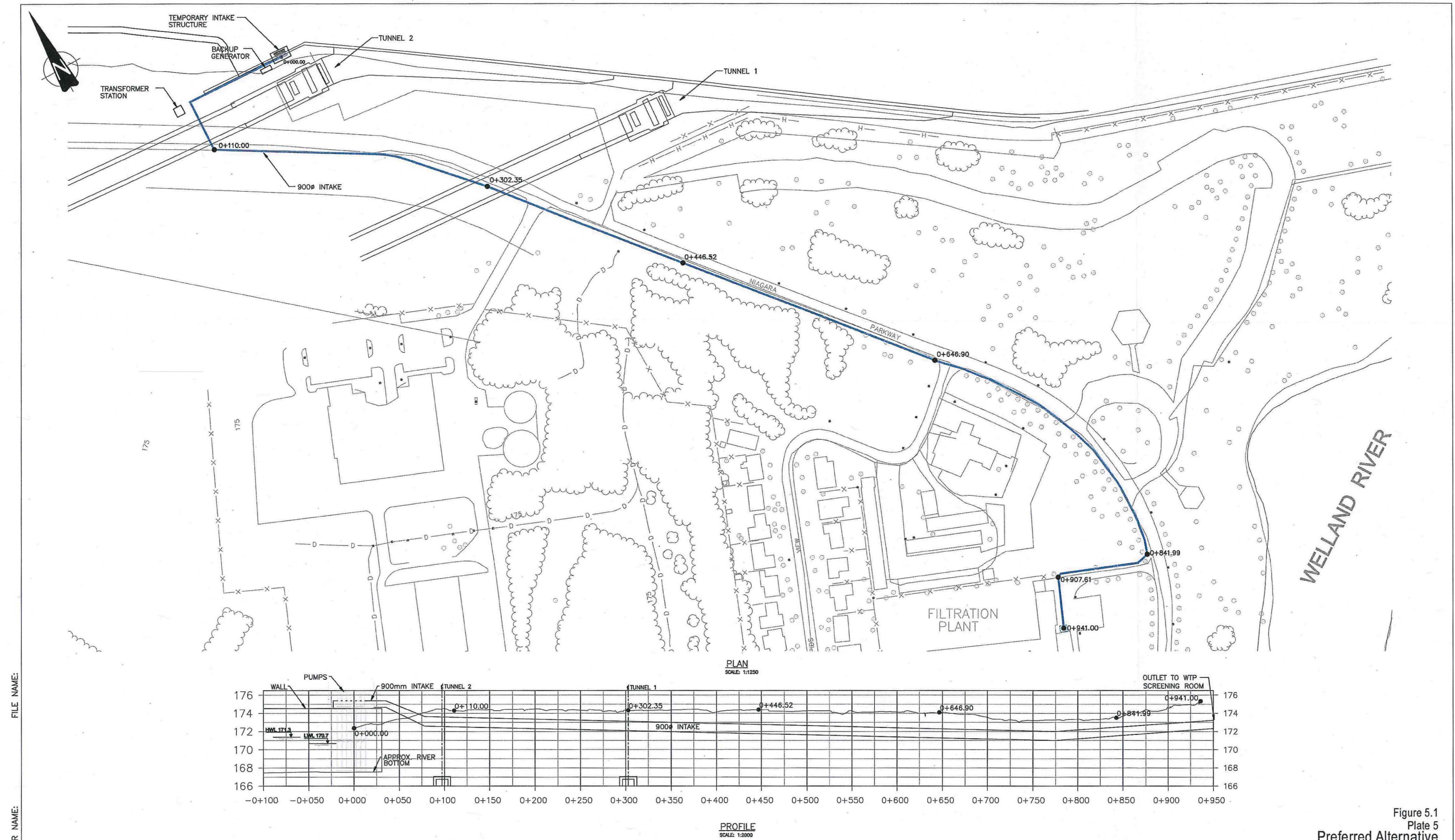
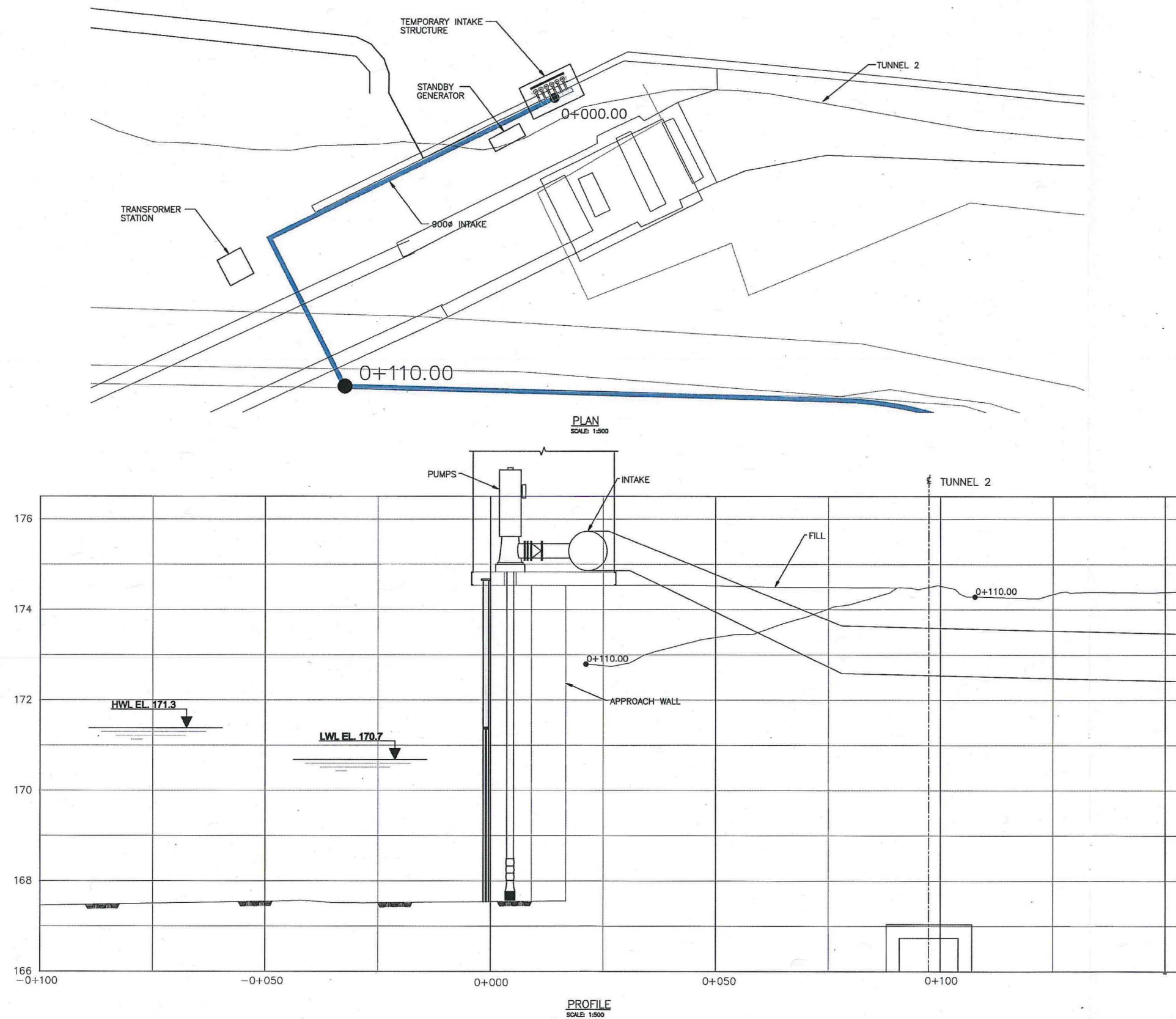


Figure 5.1
Plate 5
Preferred Alternative

ENGINEER STAMP:					 Hatch Mott MacDonald		CLIENT: Niagara Region 		
					DESIGNED BY: DATE: CHECKED BY: DATE: BAR SCALE: 		DRAWN BY: S.G. DATE: 07/11/08 PROJECT MANAGER: DATE: NIAGARA FALLS W.T.P. INTAKE INTAKE ALTERNATIVE PLAN (FROM NIAGARA RIVER TO W.T.P. SCREEN ROOM)		
	REV.	ISSUED FOR	AUTH. BY	DATE	HMM PROJECT No:	DWG SCALE(FULL SIZE):	DWG No:	SHIT No 1	REV No 0
	ISSUE AUTHORIZATION				230179	AS NOTED			

ANSI A1 (841mm x 594mm) FULL SIZE



6 Public and Agency Consultation

6 Public and Agency Consultation

6.1 Notifications

A Notice of Study Commencement letter was sent to various review agencies, potentially affected residents and other stakeholders on December 8, 2006; refer to Appendix A for a copy of the Notice letter and a list of mailing addresses.

The notice of Study Commencement was published in the Niagara Falls Review and St. Catharines Standard on Saturday, December 9th and Wednesday, December 13th, 2006.

6.2 Technical Agency Consultation

On December 8, 2006 a letter was forwarded to potentially interested agencies. This letter invited agencies to participate in this study and attend public open houses.

The following agencies and stakeholders were contacted for their comments.

- Ministry of the Environment
- Region of Niagara, Planning Department
- Niagara Peninsula Conservation Authority
- City of Niagara Falls
- Niagara Parks Commission
- Niagara River Remedial Action Plan Coordinator
- International Niagara Board of Control
- Ontario Power Generation
- The Ontario Secretariat for Aboriginal Affairs
- Indian and Northern Affairs of Canada – Specific Claims Branch
- Indian and Northern Affairs of Canada – Litigation Management and Resolution Branch
- Indian and Northern Affairs of Canada – Comprehensive Claims Branch
- Ministry of the Attorney General – Aboriginal Legal Issues Office.
- Department of Fisheries and Oceans
- Chippawa Dock Owners' Association
- Transport Canada.

Notice of PIC #1 letter was sent to the agencies and stakeholders on March 6, 2007.

Notice of PIC #2 letter was sent to the agencies and stakeholders on May 18, 2007.

Notice of PIC #3 letter was sent to the agencies and stakeholders on July 14, 2008.

Agency/Stakeholder	NOC	PIC#1	PIC#2	PIC#3
Ministry of the Environment - EAAB	•	•	•	•
Ministry of the Environment – District Office	•	•	•	•
Ministry of Natural Resources	•	•	•	•
Niagara Peninsula Conservation Authority	•	•	•	•

Agency/Stakeholder	NOC	PIC#1	PIC#2	PIC#3
Region of Niagara, Public Works	•	•	•	•
Region of Niagara, Planning and Development			•	•
City of Niagara Falls	•	•	•	•
Niagara Parks Commission	•	•	•	•
Niagara River Remedial Action Plan Coordinator	•	•	•	•
International Niagara Board of Control	•	•	•	•
Ontario Power Generation	•	•	•	•
The Ontario Secretariat for Aboriginal Affairs	•	•	•	•
Indian and Northern Affairs of Canada – Specific Claims Branch	•	•	•	•
Indian and Northern Affairs of Canada – Litigation Management and Resolution Branch	•	•	•	•
Indian and Northern Affairs of Canada – Comprehensive Claims Branch	•	•	•	•
Ministry of the Attorney General – Aboriginal Legal Issues Office	•	•	•	•
Department of Fisheries and Oceans	•	•	•	•
Transport Canada – Marine	•	•	•	•
Chippawa Dock Owners' Association	•	•	•	•
Surfside Inn	•	•	•	•
Inn on the Parkway	•	•		

The following summarizes the agency inquiries and the project team responses.

Agency	Date	Comments	Team Response
International Niagara Board of Control	December 16, 2006	Intake alternatives and withdrawal of water will not affect operation of the control (INCW) works	n/a
Niagara Parks Commission	December 15, 2006	Water Intake alternatives A, B1 and B2 would be least disruptive to the NPC. Alternatives C and D would require discussion in order that the infrastructure not preclude future development	
Ontario Power Generation	December 14, 2006	Meeting with OPG to review operations	
Ontario Power Generation	March 21, 2007	Meeting with OPG	
Ontario Power Generation	May 3, 2007	Meeting with OPG and Niagara Tunnel Project	
Ontario Power Generation	June 13, 2007	Meeting with OPG to review concerns with PIC#2	
Ontario Power Generation	October 29, 2008	Meeting with OPG to review draft ESR and PIC#3	
Ontario Power Generation	June 4, 2007	n/a	Letter to Dean Norton detailing Alternatives D1 through D3

Agency	Date	Comments	Team Response
Ontario Power Generation	June 4, 2007	n/a	Letter to Dean Norton documenting effects of QCPC shutdown on Region facilities and infrastructure.
Ontario Power Generation	July 5, 2007	Response to June 4, 2007 letter. OPG is not in favour of Alternative D1 through D3 due to interference with Niagara Tunnel Project, operation of SAB diversion structures or INCW	July 5, 2007 letter of response
Ministry of the Environment – Environmental Assessment and Planning Branch	January 27, 2007	Acknowledgement of Schedule “C” undertaking and instruction on Aboriginal contacts	Aboriginal agency contacts forwarded project info.
Transport Canada – Marine	January 2, 2007	Provision of Navigable Water Protection Guide	
Ministry of Natural Resources	April 5, 2007	Ministry permits may be required depending on alternative selected. Recommends contact with NPCA	
Department of Fisheries and Oceans	February 8, 2007	NOC acknowledgement and referral to NPCA for review. Notes that Alternative A, B1, B2, and C have potential to cause HADD	
Indian and Northern Affairs of Canada – Specific Claims Branch	June 5, 2007	No specific claims have been submitted in the area of interest.	
Transport Canada – Marine	December 7, 2007	Request for status update.	December 18, 2007, status update, temporary pumping system.
Chippawa Dock Owners’ Association	March 5, 2007	Comments on PIC#1. Provision of newspaper reports of CSO discharge to Niagara River and Chippawa Creek	
Indian and Northern Affairs Canada – Litigation Management and Resolution Branch	March 21, 2007	No active litigation in the vicinity of your property	

All relevant correspondence with interested and affected agencies is attached in Appendix A.



6.3 Public Consultation

As required by the Class EA process the public was engaged through a series of Public Information Centre (PIC) held during the EA process. The following sections detail the individual PIC, and the public comments resulting from the PIC.

6.3.1 Public Information Centre #1

A Notice of Public Information Centre (PIC) #1 was placed in the St. Catharines Standard and Niagara Falls Review on February 21 and 24, 2007.

The PIC was held as part of Phase 2 of the Class EA in order to make it possible for the public to review the available background data and the preliminary evaluation of alternatives being considered, and to invite the public's input regarding the alternative solutions.

PIC #1 was held on February 28, 2007 from 6:30 p.m. to 8:30 p.m. at the Riverview Public School, 3300 Cattell Drive, Niagara Falls, Ontario. An Information Bulletin handout and questionnaire were provided to members of the public who attended the PIC; refer to B for copies of the handout materials.

Display presentation materials were also prepared for the PIC, in order to facilitate discussion about the Class EA between members of the public and Regional and Consultant personnel in attendance; refer to Appendix B for a copy of the display presentation materials.

Members of the public were encouraged to review the information presented, ask questions of Regional and Consultant personnel in attendance, and to provide any comments that they might have in writing on the Comment Sheets that were available. The return of completed Comment Sheets was requested by Thursday, March 15, 2007.

Those in attendance were advised that, following the PIC, the alternative solutions being considered would be evaluated in detail taking into account any comments received, and that the recommended solution would then be identified.

A total of 5 people attended PIC #1.

One comment was received from the Chippawa Dock Owners' Association, as documented in the stakeholders summary.

6.3.2 Public Information Centre #2

A Notice of PIC#2 was placed in the St. Catharines Standard and Niagara Falls Review on May 5 and 9, 2007.



As part of the Class EA planning process, PIC #2 was held to present the preferred alternative solution, including the process in determining the preferred solution, alternative design concepts of the preferred solution and the next steps.

PIC #2 was held on Wednesday, May 16, 2007 from 6:30 p.m. to 8:30 p.m. at the Riverview Public School, 3300 Cattell Drive, Niagara Falls, Ontario. An Information Bulletin handout and questionnaire were provided to members of the public who attended the PIC; refer to Appendix B for copies of the handout materials.

A total of 3 people attended PIC #2. No comments from the public or stakeholders were received for PIC #2.

6.3.3 Public Information Centre #3

A Notice of PIC#3 was placed in the St. Catharines Standard and Niagara Falls Review on July 12 and 19, 2008.

As part of the Class EA planning process, PIC #3 was held to present the updated preferred alternative solution, including the process in determining the preferred solution, alternative design concepts of the preferred solution and the next steps.

PIC #3 was held on Thursday, July 24, 2007 from 6:30 p.m. to 8:00 p.m. at the Niagara Falls WTP, 3300 Macklem Drive, Niagara Falls, Ontario. An Information Bulletin handout and questionnaire were provided to members of the public who attended the PIC; refer to Appendix B for copies of the handout materials.

A total of 3 people attended PIC #3. No comments from the public or stakeholders were received for PIC #3.



7 Environmental Monitoring Program

7 Environmental Monitoring Program

Monitoring programs have been developed for two phases of the project, namely

- preconstruction monitoring
- construction monitoring.

7.1 Preconstruction Monitoring

The purpose of the preconstruction monitoring program outlined in Table 7.1 is to ensure that procedures are in place prior to construction that will satisfy regulatory requirements, and environmental mitigation commitments agreed to by the Region. This table is also intended to act as a checklist to ensure that the Contractor has contingency plans in place prior to construction to minimize the potential for adverse environmental impacts during construction.

7.2 Construction Monitoring

The purpose of the construction monitoring program outlined in Table 7.2 is to

- ensure that construction activities with a potential to create an adverse environmental impact are monitored, and mitigative actions are taken to reduce/avoid adverse environmental impacts
- review mitigation measures to determine if they are working properly (e.g., sediment control measures), and take immediate corrective actions as required to minimize impacts
- ensure that the environmental monitor submits regular monitoring reports to the project manager during construction identifying potential environmental issues and incidents. Mitigation taken to resolve issues and incidents shall also be described.
- keep regulatory agencies advised of environmental issues and/or incidents, related to permit conditions or legislative non-conformance.

Postconstruction restoration of the site will be responsibility of the Contractor and shall be to the satisfaction of the Region and the regulatory agencies.

The Ministry of Culture must be notified prior to construction with respect to Archaeological site P1.

The following Ministry of Culture conditions also apply:

- Should deeply buried archaeological remains be found on the property during construction activities, the Manager, Heritage Operations Unit, Ontario Ministry of Culture, should be notified immediately.



- In the event that human remains are encountered during construction, the proponent should immediately contact both the Ontario Ministry of Culture and the Registrar or Deputy Registrar of the Cemeteries Regulation Unit of the Ontario Ministry of Government Services, Consumer Protection Branch at (416) 326-8404 or toll-free at 1- 800-889-9768.



Table 7.1 Preconstruction Monitoring Program

Item	Description
Environmental Training	• Ensure all construction staff receiving training in the implementation of plans and procedures specified in ESR
Environmental Permits and Approvals	• Ensure that all required permits and approvals are obtained prior to start of construction (see list in Section 8)
Contractor Obligations	• Ensure commitments as stated in the ESR and plans/specifications are met including ○ sediment control plan ○ spill control and emergency response plan ○ fuel/oil storage containment located away from watercourse ○ appropriate waste disposal/sewage disposal practices ○ emergency response plan for accidents and spills ○ commitment to follow legislated health and safety and environmental requirements has been received
Ministry of Labour Notice of Project	• Ensure that Contractor(s) has submitted a "Notice of Project" to the Ministry of Labour prior to construction
Photographic Record	• Make photographic record of existing environment around the work area prior to construction for comparison with post-construction

Table 7.2 Construction Monitoring Program

Issue	Description of Monitoring Activity
Permit conditions	• Ensure all environmental permit conditions for the project are met.
Tree clearing	• Monitor clearing to avoid sensitive times for bird breeding and nesting • Ensure Contractors do not go beyond surveyed tree clearing limits
Other vegetation removal	• Ensure Contractor limits vegetation removal to minimum required for civil works construction
Water quality	• Monitor turbidity and suspended solids in settling pond prior to discharge as per MOE CoA conditions (if settling pond or other water treatment required)
Aquatic resources	• Monitor to ensure that all in-stream works occur outside spawning and incubation period unless approved by MNR/DFO
Photographic record	• Make photographic record of construction activities
Public access	• Ensure public are kept well away from construction activities and equipment; contractor to provide security, fencing and signage as appropriate
Sewage and solid waste disposal	• Ensure Contractor employs adequate and appropriate sewage and waste disposal practices (for Portalets) • Ensure Contractor disposes of waste materials in accordance with provincial regulations.
Fuel oil storage/solvents	• Ensure Contractor implements fuel/oil storage & refuelling program • Ensure chemical/fuel tanks are double-walled or bermed and located away from watercourses or drainage paths. An impermeable pad is preferred below tanks and tied into the sides of a perimeter berm. • Ensure that refueling and maintenance activities take place a minimum of 30m from watercourses or drainage paths.
Sediment/runoff control	• Ensure Contractor has properly implemented the sediment control plan and that measures are effective; make recommendations to improve control measures as necessary
Spills, health and safety	• Verify that Contractor has adequate spill contingency plans in place • Verify that sufficient effective cleanup materials are provided (and maintained) on site by the contractor and that any spills are cleaned up by the Contractor immediately • Verify that Contractor has reported spills as per Emergency Response Plan • Verify that contractor staff have had health and safety training including emergency response
Post-construction restoration	• Monitor general site cleanup • Monitor seeding/sod/landscaping activities

8 Conclusions and Recommendations

8 Conclusions and Recommendations

8.1 Recommendations

This Schedule "C" Municipal Class EA for the Intake Relocation has found that the preferred alternative is Temporary Pumping from the Niagara River with a raw water supply main following the Alternative D1 alignment. Permits and approvals may be required, as follows:

- Permit to Take Water for operations
- A Certificate of Approval for temporary water taking
- NPCA review of possible HADD and possible permitting
- OPG review and approval of final design

8.2 Implementation

Based on the Municipal Engineers Association's document entitled "Municipal Class EA", June 2000, this project falls under the Schedule "C" classification.

This Class EA Project File is being made available for the stipulated review period to fulfill the public screening requirements. As a Schedule "C" project, approval of this project is obtained once a 30-day public screening process is completed without an objection to the Minister of the Environment.

8.3 Approval Process

All potentially affected members of the public and review agencies were notified, by advertisements in the press and by letter where appropriate, that this Project File is complete and available for review. The notice clearly stated the review period and the date by which written comments and a Part II Order request must be submitted.

Written comments should be submitted to:

Mr. Robin Young, B.Eng., C.Chem
Project Manager
Regional Municipality of Niagara
Water and Wastewater Division
1151 Schmon Parkway, P.O. Box 1042
Thorold, ON L2V 4T7

Phone: (905) 685-4225 ext. 3740

Fax: (905) 685-5205

E-Mail: robin.young@regional.niagara.on.ca



If concerns regarding the proposed project cannot be resolved in discussions with the municipality within the 30 day review period, any party may request that the Minister of the Environment issue a Part II Order. A Part II Order could require the municipality to comply with some or all of the provisions of Part II of the Environmental Assessment Act, which addresses individual environmental assessments.

Part II Order requests must be received by the Minister before the end of the 30 day review period. Part II Order requests received after the 30-day review period will not be considered. Part II Order requests should be directed to:

Minister of the Environment
12th Floor, 135 St. Clair Avenue West
Toronto, Ontario
M4V 1P5

A copy of the letter requesting a Part II Order must be sent to the following:

Mr. Robin Young, B.Eng., C.Chem
Project Manager
Regional Municipality of Niagara
Water and Wastewater Division
1151 Schmon Parkway, P.O. Box 1042
Thorold, ON L2V 4T7

Phone: (905) 685-4225 ext. 3740
Fax: (905) 685-5205

E-Mail:

robin.young@regional.niagara.on.ca

Eugene Chajka, P.Eng.
Senior Project Manager
Hatch Mott MacDonald
4342 Queen Street, P.O. Box 1001
Niagara Falls, ON L2E 6W1

Phone: (905) 357-6971

Fax: (905) 357-6977

E-Mail:

eugene.chajka@hatchmott.com

When considering the acceptance or denial of a request for a Part II Order, the Minister will consider the following issues:

- Extent and nature of public concern
- Potential for significant adverse environmental effects
- Need for broader consideration of alternatives
- Consideration of urgency
- Frivolous or vexatious nature of the request
- Degree to which public consultation and dispute resolution has taken place.

8.4 Next Steps

If no concerns are expressed by the conclusion of the 30-day review period, the Region may proceed with the design of the project.

The project is expected to proceed as follows:

Notice of Class EA Completion	November 2008
Project File Available for Public Review	November/December 2008
Design	Winter 2008/09
Construction	2018*
Commissioning	2018*

* Schedule for construction and commissioning depends on the timing of the QCPC maintenance and/or shutdown by OPG.



9 References

9 References

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Appendix A
Stakeholder Consultation

Appendix A1
Correspondence

Notice of Commencement Sent to the Following Agencies and Neighbors

Updated: November 23, 2006

D'Amario, Tony Director, Water Management	Niagara Peninsula Conservation Authority 250 Thorold Road West 3rd Floor Welland, ON L3C 3W2	Phone: 905-788-3135 X 232 Email: tdamario@conservation- niagara.on.ca
Dujlovic, Ed Director Municipal Works	City of Niagara Falls 4310 Queen Street P.O. Box 1023 Niagara Falls, ON L2E 6X5	Phone: 905-356-7521 Ext 4220 Email: edujlovi@city.niagarafalls.on.ca
Durst, Joad, R.P.F. Niagara Area Supervisor Guelph District	Ministry of Natural Resources 4890 Victoria Avenue North P.O. Box 5000 Vineland Station, ON L0R 2E0	Phone: 905-562-1175 or 4147 Email: jdurst@mnr.gov.on.ca
Ian Neville, P. Eng Commissioner Planning and Development	Regional Municipality of Niagara Public Works Department Engineering Services Division 2201 St. David's Road P.O. Box 1042 Thorold, ON L2V 4T7	Phone: 905-685-1571 Email:
Barry Putt Acting Superintendent	Transport Canada, Marine Navigable Waters Protection 100 Front Street South Sarnia, ON N7T 2M4	Phone: 519-383-1862
Sheppard, Cora Environmental Assessment and Planning Coordinator, Technical Support Section, West Central Region	Ministry of the Environment Ellen Fairclough Building 12 th Floor, 119 King Street West Hamilton, Ontario L8P 4Y7	Phone: 905-521-7587 Email: cora.sheppard@ontario.ca
Arthur, Jennifer Environmental Assessment and Planning Coordinator	Ministry of the Environment Ellen Fairclough Building 12 th Floor, 119 King Street West Hamilton, Ontario L8P 4Y7	Phone: 905-521-7587 Email: cora.sheppard@ontario.ca
Murphy, Nick, P.Eng. Senior Director Technical Services	Niagara Parks Commission Box 150, 7400 Portage Road Niagara Falls, ON L2E 6T2	Phone: 905-356-2241, Ext. 240 Email: nickmur@niagaraparks.com

Nieweglowski, Paul District Manager, Niagara District Office	Ministry of the Environment 9 th Floor, Suite 15 301 St. Paul Street St. Catharines, Ontario L2R 3M8	Phone: 905-704-3910 Email: paul.nieweglowski@ene.gov.on.ca
Niven, J. Stuart Habitat Impact Assessment Biologist Burlington District Office	Fisheries and Oceans Canada 304 - 3027 Harvester Road, Suite 304 P.O. Box 85060 Burlington, ON L7R 4K3	Phone: 905-639-1632 Email: NivenST@dfo-mpo.gc.ca
Norten, Dean Public Affairs Officer	Ontario Power Generation 14000 Niagara River Parkway RR1 Niagara-on-the-Lake, Ontario L0S 1J0	Phone: 905-357-6903 Email: dean.norten@opg.com
Mason, Jay	Chippawa Dock Owners Association 17-7000 McLeod Rd, Suite 321 Niagara Falls, Ontario, L2G 7K3	Phone: 905-295-7699 Email: CDOA@sympatico.ca
Inn on the Parkway	7857 Niagara River Parkway, Niagara Falls, Ontario	Phone: 905-295-4371
Falkiner, Len Secretary	Canadian Section, International Niagara Board of Control PO Box 5050, 867 Lakeshore Rd, Burlington, ON L7R 4A6	Email: Len.Falkiner@ec.gc.ca
Surfside Inn	3655 Macklem Street Niagara River Parkway Niagara Falls, Ontario L2G 6C8	
Niagara River RAP	The Niagara River RAP Coordinator Niagara Peninsula Conservation Authority 250 Thorold Road West, 3 rd Floor Welland, Ontario L3C 3W2	Phone: 905-788-3135



**Hatch Mott
MacDonald**

4342 Queen Street
PO Box 1001
Niagara Falls, ON L2E 6W1
T 905.357.6971 F 907.357.6977
www.hatchmott.com

December 8, 2006

230144.08.01

Mr. Tony D'Amario
Director, Water Management
Niagara Peninsula Conservation Authority
250 Thorold Road West, 3rd Floor
Welland, Ontario
L3C 3W2

**Re: Class Environmental Assessment Study
Niagara Falls Water Treatment Plant Intake Relocation
Notice of Commencement**

Gentlemen:

The Regional Municipality of Niagara plans to relocate the Niagara Falls Water Treatment Plant Intake, currently located on the north bank of the Welland River, approximately 500 m west of the confluence with the Niagara River.

This relocation is planned to provide reliable, high-quality and consistent raw water from the Niagara River, upon the potential shut down of the Ontario Power Generation (OPG) power canal for maintenance purposes. The project is being planned in accordance with the requirements for Schedule C of the Municipal Class Environmental Assessment.

You are invited to provide comments on this study.

The Region is currently considering four alternative intake locations (see attached diagram), which will be reviewed against any resulting impacts using evaluation criteria established as part of the environmental assessment process with Region staff, and a preferred solution will be chosen. The study team is interested in receiving your comments as a potential stakeholder to the study. The project is planned to be constructed prior to the completion of the third OPG power tunnel.

A Public Open House will take place to obtain public input in the planning process. You will be notified of the date and time for this Public Open House. The information gathered from the study, from agencies and from the Public Open House will assist us in selecting the preferred location.

If you have initial comments or concerns, please respond in writing prior to December 21, 2006, for inclusion in the Public Open House. The Schedule C Project File will be issued and Notice of Completion circulated upon the conclusion of the study. All comments will become part of the public record. If you would like to discuss this project, please contact me at 905-357-6971.



Hatch Mott
MacDonald

Your participation in this study is appreciated.

Sincerely,

Hatch Mott MacDonald

A handwritten signature in black ink, appearing to read 'E. Chajka'.

Eugene Chajka, P.Eng.
Project Manager
T 905.357.6971 F 905.357.6977
eugene.chajka@hatchmott.com

EC:eam

Encl. - Notice of Commencement
Intake Alternatives Diagram

NIAGARA REGION
PUBLIC WORKS DEPARTMENT
CLASS ENVIRONMENTAL ASSESSMENT STUDY

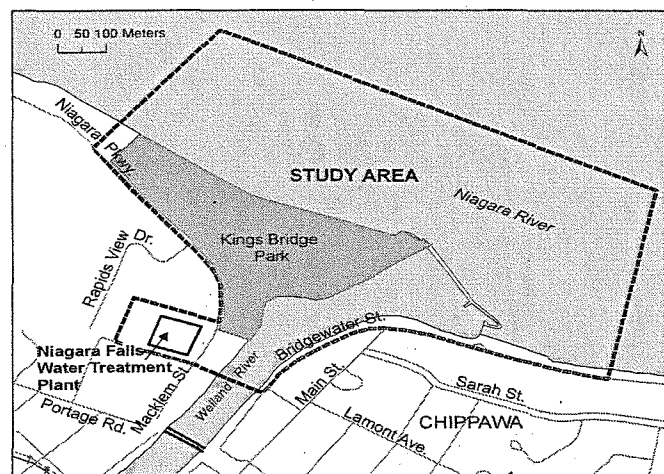
INTAKE RELOCATION
NIAGARA FALLS WATER TREATMENT PLANT
CITY OF NIAGARA FALLS

NOTICE OF COMMENCEMENT

The Regional Municipality of Niagara plans to relocate the Niagara Falls Water Treatment Plant Intake currently located on the north bank of the Welland River (Chippawa Creek), approximately 500m west of the confluence with the Niagara River.

The map located to the right shows the proposed study area for the intake relocation:

The Region is planning this relocation to provide reliable, high quality and consistent raw water from the Niagara River, upon the potential shut down of the Ontario Power Generation (OPG) power canal for maintenance purposes. The project is being planned in accordance with the requirements for Schedule 'C' of the Municipal Class Environmental Assessment.



You are invited to provide comments and add your name to our mailing list for this study.

A Public Open House will be held early in 2007, to present the recommended location of the Water Treatment Plant Intake. The Public Open House will give you a chance to meet the project team, discuss the study objectives and provide your comments on the recommended location plans.

Regional staff and the consultants are interested in receiving your comments on the study. All comments will become part of the public record. If you would like further information, please contact one of the following members of the project team:

Mr. Robin Young, B. Eng., C. Chem
Project Manager
Public Works Department
Water and Wastewater Services Division
3501 Schmon Parkway, P.O. Box 1042
Thorold, ON L2V 4T7
Phone: 905 685-4225, ext. 3740
Fax: 905 685-5205
Email: robin.young@regional.niagara.on.ca

Mr. Eugene Chajka, P. Eng.
Project Manager
Hatch Mott MacDonald
4342 Queen Street
Niagara Falls, ON
L2E 6W1
Phone: 905 357-6971
Fax: 905 357-6977
Email: Eugene.chajka@hatchmott.com

Engineering
Dave Gillis
Phone: 905/356-2241, ext. 260
Fax: 905/356-7262
E-Mail: npceng@niagaraparks.com

December 15, 2006

Eugene Chajka, P.Eng.
Project Manager
Hatch Mott MacDonald
4342 Queen Street
P.O. Box 1001
Niagara Falls, ON L2E 6W1

Dear Sir:

**RE: NIAGARA FALLS WATER TREATMENT PLANT INTAKE RELOCATION
CLASS ENVIRONMENTAL ASSESSMENT STUDY
NOTICE OF COMMENCEMENT**

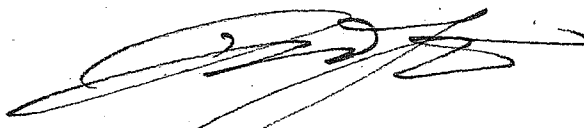
The Niagara Parks Commission (NPC) would like to provide you with some preliminary comments with respect to the proposed water intake locations.

We have enclosed water lot plans of the Niagara River riverbed. You will see that Water lot CL511 is owned by The Niagara Parks Commission and water lot CL2065 we have under a Licence of Occupation from the Ministry of Natural Resources. The other two Hydro Electric Power Commission drawings indicate the areas leased to Ontario Power Generation by The NPC. We do not have water lot plans of the Welland River.

The proposed water intake alternatives shown in your correspondence as A, B1 and B2 would be the least disruptive to The Niagara Parks Commission. While we are not dismissing alternatives C and D; these two alternatives would require some discussion in order that the infrastructure not preclude future development on or under Niagara Parks lands.

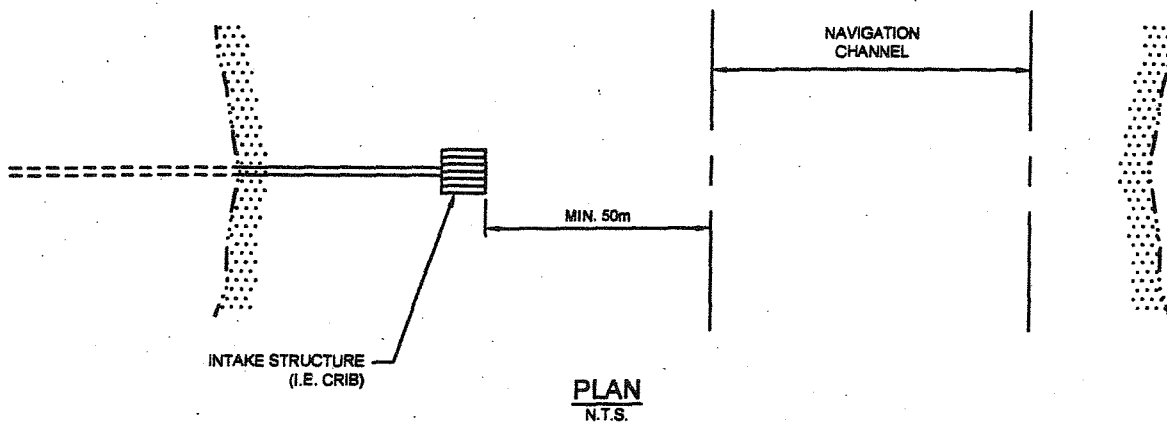
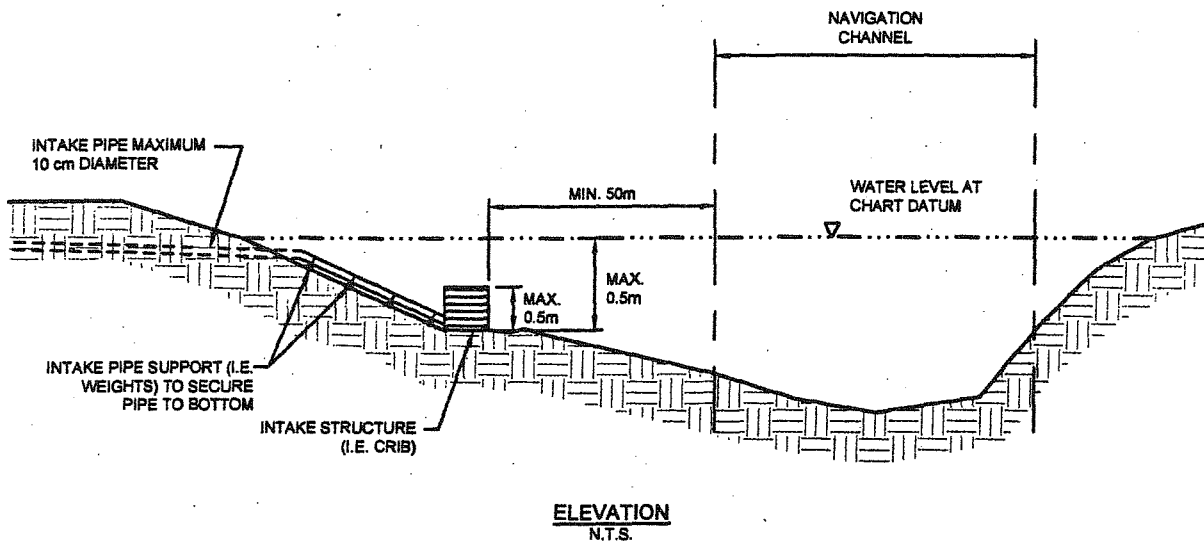
Thank you, and we would appreciate being kept apprised of any further correspondence with respect to this project.

Yours truly,



Dave Gillis, MCIP, RPP
Manager - Planning & Properties

/cr



WATER INTAKE PIPES MEETING THE CRITERIA PRESENTED HEREIN DO NOT REQUIRE REVIEW BY THE NAVIGABLE WATER PROTECTION PROGRAM UNDER THE TIER II PROCEDURE IF:

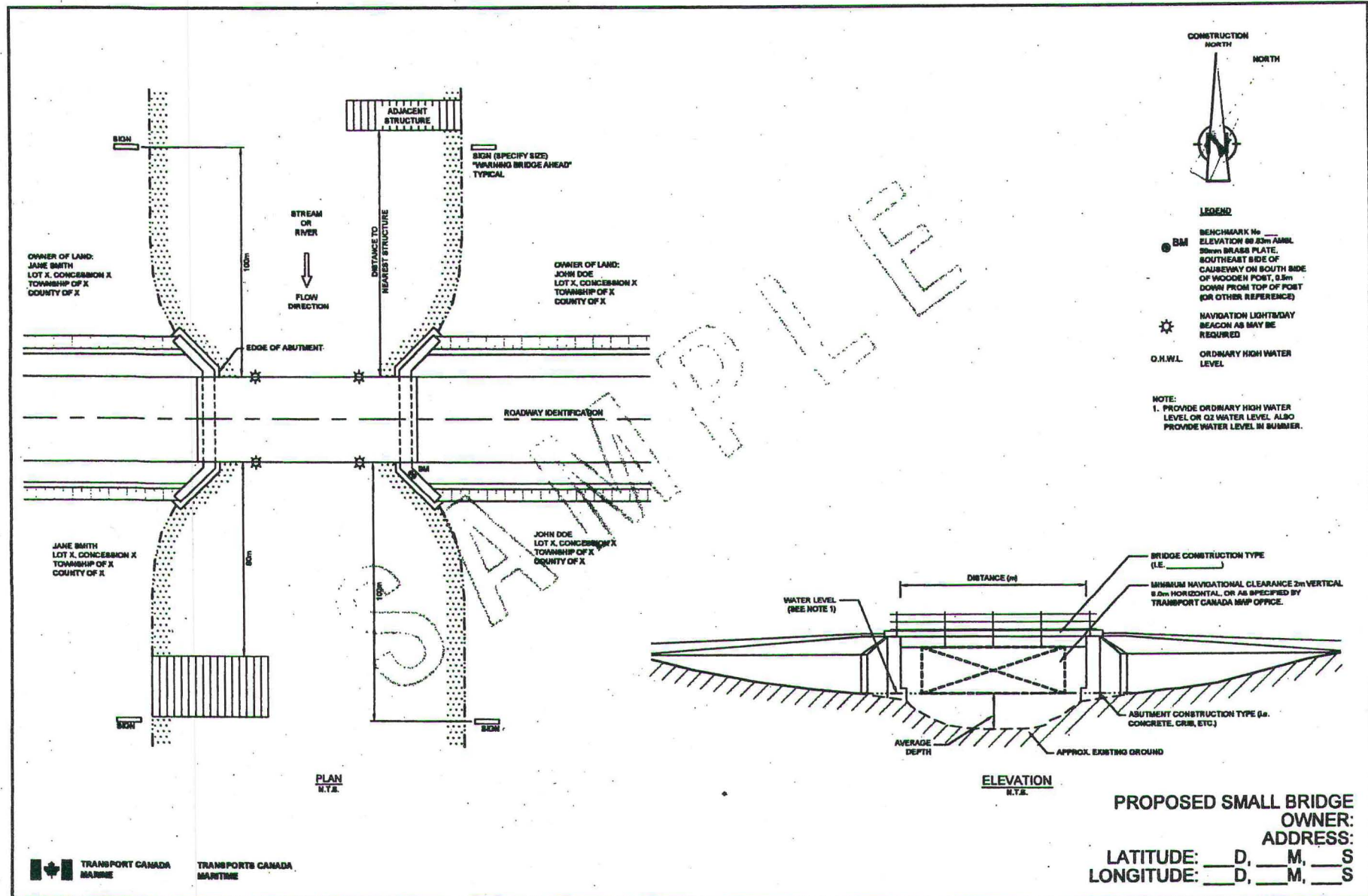
- THE WATER INTAKE PIPE IS NOT ASSOCIATED WITH A PROPOSED OR EXISTING WEIR OR DAM; AND
- CONSTRUCTION OF THE INTAKE PIPE DOES NOT REQUIRE TEMPORARY IN STREAM WORKS INCLUDING COFFERDAMS, BERMS, ROADS, ETC.

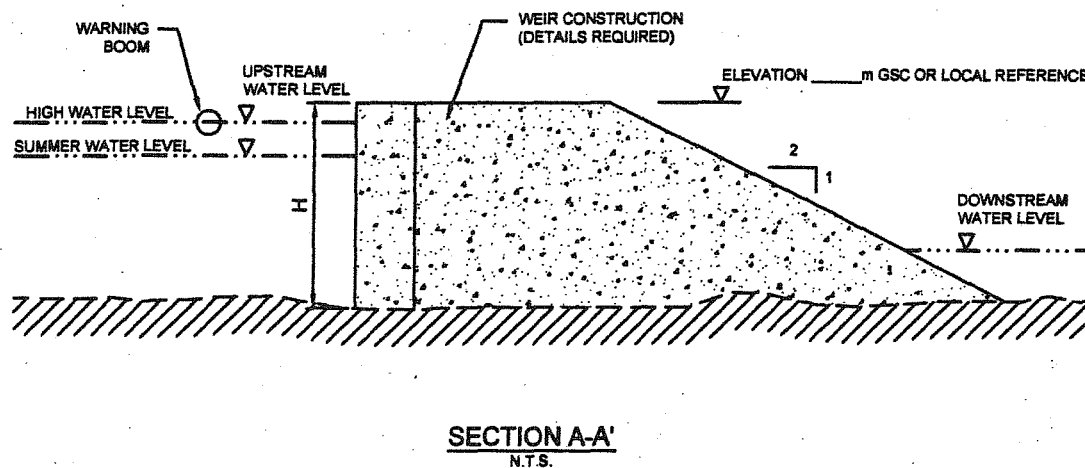
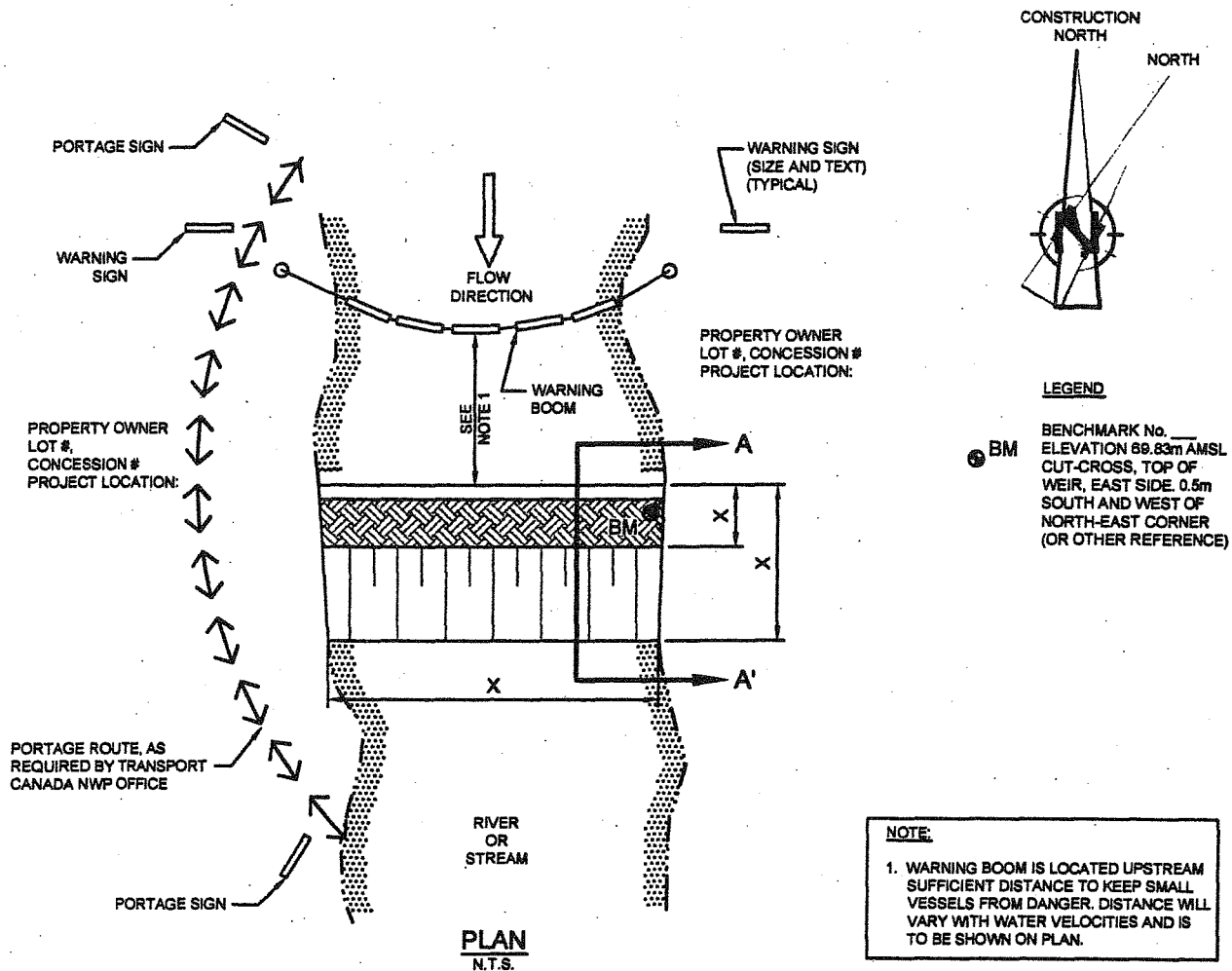


TRANSPORT CANADA
MARINE

TRANSPORTS CANADA
MARITIME

**WATER INTAKE PIPE
CHARTED WATERWAY**





PROPOSED WEIR
OWNER:
ADDRESS:

LATITUDE: _____ D _____ M _____ S
LONGITUDE: _____ D _____ M _____ S



TRANSPORT CANADA
MARINE

TRANSPORTS CANADA
MARITIME

Navigable Waters Protection Act Request for Project Review

Is this the first time you are
requesting a review for this project?

Yes

☐

No

☐

Section A	Proponent / Owner /Other Information	
	Name of Proponent/Owner:	
	Mailing Address:	
	Street Address (if different than above):	
	City/Town:	Province/Territory: Postal Code:
	Tel. No. (Residence):	Tel. No. (Work): Tel. No.: (Other)
	Fax No:	E-mail Address:
	Name of Contractor/Agency/Consultant (if applicable):	
	Mailing Address:	
	Street Address (if different than above):	
	City/Town:	Province/Territory: Postal Code:
	Tel. No. (Residence)	Tel. No. (Work): Tel No. (Other)
	Fax No:	E-mail Address:
	Section B	Location of the project and physical description of the site
Name of Nearest Community (City, Town, Village):		Municipality / District / County:
Legal Description (Lot, Concession, Township, Section, Range):		Name of Primary Watercourse (River, Lake, Bay)
Access Road to Proposed Work Site (e.g., route number, highway series number or street name/number if urban area, etc.)		
Topographic/Chart No. (if applicable)		Water lot Lease or Permit (if applicable)
Description of shoreline, if applicable (i.e., ground type, vegetation, slope, other) <u>Note: Enclose photographs:</u>		Description of watercourse <u>Note: Enclose photographs:</u>
Average width and depth of waterway at the project site:		Type of navigation (recreational/commercial):
Description of Project (Please attach additional information – see Section D)		



Transport Canada
Marine

Transports Canada
Maritime

100 S. Front Street
Sarnia, Ontario
N7T 2M4

Your file Votre référence
230144.08.01

Our file Notre référence
8200-06-7413

January 2, 2007

Regional Municipality of Niagara
C/o Hatch Mott MacDonald
4342 Queen Street
PO Box 1001
Niagara Falls, ON L2E 6W1

Attention: Eugene Chajka, P.Eng.

Dear Sir:

**Re: Application for approval of an intake, Welland River, Niagara Falls Water
Treatment Plant, Regional Municipality of Niagara, Province of Ontario**

Reference is made to correspondence dated December 8, 2006 relating to the
aforementioned proposed works.

Please note this department is responsible for the administration of the Navigable Waters
Protection Act, which prohibits the construction or placement of any "works" in navigable
waters without first obtaining approval from this office. Enclosed is an application Guide
which will assist you in making an application under the Navigable Waters Protection Act.

You are advised that no construction shall take place without approval under the Act.

Should you have any further questions, please contact this office at (519) 383-1866.

Yours truly,

Suzanne Shea
Navigable Waters Protection Officer
Navigable Waters Protection

SS/jd

Encl.

Canada



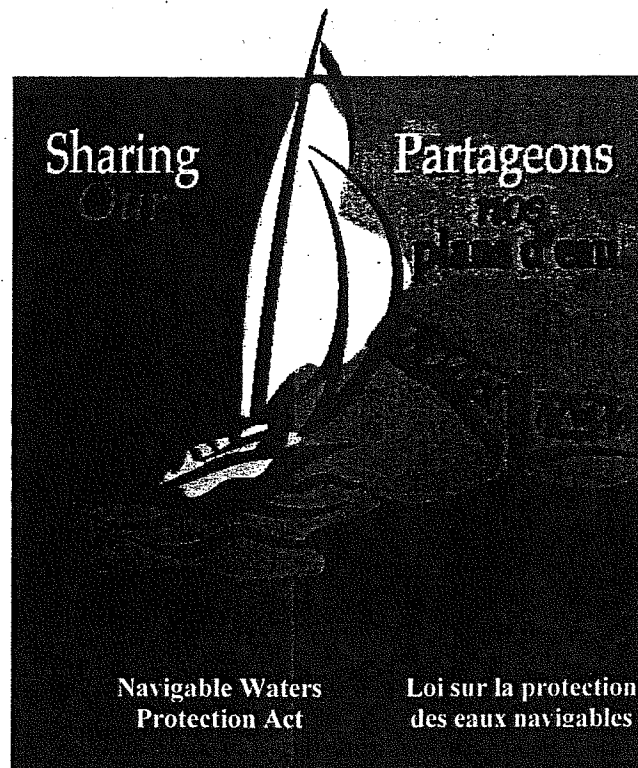
Transport Canada
Marine

Transports Canada
Maritime

Ontario Region

NAVIGABLE WATERS PROTECTION ACT

APPLICATION GUIDE



Navigable Waters Protection
100 Front Street South
Sarnia, Ontario
N7T 2M4

Phone 1-866-821-6631 Fax (519) 383-1989

Canada

APPLICATION GUIDE CHECKLIST

Before returning your application form, the following **must** be included otherwise your application will not be processed:

- ☐ Name of property owner & description of the project site
- ☐ Complete mailing address of the property owner
- ☐ Plot or survey plan with project shown & adjacent landowners
- ☐ Map or chart with arrow to show location of project
- ☐ Plan view of the project (with dimensions)
- ☐ Side view of project (with dimensions)
- ☐ Location for disposal of dredge spoils (if applicable)
- ☐ Name of the contractor/firm doing the work (if applicable).

APPLICATION GUIDE

INTRODUCTION

The Navigable Waters Protection Act (NWPA) revised Statutes of Canada, 1985, is one of the oldest pieces of federal legislation. It first became law on May 17, 1882. The principle objective is to protect the public right of navigation by prohibiting the building or placement of any "work" in, upon, over, under, through, or across a navigable water without the authorization of the Minister of Transport. The jurisdiction of the legislature begins at the high water mark. Therefore structures that are between low and high water marks will require approval under the NWPA. The administration of the NWPA was recently transferred to Transport Canada.

Important Notice

An approval granted by the Minister is neither a general approval of construction nor an authorization in respect of any law, excepting the Navigable Waters Protection Act. An authorization may also be required from the Minister under the Fisheries Act; you should contact the Department of Fisheries & Oceans for such a determination. In addition, contact should also be made with local municipal, provincial and other government offices to determine if other approvals will be required for the proposal.

What is a Navigable Waterway?

A navigable water is any body of water capable of being navigated by floating vessels of any description for the purpose of transportation, commerce or recreation. This includes both inland and coastal waters. The authority to determine the navigability of a waterway and consequently the requirement for an application under the NWPA, rests with the Minister of Transport or his/her designated representative.

Examples of Some Types of "Works" Requiring Authorization

- any bridge, boom, dam, causeway, wharf, dock, boathouse, intake, outfall, etc.;
- dredging; dumping of fill, retaining wall, groyne, breakwater;
- submarine or overhead cables, tunnel, pipeline;
- aquaculture facilities;
- any other device, structure, or thing whether similar in character to the above or not.

Permit Process

There are basically two types of processes followed in reviewing an application under the Act:

- **Formal Approval**
The formal approval process is followed when NWPA officials determine that your work or project poses a substantial interference with navigation. Under the requirements of the Act all bridges, booms, dams, and causeways must be processed by formal approval.
- **Letter of Exemption**
The exemption process is followed when NWPA officials determine that your work or project does not pose a substantial interference with navigation.

How to Make an Application

1. Application Form - Complete, sign and date the enclosed application form.

2. Site Location - Obtain 6 copies of a map or topographic chart of your area. Please include enough details to simplify the location of the proposed project. If not already shown, add the following:

- Name of the waterbody in which the project is located;
- Location of the proposed project (draw an arrow showing the exact location of the site on the map);
- Approximate latitude and longitude of the project

3. Plot Plan - One (1) copy of your plot or survey plan, showing adjacent property owners (include names), with the location of the proposed work clearly indicated.

4. Plan View (6 copies) - The plan view shows the proposed project as if you were looking straight down on it from above. Provide these drawings, to scale or dimensioned, containing sufficient detail to clearly show your proposed project, including:

- Any existing works presently on your property or adjacent properties such as docks, slipways, breakwaters etc.;
- Existing shorelines;
- Dimensions (length, width, etc.) of the project All dimensions should be from the ordinary high water mark. See sample sketches for further details;
- Average water depth around the project;
- Scale of drawing.
- North arrow.

5. Profile View or Section View (6 copies) - The profile view is a scale drawing that shows the side, front, or rear of the proposed structure as it would look if you were standing to the side of it; the section view is a scale drawing that shows the proposed structure as it would look if sliced internally for display. Clearly show the following:

- Dimensions of the project, including width, height etc. See the sample sketches for further details;
- The ordinary high water mark (O.H.W.M.) and high water mark (H.W.M.);
- Existing and proposed ground contours;
- Height above the bed of the waterway;
- The type of construction material to be used;
- Scale;

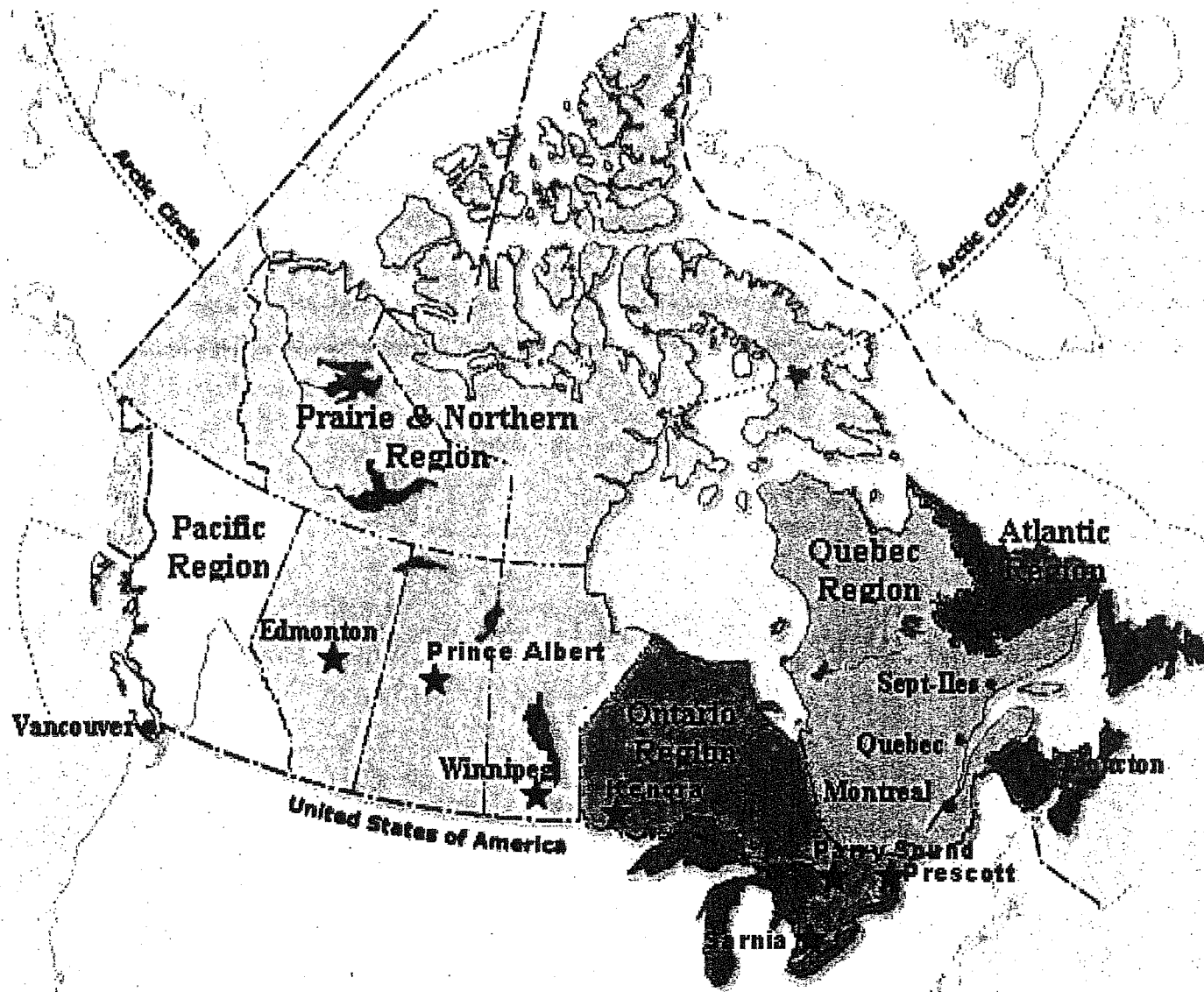
Other information

- a) If any information is missing, your application may be delayed; therefore please ensure that your application, plans, etc. are complete.
- b) Please be advised that it is recommended that applications for approval under the NWPA be made well in advance of the anticipated start-up date, to allow Coast Guard officials to do a complete investigation and possible environmental assessment of your project, which may take several months.
- c) Advise whether you have received or applied for a waterlot lease or permit, and if so, with whom you have applied and when.
- d) Provide a proposed construction schedule, advising when you plan on starting the project.
- e) If you are not the upland owner, provide the owners consent in writing.
- f) Provide an environmental assessment or study if one has been prepared.

Where to Make an Application

In accordance with the map below, please submit applications for approval to the addresses listed on Annex A "Navigable Waters Protection Act Application Addresses".

Ontario Region & Prairie & Northern Region NWP PROGRAM – AREA OFFICES



Annex A

Navigable Waters Protection Act

Application Addresses

To apply for approval of works or for additional inquiries about the Navigable Waters Protection Act or Program, please contact the appropriate office below.

NWP Regional Office - South Western Ontario

Navigable Waters Protection Program
100 Front Street South
Sarnia, ON N7T 2M4

NWPA Prescott Office - Eastern Ontario

Navigable Waters Protection Program
P.O. Box 1000
401 King St. W
Prescott, ON K0E 1T0

NWPA Parry Sound Office - North Eastern Ontario

Navigable Waters Protection Program
28 Waubeek St.
Parry Sound, ON P2A 1B9

NWPA Kenora Office - North Western Ontario

Navigable Waters Protection Program
P.O. Box 649
1100 3rd Ave. S
Kenora, Ontario P9N 3X6



Transport Canada
Marine

Transports Canada
Maritime

Canada

TEMPORARY CONSTRUCTION
WARNING SIGN VISIBLE TO
DOWNBOUND BOAT TRAFFIC

GREATER THAN
1000m TO LAKE
OR TIDAL WATERS

NATURAL
STREAM
FLOW

50m

MAX. 15m

POLE

OH
OVERHEAD LINE
MARKERS (IF REQUIRED)

POLE

CONSTRUCTION
SITE

GREATER THAN
1000m TO LAKE
OR TIDAL WATERS

50m

TEMPORARY CONSTRUCTION
WARNING SIGN VISIBLE TO
UPBOUND BOAT TRAFFIC

PLAN
N.T.S.

OVERHEAD LINE
COMPLYING WITH
CAN/CSA-C22.3 NO.1-01.

OH

OH

OH

OH

ORDINARY HIGH
WATER LEVEL

ALL POLES AND TOWERS TO
BE LOCATED OUTSIDE THE
LIMITS OF THE WATERWAY

ELEVATION
N.T.S.

AERIAL CABLES MEETING THE CRITERIA SHOWN HEREIN DO NOT REQUIRE REVIEW BY THE NAVIGABLE WATER PROTECTION PROGRAM UNDER THE TIER II PROCEDURE IF:

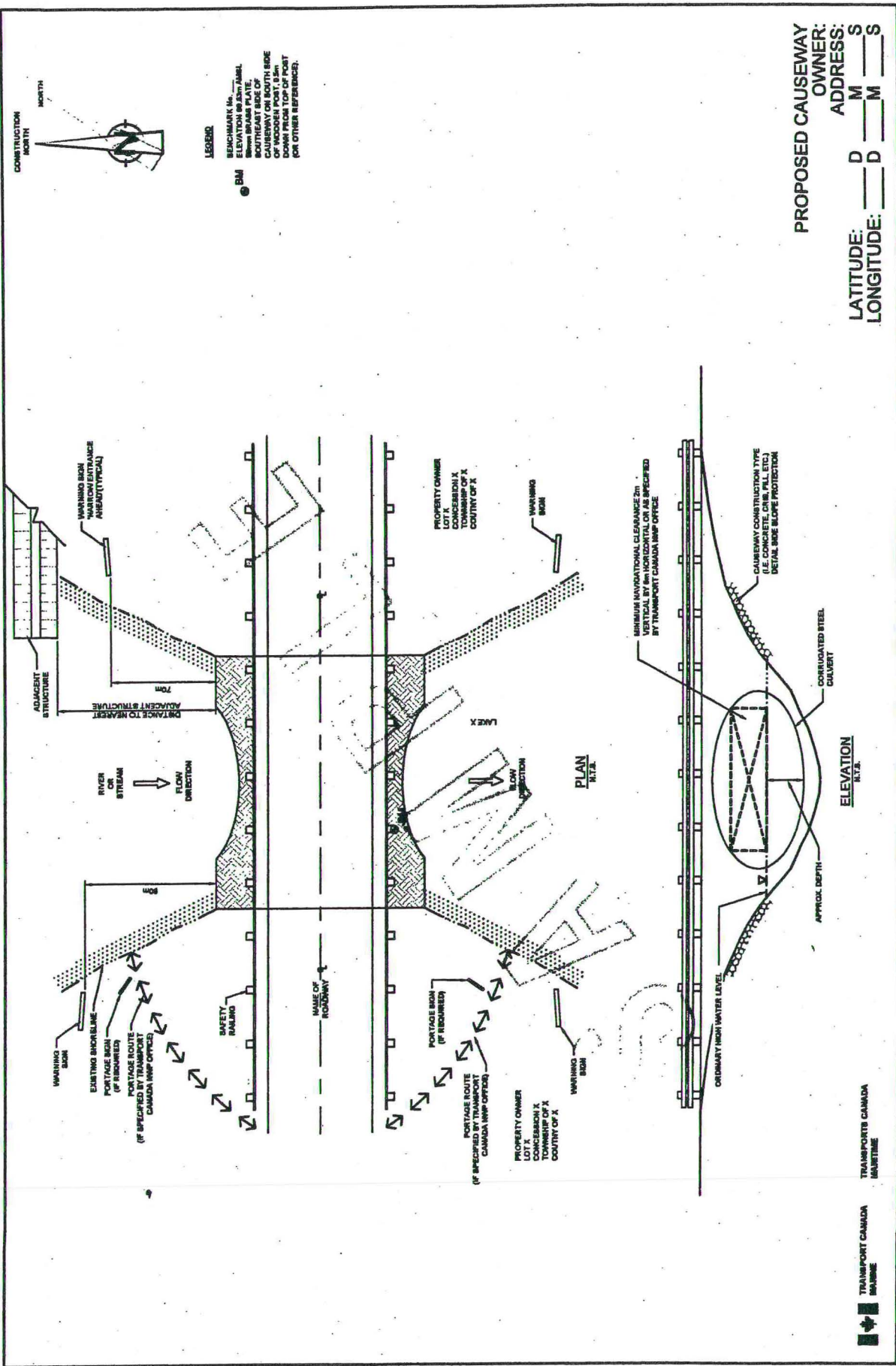
- THE PROJECT IS NOT LOCATED ON A CHARTED WATERWAY, NOT CROSSING A LAKE, TIDAL WATERS, MAN-MADE PUBLIC CANALS OR PORTIONS THEREOF, AND NOT LOCATED WITHIN 1000 M OF A LAKE OR TIDAL WATERS;
- THE PROJECT DOES NOT INCLUDE TOWERS OR POLES WITHIN THE LIMITS OF THE WATERWAY;
- USERS OF THE WATERWAY WILL BE ALLOWED SAFE PASSAGE THROUGH THE CONSTRUCTION SITE
- TEMPORARY OR PARTIAL INSTALLED CABLES WILL NOT BE LEFT UNATTENDED; AND
- THE PROPOSED CROSSING COMPLIES WITH CSA STANDARDS FOR OVERHEAD SYSTEMS (CAN/CSA-C22.3 NO.1-01), AS AMENDED.

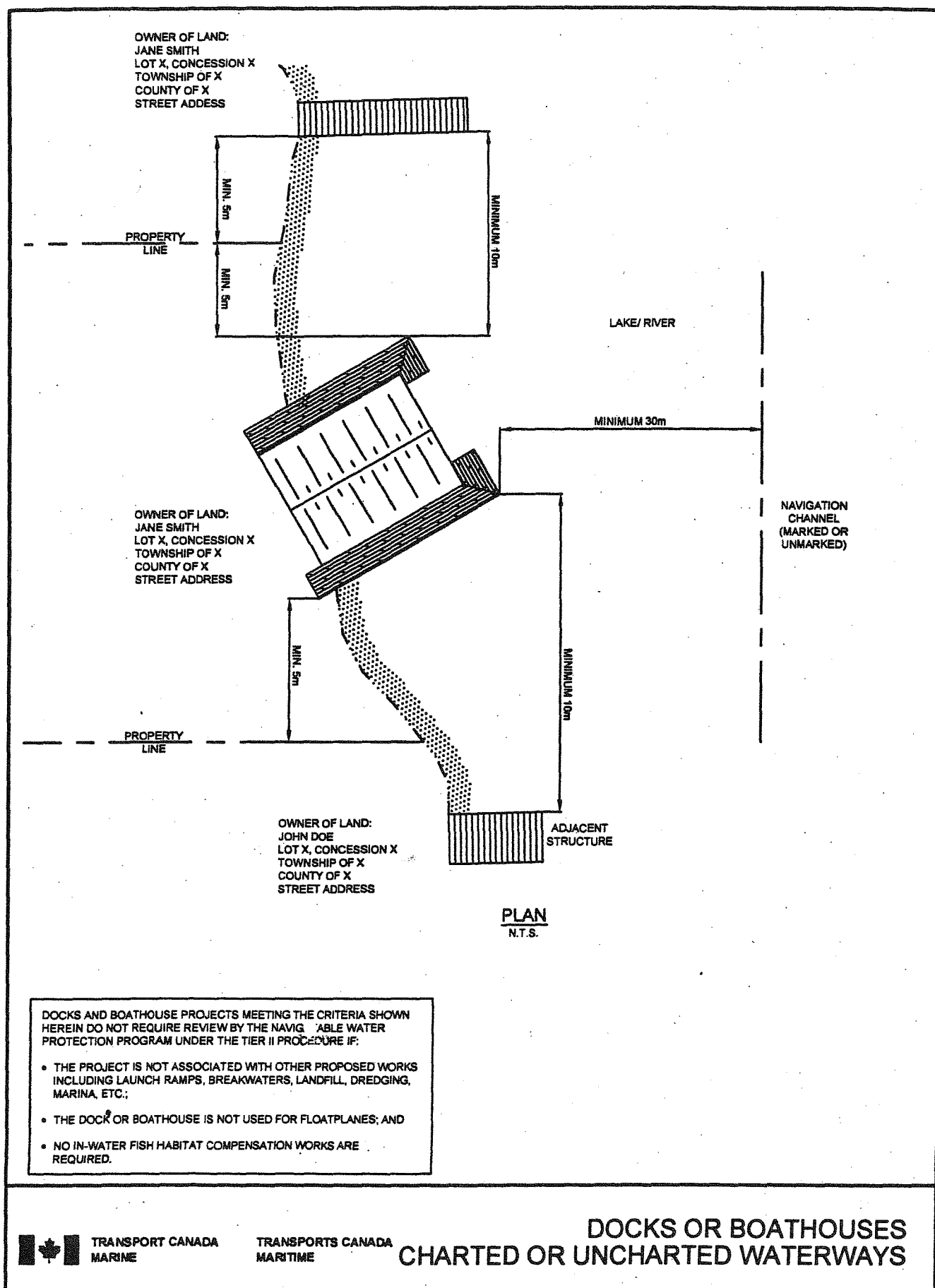


TRANSPORT CANADA
MARINE

TRANSPORTS CANADA
MARITIME

AERIAL CABLES (HYDRO AND COMMUNICATIONS) UNCHARTED WATERWAY





NOTE:

1. CONSTRUCTION WARNING SHALL BE LOCATED UPSTREAM AND DOWNSTREAM OF THE CONSTRUCTION SITE AS FOLLOWS:

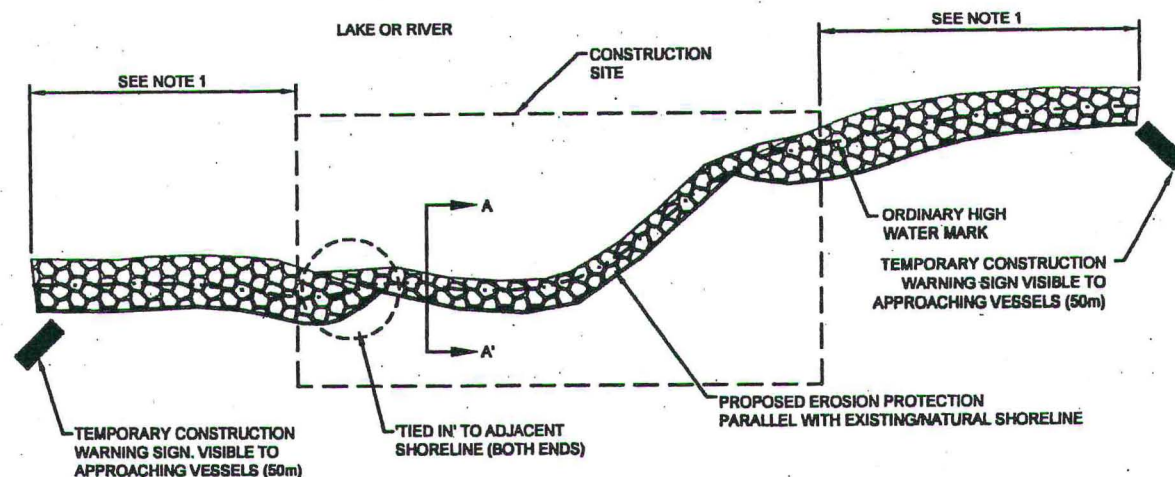
WIDTH OF WATERWAY	MINIMUM DISTANCE FROM CONSTRUCTION SITE
<10m	25m
10m-20m	50m
20m-50m	100m
>50m	200m

EROSION PROTECTION WORKS MEETING THE CRITERIA SHOWN HEREIN DO NOT REQUIRE REVIEW BY THE NAVIGABLE WATER PROTECTION PROGRAM UNDER THE TIER II PROCEDURE IF:

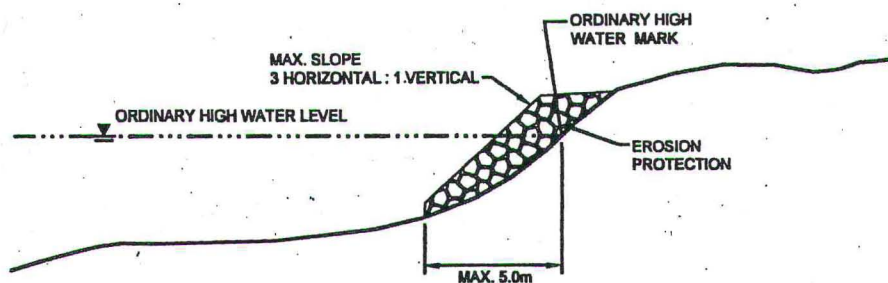
- CONSTRUCTED PARALLEL TO AND CONSISTENT WITH THE EXISTING OR NATURAL SHORELINE AND TIED INTO THE EXISTING SHORELINE; AND
- ALL TEMPORARY WORKS (BERMS, COFFERDAMS) ARE MARKED WITH YELLOW FLASHING LIGHTS FROM DUSK TO DAWN, OR DURING PERIODS OF RESTRICTED VISIBILITY;
- ANY SILT CURTAINS ARE MARKED WITH CAUTIONARY BUOYS IN COMPLIANCE WITH THE PRIVATE BOAT REGULATION (UNDER THE CANADA SHIPPING ACT), THE BUOYS ARE SPACED AT A MAXIMUM OF 30m APART AND ARE LIGHTED FROM DUSK TO DAWN, OR DURING PERIODS OF RESTRICTED VISIBILITY;
- ALL TEMPORARY WORKS (INCLUDING BUT NOT LIMITED TO SILT CURTAINS, SIGNS, COFFERDAMS) ARE COMPLETELY REMOVED UPON COMPLETION OF THE PROJECT;

ADDITIONALLY:

- USERS SHALL BE ALLOWED SAFE PASSAGE (ASSISTED IF NECESSARY) THROUGH THE CONSTRUCTION SITE;
- ANY BARGE OPERATIONS SHALL BE COMPLIANT WITH THE COLLISION REGULATIONS UNDER THE CANADA SHIPPING ACT);
- NO CONSTRUCTION OTHER THAN EROSION PROTECTION; AND
- NO IN-WATER FISH COMPENSATION WORKS REQUIRED.



PLAN
N.T.S.



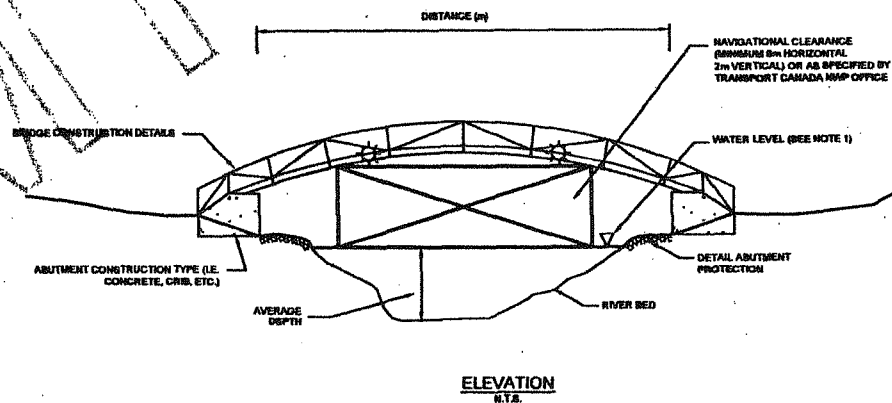
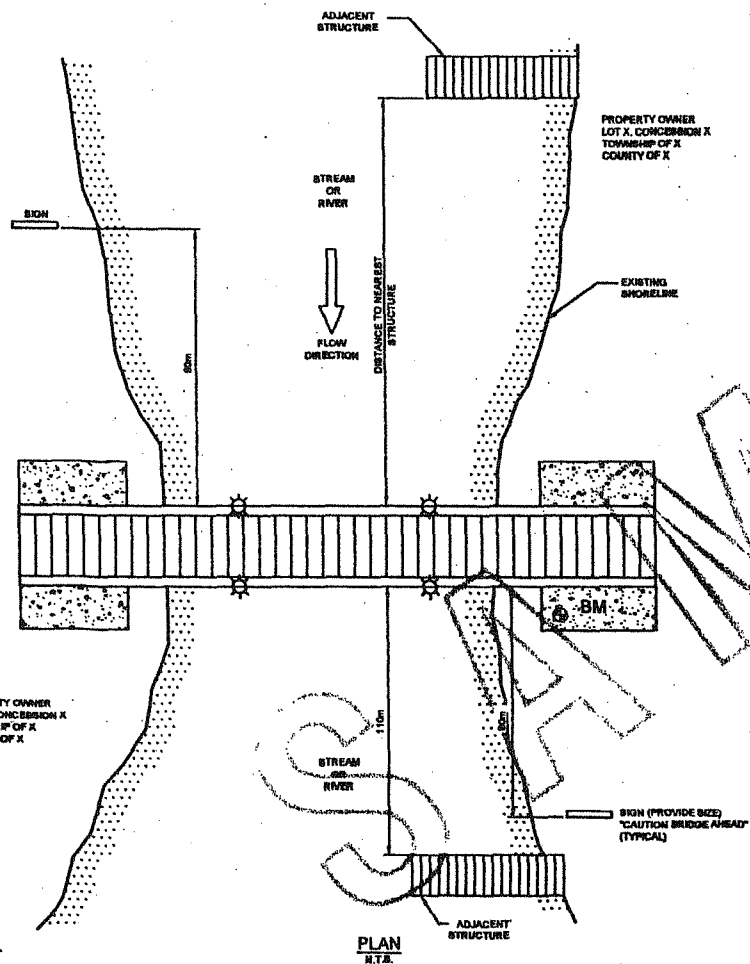
SECTION A-A'
N.T.S.



TRANSPORT CANADA
MARINE

TRANSPORTS CANADA
MARITIME

EROSION PROTECTION WORKS CHARTED AND UNCHARTED WATERS



NORTH

BM

BENCHMARK, ELEVATION 63.85m AMSL CUT CROSS TOP OF SOUTHEAST ABUTMENT, 0.5M FROM WEST AND SOUTH ABUTMENT EDGES (FOR OTHER REFERENCE).

NAVIGATION LIGHT/DAY BEACON AS MAY BE REQUIRED

NOTE:
1. PROVIDE ORDINARY HIGH WATER LEVEL OR Q2 WATER LEVEL, ALSO PROVIDE WATER LEVEL IN SUMMER.

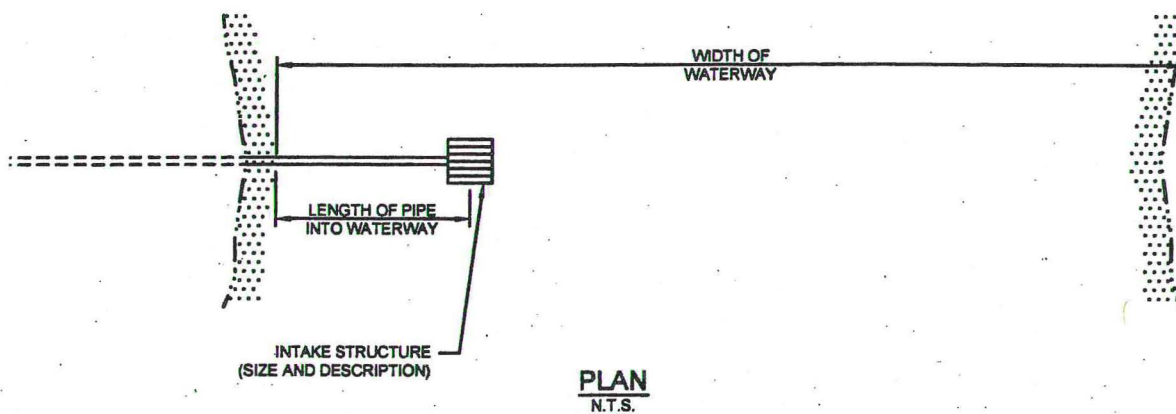
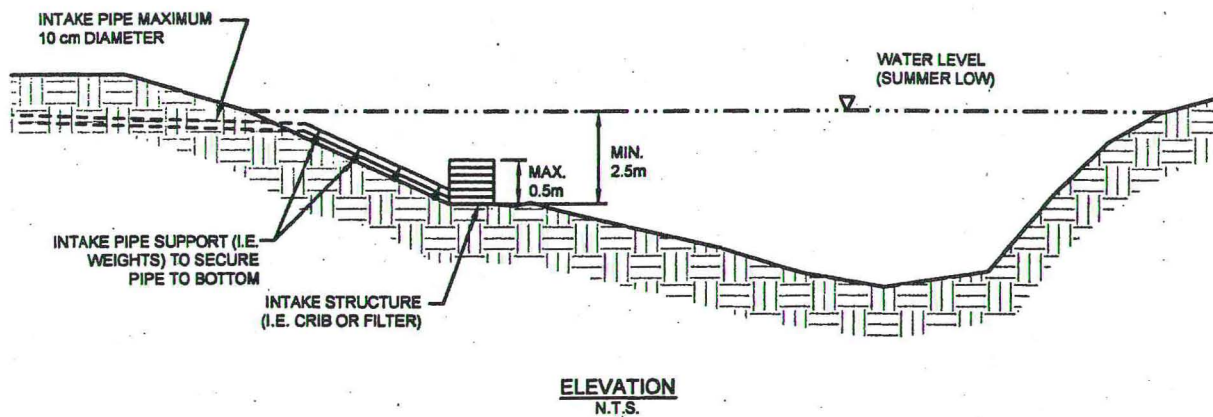
PROPOSED PEDESTRIAN BRIDGE

OWNER:

ADDRESS:

LATITUDE: D M S

LONGITUDE: D M S



WATER INTAKE PIPES MEETING THE CRITERIA PRESENTED HEREIN DO NOT REQUIRE REVIEW BY THE NAVIGABLE WATER PROTECTION PROGRAM UNDER THE TIER II PROCEDURE IF:

- THE WATER INTAKE PIPE IS NOT ASSOCIATED WITH A PROPOSED OR EXISTING WEIR OR DAM;
- CONSTRUCTION OF THE INTAKE PIPE DOES NOT REQUIRE TEMPORARY IN STREAM WORKS INCLUDING COFFERDAMS, BERMS, ROADS, ETC., AND
- NO INWATER FISH HABITAT COMPENSATION WORKS REQUIRED.



TRANSPORT CANADA
MARINE

TRANSPORTS CANADA
MARITIME

WATER INTAKE PIPE UNCHARTED WATERWAY



INTERNATIONAL NIAGARA BOARD OF CONTROL



Canadian Section

C. McLeod, Chair
R. Messervey
L. J. Falkiner, Secretary

United States Section

BG B. A. Berwick, Chair
C. G. Tjoumas, Member
J. W. Kangas, Secretary

December 10, 2006

Mr. Eugene Chajka, P.Eng.
Hatch Mott MacDonald
4342 Queen Street
P.O. Box 1001
Niagara Falls, ON
L2E 6W1

**Re: Class Environmental Assessment Study
Niagara Falls Water Treatment Plant Intake Relocation
Notice of Commencement**

Dear Mr. Chajka:

Thank you for your letter of December 8, 2006 regarding this project and the invitation to provide comments.

The operation of the International Niagara Control Works and the regulation of the water levels in the Chippawa-Grass Island Pool (Pool) come under the mandate of International Joint Commission's International Niagara Board of Control.

It appears that the intake alternatives under consideration and the withdrawal of water for this purpose will not effect the operation of the Control Works and the regulation of the Pool or have a trans-boundary impact on water levels. However, there may be issues with the Power Entities, Ontario Power Generation and the New York Power Authority, with this project as it could impact their operations both during and after construction with regard to safety and ice transport particularly in the vicinity of hydropower intakes. I suggest Ms. Joan Frain of Ontario Power Generation as a first point of contact with the Niagara Region in this regard.

Sincerely,

Len J. Falkiner
Secretary, Canadian Section
International Niagara Board of Control

Cc: Dr. Murray Clamen, International Joint Commission, Ottawa
Mr. Carr McLeod, Canadian Chair International Niagara Board of Control
Mr. Rob Messervey, Canadian Member International Niagara Board of Control
Mr. John W. Kangas, U.S. Secretary International Niagara Board of Control



Hatch Mott
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February 1, 2007
230179.08.01

Ms. Pam Wheaton
Director, Policy and Relationships Branch
Ontario Secretariat for Aboriginal Affairs
720 Bay St., 4th Floor
Toronto, ON M5G 2K1

**Re: Class Environmental Assessment Study
Niagara Falls Water Treatment Plant Intake Relocation**

Dear Ms. Wheaton:

Please find attached a copy of a letter that was previously sent out to agencies and stakeholders, advising of the commencement of the Environmental Assessment Study for the Niagara Falls Water Treatment Plant Intake Relocation project in Niagara Falls, Ontario.

We have been advised by the Ministry of the Environment to also circulate this letter to you to obtain any comments or concerns that you may have concerning this project.

If you have initial comments or concerns, please respond in writing prior to February 14, 2007 for inclusion in the Public Open House. All comments will become part of the public record. If you would like to discuss this project, please contact me at 905-357-6971.

Your participation in this study is appreciated.

Sincerely,

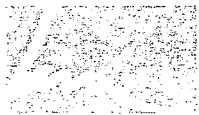
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Eugene Chajka, P.Eng.
Project Manager
T 905.357.6971 F 905.357.6977
eugene.chajka@hatchmott.com

EC:eam

Encl. - Agency Contact Letter (with attachments)



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February 1, 2007
230144.08.01

Ms. Pam Wheaton
Director, Policy and Relationships Branch
Ontario Secretariat for Aboriginal Affairs
720 Bay St., 4th Floor
Toronto, ON M5G 2K1

**Re: Class Environmental Assessment Study
Niagara Falls Water Treatment Plant Intake Relocation
Notice of Commencement**

Dr. Ms. Wheaton:

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You are invited to provide comments on this study.

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Sincerely,

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Eugene Chajka, P.Eng.
Project Manager
T 905.357.6971 F 905.357.6977
eugene.chajka@hatchmott.com

EC:eam

Encl. - Notice of Commencement
Intake Alternatives Diagram

NIAGARA REGION
PUBLIC WORKS DEPARTMENT
CLASS ENVIRONMENTAL ASSESSMENT STUDY

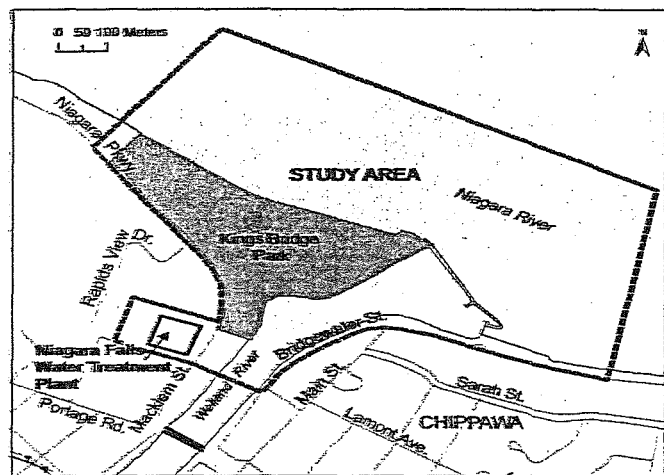
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NIAGARA FALLS WATER TREATMENT PLANT
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Phone: 905 685-4225, ext. 3740
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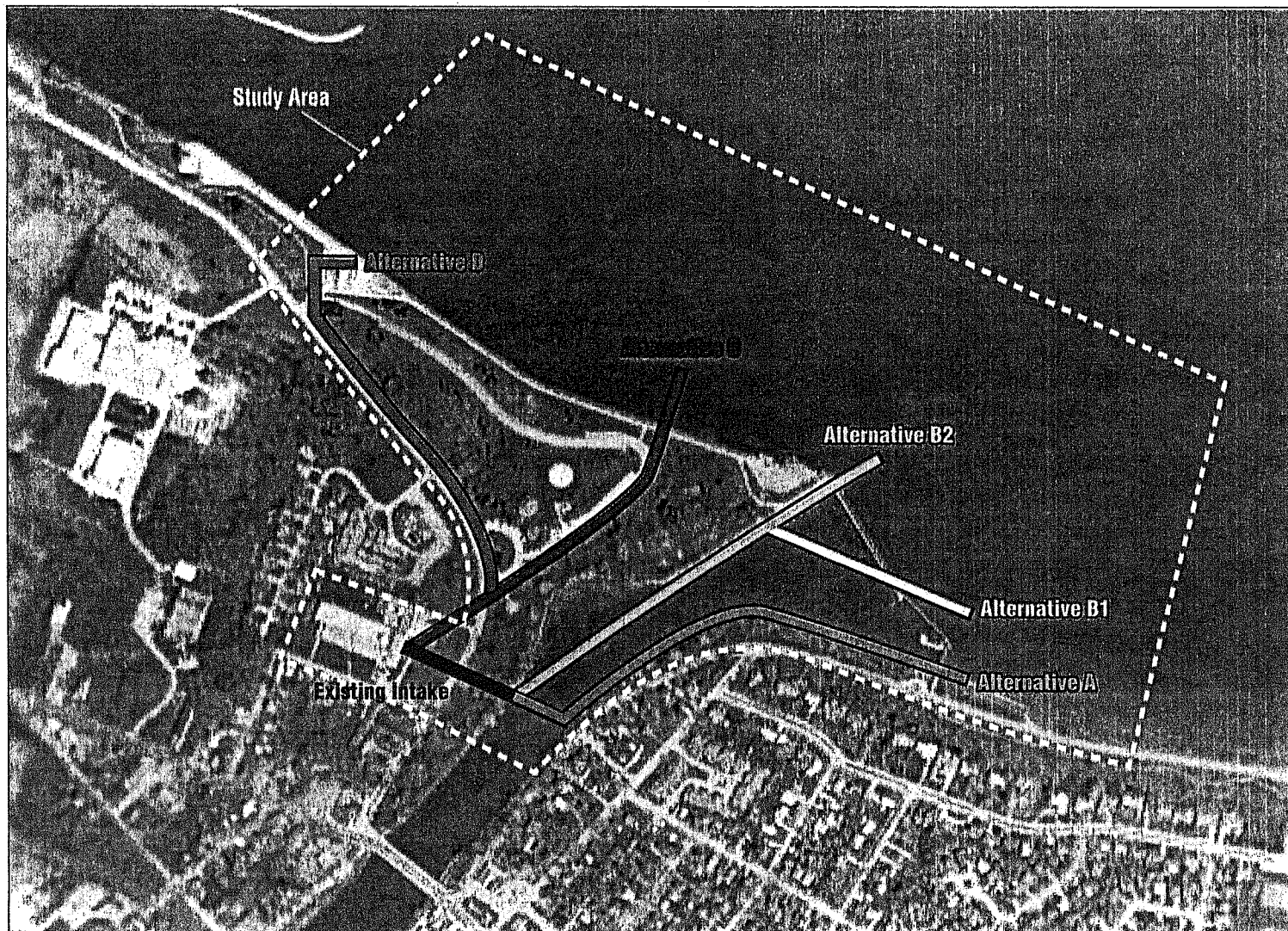


Figure 1
 Niagara Falls WTP Intake Relocation
Intake Alternatives



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February 1, 2007
230179.08.01

Mr. Grant Wedge, Council
Crown Law Office – Civil
Ministry of the Attorney General
720 Bay Street, 8th Floor
Toronto, Ontario
M5G 2K1

**Re: Class Environmental Assessment Study
Niagara Falls Water Treatment Plant Intake Relocation**

Dear Mr. Wedge:

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Encl. – Notice of Commencement Letter (with attachments)



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Project Manager

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Encl. - Notice of Commencement
Intake Alternatives Diagram

NIAGARA REGION
PUBLIC WORKS DEPARTMENT
CLASS ENVIRONMENTAL ASSESSMENT STUDY

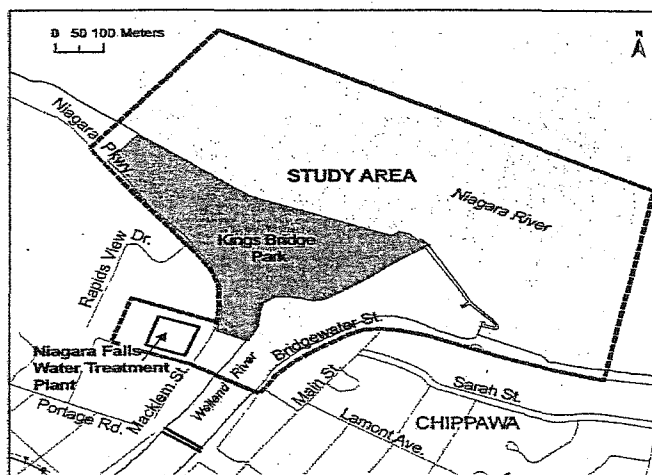
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CITY OF NIAGARA FALLS

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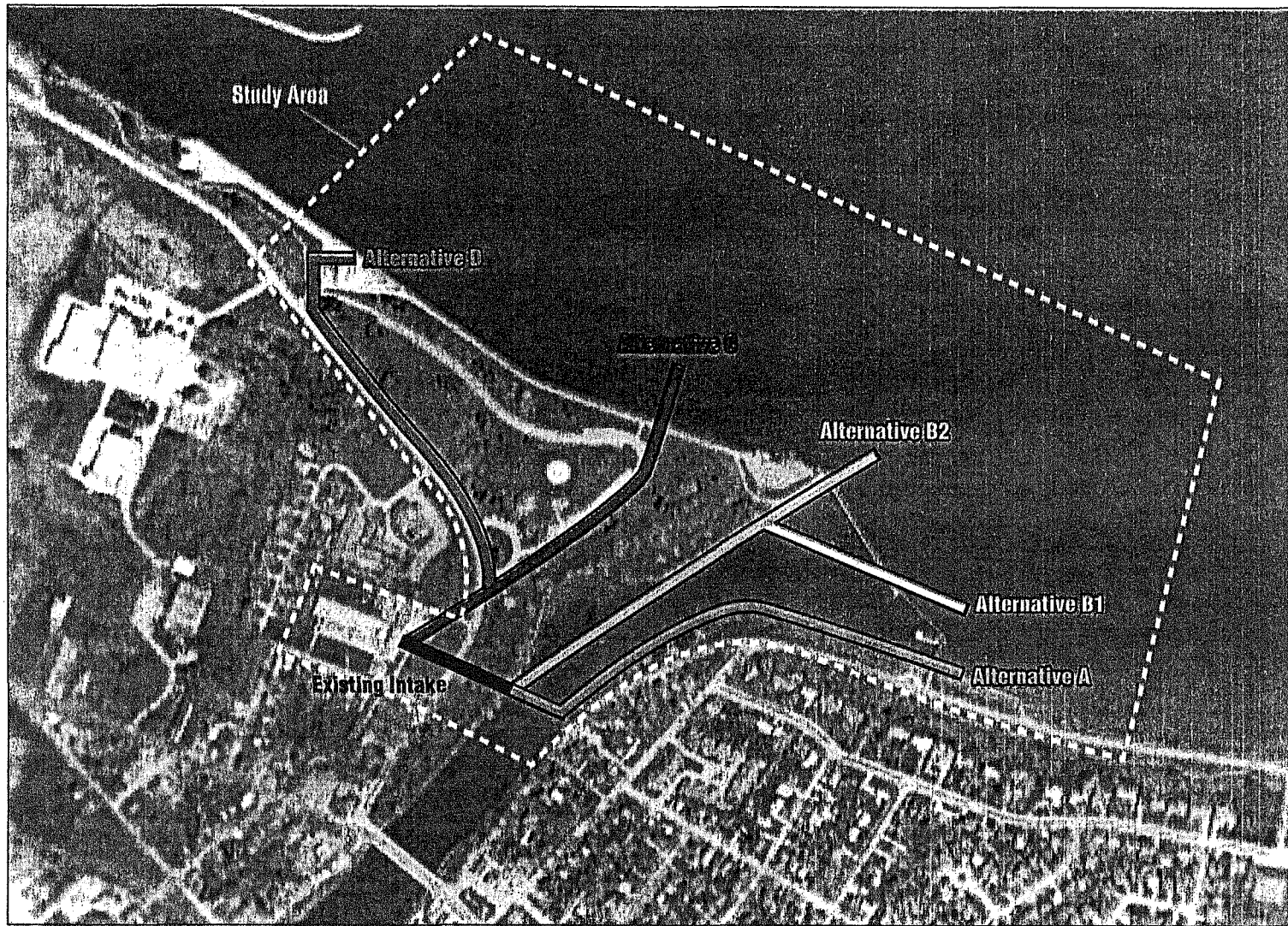


Figure 1
Niagara Falls WTP Intake Relocation
Intake Alternatives



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February 1, 2007

230179.08.01

Mr. Don Boswell
Senior Claims Analyst, Specific Claims Branch
Department of Indian and Northern Affairs
10 Wellington St., Room 1310
Gatineau, QC
K1A 0H4

**Re: Class Environmental Assessment Study
Niagara Falls Water Treatment Plant Intake Relocation**

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Encl. – Notice of Commencement Letter (with attachments)

February 1, 2007
230144.08.01

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Project Manager

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Encl. - Notice of Commencement
Intake Alternatives Diagram

NIAGARA REGION
PUBLIC WORKS DEPARTMENT
CLASS ENVIRONMENTAL ASSESSMENT STUDY

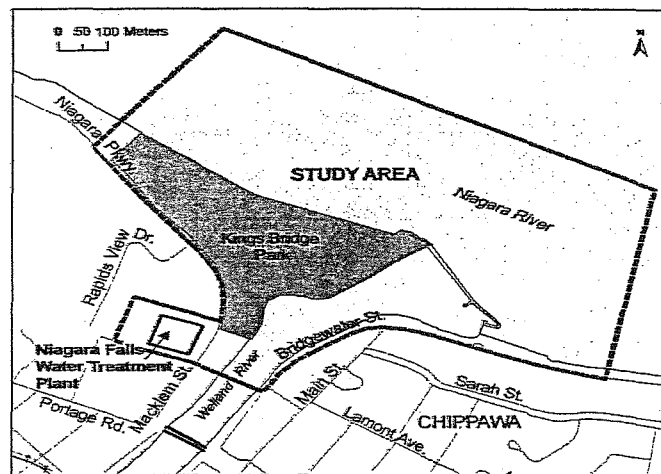
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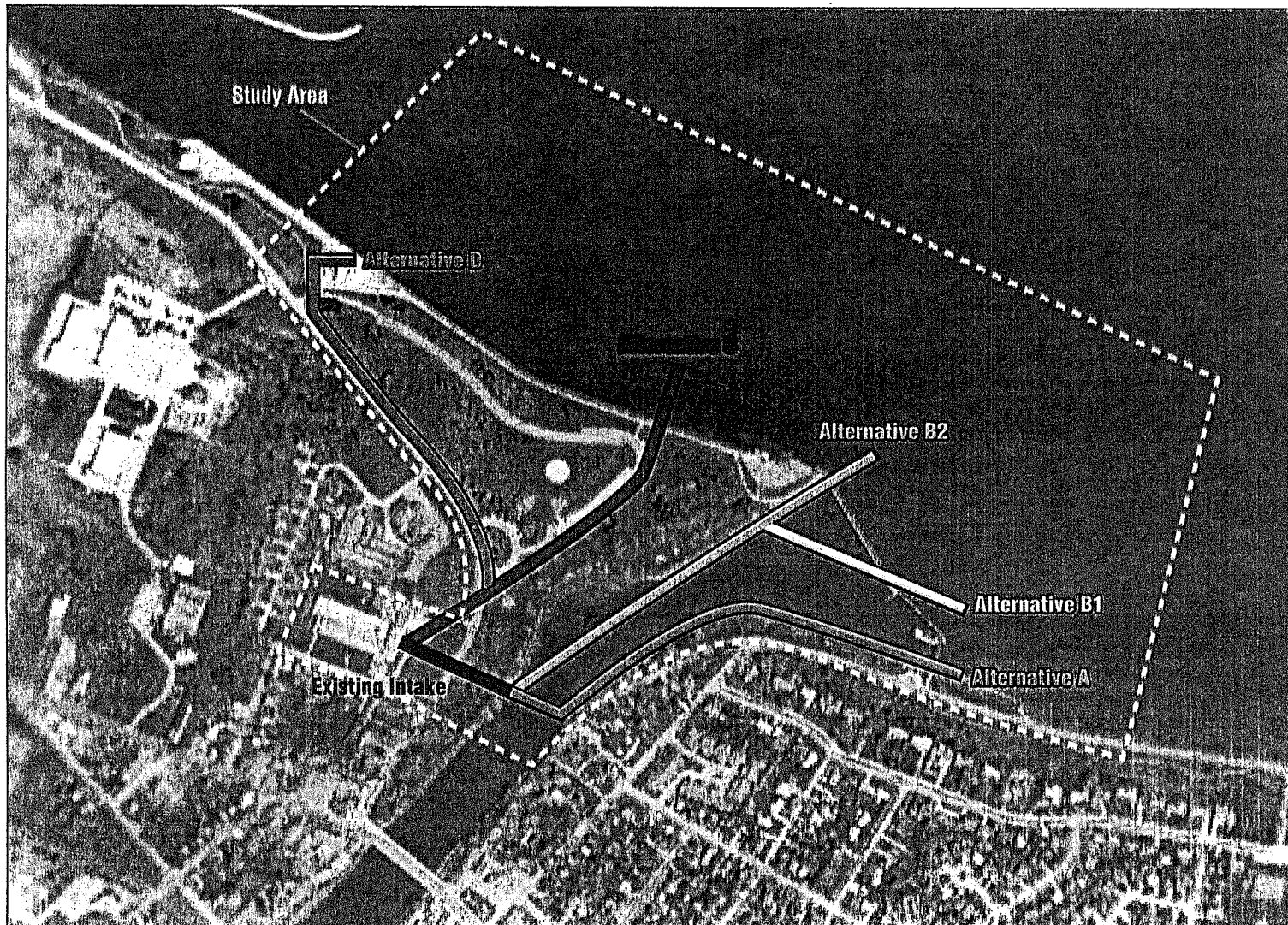


Figure 1
 Niagara Falls WTP Intake Relocation
Intake Alternatives



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February 1, 2007
230179.08.01

Mr. Franklin Roy
Director, Litigation Management and
Resolution Branch
Department of Indian and Northern Affairs
10 Wellington Street
Gatineau, QC
K1A 0H4

**Re: Class Environmental Assessment Study
Niagara Falls Water Treatment Plant Intake Relocation**

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Encl. - Notice of Commencement
Intake Alternatives Diagram

NIAGARA REGION
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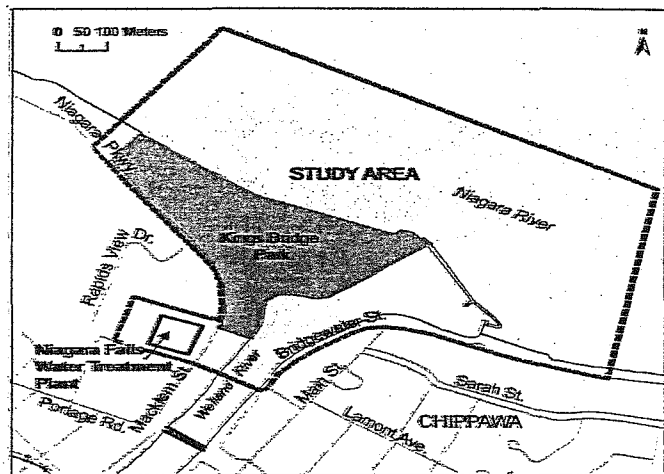
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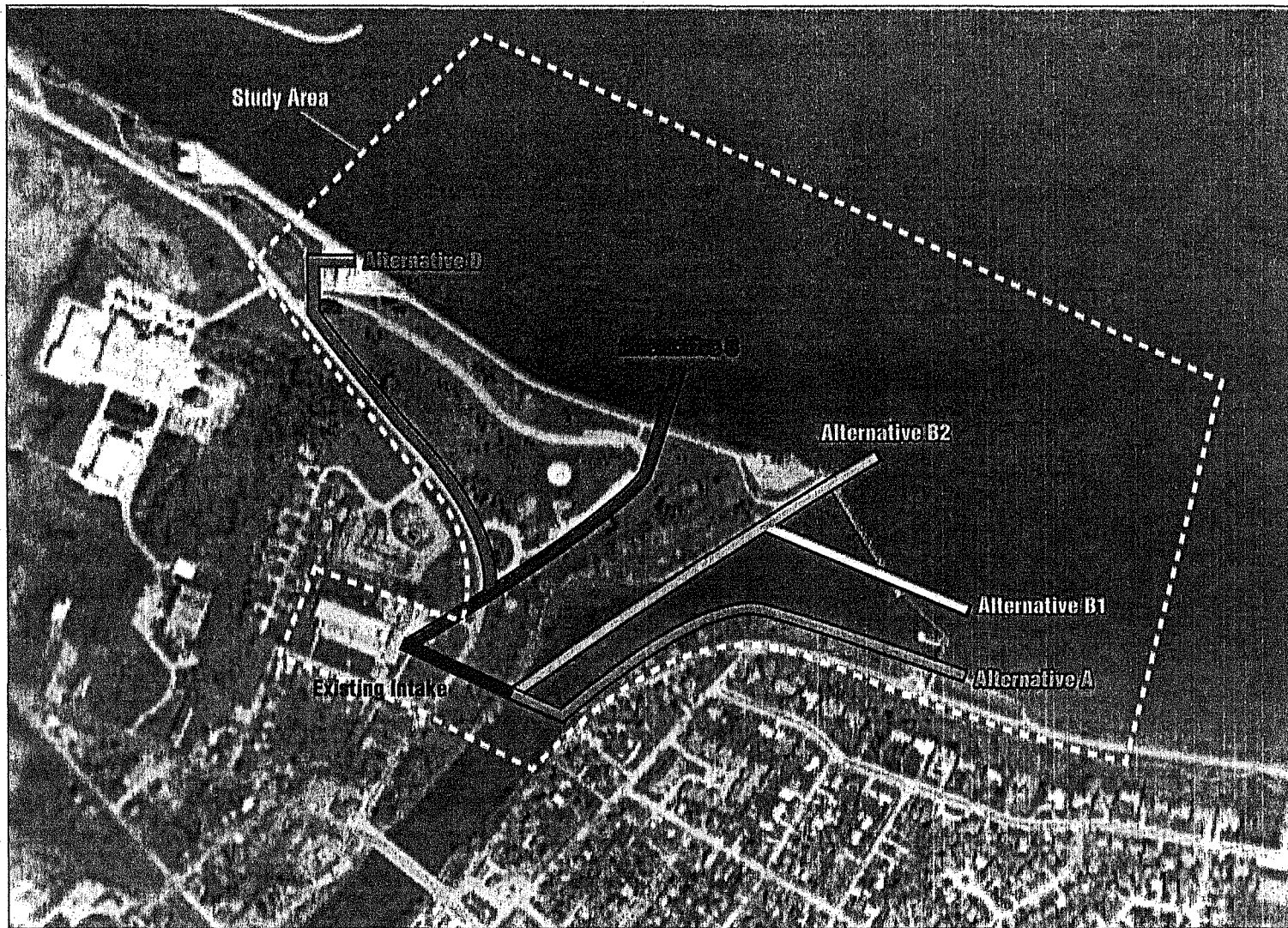


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Comprehensive Claims Branch
Department of Indian and Northern Affairs
10 Wellington Street, Room 1310
Gatineau, QC
K1A 0H4

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The Region is currently considering four alternative intake locations (see attached diagram), which will be reviewed against any resulting impacts using evaluation criteria established as part of the environmental assessment process with Region staff, and a preferred solution will be chosen. The study team is interested in receiving your comments as a potential stakeholder to the study. The project is planned to be constructed prior to the completion of the third OPG power tunnel.

A Public Open House will take place to obtain public input in the planning process. You will be notified of the date and time for this Public Open House. The information gathered from the study, from agencies and from the Public Open House will assist us in selecting the preferred location.

If you have initial comments or concerns, please respond in writing prior to December 21, 2006, for inclusion in the Public Open House. The Schedule 'C' Project File will be issued and Notice of Completion circulated upon the conclusion of the study. All comments will become part of the public record. If you would like to discuss this project, please contact me at 905-357-6971.



Hatch Mott
MacDonald

Your participation in this study is appreciated.

Sincerely,

Hatch Mott MacDonald

A handwritten signature in black ink, appearing to read 'E. Chajka'.

Eugene Chajka, P.Eng.
Project Manager
T 905.357.6971 F 905.357.6977
eugene.chajka@hatchmott.com

EC:eam

Encl. - Notice of Commencement
Intake Alternatives Diagram

NIAGARA REGION
PUBLIC WORKS DEPARTMENT
CLASS ENVIRONMENTAL ASSESSMENT STUDY

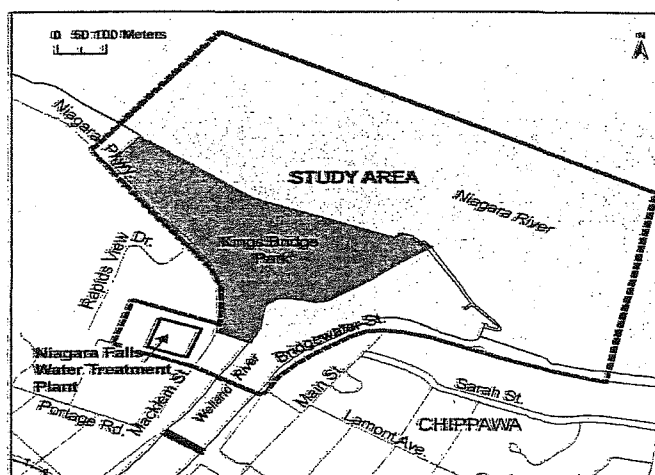
INTAKE RELOCATION
NIAGARA FALLS WATER TREATMENT PLANT
CITY OF NIAGARA FALLS

NOTICE OF COMMENCEMENT

The Regional Municipality of Niagara plans to relocate the Niagara Falls Water Treatment Plant Intake currently located on the north bank of the Welland River (Chippawa Creek); approximately 500m west of the confluence with the Niagara River.

The map located to the right shows the proposed study area for the intake relocation:

The Region is planning this relocation to provide reliable, high quality and consistent raw water from the Niagara River, upon the potential shut down of the Ontario Power Generation (OPG) power canal for maintenance purposes. The project is being planned in accordance with the requirements for Schedule 'C' of the Municipal Class Environmental Assessment.



You are invited to provide comments and add your name to our mailing list for this study.

A Public Open House will be held early in 2007, to present the recommended location of the Water Treatment Plant Intake. The Public Open House will give you a chance to meet the project team, discuss the study objectives and provide your comments on the recommended location plans.

Regional staff and the consultants are interested in receiving your comments on the study. All comments will become part of the public record. If you would like further information, please contact one of the following members of the project team:

Mr. Robin Young, B. Eng., C. Chem
Project Manager
Public Works Department
Water and Wastewater Services Division
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Thorold, ON L2V 4T7
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Mr. Eugene Chajka, P. Eng.
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4342 Queen Street
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Phone: 905 357-6971
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Email: Eugene.chajka@hatchmott.com



NOTE:
AS PER
McELHANNNEY
GEOSURVEYS LTD.
datum = NAD83

MAR 14 2007

*Danielle
please record to file*

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Suite 321
Niagara Falls, Ontario
L2G 7K3

Tel 905-295-7699
Fax 905-295-3242
e-mail CDOA@sympatico.ca



March 5, 2007

Robin Young, B.Chem, C.Chem
Project Manager, W & WW Engineering
Niagara Region Public Works
Environmental Centre
3501 Schmon Parkway
Thorold, Ontario
L2V 4T7

Mr. Young;

Per/ Niagara Falls Water Treatment Plant Intake Relocation and our conversation the evening of February 28, 2007 at the Public Information Centre

I have included the contents of the original article on 'dumping' into the Niagara River and Chippawa Creek by John Robbins from The Review Jan. 20/07. I have also included a brief on CSO (combined sewer overflows) associated with the CPS (Central Pumping Station) bypass occurrences. I must admit I was non-plussed when you said that you were unaware of these occurrences as it appears to have been co-authored by City of Niagara Falls and Niagara Region staff. I should think dumping of raw sewage upstream of the proposed intakes would be central to any evaluation, alternative design and EA.

The alternatives posed in your Relocation program may provide protection against the 'plume' from the reversal of the Welland River during the work on the Hydro Canal, but I seriously doubt it provides protection from the CSO events.

Yours truly,

Jay Mason, Chairman



The City of Niagara Falls discharged sewage into the upper Niagara River, a little more than a kilometre upstream of the intake to the city's water treatment plant, from this storm culvert in heavy rains in December

More than 11 million litres of sewage was dumped into city waterways during a heavy rainstorm last month, in an "emergency" effort by city crews to prevent basement flooding - a volume that's roughly equivalent to 1.8 million flushes of a household toilet.

City records show more than 4.5 million litres of the sewage flowed into the Niagara River - a little more than one kilometre upstream of the intake pipe for the city's water treatment plant.

"It isn't anything the municipality relishes doing, but it's essential to keeping the sewage out of the basements of homeowners," said Mayor Ted Salci.

"It's done as an emergency measure."

In the wake of a powerful storm that drenched Niagara on Dec. 1, The Review requested the city's records of emergency pumping incidents.

They show the city pumped sewage - essentially storm water tainted with human and household waste and chemicals - from the sanitary sewer system at four spots, including three in Chippawa and one on the city's west side.

In Chippawa, sewage was pumped out of sanitary sewers on Sarah Street and Cattell Drive into a storm drainage ditch that runs into the upper Niagara River, and from a location on Front Street directly into the Welland River (Chippawa Creek).

Sewage pumped out of sanitary sewers at Lexington Court was dumped into the city's storm-drainage system, which flows into Beaverdams Creek.

City records also document five other occasions since July 2004 when wet weather conditions forced the city to discharge sewage to the environment.

Sewage dumping, sometimes referred to as treatment plant bypass events, has been happening in Chippawa since the 1990s said Ed Dujlovic, the city's municipal works director.

Prior to July 2004, the dates, locations and volume of sewage discharged weren't always recorded, he said.

Dujlovic said the city reports incidents of sewage dumping to the Ontario Ministry of the Environment, as required by provincial legislation.

City public works crews add chlorine tablets similar to the type used to disinfect swimming pools to sewage from the Chippawa sewer system before it's discharged, in an effort to kill bacteria, viruses and parasites.

However, after that the city doesn't test the effluent to gauge how effective this disinfection procedure is, and is not required to under provincial law.

In the case of sewage pumped from sewers at Lexington Court, no attempts at disinfection are made prior to its release, according to the city's records.

Unlike combined sewers - which carry sewage and storm water in the same pipe - the sewers in Chippawa and the Lexington Court neighbourhood are separated. Waste from residences should, by design, be transported directly to the regional waste-water treatment plant. However, during particularly heavy rains stormwater infiltrating the sanitary sewer pipes overwhelms the system.

Dujlovic said the problem is caused by the large number of homes that have weeping tiles, which drain water away from a building's foundation, that are connected to sanitary sewers instead of storm drains.

If steps aren't taken to lower the volume in the sanitary sewers during periods of rapid storm water infiltration, pressure in the pipes can cause sewage to back up in basements.

Even with emergency pumping, basement backups can occur.

During the Dec. 1 storm, one of the portable pumps in Chippawa experienced a mechanical failure and some basement flooding occurred. The city is investigating a number of complaints of basement flooding from the storm, Dujlovic said.

Jason Oatley, Regional Niagara's manager of water and waste water services, said the region is aware of the locations where the city discharges, including the site upstream of the water treatment plant intake pipe.

The upstream site is just outside of the treatment plant's one-kilometre "intake protection zone."

He said the city's practice of discharging sewage upstream of the water intake "is relatively low risk," and under normal circumstances wouldn't require the plant's operators to shut off the intake as would

happen in the case of a chemical spill.

During the past several years, the Niagara Falls water treatment plant has received more than \$16-million worth of upgrades, including the addition of an ultraviolet light disinfection process aimed at making it even less likely organic pathogens can get through the disinfection process.

Oatley said water coming out of the plant is safe and meets government water quality standards, as demonstrated by mandatory testing.

"It (the Niagara Falls plant) has always been a good-performing plant based on lab results we've taken," Oatley said.

Recent legislative changes, including the passage of the Ontario Clean Water Act last fall, mean the region is taking a closer look at sources of surface water contamination, particularly in the areas surrounding intake pipes, Oatley said. Such a study already underway could see the intake protection zone in Niagara Falls extended.

Rich Vickers, supervisor of the Ontario Ministry of the Environment's Niagara office, said the ministry is aware of the city's practice of dumping sewage during storms.

It's not something the ministry likes to see happen, he said, but it realizes it's necessary to prevent sewage backups in basements - which are also a health hazard.

He said Niagara Falls is in the midst of updating its pollution control plan, and the ministry will want to see the city is taking steps to reduce discharges as much as possible and is addressing source-protection issues.

Asked if the ministry is concerned about discharging sewage upstream of the water treatment plant's intake pipe, Vickers said:

"Certainly the ministry has a concern about it, and if we saw that there was a large amount of sewage discharging which may impact the drinking water intake, the region would be notified and we would look at other avenues the ministry should explore to require (sewage pumping there) to be stopped.

"Having said that, there's a number of checks and balances within the actual (water treatment) plant itself and in addition to that the ministry regularly inspects it."

Dr. Uwe Brand, a professor of earth sciences at Brock University, said municipalities can't afford to put off dealing with the root problems that force them to discharge sewage into waterways.

Brand, who has studied local water quality issues with his students for more than a decade, said the approach that "dilution is the solution" is outdated thinking.

While water treatment plant processes have improved, dumping sewage into the same bodies of water that drinking supplies are taken from "simply doesn't make sense," said Brand.

"By polluting it, you just have to work harder to treat it. To me, as a scientist, it makes more sense to keep it clean in the first place."

He said municipal sewage discharges across the province are partly responsible for beach closures during the summer, and eventually take a toll on the lakes, rivers and streams because of chemical and nutrient contamination.

Salci said the city and region are spending millions on the separation of combined sewers, which by their design allow sewage to overflow into the environment during wet weather. Dealing with the problem of stormwater infiltration into separated sewer systems in Chippawa and the Lexington Court area will require the city to develop a program to entice, or compel, homeowners to remove illegal connections to the sanitary sewers.

Such connections - which were allowed in the past - are to blame, and not the sewers, he said.

"Many people fail to understand that usually the sanitary system works well," said Salci.

"If everybody flushed their toilets at the same time, the sanitary sewers would still work. The problem occurs when the rain gets picked up around the perimeter of a home."

jrobbins@nfreview.com

How much is 11 million litres?

- It's roughly equivalent to 1.8 million flushes of an average household toilet, based on six litres per flush;

- It's enough to fill 4,4 Olympic-sized swimming pools;

- It would cover an Olympic-sized hockey rink to a depth of 6.1 metres (20 feet).

COREY LAROCQUE

The Review - Local News - Wednesday, January 24, 2007

Pumping raw sewage - including untreated human waste - into the Niagara River after heavy rainstorms has been going on for years. And city council members have known about it all along, according to staff reports politicians have approved.

"We owe the residents an apology. We should have known," said Coun. Carolyn Ioannoni, reacting to a Review story about sewage discharged into the rivers.

Some politicians said this week they weren't aware of the practice until Saturday's story. But official reports show they have been informed when it has happened and politicians have even approved a \$10-million project aimed at alleviating much of the problem.

Mayor Ted Salci said he has known for years about the practice, though he doesn't like that it has to be done. Most other communities have to do the same thing when their sewage treatment plants are overwhelmed. Halifax and Vancouver discharge raw sewage into the oceans. Beaches on Lake Ontario, including those in St. Catharines, are sometimes closed due to high bacteria counts after summer storms, he said.

"Obviously, when you pump from a sanitary to a storm sewer it goes to the outfalls," Salci said Tuesday.

"That's why I have been harping on infrastructure," said the mayor, who made sewer replacement a campaign issue in 2003 and 2006.

He said he was surprised when other politicians said they weren't aware it was going on.

"I don't know what they don't know," he said.

Niagara Falls pumped 11 million litres of sanitary sewage into the Niagara River, Welland River and a creek on the city's west side, following a major storm Dec. 1, last year. It was a combination of sanitary sewage and water from areas where rainwater gets into the sewers intended to take human waste to treatment plants.

There were five other similar incidents since July 2004.

When sewers get backed up, the immediate risk is it will cause basement flooding. To relieve the pressure on the sanitary sewers, city workers pump the sewage into storm sewers, which empty directly into the rivers.

When The Review reported several examples of the ongoing problem, several councillors said they knew sanitary sewage was a problem during storms over the years, but politicians have focused their attention on helping homeowners who have had sewage flood their basements.

"Nobody thought to ask the followup question, further down the line, where does the storm sewer go?" Coun. Janice Wing said.

Pumping sewage from a sanitary sewer into a storm sewer is the "lesser of two evils," municipal works director Ed Dujlovic told council Monday. Ontario's environment ministry and public health departments agree it's better to pump sewage into waterways than to have it back up in basements, Dujlovic said.

There have been numerous reports over the years that have referred to the practice of emergency pumping, he said.

But the reports often use technical language. For example, a Sept. 19, 2005 report described the city's response to a heavy rainstorm, Aug. 31. Pump crews were sent to the Kalar Road area "to provide relief to the sanitary sewers..."

"Pump crews relieved the sanitary sewer in the Lexington Court area by pumping excess sanitary sewer flow to the local storm sewer."

A Jan. 23, 2006 report about splitting the \$20-million cost for a new treatment facility with regional council also mentions the practice. The report referred to 425,000 cubic metres of combined sewer overflow "being discharged on an annual basis to the Niagara River."

Staff reports have hindered politicians' understanding of the situation, said Wing.

"If they had phrased it differently, we would have caught it. We didn't catch the full implications of it. They could have spelled it out differently," Wing said.

Part of the municipal works department's response will be a report for council that explains the terminology, history and function of the city's sewer system.

"Let's call it Sewer 101," Dujlovic said. "They may simply have not understood some of the terminology."

Satellite treatment technology helps Niagara Falls to meet Ontario's F-5-5 CSO requirement

By Geoff Burn, Derek Blakemore, David Watt and Peter Baker

Ontario's Niagara Falls is famous as a tourist destination to view one of the "Seven Wonders of the Modern World" and with the construction of a world class casino and several new highrises and first class hotels, the downtown tourist district is experiencing rapid growth and revitalization. Besides tourism, the city also has a diverse economic base that includes manufacturing, professional services, construction, transportation, sport and recreation, and entertainment.

The downtown development is being serviced by infrastructure with some sections installed at the turn of the 20th century; much of this provides combined drainage for sanitary wastewater and stormwater. There is a system of four pumping stations that collect the flows from the downtown core with all the flows converging at the Central Pump Station, which conveys wastewater to the local treatment plant. Combined sewer overflows (CSO) associated with the Central Pump Station represent a significant portion of the city-wide annual volume, with peak instantaneous flows as high as 8,000 L/s. Historically, raw sewage overflows occur during moderate-to-significant rainfall events, with approximately 30 overflow events annually to the Niagara River.

The Niagara River is one of ten *Areas of Concern* as designated by the Great Lakes Water Quality Agreement between Canada and the United States. Reduction of CSOs into the Niagara River has been identified as one of the projects to improve its water

quality.

The Ontario Ministry of the Environment (MOE), through the application of Procedure F-5-5, will require the City of Niagara Falls and the Regional Municipality of Niagara to meet the following criteria for combined sewer systems:

- Capture and treat all dry-weather flow plus 90% of the wet-weather flow volume for an average year, during the 7-month wet-weather period commencing within 15 days of April 1.
- 30% BOD5 removal for the 7-month wet-weather period.
- 50% Total Suspended Solids (TSS) removal for the 7-month wet-weather period.
- TSS concentrations should not exceed 90 mg/L for more than 50% of the time for an average year.

The City of Niagara Falls and the Regional Municipality of Niagara embarked on a project that will result in one of the first CSO abatement facilities in Ontario to meet the Procedure F-5-5 criteria.

A Municipal Class Environmental Assessment established that the preferred solution was to implement a system-wide CSO control project that includes a new Central Pump Station (CPS) and a CSO High Rate Treatment Facility (HRTF). This will provide greater than 90% volumetric control of wet-weather flow so that only flows in excess of the combined capacity of CPS and HRTF will bypass the new pumping and treatment facilities.

The preliminary design phase included an evaluation component to select the preferred high rate CSO treatment process. After reviewing a comprehensive list of treatment options, four technologies were evaluated in detail: Vortex Separation, High Rate Screening/Filtration, High Rate Sedimentation, and Retention Treatment Basins. Conceptual designs were developed for each alternative in order to allow comparative evaluation with respect to effectiveness to achieve the required MOE F-5-5 treatment levels, facility sizing or footprint, reliability, complexity of operations and ability to be upgraded or expanded.

Table 1 - Summary of Comparative Evaluation							
Technology	Ability to Meet Procedure F-5-5		Footprint	Reliability	Complexity	Ability to Upgrade	Cost
	Mass Removal	90 mg/l TSS					
Vortex Separation	Moderate	No	Small	High	Low	Moderately Difficult	Low
HR Screening/Filtration	High	Yes	Moderate	Moderate	High	N.A.	High
HR Sedimentation	High	Yes	Small	Moderate	High	N.A.	Low
Retention Treatment Basins	Moderate	No	Moderate	High	Moderate	Moderately Difficult	Moderately Low

The comparative evaluation of the five technologies considered is summarized in Table 1. Based on performance, coupled with relative costs and footprint considerations, High Rate Screening/Filtration, Retention Treatment Basins and Storage are not suited to this HRTF Project. The two technologies that appear most suitable are Vortex Separation and High Rate Sedimentation. Both processes are relatively low in cost and have small footprints. The former is less complex to operate but may not meet the 90 mg/L TSS limit without future enhancements. The latter is more complex to operate, but is able to meet the 90 mg/L TSS limit.

When considering these competing factors, Vortex Separation is the preferred technology for the following reasons. First, it is the least complicated technology and likely to be among the lowest in overall costs. Secondly, it is amenable to enhancements with either chemical addition and/or filtration, should the need arise.

High-Rate Sedimentation is also likely to be cost-competitive and will not require future enhancement. However, when taking into account the complexity of its operation, and the need for chemical deliveries, storage and feed operations, the technology is less attractive than Vortex Separation.

Since each vortex technology is slightly different it was decided that the vortex equipment should be preselected. Request for quotation documents were prepared for the vortex equipment for the Central HRTF. Two suppliers were invited to prepare submittals for this equipment. The submittals were evaluated on both quality factors and cost factors. The quality factors include compliance with the technical specifications and the quality of references. Based on an evaluation of the submittals, John Meunier, Inc.'s FluidSep® was the preferred vortex technology for the Central HRTF.

A value engineering team consisting of industry experts further scrutinized the recommended treatment option. Vortex treatment technology was ultimately recommended and accepted by the City and the Region due to the favourable life cycle cost and ease of operation.

The preliminary design proceeded based on the use of two 13-metre diameter vortex units, each to treat a design flow of 1,000 L/s and a peak flow of 2,000 L/s. A second value engineering session confirmed the proposed preliminary design, and led to several enhancements to the project, which resulted in additional cost savings.

Currently in the detailed design stage there are a number of interesting features that have been incorporated into the project. Under normal dry weather conditions the flow will pass directly through to the Central Pump Station where the sewage will be pumped to the Stanley Avenue Wastewater Treatment Plant. During a CSO event, as the incoming flow exceeds the capacity of the CPS then the excess flow will begin to pass up through two mechanically cleaned COPA horizontal storm screens with 6-mm openings. These screens are each designed for 4,000 L/s and used for control of floatables in the wet weather flow prior to entering into the high rate vortex treatment system. As long as the COPA screens are operating there will be no bypassing of the HRTF. The treated overflow from the Central HRTF and any bypass flows will be discharged to the Niagara River.

While the vortex units have been designed for a peak flow of 4,000 L/s, hydraulically the vortex system can pass 8,000 L/s, but at a reduced treatment level. The 100 L/s underflow from each vortex unit is collected in a separate wet well and submersible grit pumps transport the slurry to the CPS. The capacity of the CPS was increased to account for this underflow.

The detailed design is nearing completion and there is a plan to call tenders in the summer of 2005. It is estimated that construction will be completed in fall of 2006.

Associated Engineering lead the preliminary and detailed design of the Central Pump Station and CSO HRT facility. Other consultants contributing to the project include Brown & Caldwell, XCG Consultants, Acres International and Questor Veritas.

*Geoff Burn, P.Eng., is Manager Civil Infrastructure Systems Group,
Derek Blakemore, P.Eng., is Detailed Design Lead with Associated Engineering.
David Watt, CET, is with the City of Niagara Falls and
Peter Baker, P. Eng. is with the Regional Municipality of Niagara.
Contact: steelp@ae.ca.*

Follow-up Letter to Notice of Commencement Sent to the Following Agencies and Neighbors on March 6, 2007

D'Amario, Tony Director, Water Management	Niagara Peninsula Conservation Authority 250 Thorold Road West 3rd Floor Welland, ON L3C 3W2	Phone: 905-788-3135 X 232 Email: tdamario@conservation-niagara.on.ca
Dujlovic, Ed Director Municipal Works	City of Niagara Falls 4310 Queen Street P.O. Box 1023 Niagara Falls, ON L2E 6X5	Phone: 905-356-7521 Ext 4220 Email: edujlovi@city.niagarafalls.on.ca
Durst, Joad, R.P.F. Niagara Area Supervisor Guelph District	Ministry of Natural Resources 4890 Victoria Avenue North P.O. Box 5000 Vineland Station, ON L0R 2E0	Phone: 905-562-1175 or 4147 Email: jdurst@mnr.gov.on.ca
Ian Neville, P. Eng Commissioner Planning and Development	Regional Municipality of Niagara Public Works Department Engineering Services Division 2201 St. David's Road P.O. Box 1042 Thorold, ON L2V 4T7	Phone: 905-685-1571 Email:
Barry Putt Acting Superintendent	Transport Canada, Marine Navigable Waters Protection 100 Front Street South Sarnia, ON N7T 2M4	Phone: 519-383-1862
Sheppard, Cora Environmental Assessment and Planning Coordinator, Technical Support Section, West Central Region	Ministry of the Environment Ellen Fairclough Building 12 th Floor, 119 king Street West Hamilton, Ontario L8P 4Y7	Phone: 905-521-7587 Email: cora.sheppard@ontario.ca
Arthur, Jennifer Environmental Assessment and Planning Coordinator	Ministry of the Environment Ellen Fairclough Building 12 th Floor, 119 king Street West Hamilton, Ontario L8P 4Y7	Phone: 905-521-7587 Email: cora.sheppard@ontario.ca
Murphy, Nick, P.Eng. Senior Director Technical Services	Niagara Parks Commission Box 150, 7400 Portage Road Niagara Falls, ON L2E 6T2	Phone: 905-356-2241, Ext. 240 Email: nickmur@niagaraparks.com

Nieweglowski, Paul District Manager, Niagara District Office	Ministry of the Environment 9 th Floor, Suite 15 301 St. Paul Street St. Catharines, Ontario L2R 3M8	Phone: 905-704-3910 Email: paul.nieweglowski@ene.gov.on.ca
Niven, J. Stuart Habitat Impact Assessment Biologist Burlington District Office	Fisheries and Oceans Canada 304 - 3027 Harvester Road, Suite 304 P.O. Box 85060 Burlington, ON L7R 4K3	Phone: 905-639-1632 Email: NivenST@dfo-mpo.gc.ca
Norten, Dean Public Affairs Officer	Ontario Power Generation 14000 Niagara River Parkway RR1 Niagara-on-the-Lake, Ontario L0S 1J0	Phone: 905-357-6903 Email: dean.norten@opg.com
Mason, Jay	Chippawa Dock Owners Association 17-7000 McLeod Rd, Suite 321 Niagara Falls, Ontario, L2G 7K3	Phone: 905-295-7699 Email: CDOA@sympatico.ca
Inn on the Parkway	7857 Niagara River Parkway, Niagara Falls, Ontario	Phone: 905-295-4371
Falkiner, Len Secretary	Canadian Section, International Niagara Board of Control PO Box 5050, 867 Lakeshore Rd, Burlington, ON L7R 4A6	Email: Len.Falkiner@ec.gc.ca
Surfside Inn	3655 Macklem Street Niagara River Parkway Niagara Falls, Ontario L2G 6C8	
	The Niagara River RAP Coordinator Niagara Peninsula Conservation Authority 250 Thorold Road West, 3 rd Floor Welland, Ontario L3C 3W2	Phone: 905-788-3135
Mr. Don Boswell Senior Claims Analyst Specific Claims Branch	Department of Indian and Northern Affairs 10 Wellington St., Room 1310 Gatineau, QC K1A 0H4	

Mr. Franklin Roy Director, Litigation Management and Resolution Branch	Department of Indian and Northern Affairs 10 Wellington St. Gatineau, QC K1A 0H4	
Ms. Louise Trepanier Director, Claims East of Manitoba Comprehensive Claims Branch	Department of Indian and Northern Affairs 10 Wellington St., Room 1310 Gatineau, QC K1A 0H4	
Ms. Pam Wheaton Director, Policy and Relationships Branch	Ontario Secretariat for Aboriginal Affairs 720 Bay St., 4th Floor Toronto, ON M5G 2K1	
Mr. Grant Wedge, Council	Crown Law Office – Civil Ministry of the Attorney General 720 Bay Street, 8th Floor Toronto, ON M5G 2K1	



**Hatch Mott
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March 5, 2007
230144.08.01

(To: See List of Addressees)

**Re: Class Environmental Assessment Study
Niagara Falls Water Treatment Plant Intake Relocation
Notice of Commencement**

Gentlemen:

The Regional Municipality of Niagara plans to relocate the Niagara Falls Water Treatment Plant Intake, currently located on the north bank of the Welland River, approximately 500 m west of the confluence with the Niagara River.

This relocation is planned to provide reliable, high quality and consistent raw water from the Niagara River, upon the potential shutdown of the Ontario Power Generation (OPG) power canal for maintenance purposes. The project is being planned in accordance with the requirements for Schedule 'C' of the Municipal Class Environmental Assessment. However, if the preferred alternative solution is the addition of pre-treatment at the Water Treatment Plant, the Class Environmental Assessment will progress as a Schedule 'B'.

The first Public Information Centre was held on Wednesday, February 28, 2007 at Riverview Public School in Chippawa to present the project and to obtain public input prior to selecting the preferred alternative solution. For your information and input, we are enclosing a copy of the project brief, and a copy of the display boards from PIC #1.

If you have any comments or concerns, please respond before March 15, 2007. A copy of the comment sheet is attached for your convenience. All comments will become part of the public record. If you would like to discuss this project in more detail, please contact me at 905-357-6971.

Your participation in this study is appreciated.

Sincerely,
Hatch Mott MacDonald

Eugene Chajka, P.Eng.
Project Manager
T 905.357.6971 F 905.357.6977
eugene.chajka@hatchmott.com

EC:eam

Encl: Display and hand-out information
Comment Sheet

**NIAGARA FALLS
WATER TREATMENT PLANT INTAKE RELOCATION
CLASS ENVIRONMENTAL ASSESSMENT**

PUBLIC INFORMATION CENTRE

Wednesday, February 28, 2007

6:30 p.m. – 8:30 p.m.

INTRODUCTION

The Regional Municipality of Niagara is proposing to relocate the intake of the Niagara Falls Water Treatment Plant. This proposed work is intended to ensure an adequate and high quality raw water supply for the plant when Ontario Power Generation (OPG) shuts down their Queenston-Chippawa Power Canal on the Welland River for maintenance, once the new power tunnel on the Niagara River is commissioned.

The Niagara Falls Water Treatment Plant services the City of Niagara Falls with a population of 79,000. It is located along the Welland River on Macklem Street across from Kings Bridge Park in the City of Niagara Falls. It has a rated capacity of 145.5 ML/d and has recently undergone a series of upgrades including an increase in storage capacity and the addition of UV Disinfection.

The plant currently draws water from the Welland River/Chippawa Creek upstream of its point of confluence with the Niagara River, located just upstream of the Horseshoe Falls. Since the 1920's, water has been diverted from the Niagara River, up the Welland River, and into the Queenston – Chippawa Power Canal. Therefore, the Plant's raw water is actually water that has come from the Niagara River, originating in Lake Erie. Therefore, the Welland River normal flow has been artificially reversed due to the Queenston-Chippawa Power Canal. The current intake is located 150 m west of the confluence with the Niagara River, and 5 to 6 km east from the entrance of the Queenston-Chippawa Power Canal. It is 139 m long and 1200 mm in diameter; this includes an intake structure consisting of a timber apron and sheet piling sides, which does not meet current regional security standards.

CLASS ENVIRONMENTAL ASSESSMENT PROCESS

This Class Environmental Assessment (Class EA) is being undertaken in accordance with the requirements of a Schedule C project as detailed in the "Municipal Engineers Association Class Environmental Assessment for Water and Wastewater Projects (June 2000), which includes the following:

Phase 1	Problem Identification
Phase 2	Evaluation of Alternative Solutions
Phase 3	Evaluation of Alternative Design Concepts
Phase 2	Prepare Environmental Study Report
Phase 5	Design and Construction

You are encouraged to review the information being presented, ask questions of Regional and Consultant personnel in attendance and provide any comments that you may have in writing on the Comment Sheets that

are available. Completed Comment Sheets can be left at the meeting, or sent to the address below by March 15, 2007.

Mr. Robin Young, B. Eng., C. Chem
Project Manager
Public Works Department
Water and Wastewater Services Division
3501 Schmon Parkway, P.O. Box 1042
Thorold, ON L2V 4T7
Phone: 905 685-4225, ext. 3740
Fax: 905 685-5205

Following the PIC, the preferred solution will be selected in light of comments received from the public and review agencies; if the preferred solution is a Schedule 'C', we will proceed with a second PIC to review the preferred alternative design options, then an Environmental Assessment Report for the intake will made available for public review for a thirty (30) days during which time, any objections or concerns that cannot be resolved through discussions with the Region may be forwarded to the Minister of the Environment by requesting a "Part II Order". The public will be notified of the publication of the Environmental Assessment Report through a newspaper notice at the appropriate time.

PROBLEM STATEMENT

It is OPG's intention to temporarily shutdown the Queenston-Chippawa Power Canal for maintenance at the completion of their new intake tunnel on the Niagara River. This shutdown will cause a reversal of flow in the Welland River allowing higher turbidity water to flow past the existing intake and into the Niagara Falls Water Treatment Plant. The problem statement for this study is therefore **"to maintain a high quality raw water supply to the Niagara Falls Water Treatment Plant when an operation change by OPG occurs"**. In addition, this may also provide **"an opportunity to provide an intake that meets current standards and design capacities"**.

ALTERNATIVE SOLUTIONS CONSIDERED

1. "Do Nothing" Alternative:

- Leave the existing water intake where it is and continue to draw Niagara River or Welland River water.

2. "Relocate the Intake to the Niagara River" Alternative:

- Build a new intake from the Niagara Falls Water Treatment Plant to the Niagara River; this included the examination of 4 possible alignments (Alternatives A, B, C, and D) for a proposed 1800 mm diameter pipe.

3. Pre-Treatment Alternative:

- Alternative A - Actiflo® → ballasted coagulation and sedimentation
- Alternative B - A pre-sedimentation tank

4. Temporary Pumping Alternative

- Using temporary pumping equipment only during periods of Power Canal shut-down

INVESTIGATION OF ALTERNATIVES

Each alternative solution for the intake was evaluated in terms of impacts on the natural and socio-economic environments, as well as technical merits and cost. The following are a series of impacts that were identified for each alternative solution.

1. "Do Nothing" Alternative

- No construction = no net adverse impacts.
- Impact on plant processes and potentially drinking water quality when raw water has a high and/or variable turbidity.
- *This alternative solution does not satisfy water quantity and quality requirements and therefore does not satisfy the problem statement.*

2. "Relocate Intake to Niagara River" Alternative

- Distance into Niagara River required to avoid turbidity plume/ice conditions is 200 to 500 m.
- Significant short-term disruption of fish habitat (except for Alt. D).
- Potential fish mortality (if blasting used).
- Loss of habitat due to intake footprint (compensation may be required).
- Tunneling or difficult marine construction required (except for Alt. D).
- Frazil ice may be a concern.
- Requires amendment to Permit to Take Water.

3. Pre-Treatment Alternative

- Potential impact on navigation due to new intake structure.
- Minor disruption and loss of aquatic habitat at intake location (compensation may be required).
- Location is feasible (land acquisition may be required).
- High degree of flexibility to deal with high and/or variable raw water turbidity.
- Large sludge volumes produced when raw water turbidity is high.

4. Temporary Pumping Alternative

- Minor disruption of parkland use during installation of temporary pipe.
- Significant noise emissions over a 3-7 month period.
- Operation likely to occur during summer tourist season.
- Reliability of supply is a concern.

ALTERNATIVE ALIGNMENTS FOR RELOCATING THE INTAKE TO THE NIAGARA RIVER

1. **Alternative A** - takes advantage of drawing water from Niagara River upstream of the future confluence of the Welland River flows. The intake pipe could follow Niagara Parkway alignment on the south side of the Welland River and cross the river in the proximity of the existing intake.
2. **Alternative B** - would draw water upstream of the Welland River confluence, similar to the previous alternative, but would be constructed in the bed of the Welland River.
3. **Alternative C** - would run directly from the Niagara River, through Kings Bridge Park to the WTP and draw water from the Niagara River upstream of the OPG intake tunnels.
4. **Alternative D** - would draw water from between the existing OPG intake tunnels on the Niagara River and run through the NPC lands to the WTP

EVALUATION OF ALTERNATIVE SOLUTIONS

As required by the Class Environmental Assessment Study process, each alternative was analyzed in terms of impacts on the natural and socio-economic environments including the following factors, as well as technical merits:

- Terrestrial, Vegetation and wildlife resources
- Technical and operational concerns
- Economic and social effects
- Public health
- Aesthetics and Recreational uses

In evaluating the alternative solutions, the following criteria were considered and the alternatives were assigned a low to high impact rating:

1. **Natural Environmental Impact** (Terrestrial Environment, Aquatic Environment including impacts to fish community and habitat) An alternative and a site should allow for the construction and operation of the new intake without significant impact on existing natural features.
2. **Social Impact** (Disruption to parklands, Noise, Impacts on Navigation, Aesthetics):
 - An alternative that will result in the least amount of impact to the existing residents, both during the construction phase and the future operation of the new intake.
 - An alternative that will not be obtrusive both in terms of appearance and operation.
 - An alternative that does not impede navigation.
3. **Economics** (Capital Cost): An alternative that provides a practical solution in terms of initial capital costs for all required infrastructure.
4. **Technical and Operational Concerns** (O&M considerations): An alternative that provides the most practical long-term solution in terms of operating and maintenance.

NEXT STEPS

Following receipt of comments from review agencies and the public on the evaluation of alternatives, the preferred solution will be selected and if the preferred solution is a Schedule 'C' a 2nd PIC will be held to review the preferred alternative design. Following the 2nd a Project File will be made available for public review for a 30 day period during which time any objections or concerns that cannot be resolved through discussions with the Region may be forwarded to the Minister of the Environment by requesting a "Part II Order". If no objections are expressed, the project may proceed to design, and ultimately to construction and commissioning.

The project is expected to proceed as follows:

➤ PUBLIC INFORMATION CENTRE (PIC)	February 28 th , 2007
➤ PIC COMMENTS DUE	March 15 th , 2007
➤ 2 ND PUBLIC INFORMATION CENTRE (PIC)	April 2007
➤ NOTICE OF CLASS EA COMPLETION	May 2007
➤ PROJECT FILE AVAILABLE FOR PUBLIC REVIEW	May - June 2007
➤ DESIGN	Spring/Summer 2007
➤ CONSTRUCTION	Fall/Winter 2007/2008
➤ COMMISSIONING	Summer 2008

Thank you for your interest and participation.

**NIAGARA FALLS WATER TREATMENT PLANT
INTAKE RELOCATION
CLASS ENVIRONMENTAL ASSESSMENT**

EVALUATION SUMMARY

EVALUATION OF ALTERNATIVES							
Criteria		"Do Nothing" Alternative	"Relocate Intake to Niagara River" Alternative		Temporary Pumping Alternative	Pre-Treatment Alternative	
			Trenching	Tunneling		Actiflo®	Pre-Sedimentation tank
NOT A VIABLE OPTION			High	Moderate	Low	Moderate	Moderate
			Low	Low	High, but limited period	Low	Low
Social Environment Impacts	Construction		Moderate	Moderate	Low	Moderate	Moderate
	Operations		None	None	High	None	None
Technical & Operational Concerns	Construction		High	Moderate	Low	Low	Low
	Operations		Low	Low	Moderate	Low (during normal operation, large sludge volume when turbidity high)	Low (during normal operations, large sludge volumes when turbidity is high)
Cost	Construction		High (Alt D1 – Low)	High	Low to Moderate	Moderate	Low to Moderate
	Operations		None	None	Low	Low	Low

**NIAGARA FALLS WATER TREATMENT PLANT
INTAKE RELOCATION
CLASS ENVIRONMENTAL ASSESSMENT**

WELCOME TO THE PUBLIC INFORMATION CENTRE
Wednesday, February 28, 2007
6:30 p.m. – 8:30 p.m.

Please sign the list at the front table so that we know you have been here to review the materials on display, and in order for us to be able to communicate with you as the project moves forward.

BACKGROUND AND PURPOSE

The Regional Municipality of Niagara is proposing to relocate the intake of the Niagara Falls Water Treatment Plant. This proposed work is intended to ensure an adequate and high quality raw water supply for the plant when Ontario Power Generation (OPG) shuts down their Queenston-Chippawa Power Canal on the Welland River for maintenance, once the new power tunnel on the Niagara River is commissioned.

The Niagara Falls Water Treatment Plant services the City of Niagara Falls with a population of 79,000. It is located along the Welland River on Macklem Street across from Kings Bridge Park in the City of Niagara Falls. It has a rated capacity of 145.5 ML/d and has recently undergone a series of upgrades including an increase in storage capacity and the addition of UV Disinfection.

The plant currently draws water from the Welland River/Chippawa Creek upstream of it's point of confluence with the Niagara River, located just upstream of the Horseshoe Falls. Since the 1920's, water has been diverted from the Niagara River, up the Welland River, and into the Queenston – Chippawa Power Canal. Therefore, the Plant's raw water is actually water that has come from the Niagara River, originating in Lake Erie. Therefore, the Welland River normal flow has been artificially reversed due to the Queenston-Chippawa Power Canal. The current intake is located 150 m west of the confluence with the Niagara River, and 5 to 6 km east from the entrance of the Queenston-Chippawa Power Canal. It is 139 m long and 1200 mm in diameter; this includes an intake structure consisting of a timber apron and sheet piling sides, which does not meet current regional security standards.



**NIAGARA FALLS WATER TREATMENT PLANT
INTAKE RELOCATION
CLASS ENVIRONMENTAL ASSESSMENT**

CLASS ENVIRONMENTAL ASSESSMENT (CLASS EA)

This Class Environmental Assessment (Class EA) is being undertaken in accordance with the requirements of a Schedule C project as detailed in the "Municipal Engineers Association Class Environmental Assessment for Water and Wastewater Projects (June 2000).

The Municipal Class Environmental Assessment establishes an approved planning process for municipalities to follow to satisfy the requirements of the Environmental Assessment Act for specified projects. Schedule C projects have the potential for significant environmental effects and must proceed under the full planning and documentation procedures specified in the Class Environmental Assessment. Schedule C projects require preparation of an Environmental Study Report and public review.

This Public Information Centre (PIC) provides stakeholders with an opportunity to meet the Project Team, review the study scope and discuss issues related to the project, including assessment of:

- (1) A wide range of options to ensure an adequate raw water supply to mitigate the effects due to Ontario Power Generation's operation and shutdown of the Queenston-Chippawa Power Canal.
- (2) Potential impacts of the improvements on the natural and social environments and mitigation measures.

Comment sheets are available for you to complete and either hand in before you leave, or return to the Project Team during the next two (2) weeks, and prior to
March 15, 2007.

Following the PIC, the preferred solution will be selected in light of comments received from the public and review agencies; if the preferred solution is a Schedule "C", we will proceed with a second PIC to review the preferred alternative solution, then a Project File for the intake will be placed on the public record for a thirty (30) day review period during which time, any objections or concerns that cannot be resolved through discussions with the Region may be forwarded to the Minister of the Environment by requesting a "Part II Order". The public will be notified of the publication of the Class EA Project File through a newspaper notice at the appropriate time.

**NIAGARA FALLS WATER TREATMENT PLANT
INTAKE RELOCATION
CLASS ENVIRONMENTAL ASSESSMENT**

PROBLEM STATEMENT

It is OPG's intention to temporarily shutdown the Queenston-Chippawa Power Canal for maintenance at the completion of their new intake tunnel on the Niagara River.

This shutdown will cause a reversal of flow in the Welland River allowing higher turbidity water to flow past the existing intake and into the Niagara Falls Water Treatment Plant. The problem statement for this study is therefore **“to maintain a high quality raw water supply to the Niagara Falls Water Treatment Plant when an operation change by OPG occurs”**. In addition, this may also provide **“an opportunity to provide an intake that meets current standards and design capacities”**.

ALTERNATIVE SOLUTIONS

1. “Do Nothing” Alternative:

- Leave the existing water intake where it is and continue to draw Niagara River or Welland River water.

2. “Relocate the Intake to the Niagara River” Alternative:

- Build a new intake from the Niagara Falls Water Treatment Plant to the Niagara River; this included the examination of 4 possible alignments (Alternatives A, B, C, and D) for a proposed 1800 mm diameter pipe.

3. Pre-Treatment Alternative:

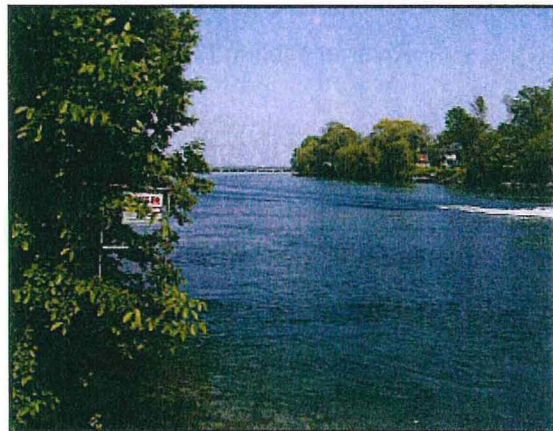
- Alternative A - Actiflores → ballasted coagulation and sedimentation
- Alternative B - A pre-sedimentation tank

4. Temporary Pumping Alternative

**NIAGARA FALLS WATER TREATMENT PLANT
INTAKE RELOCATION
CLASS ENVIRONMENTAL ASSESSMENT**

“Do Nothing” Alternative

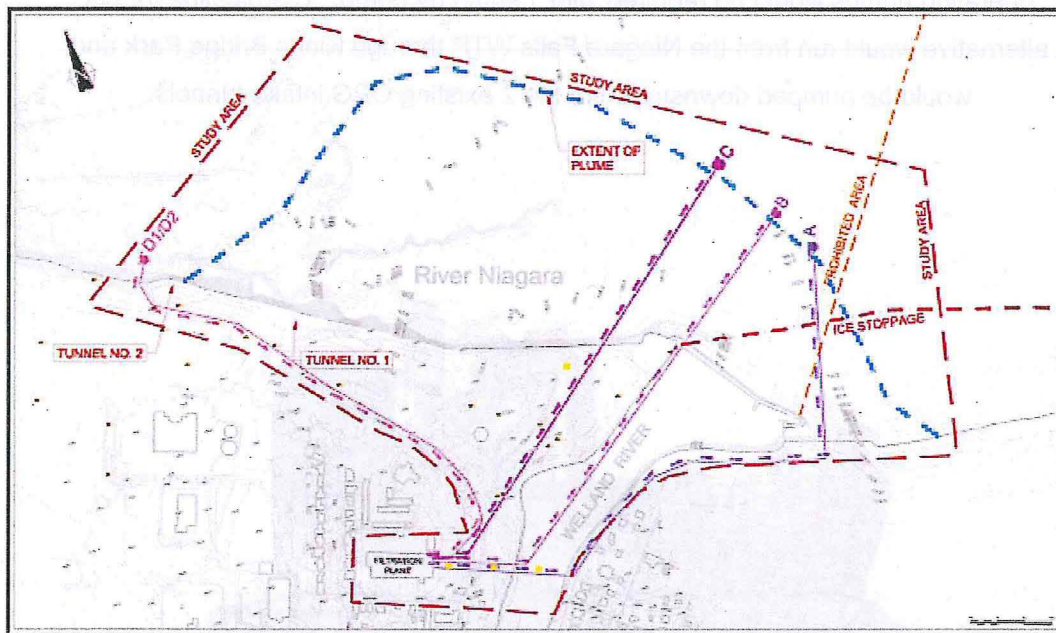
The “Do Nothing” alternative involves leaving the existing intake in its current location and continuing to operate it and the Niagara Falls Water Treatment Plant as usual, and dealing with changing water quality as it occurs with existing plant processes. The Plant will likely experience high and variable turbidity in the raw water, as this would otherwise reduce the capacity and possibly supply to the plant.



NIAGARA FALLS WATER TREATMENT PLANT INTAKE RELOCATION CLASS ENVIRONMENTAL ASSESSMENT

“Relocate Intake to the Niagara River” Alternative

This alternative solution required the examination of a series of alternative alignments for a new intake to the Niagara Falls Water Treatment Plant. There are 4 potential alignments A, B, C, and D. All of these alignments needed to be located away from the ice stoppage location and outside the extent of a possible turbidity plume from the Welland River.



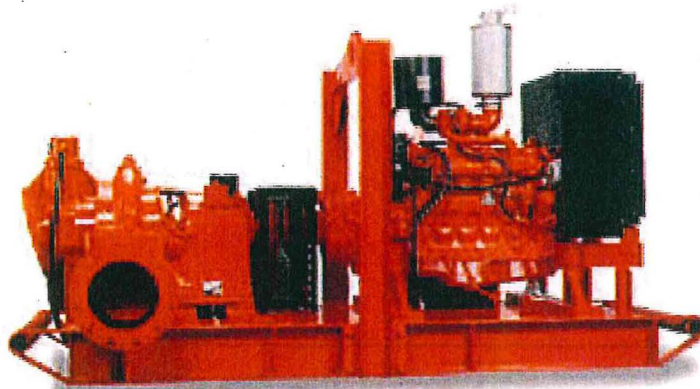
ALTERNATIVE ALIGNMENTS FOR RELOCATING THE INTAKE TO THE NIAGARA RIVER

1. Alternative A - takes advantage of drawing water from Niagara River upstream of the future confluence of the Welland River flows. The intake pipe could follow Niagara Parkway alignment on the south side of the Welland River and cross the river in the proximity of the existing intake.
2. Alternative B - would draw water upstream of the Welland River confluence, similar to the previous alternative, but would be constructed in the bed of the Welland River.
3. Alternative C - would run directly from the Niagara River, through Kings Bridge Park to the WTP and draw water from the Niagara River upstream of the OPG intake tunnels.
4. Alternative D - would draw water from between the existing OPG intake tunnels on the Niagara River and run through the NPC lands to the WTP.

**NIAGARA FALLS WATER TREATMENT PLANT
INTAKE RELOCATION
CLASS ENVIRONMENTAL ASSESSMENT**

Temporary Pumping Alternative

This alternative solution requires raw water to be pumped from the Niagara River for the duration of the Queenston-Chippawa Power Canal maintenance activities which are estimated to last between 3-7 months beginning after the completion of the third OPG intake tunnel in 2009. Critically silenced pumps would be utilized, and 7 operating pumps would be required with 1 stand by pump. The pipeline for this alternative would run from the Niagara Falls WTP through Kings Bridge Park and would be pumped downstream of the 2 existing OPG intake tunnels.



"Critically Silenced" 12" Portable Diesel Pump (7 required)

NIAGARA FALLS WATER TREATMENT PLANT INTAKE RELOCATION CLASS ENVIRONMENTAL ASSESSMENT

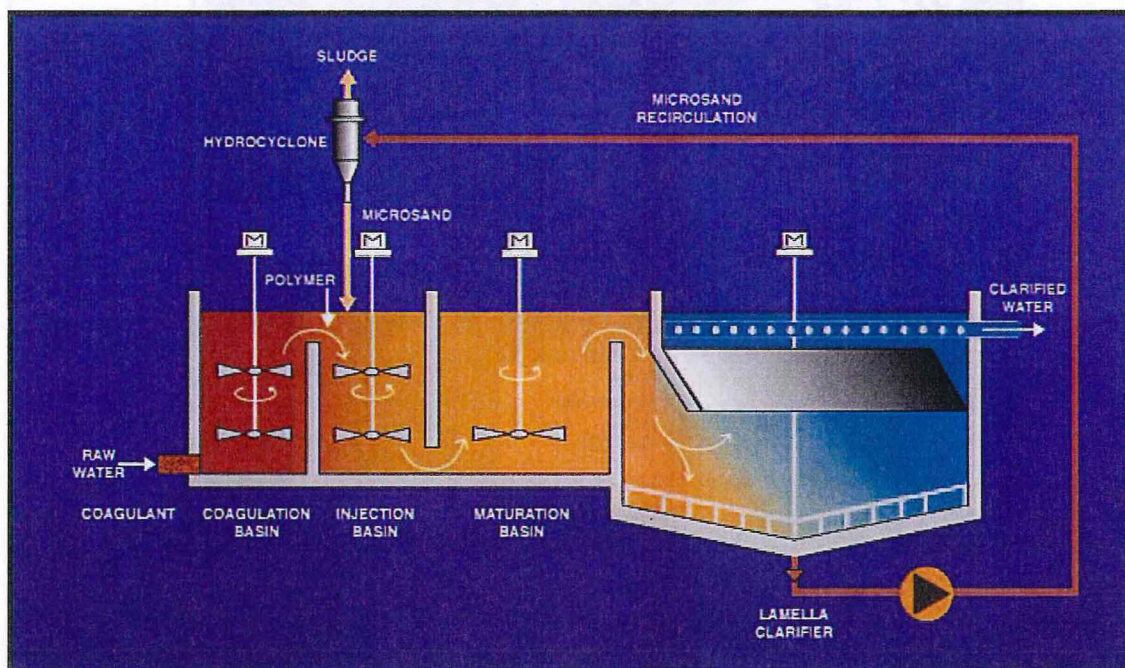
Pre-Treatment Alternative

This alternative solution is intended to be added onto the existing plant processes ahead of the WTP. It is intended to reduce water turbidity levels to < 30 NTU prior to treatment. This alternative would not require relocated the intake, rather improving the existing intake and extending it into the center of the Welland River for increased security.

Alternative A - Actiflo[®]

Actiflo[®] is a high rate settling process with a small footprint. It can provide a removal efficiency exceeding 90% for turbidity, color, algae and arsenic. It uses micro-sand as a seed for floc formation and as ballast to increase floc density and give a high settling velocity. It also utilizes plate settling to reduce the clarifier surface. For this installation, 3 units would be required at 49,500 m³/d each.

BALLASTED COAGULATION AND SEDIMENTATION



**NIAGARA FALLS WATER TREATMENT PLANT
INTAKE RELOCATION
CLASS ENVIRONMENTAL ASSESSMENT**

Alternative B - Pre-Sedimentation Tank

This alternative would provide an impoundment to provide pre-sedimentation, and the addition of a polyelectrolyte to cause fairly rapid settling and a reduction in suspended solids to a more 'normal' level, thereby allowing the treatment plant to function and perform as usual.

To maintain a plant capacity of 145,000 m³/day, the pre-treatment sedimentation process would consist of two cells, each 5m deep, 15m wide, and 45m long. A valve/diversion chamber on the intake line will allow high quality raw water to bypass the pre-sedimentation cells; a polymer feed system would be introduced, and powdered activated carbon could be applied to handle the possible higher organic loads resulting from the influx of Welland River water with a higher organic or minor contaminant loading.



NIAGARA FALLS WATER TREATMENT PLANT INTAKE RELOCATION CLASS ENVIRONMENTAL ASSESSMENT

Potential Impacts of Alternative Solutions

Each alternative solution for the intake was evaluated in terms of impacts on the natural and socio-economic environments, as well as technical merits and cost. The following are a series of impacts that were identified for each alternative solution.

"Do Nothing" Alternative

- No construction = no net adverse impacts.
- Impact on plant processes and potentially drinking water quality when raw water has a high and/or variable turbidity.
- *This alternative solution does not satisfy water quantity and quality requirements and therefore does not satisfy the problem statement.*

"Relocate Intake to Niagara River" Alternative

- Length required to avoid turbidity plume/ice conditions is 200 to 500 m.
- Significant short-term disruption of fish habitat (except for Alt. D).
 - Potential fish mortality (if blasting used).
- Loss of habitat due to intake footprint (compensation may be required).
- Tunneling or difficult marine construction required (except for Alt. D).
 - Frazil ice may be a concern.
- Requires amendment to Permit to Take Water.

Pre-Treatment Alternative

- Potential impact on navigation due to new intake structure.
- Minor disruption and loss of aquatic habitat at intake location (compensation may be required).
 - Location is feasible (land acquisition may be required).
- High degree of flexibility to deal with high and/or variable raw water turbidity.
 - Large sludge volumes produced when raw water turbidity is high.

Temporary Pumping Alternative

- Minor disruption of parkland use during installation of temporary pipe.
 - Significant noise emissions over a 3-7 month period.
 - Operation likely to occur during Summer tourist season.
 - Reliability of supply is a concern.

**NIAGARA FALLS WATER TREATMENT PLANT
INTAKE RELOCATION
CLASS ENVIRONMENTAL ASSESSMENT**

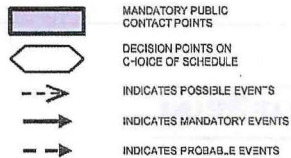
NEXT STEPS

- WITH INPUT FROM PUBLIC INFORMATION CENTRE, PREFERRED SOLUTION WILL BE SELECTED.
- IF PREFERRED SOLUTION IS A SCHEDULE 'C', A SECOND PUBLIC INFORMATION CENTRE WILL BE HELD TO REVIEW THE PREFERRED ALTERNATIVE DESIGN.
- PROJECT FILE WILL BE MADE AVAILABLE FOR PUBLIC REVIEW FOR 30 DAY PERIOD DURING WHICH TIME ANY OBJECTIONS OR CONCERNS THAT CANNOT BE RESOLVED THROUGH DISCUSSIONS WITH THE REGION OF NIAGARA MAY BE FORWARDED TO THE MINISTER OF ENVIRONMENT BY REQUESTING A "PART II ORDER".
- IF NO OBJECTIONS ARE EXPRESSED, PROJECT MAY PROCEED TO DESIGN, AND ULTIMATELY TO CONSTRUCTION AND COMMISSIONING.

- PROJECT IS EXPECTED TO PROCEED AS FOLLOWS:

• PUBLIC INFORMATION CENTRE (PIC)	February 28 th , 2007
• PIC COMMENTS DUE	March 15 th , 2007
• 2 ND PUBLIC INFORMATION CENTRE (PIC)	April 2007
• NOTICE OF CLASS EA COMPLETION	May 2007
• PROJECT FILE AVAILABLE FOR PUBLIC REVIEW	May - June 2007
• DESIGN	Spring/Summer 2007
• CONSTRUCTION	Fall/Winter 2008
• COMMISSIONING	Summer 2008

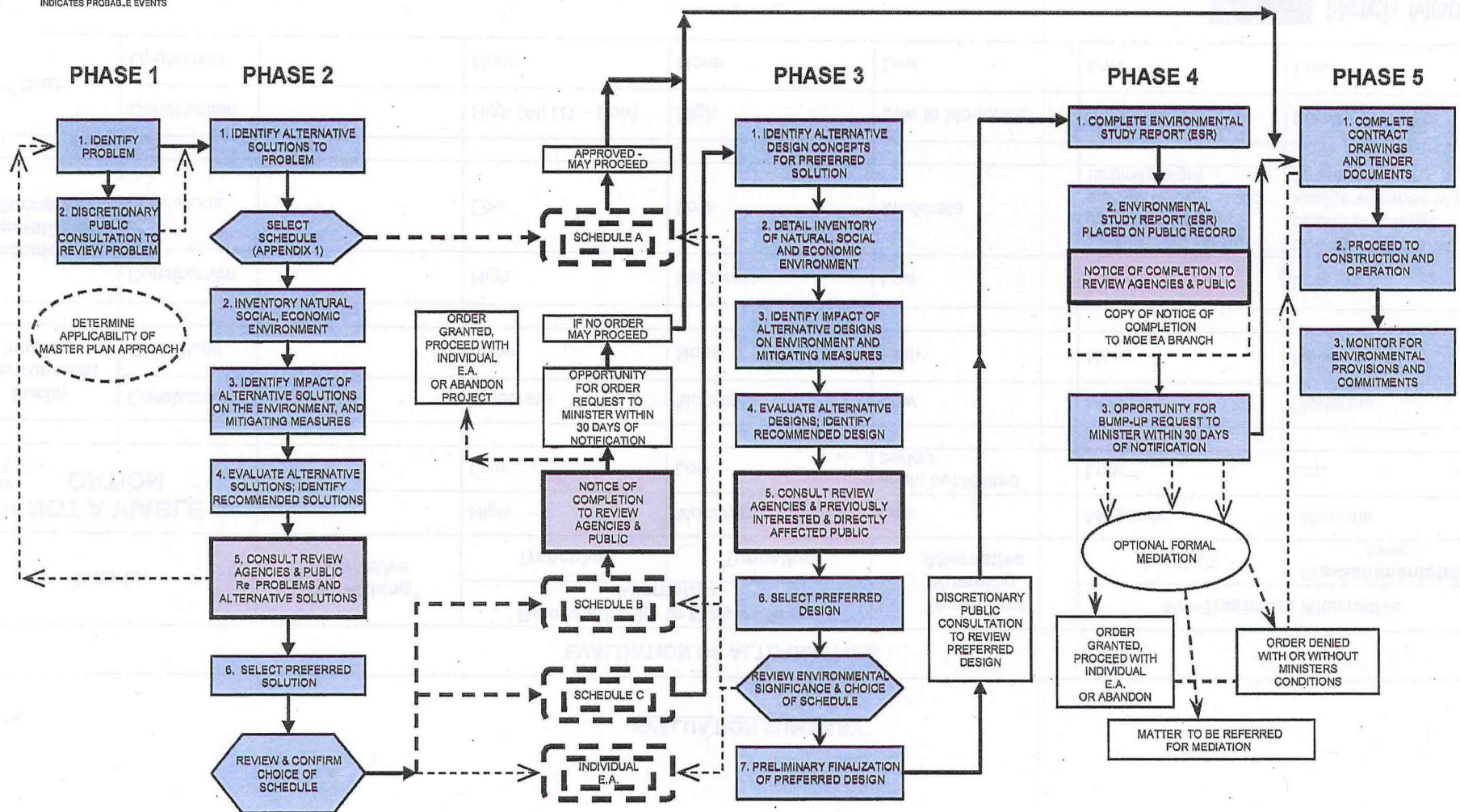




PLANNING & DESIGN PROCESS - CLASS EA FOR MUNICIPAL PROJECTS

BASED ON MUNICIPAL ENGINEERS ASSOCIATION, October 2000

Figure 1.2



**NIAGARA FALLS WATER TREATMENT PLANT
INTAKE RELOCATION
CLASS ENVIRONMENTAL ASSESSMENT**

EVALUATION SUMMARY

EVALUATION OF ALTERNATIVES							
Criteria		"Do Nothing" Alternative	"Relocate Intake to Niagara River" Alternative		Temporary Pumping Alternative	Pre-Treatment Alternative	
			Trenching	Tunneling		Actiflo®	Pre-Sedimentation tank
NOT A VIABLE OPTION	Construction		High	Moderate	Low	Moderate	Moderate
	Operations		Low	Low	High, but limited period	Low	Low
Social Environment Impacts	Construction		Moderate	Moderate	Low	Moderate	Moderate
	Operations		None	None	High	None	None
Technical & Operational Concerns	Construction		High	Moderate	Low	Low	Low
	Operations		Low	Low	Moderate	Low (during normal operation, large sludge volume when turbidity high)	Low (during normal operations, large sludge volumes when turbidity is high)
Cost	Construction		High (Alt D1 – Low)	High	Low to Moderate	Moderate	Low to Moderate
	Operations		None	None	Low	Low	Low

Niagara Falls Water Treatment Plant Intake Relocation – Contact List

Last Updated: April 23, 2007

Tony D'Amario, P.Eng Director Water Management	Niagara Peninsula Conservation Authority 250 Thorold Road West 3rd Floor Welland, ON L3C 3W2	Phone: 905-788-3135 X 232 Email: tdamario@conservation-niagara.on.ca
Ed Dujlovic, P.Eng Director Municipal Works	City of Niagara Falls 4310 Queen Street P.O. Box 1023 Niagara Falls, ON L2E 6X5	Phone: 905-356-7521 Ext 4220 Email: edujlovi@city.niagarafalls.on.ca
Joad Durst, R.P.F. Supervisor, Niagara Area Office	Ministry of Natural Resources 4890 Victoria Avenue North P.O. Box 5000 Vineland, ON L0R 2E0	Phone: 905-562-1175 or 4147 Email: jdurst@mnr.gov.on.ca Fax: 905-562-1154
Kenneth Brothers, P. Eng Commissioner Public Works	Regional Municipality of Niagara Public Works Department 2201 St. David's Road P.O. Box 1042 Thorold, ON L2V 4T7	Phone: 905-685-1571 Email: ian.neville@regional.niagara.on.ca
Patrick Robson Acting Commissioner, Planning Services	Regional Municipality of Niagara Planning Services Department 2201 St. David's Road, P.O. Box 1042 Thorold, Ontario L2V 4T7	Phone: Phone: 905-685-1571 Email: corwin.cambray@regional.niagara.on.ca
Barry Putt Superintendent, Navigation Waters Protection	Transport Canada Marine Safety 100 Front Street South Sarnia, ON N7T 2M4	Phone: 519-383-1862 Email: PuttB@tc.gc.ca
Mrs. Barbara Slattery Environmental Assessment and Planning Coordinator	West Central Region Ministry of the Environment 119 King St. W. 12th Floor Hamilton, ON L8P 4Y7	T (905) 521-7664 F (905) 521-7820 jennifer.arthur@ontario.ca
Nick Murphy, P.Eng. Executive Director, Engineering	Niagara Parks Commission Box 150, 7400 Portage Road Niagara Falls, ON L2E 6T2	Phone: 905-356-2241, Ext. 240 Email: nickmur@niagaraparks.com

Paul Nieweglowski District Manager, Niagara District Office	Ministry of the Environment 9 th Floor, Suite 15 301 St. Paul Street St. Catharines, Ontario L2R 3M8	Phone: 905-704-3910 Email: paul.nieweglowski@ene.gov.on.ca Fax: 905-704-4015
Stuart Niven Partnership Coordinator	Fisheries and Oceans Canada OGLA -- Program Coordinator 867 lakeshore Road Burlington, ON L7R 4A6	Phone: 905-336-6235 Email: NivenST@dfo-mpo.gc.ca Fax: 905-336-6285
Dean Norten Public Affairs Officer Niagara Plant Group	Ontario Power Generation 14000 Niagara River Parkway, RR1 Niagara-on-the-Lake, Ontario L0S 1J0	Phone: 905-357-6903 Email: dean.norten@opg.com Fax: 905-357-6954 Cell: 905-351-0468
Jay Mason	Chippawa Dock Owners Association 17-7000 McLeod Rd, Suite 321 Niagara Falls, Ontario, L2G 7K3	Phone: 905-295-7699 Email: CDOA@sympatico.ca
Len Falkiner Canadian Secretary	International Niagara Board of Control C/O Environment Canada PO Box 5050 867 Lakeshore Rd, Burlington, ON L7R 4A6	Email: Len.Falkiner@ec.gc.ca T: 905-336-4947 F: 905-336-8901
Surfside Inn	3665 Macklem Street Niagara Falls, Ontario L2G 6C8	T: 905-295-4354 F: 905-295-4374
Niagara River RAP Coordinator	Niagara Peninsula Conservation Authority 250 Thorold Road West, 3 rd Floor Welland, Ontario L3C 3W2	Phone: 905-788-3135
John Robbins	Niagara Falls Review 4801 Valley Way Niagara Falls, Ontario L2E 6T6	T: 905-358-5711 ext. 1155 Email: jrobbins@nfreview.com
Mr. Don Boswell Senior Claims Analyst Specific Claims Branch	Department of Indian and Northern Affairs 10 Wellington St., Room 1310 Gatineau, QC K1A 0H4	
Mr. Franklin Roy Director, Litigation Management and Resolution Branch	Department of Indian and Northern Affairs 10 Wellington St. Gatineau, QC K1A 0H4	
Ms. Louise Trepanier Director, Claims East	Department of Indian and Northern Affairs	

of Manitoba Comprehensive Claims Branch	10 Wellington St., Room 1310 Gatineau, QC K1A 0H4	
Ms. Pam Wheaton Director, Policy and Relationships Branch	Ontario Secretariat for Aboriginal Affairs 720 Bay St., 4th Floor Toronto, ON M5G 2K1	
Mr. Grant Wedge, Council	Crown Law Office – Civil Ministry of the Attorney General 720 Bay Street, 8th Floor Toronto, ON M5G 2K1	
Mr. and Mrs. A. Oleksuik	4083 Front Street Niagara Falls, ON L2G 6G5	

Further Project Contacts:

Rick Saltese Ontario Power Generation Services Manager 905-357-6929

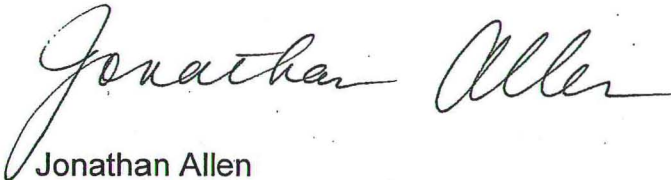
Joe Grcevic Ontario Power Generation Outage Scheduler 905-357-6929

Peter Kowalski Ontario Power Generation Operations

Peter.Kowalski@opg.com Cell: 905-931-8984

If you have any further questions please do not hesitate to contact me at (819)956-3181.

Sincerely,

A handwritten signature in cursive script that reads "Jonathan Allen". The signature is written in dark ink and is positioned above the printed name and title.

Jonathan Allen
A/Litigation Team Leader
Litigation Portfolio Operations East
Litigation Management and Resolution Branch

DISCLAIMER: In this Disclaimer, "Canada" means Her Majesty the Queen in right of Canada and the Minister of Indian Affairs and Northern Development and their servants and agents. Canada does not warrant or assume any legal liability or responsibility for the accuracy, completeness, or usefulness of any data or information disclosed with this correspondence or for any actions in reliance upon such data or information or on any statement contained in this correspondence. Data and information is based on information in departmental records and is disclosed for convenience of reference only. Canada does not act as a representative for any Aboriginal group for the purpose of any claim. Information from other government sources and private sources (including Aboriginal groups) should be sought, to ensure that the information you have is accurate and complete.



Hatch Mott
MacDonald

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Niagara Falls, ON L2E 6W1
T 905.357.6971 F 907.357.6977
www.hatchmott.com

April 5, 2007
230144-08.01

Mr. Ian Neville, MPA, P.Eng.
Commissioner of Public Works
Regional Municipality of Niagara
Public Works Department
2201 St. David's Road, P.O Box 1042
Thorold, Ontario
L2V 4T7

**Re: Class Environmental Assessment Study
Niagara Falls Water Treatment Plant Intake Relocation**

Dear Mr. Neville:

Thank you for your comments and response to the Niagara Falls Intake Relocation project and PIC #1 information package. We would like to apologize for showing your title incorrectly.

The previous letter and information package should have been forwarded to Planning and Development, as they generally deal with the Environmental Assessments, so we further apologize for the mix up.

We would also like to acknowledge that your comments on PIC #1 have been taken into consideration. We agree that the Niagara Falls Water Treatment Plant services a population greater than 79,000, and this information emphasizes that this project is of high importance to the Region as it impacts a large number of residents of Niagara. We have corrected our information and will acknowledge this fact as part of our EA Report. Furthermore, life cycle costing is currently underway and the results of that analysis will be an integral factor in choosing a preferred alternative solution.

If you have further comments or concerns, please feel free to contact me at your convenience 905-357-6971.

Your participation in this study is appreciated.

Sincerely,
Hatch Mott MacDonald

Eugene Chajka, P.Eng.
Senior Project Manager
T 905.357.6971 F 905.357.6977
eugene.chajka@hatchmott.com

EC:eam
Encl

✓bcc: R. Young, R. Mon.

**PUBLIC WORKS
Water & Wastewater
Services**

3501 Schmon Parkway, P.O. Box 1042
Thorold ON L2V 4T7
Tel: 905-685-1571 TTY: 905-984-3613
Toll-free: 1-800-263-7215
Fax: 905-685-5205
www.regional.niagara.on.ca

June 4, 2007

Mr. Dean Norton
Ontario Power Generation – Niagara Plant Group
14000 Niagara River Parkway
Niagara-on-the-Lake, ON L0S 1J0

Dear Mr. Norton:

**Proposed Shutdown of Sir Adam Beck 1 Power Canal –
Impacts on Regional Infrastructure and Operations
Our File: O.01.04 99 40223**

We understand that OPG is planning to close the Sir Adam Beck 1 Power Canal in 2010 or 2011 for maintenance purposes. The objective of this letter is to inform OPG of the potential effects of that shutdown on the Regional Municipality of Niagara's infrastructure and operations.

At this time, it appears that the impact of the Beck 1 Canal shutdown will include the following:

- 1) **Operation of the Niagara Falls Water Treatment Plant (WTP).** The WTP presently obtains its raw water from an intake on Chippawa Creek between the entrance to the Beck 1 Canal and the Niagara River. Due to flow reversal of this section of Chippawa Creek, the WTP intake normally draws low-turbidity, Niagara River water. However, when OPG closes the Beck 1 Canal, the flow in Chippawa Creek will reverse and Welland River water will flow past the intake. Water from the Welland River has frequently high and variable turbidity and it would be very difficult for the WTP to provide safe, adequate quality drinking water with this as its raw water sources.

Due to the important public health considerations, the Region wishes to ensure that an adequate, low-turbidity raw water source is still available when OPG shuts down the Beck 1 Canal. As you are aware, the Region therefore initiated an Environmental Assessment (EA) to determine the preferred means to achieve that objective. During the course of the EA, we

have had several meetings with you and other members of OPG's Niagara Plant Group and have also met with OPG's Niagara Tunnel Project. At the present time, relocation of the WTP intake to a point downstream of the existing OPG Power Tunnels appears to be the most suitable means of mitigating impacts to the WTP raw water supply.

During a previous shutdown of the Beck 1 Canal in the 1960s, the City of Niagara Falls and Ontario Hydro undertook a joint project to pump water from the Niagara River to the WTP to ensure that safe drinking water could be produced.

- 2) **Operation of the Niagara Falls Wastewater Treatment Plant (WWTP).** Presently the WWTP discharges an average of approximately 50,000 m³/day of treated effluent into the Power Canal and has a peak rated capacity of 136,400 m³/day. This must be taken into account in OPG's plan for the Beck 1 Canal shutdown, so that both the WWTP operations and OPG's maintenance activities in the Beck 1 Canal are not unduly impacted.
- 3) **Combined sewer overflow (CSOs).** The City of Niagara Falls has a combined sewer system, i.e., both sanitary wastewater and stormwater flow in the same sewer. During periods of high or intense rainfall, the volume of stormwater entering the combined sewer system exceeds the capacity of the sewer system to convey it, and consequently the system overflows at certain points. These overflows are termed Combined Sewer Overflows (CSOs). There are approximately 15 CSOs along the Beck 1 Canal. It should be noted, therefore, that during periods of high rainfall, overflows from the sewer system will enter the Beck 1 Canal at the CSO locations and possibly impact OPG's maintenance activities.
- 4) **Regional roads and bridges.** It is possible that OPG's maintenance activities will affect Regional roads and bridges adjacent to or over the Power Canal. At the present time, the extent of such impacts are not known.

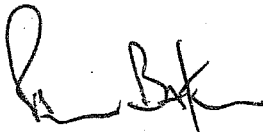
The above reflects only those potential impacts of which the Region is aware at the present time. Other impacts may be apparent as OPG finalizes its plans for closing the Beck 1 Canal and its associated maintenance activities.

We believe it would be advantageous to identify all potential impacts of the Beck 1 Canal shutdown as soon as possible, so that the effects and associated costs can be mitigated as much as possible and contingency plans put in place where necessary. We therefore request that a meeting be arranged between appropriate personnel from both the Region

and OPG as soon as possible. As part of the discussions, we would also like to address the issue of responsibility for costs ensuing from the Beck 1 Canal shutdown.

Please inform me of dates which would be convenient for OPG for this meeting. In the meantime, if you have any questions or comments, please do not hesitate to contact me.

Yours truly,



Peter Baker, P. Eng.
Associate Director Engineering
peter.baker@regional.niagara.on.ca

PB/sp

Attachments

(#07 06 04 - OPG - Impacts - NFWTP Intake.doc)

cc: E. Dujlovic, P.Eng., City of Niagara Falls
C. Bedimeade, P.Eng., Hatch Mott MacDonald
R. Young, P.Eng., C.Chem, Regional Municipality of Niagara
S. Sharma, P.Eng., Regional Municipality of Niagara

12/4/07



Indian and Northern
Affairs Canada

www.inac.gc.ca

Affaires indiennes
et du Nord Canada

www.ainc.gc.ca

By facsimile transmission 1-905-357-6977

Votre file - Votre référence
B 8260-12

Our file - Notre référence

JUN - 5 2007

Hatch Mott MacDonald
4342 Queen Street, PO Box 1001
NIAGARA FALLS ON L2E 6W1

Attn: Eugene Chajka, P. Eng.

**Re: Class Environmental Assessment Study
Niagara Falls Water Treatment Plant Intake Relocation
Public Information Centre #2**

Dear Mr. Chajka:

I am responding to your letter of May 18., 2007 inquiring as to whether there were any First Nation land claims in the area of the above project, more particularly in the Niagara Falls area.

We have conducted a search of our records and determined that no specific claims have been submitted in the area of interest. Although no specific claims affecting the indicated property have been filed to date, we cannot make any representations regarding potential or future claims.

Please rest assured that it is the policy of the Government of Canada as expressed in Outstanding Business: A Native Claims Policy that "In any settlement of specific native claims the government will take third party interests into account. As a general rule, the government will not accept any settlement which will lead to third parties being dispossessed."

We can only speak directly to claims filed under the Specific Claims Policy for the Province of Ontario. We cannot make any comments regarding potential or future claims, or claims filed under other departmental policies. This includes claims under Canada's Comprehensive Claims Policy or legal action by the First Nation against the Crown. You will have to contact the Comprehensive Claims Branch at (819) 994-7521 or the Litigation Management and Resolution Branch at (819) 934-2185 directly for more information.

.../2

Canada

- 2 -

Specific Claims has developed a "Public Information Status Report" on all claims which have been submitted to date. This information is available to the public on the Indian and Northern Affairs Canada website and can be found at http://www.ainc-inac.gc.ca/ps/clm/pis_e.html

It should be noted that the reports available on the Indian and Northern Affairs website are updated quarterly and therefore, you may want to check this site at regular intervals for updates. In accordance with legislative requirements, confidential information has not been disclosed.

To the best of our knowledge, the information we have provided you is current and up-to-date. However, this information may not be exhaustive with regard to your needs and you may wish to consider seeking information from other government and private sources (including Aboriginal groups). In addition, please note that Canada does not act as a representative for any Aboriginal group for the purpose of any claim or the purpose of consultation.

I hope this information will assist you in any further queries. I trust that this satisfactorily addresses your concerns. If you wish to discuss this matter further please contact me at (819) 953-1940.

Yours sincerely,



Don Boswell
A/Senior Claims Analyst
Ontario Research Team
Specific Claims Branch
1-819-953-1940

ONTARIO POWER GENERATION

Dean Norton
Public Affairs and Property Management Advisor
Tel: 905 357-6903
dean.norton@opg.com

Niagara Plant Group 14,000 Niagara Parkway, RR#1, Niagara on the Lake, Ontario. L0S 1J0 Tel: (905) 357-0322 Fax: (905) 357-6954

July 5, 2007

Niagara Region
Public Works
Water and Waste Water Services
3501 Schmon Parkway
Thorold, Ontario. L2V 4T7
Attention: Mr. Peter Baker
Associate Director of Engineering

Dear Mr. Baker:

Re: Proposed Shutdown of Sir Adam Beck 1 Power Canal – Niagara Falls Water Treatment Plant Intake

We have reviewed the documents that you forwarded to Ontario Power Generation (OPG) regarding the proposed relocation of the intake to the Niagara Falls (NF) Water Treatment Plant (WTP). Following are our comments regarding the WTP alternatives D1, D2 and D3.

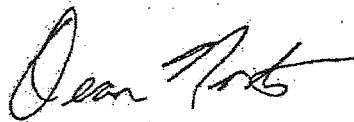
OPG is not in favour of and cannot support any of the WTP intake D alternatives for the following reasons:

- Any interference with the construction of the Niagara Tunnel could potentially trigger significant costs to OPG through an excusable delay or extra work.
- Any interference with the operation of the Sir Adam Beck diversion intakes for flow reductions or outages to facilitate construction or maintenance of the WTP intake could result in significant production losses and revenue impacts to OPG.
- Any interference with the operation of the International Niagara Control Works (INCW), such as gate closures to facilitate construction or maintenance of the WTP intake, could compromise OPG's ability to meet the 1950 Treaty, the 1993 Directive or ice management requirements.

OPG encourages the Regional Municipality of Niagara to identify a new WTP intake location that does not disrupt the construction of the new tunnel intake or impact on future operations of the existing and new tunnel intakes or the INCW.

If you require further information or assistance, please let me know.

Sincerely,



Dean Norton
Public Affairs and Property Management Advisor

Used for July 14/07 issue.

Niagara Falls Water Treatment Plant Intake Relocation – Contact List

Last Updated: April 23, 2007

Tony D'Amario, P.Eng Director Water Management	Niagara Peninsula Conservation Authority 250 Thorold Road West 3rd Floor Welland, ON L3C 3W2	Phone: 905-788-3135 X 232 Email: tdamario@conservation- niagara.on.ca
Ed Dujlovic, P.Eng Director Municipal Works	City of Niagara Falls 4310 Queen Street P.O. Box 1023 Niagara Falls, ON L2E 6X5	Phone: 905-356-7521 Ext 4220 Email: edujlovi@city.niagarafalls.on.ca
Joad Durst, R.P.F. Supervisor, Niagara Area Office	Ministry of Natural Resources 4890 Victoria Avenue North P.O. Box 5000 Vineland, ON L0R 2E0	Phone: 905-562-1175 or 4147 Email: jdurst@mnr.gov.on.ca Fax: 905-562-1154
Ian Neville, MPA, P. Eng Commissioner Public Works	Regional Municipality of Niagara Public Works Department 2201 St. David's Road P.O. Box 1042 Thorold, ON L2V 4T7	Phone: 905-685-1571 Email: ian.neville@regional.niagara.on.ca
Corwin Cambray, P.Eng Commissioner Planning and Development	Regional Municipality of Niagara Planning and Development Department 2201 St. David's Road, P.O. Box 1042 Thorold, Ontario L2V 4T7	Phone: Phone: 905-685-1571 Email: corwin.cambray@regional.niagara.on .ca
Barry Putt Superintendent, Navigation Waters Protection	Transport Canada Marine Safety 100 Front Street South Sarnia, ON N7T 2M4	Phone: 519-383-1862 Email: PuttB@tc.gc.ca
Jennifer Arthur Environmental Assessment and Planning Coordinator	West Central Region Ministry of the Environment 119 King St. W. 12th Floor Hamilton, ON L8P 4Y7	T (905) 521-7664 F (905) 521-7820 jennifer.arthur@ontario.ca
Nick Murphy, P.Eng. Executive Director, Engineering	Niagara Parks Commission Box 150, 7400 Portage Road Niagara Falls, ON L2E 6T2	Phone: 905-356-2241, Ext. 240 Email: nickmur@niagaraparks.com

Paul Nieweglowski District Manager, Niagara District Office	Ministry of the Environment 9 th Floor, Suite 15 301 St. Paul Street St. Catharines, Ontario L2R 3M8	Phone: 905-704-3910 Email: paul.nieweglowski@ene.gov.on.ca Fax: 905-704-4015
Stuart Niven Partnership Coordinator	Fisheries and Oceans Canada OGLA – Program Coordinator 867 lakeshore Road Burlington, ON L7R 4A6	Phone: 905-336-6235 Email: NivenST@dfo-mpo.gc.ca Fax: 905-336-6285
Dean Norten Public Affairs Officer Niagara Plant Group	Ontario Power Generation 14000 Niagara River Parkway, RR1 Niagara-on-the-Lake, Ontario L0S 1J0	Phone: 905-357-6903 Email: dean.norten@opg.com Fax: 905-357-6954 Cell: 905-351-0468
Jay Mason	Chippawa Dock Owners Association 17-7000 McLeod Rd, Suite 321 Niagara Falls, Ontario, L2G 7K3	Phone: 905-295-7699 Email: CDOA@sympatico.ca
Len Falkiner Canadian Secretary	International Niagara Board of Control C/O Environment Canada PO Box 5050 867 Lakeshore Rd, Burlington, ON L7R 4A6	Email: Len.Falkiner@ec.gc.ca T: 905-336-4947 F: 905-336-8901
Surfside Inn	3665 Macklem Street Niagara Falls, Ontario L2G 6C8	T: 905-295-4354 F: 905-295-4374
Niagara River RAP Coordinator	Niagara Peninsula Conservation Authority 250 Thorold Road West, 3 rd Floor Welland, Ontario L3C 3W2	Phone: 905-788-3135
John Robbins	Niagara Falls Review 4801 Valley Way Niagara Falls, Ontario L2E 6T6	T: 905-358-5711 ext. 1155 Email: jrobbins@nfreview.com
Mr. Don Boswell Senior Claims Analyst Specific Claims Branch	Department of Indian and Northern Affairs 10 Wellington St., Room 1310 Gatineau, QC K1A 0H4	
Mr. Franklin Roy Director, Litigation Management and Resolution Branch	Department of Indian and Northern Affairs 10 Wellington St. Gatineau, QC K1A 0H4	
Ms. Louise Trepanier Director, Claims East	Department of Indian and Northern Affairs	

of Manitoba Comprehensive Claims Branch	10 Wellington St., Room 1310 Gatineau, QC K1A 0H4	
Ms. Pam Wheaton Director, Policy and Relationships Branch	Ontario Secretariat for Aboriginal Affairs 720 Bay St., 4th Floor Toronto, ON M5G 2K1	
Mr. Grant Wedge, Council	Crown Law Office – Civil Ministry of the Attorney General 720 Bay Street, 8th Floor Toronto, ON M5G 2K1	
Al and Penny Oleksuik	4083 Front Street Niagara Falls, Ontario L2G 6G5	(sent PIC#2 pkg)

Further Project Contacts:

Rick Saltese Ontario Power Generation Services Manager 905-357-6929

Joe Grcevic Ontario Power Generation Outage Scheduler 905-357-6929

Peter Kowalski Ontario Power Generation Operations
Peter.Kowalski@opg.com Cell: 905-931-8984



**Hatch Mott
MacDonald**

4342 Queen Street, PO Box 1001
Niagara Falls, ON L2E 6W1
T 905.357.6971 www.hatchmott.com

July 14, 2008
230179.08.01

Mr. Tony D'Amario, P.Eng.
Director, Water Management
Niagara Peninsula Conservation Authority
250 Thorold Road West, 3rd Floor
Welland, Ontario L3C 3W2

**Re: Class Environmental Assessment Study
Niagara Falls Water Treatment Plant Intake Relocation
Public Information Centre #3**

Dear Sir:

The Regional Municipality of Niagara is making provision for temporary relocation of the Niagara Falls Water Treatment Plant Intake, currently located on the north bank of the Welland River, approximately 500 m west of the confluence with the Niagara River. The project is being planned in accordance with the requirements for Schedule 'C' of the Municipal Class Environmental Assessment.

As a result of additional input from Ontario Power Generation (OPG), the preferred solution is being revised to a temporary intake relocation instead of the permanent relocation previously proposed. The third Public Information Centre (PIC) will be held on Thursday, July 24, 2008, at the Niagara Falls Water Treatment Plant, 3599 Macklem Street, Niagara Falls (in Chippawa) to present the revised solution and to obtain public input prior to concluding the Environmental Assessment. The advertisement for PIC #3 is enclosed for your information.

We invite you to come out and provide any comments or concerns you may have. All comments will become part of the public record. If you would like to discuss this project in more detail, please contact me at 905-357-6971.

Your participation in this study is appreciated.

Sincerely,
Hatch Mott MacDonald

A handwritten signature in black ink, appearing to read 'Eugene Chajka'.

Eugene Chajka, P.Eng.
Project Manager
T 905.357.6971 F 905.357.6977
eugene.chajka@hatchmott.com

EC:eam
Encl: PIC #3 Notice

**CLASS ENVIRONMENTAL ASSESSMENT STUDY
NOTICE OF PUBLIC INFORMATION CENTRE**

**INTAKE RELOCATION
NIAGARA FALLS WATER TREATMENT PLANT
CITY OF NIAGARA FALLS**

Niagara Region is making provisions for temporary relocation of the Niagara Falls Water Treatment Plant Intake currently located on the north bank of the Welland River (Chippawa Creek), approximately 500 m west of the confluence with the Niagara River.

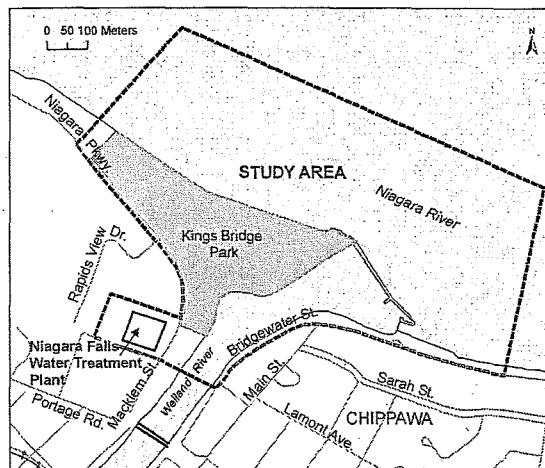
The Region is planning this potential relocation to provide reliable, high quality and consistent raw water should shut down of the Ontario Power Generation (OPG) power canal be required for maintenance purposes. The project is being planned in accordance with the requirements for Schedule 'C' of the Municipal Class Environmental Assessment.

As a result of discussions with OPG, who is a stakeholder in this Class EA planning process, a third Public Information Centre is being held to present the revised preliminary design of the preferred solution and the next steps. You are invited to attend this Public Information Centre to review the preferred solution, provide comments and discuss concerns you may have with representatives of Niagara Region. This Public Information Centre will be an informal meeting and you are invited to drop in at your convenience.

The Public Information Centre is scheduled for:

Date: Thursday, July 24, 2008
Time: 6:30 P.M. to 8:00 P.M.
Location: Niagara Falls Water Treatment Plant
3599 Macklem Street
Niagara Falls, Ontario

If you are unable to attend this Public Information Centre and wish to obtain more information or provide written comments, please address your concerns to:



Robin Young, P. Eng., C. Chem, Project Manager
Water and Wastewater Services Division
3501 Schmon Parkway, P.O. Box 1042
Thorold, ON L2V 4T7
Phone: 905 685-4225, ext. 3740, 1-800-263-7215
or TTY# 905 984-3613
Fax: 905 685-5205
Email: robin.young@regional.niagara.on.ca

Eugene Chajka, P. Eng., Project Manager
Hatch Mott MacDonald
4342 Queen Street
Niagara Falls, ON
L2E 6W1
Phone: 905 357-6971
Fax: 905 357-6977
Email: eugene.chajka@hatchmott.com



**Hatch Mott
MacDonald**

4342 Queen Street, PO Box 1001
Niagara Falls, ON L2E 6W1
T 905.357.6971 www.hatchmott.com

December 18, 2007

230179.08.01

Ms. Donna Patterson
Information Management Supervisor
Navigable Waters Protection
Transport Canada – Marine
100 S. Front Street
Sarnia, Ontario
N7T 2M4

**Re: Niagara Falls Water Treatment Plant Intake
Regional Municipality of Niagara File O.01.04 99 40223
Your File 8200-06-7413**

Dear Donna:

Thank you for your letter dated December 7, 2007, asking for a project update.

We wish to advise you that we are in the process of completing the municipal Class EA process, and are working with OPG to develop a mutually satisfactory solution. At this point, it appears that a temporary pumping system from the Niagara River to the water treatment plant will be the preferred design. This temporary intake would be downstream of OPG's intake No. 1.

We will advise you when we have reached a satisfactory conclusion and expect that another Public Information Centre will be conducted at that time. In the meantime, we would be happy to receive any comments or input that you may have to offer.

Yours truly,
Hatch Mott Macdonald

A handwritten signature in black ink, appearing to read 'E. Chajka', written over a horizontal line.

Eugene P. Chajka, P.Eng.
Senior Project Manager

cc: R. Young, Regional Municipality of Niagara
C. Bodimeade, P.Eng., Hatch Mott MacDonald



Transport Canada
Marine

Transports Canada
Maritime

100 S. Front Street
Sarnia, Ontario
N7T 2M4

December 7, 2007

Regional Municipality of Niagara
C/o Hatch Mott MacDonald
4342 Queen Street
PO Box 1001
Niagara Falls, ON
L2E 6W1

Attention: Eugene Chajka, P.Eng.

Dear Sir/Madam:

Re: Application for approval of an intake, Welland River, Niagara Falls Water Treatment Plant, Regional Municipality of Niagara, Province of Ontario

Reference is made to previous correspondence concerning the above-noted work.

In order to update our file, please provide this office with a status of this project.

Should you have any questions, please contact the undersigned at (519) 333-6303.

Yours truly,


Donna Patterson
Information Management Supervisor
Navigable Waters Protection

DP/jd

Your file · Votre référence
230144.08.01
Our file · Notre référence
8200-06-7413

Canada

Chajka, Eugene

From: Don Boswell [boswelld@ainc-inac.gc.ca]
Sent: Friday, May 11, 2007 3:59 PM
To: Chajka, Eugene
Subject: Class Environmental Assessment Study - Niagara Falls Water Treatment Plant Intake Relocation

Eugene Chajka, P. Eng.
Project Manager
Hatch Mott MacDonald
4342 Queen Street
P.O. Box 1001
NIAGARA FALLS ON L2E 6W1

Dear Mr. Chajka:

Re: Class Environmental Assessment Study - Niagara Falls Water Treatment Plant Intake Relocation

I am responding to your April 24, 2007 letter (PIC#2 Notice) inquiring to whether there were any First Nation land claims in the area of the above project, more particularly in the Niagara Falls area.

We have conducted a search of our records and determined that no specific claims have been submitted in the area of interest. Although no specific claims affecting the indicated property have been filed to date, we cannot make any representations regarding potential or future claims.

Please rest assured that it is the policy of the Government of Canada as expressed in Outstanding Business: A Native Claims Policy that "In any settlement of specific native claims the government will take third party interests into account. As a general rule, the government will not accept any settlement which will lead to third parties being dispossessed."

We can only speak directly to claims filed under the Specific Claims Policy for the Province of Ontario. We cannot make any comments regarding potential or future claims, or claims filed under other departmental policies. This includes claims under Canada's Comprehensive Claims Policy or legal action by the First Nation against the Crown. You will have to contact the Comprehensive Claims Branch at (819) 994-7521 or the Litigation Management and Resolution Branch at (819) 934-2185 directly for more information.

Specific Claims has developed a "Public Information Status Report" on all claims which have been submitted to date. This information is available to the public on the Indian and Northern Affairs Canada website and can be found at http://www.ainc-inac.gc.ca/ps/clm/pis_e.html

It should be noted that the reports available on the Indian and Northern Affairs website are updated quarterly and therefore, you may want to check this site at regular intervals for updates. In accordance with legislative requirements, confidential information has not been disclosed.

To the best of our knowledge, the information we have provided you is current and up-to-date. However, this information may not be exhaustive with regard to your needs and you may wish to consider seeking information from other government and private sources (including Aboriginal groups). In addition, please note that Canada does not act as a representative for any Aboriginal group for the purpose of any

claim or the purpose of consultation.

I hope this information will assist you in any further queries. I trust that this satisfactorily addresses your concerns. If you wish to discuss this matter further please contact me at (819) 953-1940.

Yours sincerely,

Don Boswell
A/Senior Claims Analyst
Ontario Research Team
Specific Claims Branch
1-819-953-1940



Fisheries and Oceans
Canada

Pêches et Océans
Canada

Burlington District Office
3027 Harvester Road
P.O. Box 85060
Burlington, Ontario
L7R 4K3

Bureau de District - Burlington
3027, chemin Harvester
C.P. 85060
Burlington (Ontario)
L7R 4K3

Fax

Central & Arctic Region - Ontario Great Lakes Area

Fish Habitat Management

Phone (905) 639-0599

Fax (905) 639-3549

Date : February 8 2007	DFO File N°:
Sender's Name/Nom de l'expéditeur : Amy Liu, Fish Habitat Biologist	
Subject/Sujet : Niagara Falls Water Treatment Plant Intake Relocation - DFO Comments	

Eugene Chajka	Hatch Moti MacDonald	905-357-6977
Ian Barrett	NPCA	905-788-1121
Greg Bekmore	MNR-Vineland	905-562-1154
☐ Urgent	☐ For your information Pour votre information	☐ Action Faire le nécessaire
		☐ As requested A votre demande
Pages to follow/Pages à suivre: 2		

This communication may contain confidential information and is intended for the addressee only. If you are not the intended recipient and have received this communication, please notify us immediately by telephone and return the original by mail. Thank you.

Canada



Fisheries and Oceans
Canada

Pêches et Océans
Canada

Southern District Office
304-3027 Harvester Road
Burlington, Ontario
L7R 4K3

February 8, 2007

Eugene Chajka
Hatch Moti MacDonald
4342 Queen Street
Niagara Falls, ON
L2E 6W1

Dear Mr. Chajka:

Subject: Niagara Falls Water Treatment Plant Intake Relocation

Fisheries and Oceans Canada (DFO) received your notice of commencement concerning the relocation of the Niagara Falls Water Treatment Plant Intake, located on the north bank of the Welland River, approximately 500 metres west of the confluence with the Niagara River. Thank you for the opportunity to review the above notice of commencement.

As detailed in DFO's "A Protocol Detailing the Fish Habitat Referral Process in Ontario (August, 2006)", we have a Level II partnership agreement with the Niagara Peninsula Conservation Authority (NPCA) to review projects within the NPCA watershed, on behalf of DFO, which have the potential to adversely affect fish and fish habitat. Under this partnership, the NPCA reviews and comments on Class Environmental Assessments regarding fish and fish habitat. NPCA works with project proponents to relocate, redesign or mitigate projects that have the potential to result in the harmful alteration, disruption or destruction (HADD) of fish habitat. Those projects that the NPCA reviews and determines are likely to result in the HADD of fish habitat are referred to DFO for a decision under section 35 of the *Fisheries Act*.

I would like to add that the Policy for the Management of Fish Habitat guides DFO in the implementation of the *Fisheries Act*. The overall objective of that Policy is a Net Gain in the productive capacity of habitats for Canada's fisheries resources. This is achieved through the goals of fish habitat conservation, restoration, and development (enhancement). In reviewing proposed works, the Department's Policy for the Management of Fish Habitat will be considered, which provides that no *Fisheries Act* subsection 35(2) authorizations be issued unless acceptable mitigation and compensation measures for any habitat loss are developed and implemented by the proponent.

DFO prefers to avoid the harmful alteration, disruption, or destruction (HADD) of fish habitat. According to Figure 1 of the Intake Alternatives, Alternative A, B1, B2 and C, have the potential to result in a HADD of fish habitat in the Welland and Niagara Rivers.

Canada

- 2 -

However, the method of construction may play a role in mitigating residual impacts to fish and fish habitat.

Please continue to consult with the staff at Niagara Peninsula Conservation Authority regarding the project alternatives. If the HADD of fish habitat can be avoided through relocation, redesign, or mitigation, it will not be necessary to contact DFO for a section 35 Fisheries Act authorization.

If you have any questions concerning the above, please contact myself directly at our Burlington office by telephone at (905) 639-0599, by fax at (905) 639-3549, or by e-mail at Lina@dfo-mpo.gc.ca.

Yours sincerely,



Amy Liu

Fish Habitat Biologist

Fisheries and Oceans Canada

Copy: Ian Barten - Niagara Peninsula Conservation Authority

Greg Bennett - Ontario Ministry of Natural Resources - Vineland Area Office

Anders, Danielle

From: Stone, Mike (MNR) [mike.stone@ontario.ca]
Sent: Thursday, April 05, 2007 12:23 PM
To: Anders, Danielle
Cc: Belmore, Greg (MNR)
Subject: RE: Niagara Falls Water Treatment Plant Intake Relocation - Public Information Centre - Information Package

Dear Ms. Anders,

Thank you for your email of March 2, 2007 to Joad Durst regarding the Niagara Falls WTP intake relocation project. The Ministry notes permits may be required depending on the preferred alternative selected. You may contact Greg Belmore in the Ministry's Vineland Office (905-562-1176) for more information about potential permit/approval requirements.

The Ministry also recommends you contact the Niagara Peninsula Conservation Authority concerning the fisheries aspects of the project if you have not already done so. There are historic records for rare mussel species in the Niagara River. Fisheries and Oceans Canada may have more current information concerning the occurrence of rare aquatic species in the Niagara River.

Kind Regards,

Mike Stone

--
Mike Stone
District Planer
Ministry of Natural Resources
Guelph District

-----Original Message-----

From: Anders, Danielle [mailto:danielle.angeloni@hatchmott.com]
Sent: Friday, March 02, 2007 8:55 AM
To: ian.neville@regional.niagara.on.ca; Arthur, Jennifer (ENE); Nieweglowski, Paul (ENE); NivenST@dfo-mpo.gc.ca; Len.Falkiner@ec.gc.ca; puttb@tc.gc.ca; Durst, Joad (MNR)
Subject: Niagara Falls Water Treatment Plant Intake Relocation - Public Information Centre - Information Package

Dear Agencies,

This is an information package from the Public Information Centre for the Niagara Falls Water Treatment Plant Intake Relocation project held Wednesday February 28th. Please find copies of PIC boards, comment sheet and handout attached for your information. We welcome any questions concerning this project and encourage you to provide us with feedback on the comment sheet attached. Thank you for your cooperation.

<<PICboards.pdf>>
<<Comment Sheet.pdf>>
<<Hand Out.pdf>>

Thank you.

4/5/2007

Appendix A2
Minutes of Meetings

Record of Meeting/Discussion



Project Title: Niagara WTP Intake Relocation
Regional Municipality of Niagara
(RMON)

Division: WTC - CAN

Subject: Progress Status

Project No: HMM-230179

Location: HMM, Niagara Office

Date of Meeting: October 29, 2008

Present: Don Haber (OPG)
Dean Norton (OPG)
Robin Young (RMON)

Carl Bodimeade (HMM)
Eugene Chajka (HMM)

Recorded by:	Distribution	
CB/EC	All present	
Item	Text	Action
1	Carl and Eugene provided an overview of the Public Information Centre #2 information to recap the project status to date.	
2	- OPG stated that the 'temporary pumping' alternative recommended by the Class EA process was acceptable in principle. - The advantages to have temporary pumping from the 'bay' just downstream of the second tunnel intake were pointed out. - OPG will check whether the temporary pumping alternative will impact on the icebreaker 'bail-out' area. - OPG said that it is not expected that the canal would be shut down before 2019. Outage could start from April 1 as OPG can take less water from that period on (shut-down of canal 3 to 7 months duration depending on the required maintenance work).	
3	The Region intends that design of the temporary pumping project will be completed as a contingency measure in case OPG has to close down the power canal. It is intended that detailed design would be prepared for the conveyance pipe and slab/piles for the pumps, but only pre-design and performance spec would be carried out for pumping system and building.	

Record of Meeting/Discussion



Hatch Mott
MacDonald

Project: HMM – 230179

Date of Meeting: October 29, 2008

4	Specifications to indicate OPG's area of responsibility and health and safety requirements. Also that construction must not interfere with OPG operations.	
5	Survey/soundings along the Tunnel #2 wall to determine water depth will be carried out by HMM with OPG approval; include safety measures from tunnel contractor's safety standards.	
6	The Region intends to finalize the ESR and carry out the 30-day review period before Christmas.	
	Action Items	
1	Timing of soundings – Eugene to advise Dean Norton.	EC
2	Contact for detailed design will be Don Haber.	
3	Don Haber to check if drawings on retaining wall are available, particularly depth of footing; reference Strabag Dwg #017.	DH
4	Eugene to contact Niagara Falls Hydro to verify hydro power licence for temporary pumping.	EC

Reported by:

C. Bodimeade/E. Chajka

/eam

Record of Meeting/Discussion

Hatch Mott
MacDonald

FINAL

Project Title: Niagara WTP Intake Relocation
 Regional Municipality of Niagara
 (RMON)

Division: WTC - CAN

Subject: Meeting with OPG Regarding Impact of
 Sir Adam Beck 1 Power Canal Shutdown
 on Regional Infrastructure

Project No: HMM-230179

Location: Environmental Centre – Regional
 Municipality of Niagara, Thorold

Date of Meeting: September 10, 2007

Present: Robin Young (RMON) Carl Bodimeade (HMM)
 Peter Baker (RMON)
 Sunil Sharma (RMON)
 Mike Janas (RMON)
 Mary Rae (RMON)
 Dean Norton (OPG)
 Don Haber (OPG)
 Alain Diallo (OPG)

Recorded by:	Distribution	
CB	All present Eugene Chajka (HMM)	
Item	Text	Action
1	Meeting participants introduced themselves and the proposed agenda (attached) was approved.	
2	HMM described the objectives of the meeting and gave an overview of the activities and contact with OPG to date relating to the Niagara Falls WTP Intake Relocation project. This meeting is in response to the Region's letter of June 4, 2007 and OPG's letter of July 5, 2007, relating to the impacts of the Sir Adam Beck 1 Power Canal shutdown on the Niagara Falls WTP, and the Region's letter of June 4, 2007, relating to the potential impacts of the Power Canal shutdown on the Region's overall infrastructure (copies attached). Prior to the meeting, the Region and OPG had provided the other	

Record of Meeting/Discussion



Hatch Mott
MacDonald

Project: HMM – 230179

Date of Meeting: September 10, 2007

	party with any documentation or agreements in their possession relating to this subject.	
3	OPG noted that they believed that a new intake was required for the Niagara Falls WTP to solve frazil ice problems and also to provide a back-up intake due to MOE regulations. RMON said that measures to solve the frazil ice problem had been included as part of the latest upgrade at the WTP. The Region is not aware of any MOE requirement for a back-up intake. It is possible that MOE raised the possibility of an alternative intake in about 2002, but a subsequent study indicated there is no practical alternative raw water source. The Region will provide a copy of the raw water characterization study to OPG. Region clarified that the intent of this project is to relocate the existing intake to the WTP solely in order to mitigate the risk of water quality and quantity impacts when the OPG Power Canal is shut down for maintenance.	Region
4	OPG's Proposed Schedule and Duration of Power Canal Shutdown OPG gave the following information on the present plans for the Power Canal shutdown. • Timing is likely to be shortly after commissioning of new tunnel, which is now anticipated to be Q1 2010; however, this is still not certain. • The duration of the shutdown could range from a minor outage, with any works being carried out underwater in zero flow or reduced flow conditions, to a major outage which could require dewatering and last months. Recent investigations have shown that if the current is reduced to 1 ft/s, then some work can be done underwater. • A condition assessment of the Power Canal has commenced but could take 2 to 3 years, i.e., it could be Q3 2009 to Q3 2010 before it is completed. However, if major problems were to be found during investigations, this could be accelerated. Sonar surveys will be carried out next week in known problem areas. • Flow in the Power Canal was reduced during the previous weekend shutdown (September 8 and 9) for 8 to 10 hours. During the shutdown it was raining and lots of debris and flow were coming in through storm sewers.	
5	Potential Impacts Major points of discussion were as follows. • From the Region's and HMM's review of previous	

Record of Meeting/Discussion



Hatch Mott
MacDonald

Project: HMM – 230179

Date of Meeting: September 10, 2007

	documentation, it appears that all the measures required to mitigate the impacts of the 1964 shutdown were carried out by Ontario Hydro (design and construction of mitigation works). • OPG acknowledged that this was the case, but their review of the documentation indicated that Ontario Hydro was not required to do this.	
5.1	Niagara Falls WTP • As noted in the Region's letter of June 4, 2007, the preferred alternative for relocation of the WTP intake is Alternative D. OPG comments on that alternative were provided in their letter of July 5, 2007. In addition, OPG noted: ○ The refuge area for OPG's ice breaker, should it run into difficulties, will be just downstream of the Tunnel #2 intake, i.e., the same location as Alternative D1 ○ HMM asked if the alignment for Alternative D1 was kept outside Strabag's (Niagara Tunnel Project contractor) present work area, would that be acceptable to OPG. OPG replied that this was not acceptable as Strabag may need all of this area in the future. ○ OPG has concerns on the long-term impact of a new WTP intake in this area on their power generation and maintenance activities. • After discussion, OPG indicated that a temporary intake, located just downstream of the intake for Tunnel #2, would be acceptable. Whether this will draw water by pumping or gravity will depend on the respective costs. • The Region should forward a formal request to OPG relating to provision of a temporary intake once the cost has been determined.	Region
5.2	Niagara Falls WWTP • OPG asked if WWTP could also be shut down at the same time as the Power Canal. Region said no, as it is a continuous treatment process dealing with all of Niagara Falls wastewater. As Niagara Falls is partially serviced by a combined sewer system, flows will increase during wet weather. • The Region noted that there are a number of combined sewer overflows (CSOs) along the Power Canal and there can be significant flow from these during wet weather, as well as from storm sewers.	
5.3	Other Infrastructure • As OPG's plans for the Power Canal shutdown have not yet	

Record of Meeting/Discussion



Project: HMM - 230179

Date of Meeting: September 10, 2007

	been finalized, potential impacts on other Regional infrastructure, such as roads and bridges, are not known at the present time.	
6	Previous Agreements	
	As their legal counsel was not present at this meeting, OPG did not want to comment at this time on responsibility for mitigation measures and the associated costs.	
7	Action Items	
	1 - Region will provide to OPG a proposal regarding temporary pumping for the Niagara Falls WTP, including timeline, discussion of operational requirements and costs. 2 - Region will provide a proposal to OPG for measures to deal with the WWTP effluent, e.g., for it to be directed over to the Sir Adam Beck 2 Power Canal. 3 - After review of confidentiality requirements, OPG will provide a summary of the results of present condition assessments of the Power Canal. OPG will keep the Region informed on the results of further investigations. 4 - All parties will provide any new documents which are found to the other parties.	Region Region OPG OPG/Region

Reported by:

Carl Bodimeade
HMM

CB/eam

Attach: Agenda

RMON letter to OPG dated June 4, 2007

RMON letter to OPG dated June 4, 2007

OPG letter to RMON dated July 5, 2007



Hatch Mott
MacDonald

REGIONAL MUNICIPALITY OF NIAGARA

**Meeting to Discuss OPG Shutdown of Sir Adam Beck 1 Power Canal
and Potential Impacts on Regional Infrastructure**

Monday, September 10, 2007

10:30 am

At Regional Environmental Center

MEETING AGENDA

- 1.0 Introductions and Approval of Agenda**
- 2.0 Meeting Objectives**
- 3.0 OPG's Proposed Schedule and Duration of Canal Shutdown**
- 4.0 Potential Impacts**
 - 4.1 Niagara Falls WTP**
 - 4.2 Niagara Falls WWTP**
 - 4.3 Other Infrastructure**
- 5.0 Prior (1964) Shutdown**
- 6.0 Previous Agreements**
- 7.0 Action Items**

JUN 08 2007

Niagara Region

230172

PUBLIC WORKS Water & Wastewater Services

3501 Schmon Parkway, P.O. Box 1042
Thorold ON L2V 4T7
Tel: 905-685-1571 TTY: 905-984-3613
Toll-free: 1-800-263-7215
Fax: 905-685-5205
www.regional.niagara.on.ca

June 4, 2007

Mr. Dean Norton
Ontario Power Generation - Niagara Plant Group
14000 Niagara River Parkway
Niagara-on-the-Lake, ON L0S 1J0

① *EUGENE*
② *DANIEL*
③ *FILE*

Dear Mr. Norton:

**Proposed Shutdown of Sir Adam Beck 1 Power Canal -
Niagara Falls Water Treatment Plant Intake
Our File: O.01.04 99 40223**

Further to our meeting with yourself and other representatives of OPG, the Niagara Tunnel Project and Hatch Mott MacDonald, we are writing to provide further details of our preferred concept for relocation of the Niagara Falls Water Treatment Plant (WTP) intake.

As you are aware, the relocation of the intake is required to ensure an adequate and high-quality raw water supply for the WTP when OPG shuts down the Sir Adam Beck 1 Power Canal (the Beck 1 Canal), which is anticipated to be in 2010 or 2011. Through the Municipal Class EA process, the preferred means to achieve that objective has been determined to be the "Relocate the Intake to the Niagara River" alternative, with a preferred alignment of Alternative D. The attached information, which was presented at the recent second Public Information Center (PIC), indicates the alternatives evaluated, and the preferred alignment of Alternative D.

Three design concepts were developed for the preferred solution, details of which are shown in the attached drawings:

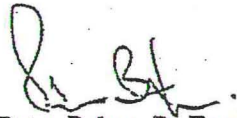
- D1 - 1800 mm diameter gravity pipe, 1292 m long from the WTP to the downstream side of OPG intake Tunnel #2, crossing over both OPG intakes and extending out into the Niagara River at 162.2 m, requiring excavation in the Niagara River
- D2 - 1800 mm diameter gravity pipe, 1212 m long from the WTP to the area approximately 194 m downstream of Tunnel #2, where excavation to 162.2 m has already been completed for the new Tunnel #3
- D3 - 1800 mm diameter gravity pipe, 1245 m long from the WTP to inside the existing cofferdam built for the new Tunnel #3.

We recognize that OPG's approval will be required for the solution eventually adopted. Also, OPG's operations impact the viability of all design concepts; therefore, all design concepts require OPG's input before a preferred design concept can be identified.

Therefore, we would appreciate OPG's comments on the three preferred concepts (D1, D2 and D3) at your earliest convenience. We understand that any comments that the Niagara Tunnel Project may have will be directed through you also.

If you wish to discuss this matter or require any further information, please contact Mr. Robin Young at (905) 685-4225, ext. 3740.

Yours truly,



Peter Baker, P. Eng.
Associate Director Engineering
peter.baker@regional.niagara.on.ca

PB/sp
Attachments
(#07 06 04 - OPG - NFWTP Intake.doc)

cc: R. Young, P.Eng., C.Chem., Regional Municipality of Niagara
S. Sharma, P.Eng., Regional Municipality of Niagara
C. Bodinade, P.Eng., Hatch Mott MacDonald

OS. 12/6/07

JUN 08 2007

**PUBLIC WORKS
Water & Wastewater
Services**

3501 Schmon Parkway, P.O. Box 1042
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www.regional.niagara.on.ca

230179

June 4, 2007

Mr. Dean Norton
Ontario Power Generation - Niagara Plant Group
14000 Niagara River Parkway
Niagara-on-the-Lake, ON L0S 1J0

① EUGENE
② DANIELLE
③ FILE

Dear Mr. Norton:

**Proposed Shutdown of Sir Adam Beck 1 Power Canal -
Impacts on Regional Infrastructure and Operations
Our File: O.01.04 99 40223**

We understand that OPG is planning to close the Sir Adam Beck 1 Power Canal in 2010 or 2011 for maintenance purposes. The objective of this letter is to inform OPG of the potential effects of that shutdown on the Regional Municipality of Niagara's infrastructure and operations.

At this time, it appears that the impact of the Beck 1 Canal shutdown will include the following:

- 1) **Operation of the Niagara Falls Water Treatment Plant (WTP).** The WTP presently obtains its raw water from an intake on Chippawa Creek between the entrance to the Beck 1 Canal and the Niagara River. Due to flow reversal of this section of Chippawa Creek, the WTP intake normally draws low-turbidity, Niagara River water. However, when OPG closes the Beck 1 Canal, the flow in Chippawa Creek will reverse and Welland River water will flow past the intake. Water from the Welland River has frequently high and variable turbidity and it would be very difficult for the WTP to provide safe, adequate quality drinking water with this as its raw water sources.

Due to the important public health considerations, the Region wishes to ensure that an adequate, low-turbidity raw water source is still available when OPG shuts down the Beck 1 Canal. As you are aware, the Region therefore initiated an Environmental Assessment (EA) to determine the preferred means to achieve that objective. During the course of the EA, we

have had several meetings with you and other members of OPG's Niagara Plant Group and have also met with OPG's Niagara Tunnel Project. At the present time, relocation of the WTP intake to a point downstream of the existing OPG Power Tunnels appears to be the most suitable means of mitigating impacts to the WTP raw water supply.

During a previous shutdown of the Beck 1 Canal in the 1960s, the City of Niagara Falls and Ontario Hydro undertook a joint project to pump water from the Niagara River to the WTP to ensure that safe drinking water could be produced.

- 2) **Operation of the Niagara Falls Wastewater Treatment Plant (WWTP).** Presently the WWTP discharges an average of approximately 50,000 m³/day of treated effluent into the Power Canal and has a peak rated capacity of 136,400 m³/day. This must be taken into account in OPG's plan for the Beck 1 Canal shutdown, so that both the WWTP operations and OPG's maintenance activities in the Beck 1 Canal are not unduly impacted.
- 3) **Combined sewer overflow (CSOs).** The City of Niagara Falls has a combined sewer system, i.e., both sanitary wastewater and stormwater flow in the same sewer. During periods of high or intense rainfall, the volume of stormwater entering the combined sewer system exceeds the capacity of the sewer system to convey it, and consequently the system overflows at certain points. These overflows are termed Combined Sewer Overflows (CSOs). There are approximately 15 CSOs along the Beck 1 Canal. It should be noted, therefore, that during periods of high rainfall, overflows from the sewer system will enter the Beck 1 Canal at the CSO locations and possibly impact OPG's maintenance activities.
- 4) **Regional roads and bridges.** It is possible that OPG's maintenance activities will affect Regional roads and bridges adjacent to or over the Power Canal. At the present time, the extent of such impacts are not known.

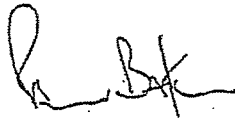
The above reflects only those potential impacts of which the Region is aware at the present time. Other impacts may be apparent as OPG finalizes its plans for closing the Beck 1 Canal and its associated maintenance activities.

We believe it would be advantageous to identify all potential impacts of the Beck 1 Canal shutdown as soon as possible, so that the effects and associated costs can be mitigated as much as possible and contingency plans put in place where necessary. We therefore request that a meeting be arranged between appropriate personnel from both the Region

and OPG as soon as possible. As part of the discussions, we would also like to address the issue of responsibility for costs ensuing from the Beck 1 Canal shutdown.

Please inform me of dates which would be convenient for OPG for this meeting. In the meantime, if you have any questions or comments, please do not hesitate to contact me.

Yours truly,



Peter Baker, P. Eng.
Associate Director Engineering
peter.baker@regional.niagara.on.ca

PB/sp
Attachments
(#07 06 04 - OPG - Impacts - NFWTP Intake.doc)

cc: E. Dujlovic, P.Eng., City of Niagara Falls
C. Bodineade, P.Eng., Hatch Mott MacDonald
R. Young, P.Eng., C.Chem, Regional Municipality of Niagara
S. Sharma, P.Eng., Regional Municipality of Niagara

12/4/07

ONTARIO POWER GENERATION

Dean Norton
Public Affairs and Property Management Advisor
Tel: 905 357-6903
dean.norton@opg.com

Niagara Plant Group 14,000 Niagara Parkway, RR#1, Niagara on the Lake, Ontario. L0S 1J0 Tel: (905) 357-0322 Fax: (905) 357-6954

July 5, 2007

Niagara Region
Public Works
Water and Waste Water Services
3501 Schmon Parkway
Thorold, Ontario, L2V 4T7
Attention: Mr. Peter Baker
Associate Director of Engineering

Dear Mr. Baker:

Re: Proposed Shutdown of Sir Adam Beck 1 Power Canal – Niagara Falls Water Treatment Plant Intake

We have reviewed the documents that you forwarded to Ontario Power Generation (OPG) regarding the proposed relocation of the intake to the Niagara Falls (NF) Water Treatment Plant (WTP). Following are our comments regarding the WTP alternatives D1, D2 and D3.

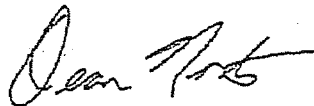
OPG is not in favour of and cannot support any of the WTP intake D alternatives for the following reasons:

- Any interference with the construction of the Niagara Tunnel could potentially trigger significant costs to OPG through an excusable delay or extra work.
- Any interference with the operation of the Sir Adam Beck diversion intakes for flow reductions or outages to facilitate construction or maintenance of the WTP intake could result in significant production losses and revenue impacts to OPG.
- Any interference with the operation of the International Niagara Control Works (INCW), such as gate closures to facilitate construction or maintenance of the WTP intake, could compromise OPG's ability to meet the 1950 Treaty, the 1993 Directive or ice management requirements.

OPG encourages the Regional Municipality of Niagara to identify a new WTP intake location that does not disrupt the construction of the new tunnel intake or impact on future operations of the existing and new tunnel intakes or the INCW.

If you require further information or assistance, please let me know.

Sincerely,



Dean Norton
Public Affairs and Property Management Advisor

Record of Meeting/Discussion



Hatch Mott
MacDonald

Project Title: Niagara WTP Intake Relocation
Regional Municipality of Niagara
(RMON)

Division:

Subject: NPC Concerns from PIC #2

Project No: HMM-230179

Location: NPC Main Office
Niagara Falls, Ontario

Date of Meeting: June 13, 2007
10:00 am

Present: Eugene Chajka (HMM)
Danielle Anders (HMM)
Dean Norton (OPG)
Nick Murphy (NPC)
Dave Gillis (NPC)

Robin Young (RMON)

Recorded by:	Distribution	
dma	all	
Item	Text	Action
1	Eugene Chajka went over the conceptual design presented at PIC #2, providing an overview of the preferred design solution and the 3 design concepts that were presented.	
2	Nick Murphy from NPC explained that NPC has concerns that the intake alignment is shown in Kings Bridge Park and not on the Niagara Parkway, and that NPC would prefer it be placed in the roadway.	
3	Eugene Chajka explained that the reason it is shown in the park is because restoration less costly and simpler in the park than in the road.	
4	The Niagara Parkway through the study area is planned for reconstruction, and Eugene Chajka suggested that it might be a good idea to consider deferring it to coincide with the installation of the new intake as not to dig up the road now and then in two years dig up a brand new road.	
5	Nick Murphy has some concerns in regards to a pipe that may have been installed for the previous OPG shutdown in the late 1960's. Eugene Chajka indicated that there is a lack of information concerning this pipe and it is unknown if it is	
6	Eugene Chajka suggested that if deferring the road reconstruction until the installation of the intake (2009-2011) is not feasible then perhaps the work could be staged, the first section of intake can be installed to coincide with the road reconstruction and the remainder of the intake pipe installation can continue	

Record of Meeting/Discussion



Hatch Mott
MacDonald

Project: HMM - 230179

Date of Meeting: May 3, 2007

5	It was agreed that the Region would provide a letter describing the requirements for the new WTP intake and the proposed works to OPG (attention: Dean Norton) for comment.	HMM/Region
Action Items:		
	1 - HMM/Region to prepare letter to OPG.	HMM/Region
	2 - HMM will visit NTP site offices to look at drawings available and evaluate what may be of interest.	HMM
	3 - OPG NTP to advise on release agreement requirements for information required by HMM/Region (i.e., overall "blanket" release or release for specific information).	OPG NTP

Reported by:

A handwritten signature in black ink, appearing to read "Carl Bodimeade".

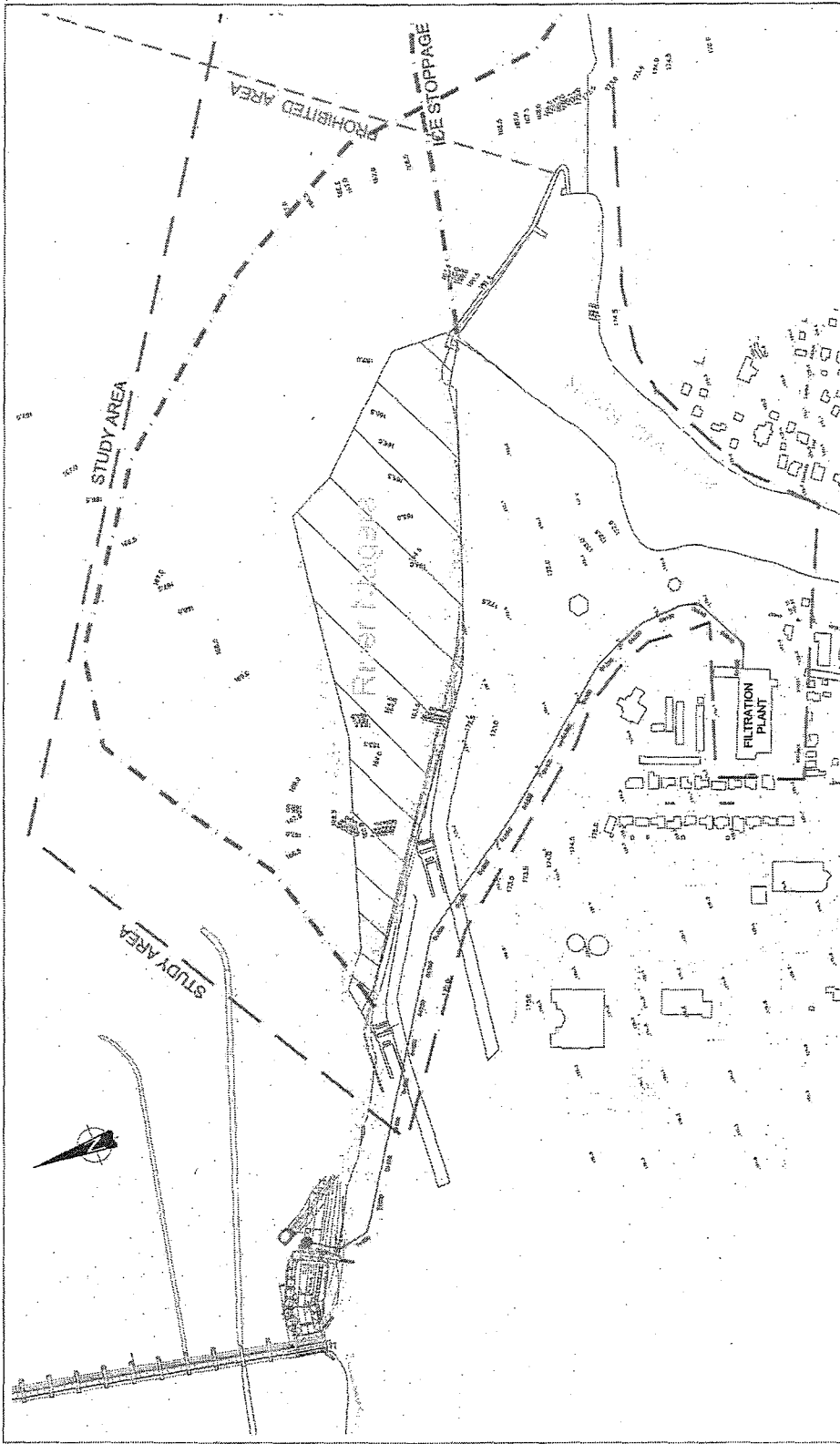
Carl Bodimeade
HMM

CB/eam

**NIAGARA FALLS WATER TREATMENT PLANT
INTAKE RELOCATION
CLASS ENVIRONMENTAL ASSESSMENT**

Evaluation Table

Evaluation Table								
Criteria		“Do Nothing Alternative”	“Relocate Intake to Niagara River” Alternative			Temporary Pumping Alternative	Pre-Treatment Alternatives	
			Alternatives A, B and C		Alt D		Actiflo®	Pre-Sedimentation Tank
Natural Environment Impacts	Construction	Not a Viable Option	Trenching	Tunneling				
	Operations		Low	Low	Low	High, but limited period	Low	Low
Social Environment Impacts	Construction		Moderate	Moderate	Moderate	Low	Moderate	Moderate
	Operations		None	None	None	High	None	None
Technical & Operational Concerns	Construction		High	Moderate	Low	Low	Low	Low
	Operations		Low	Low	Low	Moderate	Low (During normal operation, large sludge volume when turbidity high)	Low (During normal operations, large sludge volumes when turbidity is high)
Cost	Construction		High	High	Low	Moderate	Moderate	Moderate
	Operations		None	None	None	High	Moderate	Moderate



Hatch Mott MacDonald REGIONAL OFFICE 1000 WEST 10TH AVENUE SUITE 100 DENVER, CO 80202 TEL: 303.733.1000 FAX: 303.733.1001 WWW.HATCHMOTTMACDONALD.COM		Niagara Region NIAGARA FALLS W.T.P. INTAKE INTAKE ALIGNMENT PLAN (FROM NIAGARA RIVER TO W.T.P. SCREEN ROOM) SHEET NO. 1 OF 1 DATE: 08/14/07 DRAWN BY: J. B. BROWN CHECKED BY: J. B. BROWN APPROVED BY: J. B. BROWN SCALE: AS SHOWN PROJECT NO. 03-01-001 ISSUE: AUTHORIZATION	
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Record of Meeting/Discussion



Project Title:	Niagara WTP Intake Relocation Regional Municipality of Niagara (RMON)	Division:	WTC - CAn
Subject:	Meeting with OPG	Project No:	HMM-230179
Location:	OPG Offices, SAB Generating Station, NOTL	Date of Meeting:	March 21, 2007
Present:	Robin Young (RMON) John Macpherson, (RMON) Operations John Burns (RMON) Dean Norton (OPG) Allan Reid (OPG)	Don Haber (OPG) Carl Bodimeade (HMM) Eugene Chajka (HMM) Danielle Anders (HMM)	

Recorded by:	Distribution	
dma	All, Sunil Sharma (RMON)	
Item	Text	Action
1	Carl Bodimeade initiated introductions and provided an overview of the purpose and objectives of the project. During the previous closure of the Power Canal in 1968, temporary pumping from the Niagara River had been carried out as a joint City / Ontario Hydro project to provide raw water to the Niagara Falls WTP. Don Haber inquired as to whether the security of the intake is one of the objectives. Carl Bodimeade explained that the intake is currently vulnerable because of its location on the bank of the Welland River; accordingly, although this is not the primary reason for initiating the project, the Region would use this opportunity to improve the security of the intake.	
2	Allan Reid indicated that investigation of the Queenston-Chippawa Power Canal wall has already begun and that they will be performing sonar and ROV inspections, as well as possibly diver inspections, to determine on how much work will likely be required when it is dewatered. The shutdown is currently scheduled for 2010 but could move to 2011, depending on the progress of OPG Tunnel #3.	
3	Don Haber indicated that the previous shutdown was in 1968 and that the expected maintenance shutdown could be every 40 years. He also indicated that the 2010 shutdown could range from 3 months to a year depending on the extent of the work that needs to	

Record of Meeting/Discussion



Project: HMM – 230179

	be done.	
4	Eugene Chajka went over the Class EA Process and where the project is currently in the process.	
5	Eugene Chajka played the video of the results of the turbidity plume modeling and described its significance.	
5	Dean Norton inquired if the model considered the gathering tubes for the existing OPG intake; Carl Bodimeade explained that the model that was used in this analysis is the same model that was used for the analysis for OPG Tunnel #3. Dean Norton provided some photos of the gathering tubes when they were under construction.	
6	Eugene Chajka described the various alternatives considered and discussed the Evaluation Matrix of these, and the estimated costs of each (see attached material handed out at meeting). He indicated that alternative Alignment D1 (permanent relocation of the intake to downstream of OPG Tunnel #2) is the most attractive option at this point followed by temporary pumping and also pre-treatment.	
7	Eugene Chajka indicated that although Alignment D1 seems to be the most attractive option there is information that HMM needs to verify this including: • Bathymetry data for the Niagara River between OPG Tunnel #2 and the new OPG Tunnel #3, • Information on the intake structure and profile of Tunnel #2, and • A general arrangement drawing of the existing and future tunnels. Don Haber indicated that the request for information for the new OPG tunnel and Tunnel #2 that had been previously made by Danielle Anders has been passed along to the appropriate individuals at OPG and the Niagara Tunnel Project; he will forward the information to Danielle Anders when he receives it.	Don Haber (OPG)
8	Dean Norton indicated that the cofferdam for OPG Tunnel #3 is in place. It is currently being grouted and is flooded at this time.	
9	Dean Norton indicated that the dock for the OPG Ice Breaker is being moved downstream of OPG Tunnel #2 and this should be kept in mind if we intend to do construction in the winter.	
10	Dean Norton indicated that he believes the land involved in Alignment D1 would all be dealt with through an easement with NPC. Eugene Chajka indicated it was HMM's understanding that the Niagara River bed belonged to OPG in the area of Tunnel #2.	

Record of Meeting/Discussion



Hatch Mott
MacDonald

Project: HMM – 230179

	Carl Bodimeade requested a property map showing, who owns which lands in the study area, but Dean Norton indicated that all the lands owned by OPG might not be recorded. OPG will investigate this.	Dean Norton (OPG)
11	Carl Bodimeade asked the OPG representatives if they have any objectives to the possible alternative solutions, specifically alternative alignment D1, and what the process is to get approvals for constructing this new intake. Don Haber indicated that OPG has no objections at this point, however to proceed HMM and RMON would have to submit a proposal to OPG's Property Management department. This proposal would have to describe the project and what is planned. Carl Bodimeade indicated that HMM would be proceeding to complete the EA portion of the project and then carry out a Preliminary Design of the Preferred Alternative; this could then form the basis for the proposal to OPG. OPG felt that this process would be satisfactory.	HMM / Region
12	Carl Bodimeade asked who the contact person should be for this project and it was indicated that Dean Norton should be continue to be the first point of contact with OPG.	

Minutes prepared by: Danielle Anders
HMM



Hatch Mott
MacDonald

March 20, 2007

**REGIONAL MUNICIPALITY OF NIAGARA
NIAGARA FALLS WTP INTAKE RELOCATION**

**Meeting with OPG
Wednesday, March 21, 2007 @ 2:30 pm
At OPG Offices**

MEETING AGENDA

- 1.0 Introduction and Purpose**
- 2.0 OPG Plans for Queenston-Chippawa Power Canal shutdown**
- 3.0 Project Status and EA Process**
- 4.0 Overview of Possible Alternative Solutions and OPG Comments**
- 5.0 Data Collection**
- 6.0 OPG Approvals**
 - 6.1 Approvals Process**
 - 6.2 Permission to conduct works**
 - 6.2.1 Investigative**
 - 6.2.2 Construction**
 - 6.3 Contact Person**
 - 6.4 Co-ordination with OPG Tunnel Project**
- 7.0 Other Items**

Record of Meeting/Discussion



Hatch Mott
MacDonald

Project Title: Niagara WTP Intake Relocation
Regional Municipality of Niagara
(RMON)

Date: March 6, 2007

Subject: Progress Meeting # 7

Project No: HMM-230179

Location: Regional Environmental Centre, Thorold

Date of Meeting: February 20, 2007
1:30 pm

Present: Sunil Sharma (RMON)
Robin Young (RMON)
John Burns (RMON)
Bob Steele (RMON)
Charles Rittner (RMON)
Peter Baker (RMON)
Mike Janas (RMON)

Carl Bodimeade (HMM)
Khurram Afzal (HMM)
Andy Bowers (HMM)
Brendan Buggeln (Hatch Energy)

Jayne Campbell (Niagara Peninsula
Conservation Authority)

Recorded by:	Distribution	
KA	All present, J Shaw (Hatch Energy), E. Chajka (HMM), D. Anders (HMM), Herb Maracle (RMON)	
Item	Text	Action
1	Carl Bodimeade opened the meeting with a brief introduction/ history of the project. Presentation handouts, Intake Alternatives Plan and a preliminary evaluation of alternatives table were distributed to all present.	
2	HMM stated that Welland River normal flow has been artificially reversed due to the Queenston-Chippawa power canal. Niagara WTP raw water source is the Niagara River (turbidity <10 NTU) at present. OPG intends to shut down the power canal for maintenance for 3 to 7 months once the OPG tunnel #3 at Niagara River is completed and during this period the source to the WTP will be the Welland River (turbidity can be >180 NTU).	
3	HMM stated that a 'Flow 3D' model of the Niagara and Welland rivers was used to study the distribution and flow pattern of high turbidity water from the Welland River into the Niagara River.	

Record of Meeting/Discussion



Hatch Mott
MacDonald

Project: HMM – 230179

Date of Meeting: February 20, 2007

4	The following four (4) alternatives were discussed: • Do Nothing • Relocate the Intake to the Niagara River • Temporary Pumping from the Niagara River • Pre-Treatment at the WTP.	
5	Do Nothing Option: HMM stated that under this option there will be significant potential impacts on plant process and will require upgrades in the plant process. Mike Janas stated that the Niagara Falls WTP cannot handle 180/200 NTU turbidity of the Welland River without significant upgrades. RMON stated that the turbidity of the Welland River can exceed 200 NTU.	
6	Relocate the Intake to Niagara River (New Permanent Intake): HMM stated that as per the 'Flow 3D' Model, the length of intake required to avoid turbidity plume and/or ice build-up is approximately 300 m to 350 m. HMM stated that there will be significant short-term disruption to fish habitat and potential fish mortality if blasting is used; frazil ice is also a concern. Under this option an amendment to the PTTW will be required and it will be a Schedule C EA. The 'Flow 3D' model also showed that the pollution plume extends beyond intake tunnel #1. HMM to extend the 'Flow 3D' Model beyond tunnel #2 to further study the extent of pollution plume. Alternatives A, B and C - In these options, an intake is proposed beyond the likely turbidity plume limit in the Niagara River, approximately 300to 350m from land. The construction cost (tunneling /trenching) and Natural/Social Environmental impacts are high under this option. Alternative D1 – Installation of gravity pipe downstream of OPG tunnel #2 by trenching - HMM stated that the construction cost is low under this alternative but will require input and approvals from OPG.	HMM
7	Temporary Pumping from the Niagara River Alternative D2 – Temporary pumping from downstream of OPG tunnel #2 – This option includes installation of critically silenced pumps (7 operating/1 standby) downstream of tunnel #2. HMM stated that the construction costs are low but with high natural/social environmental impacts. Operational issues regarding security of supply during temporary pumping concerned RMON WTP staff.	

Record of Meeting/Discussion



Hatch Mott
MacDonald

Project: HMM – 230179

Date of Meeting: February 20, 2007

8	Pretreatment at Plant – HMM stated that under this alternative there is a high degree of flexibility to deal with high and/or variable raw water turbidity. With this option, it is proposed to reduce raw water turbidity levels to <30 NTU prior to treatment, by pretreatment ahead of screens and intake at Welland River will be modified for increased security and capacity (limit to be equal to that approved in the PTTW). There is a potential impact on navigation due to new intake location in the Welland River. The following two (2) alternatives for Pre-Treatment were discussed: • Actiflo • Pre-sedimentation Tank Actiflo - HMM stated that Actiflo is settling process with high overflow rates, low footprint, and removal efficiency exceeding 90% for turbidity/color/algae and arsenic. In this process, micro-sand ballasted flocs display high settling, creating high flow rates and short retention time. It is estimated that three units will be required, each having a capacity of 49.5 ML/day. RMON stated that the option of installing Actiflo for a limited period of time (3 to 7 months), which could costs around \$4.0M to \$5.5M, does not appear to be a viable option. RMON also stated that the operating cost of Actiflo can be very high, i.e., the handling/removal of sludge from Actiflo. HMM to estimate the sludge production from Actiflo on a daily basis. Pre-sedimentation Tank – HMM stated that with this option, the addition of polyelectrolyte increases settling process to reduce suspended solids The hydraulic retention time is estimated to be 1 hour. HMM estimates that two cells, each 5m effective depth, 15m wide and 45m long, will be required, with the process supplied by a valve/diversion chamber on the Intake line. It also provides another mixing location for powdered activated carbon (PAC) application for taste and odor, if required. RMON stated that the sludge may need to be removed twice a day under this option, which will increase operational costs. Also, sludge containing PAC is not accepted by local landfill sites and also cannot be drained into the sewer system. HMM clarified that the conceptual cost provided for this option includes upgrading of the existing intake at the Welland River with increased security and capacity (to be equal to amount approved in the PTTW).	HMM
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Record of Meeting/Discussion



Hatch Mott
MacDonald

Project: HMM – 230179

Date of Meeting: February 20, 2007

9	HMM stated that they have intentionally not shown any preferred alternative in the presentation so that all options can be discussed and reviewed in this meeting. Based on input from all present in the meeting, HMM will further study Alternative D1 (i.e., gravity pipe from downstream of tunnel #2) to evaluate any possible conflicts with the OPG intake and to confirm that adequate water depth is available to prevent frazil ice. HMM to gather data/details of existing plants at OPG tunnel #2.	HMM
10	Construction Period - HMM stated that the construction activities could only be scheduled during the winter to avoid the tourist season.	

Minutes prepared by: Khurram Afzal, P.Eng.
Hatch Mott MacDonald

Please review the above for any discrepancies and advise the author as soon as possible.

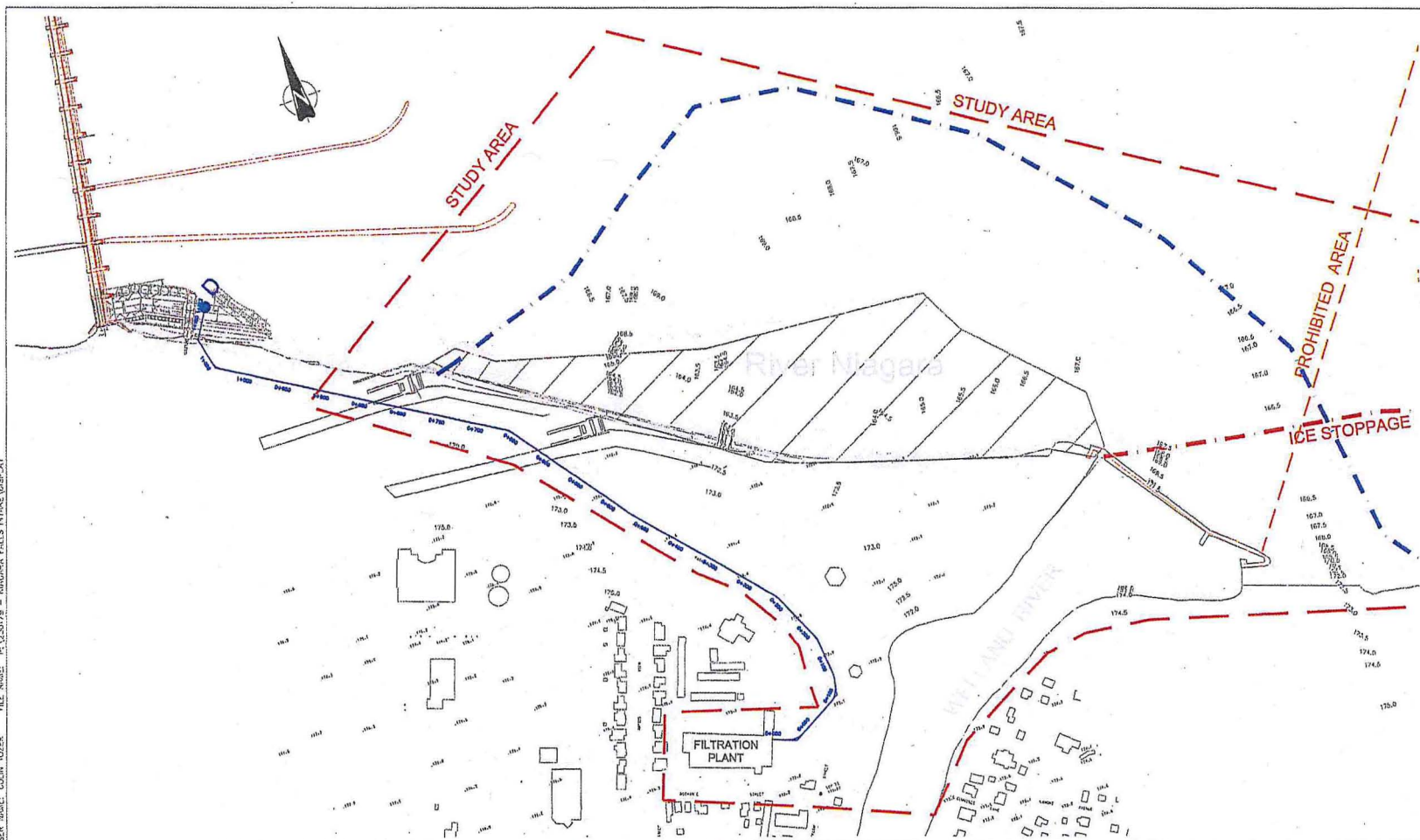
**Table 6.2
EVALUATION OF ALTERNATIVES**

Criteria		Do Nothing	Relocate Intake to Niagara River		Temporary Pumping	Install Pre-Treatment Facilities	
			Trenching	Tunneling		Actiflo	Settling Basin
Natural Environment Impacts	Construction	None	High	Moderate	Low	Moderate	Moderate
	Operations	None	Low	Low	High, but limited period	Low	Low
Social Environment Impacts	Construction	None	Moderate	Moderate	Low	Moderate	Moderate
	Operations	None	None	None	High	None	None
Technical & Operational Concerns	Construction	None	High	Moderate	Low	Low	Low
	Operations	High	Low	Low	Moderate	Low	Low
Cost	Construction	None	High (Alt D1 – Low)	High	Low	Moderate	Low to Moderate
	Operations	Low to Moderate	None	None	Low	Low	Low

Conceptual Costs

Description	Estimated Cost (\$M)	Ranges	
		High (+50%) (\$M)	Low (-30%) (\$M)
DO NOTHING	?	?	?
RELOCATE INTAKE TO NIAGARA RIVER			
Horizontal Alignment A			
A1 - Tunneling Beneath Niagara River	\$5.5	\$8.2	\$3.8
A2 - Trenching in Niagara River	\$5.4	\$8.1	\$3.8
Horizontal Alignment B			
B - Pipe laid on Welland River-beds and Trenching in Niagara River	\$6.9	\$10.3	\$4.8
Horizontal Alignment C			
C1 - Open Cut/Trenching Excavation on-land & in-river to Intake structure	\$4.7	\$7.1	\$3.3
C2 - Open Cut Excavation up to Niagara River Edge and Tunneling beneath Niagara River up to Intake Structure	\$4.6	\$6.9	\$3.2
Horizontal Alignment D			
D1 - Gravity Pipe from Downstream of OPG Tunnel No. 2	\$2.0	\$3.0	\$1.4
TEMPORARY PUMPING & UPGRADING OF EX. INTAKE			
D2 - Temporary Pumping From Downstream of OPG Tunnel No. 2 and upgrading of existing intake pipe @ Welland River with increased capacity & Security	\$3.2	\$4.8	\$2.3
INSTALL PRE-TREATMENT FACILITIES INCL. UPGRADING OF EX. INTAKE			
Actiflo	\$4.1	\$6.2	\$2.9
Settling Basin	\$3.3	\$5.0	\$2.3

FILE NAME: P:\230179 - NIAGARA FALLS INTAKE\DEP.AY
 USER NAME: COLIN TOZER
 PRINT DATE: 02/13/07



LEGEND: SHARP

DESIGNED BY: C.E. 02/13/07 CHECKED BY: DATE:		DRAWN BY: C.E. 02/13/07 PROJECT MANAGER: DATE:	
ISSUED FOR REVIEW REV:		SCALE: (HORIZONTAL) 1" = 100' (VERTICAL) 1" = 10'	
ISSUE AUTHORIZATION 230179		SHEET NO. 1 OF 1 FULL SIZE	

NIAGARA FALLS W.T.P. INTAKE
 INTAKE ALIGNMENT PLAN
 (FROM NIAGARA RIVER TO W.T.P. SCREEN ROOM)

Record of Meeting/Discussion



Hatch Mott
MacDonald

Project Title:	Niagara WTP Intake Relocation Regional Municipality of Niagara (RMON)	Division:	
Subject:	OPG Operations	Project No:	HMM-230179
Location:	Niagara Falls Water Treatment Plant, Niagara Falls, ON	Date of Meeting:	December 14, 2006 2:30 pm
Present:	Herb Maracle (RMON) John Burns (RMON) Eugene Chajka (HMM) Danielle Anders (HMM) Jason Shaw (Hatch Energy)	Peter Kowalski (OPG)	

Recorded by:	Distribution	
dma	All, S. Sharma, R. Young, C. Bodimeade	
Item	Text	Action
1	Peter Kowalski works in Operations for OPG and has knowledge of how OPG operates the power canals in and around our study area.	
2	Peter Kowalski indicated that the diversion structures and the generating plants control water levels in the area. Water resources are shared by both sides (USA and Canada) and both sides must follow the Niagara Falls Treaty: falls flow must be met first and flow for power generation comes second. Generally, daytime tourist season Niagara Falls flow is approximately 100,000 cfs and night time flow is 50,000 cfs. Day to night flow condition change over occurs between 9:30 pm to 11 pm each day.	
3	Water levels cycle throughout the day and the Grass Island pool fluctuates up to 1.5 ft per day.	
4	Any excess flow to actual power generation is stored in the Queenston Reservoir.	
5	The cycling of the levels causes potential for a sloshing of water back and forth in the Welland River; as the level is increased in the Grass Island Pool the water will slosh back up the Welland River and as it decreases it will slosh towards the Niagara River. This potential sloshing could pose an issue in terms of trapping pollutants.	
6	Peter Kowalski indicated that hand written records are kept every winter on the conditions the Ice Breaker encounters, the depth of	OPG – Peter Kowalski

Record of Meeting/Discussion



Project: HMM – 230179

Date of Meeting: December 14, 2006

	ice and location. He is going to look back in his records and supply us with some data for the past 10 years to indicate the worst case scenarios encountered in our study area over that time period.	
7	In reviewing the proposed alternatives, Peter Kowalski's recommendation would be Alternative A.	
8	Peter Kowalski did not have any information on the planned maintenance of the old canal once the new tunnel has been put into operation. He directed us to contact Joe Grcevic, Outage Scheduler, 905-357-0322 to get further information.	HMM
9	Peter Kowalski indicated that frazzle ice is usually formed in the early morning hours from 2 am to 6 am.	
10	Peter Kowalski also directed us to Ms. Joan Friar, Niagara Board of Control, to collect further information on the operations and the modeling that has been completed by OPG for the study area. Joan Friar's information has been passed along to Jason Shaw for follow-up.	HE – Jason Shaw
11	Niagara Falls, New York's water plant has their intake on the Niagara River. Herb Maracle indicated he had spoken with Charlie Gonzalez 716-283-9770 ext. 203 and he is open to HMM contacting him and asking him questions or setting up a meeting.	HMM

Minutes prepared by: Danielle Anders
HMM

Record of Meeting/Discussion

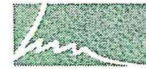


Hatch Mott
MacDonald

Project Title:	Niagara WTP Intake Relocation Regional Municipality of Niagara (RMON)	Division:	
Subject:	Information Gathering	Project No:	HMM-230179
Location:	Niagara Parks Commission (NPC) Office, Niagara Falls, ON	Date of Meeting:	September 29, 2006 9:30 am
Present:	Sunil Sharma (RMON) Robin Young (RMON) David Gillis (NPC)		Danielle Angeloni (HMM) Eugene Chajka (HMM)

Recorded by:	Distribution	
dma	all	
Item	Text	Action
1	David indicated modeling on Niagara River has been done by OPG Toronto	HMM to ask C. Mee
2	NPC upgraded bridge structure from Kings Bridge Park across top of Ice deflection structure at mouth of Chippawa Creek approx. 7 yrs ago- David indicated that gates on small lock at same location were new approximately 3 yrs ago	HMM – to follow-up with OPG for information
3	David indicated that Chippawa Creek was excavated in 1952	HMM – to follow-up with OPG for information
4	David indicated that there used to be an island were the tip of Kings Bridge Park is called Hogg Island and it used to have a Fort on it named Fort Chippawa	Information to be passed along for environmental assessment
5	David has some drawings of the study area available may have more in his archives that may assist us	Follow up with David - HMM
6	For biological inventory information NPC Rob Ritchie could have information on vegetation and biologist Ian Barrett with NPCA	Information to be passed along for environmental assessment

Record of Meeting/Discussion



Hatch Mott
MacDonald

Project: HMM – 230179

Date of Meeting: August 18, 2006

7	City of Niagara Falls may have more drawings of their servicing in the study area	HMM – Eugene to contact Ed Dujlovic
8	David indicated MNR has completed some electro-fishing in the area	Information to be passed along for environmental assessment
9	NPC published book named “Niagara Parks 100 yrs” has background information on Kings Bridge Park and former Hogg Island	HMM – David to provide us a copy of relevant chapter

Minutes prepared by: Danielle Angeloni
HMM

Appendix B
Public Consultation

Notice of Completion

**INTAKE RELOCATION - NIAGARA FALLS WATER TREATMENT PLANT
CITY OF NIAGARA FALLS
CLASS ENVIRONMENTAL ASSESSMENT STUDY**

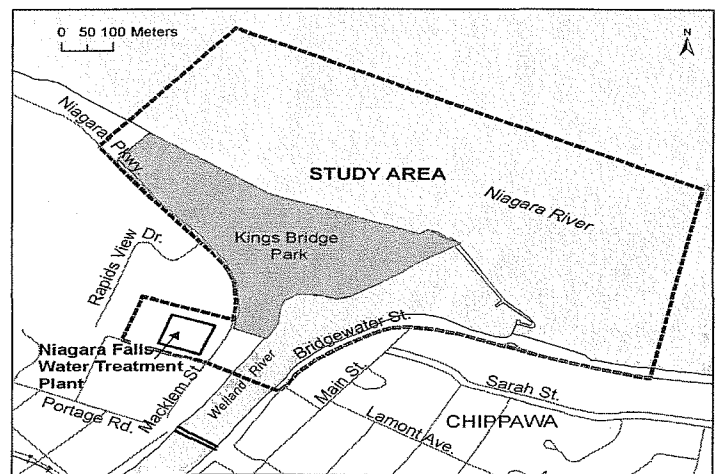
NOTICE OF COMPLETION

Niagara Region has completed a Class Environmental Assessment Study to examine the possible methods to provide a high quality and consistent raw water source for the Niagara Falls Water Treatment Plant upon the potential shut down of the Ontario Power Generation (OPG) power canal for maintenance purposes. This study involved examination of alternative approaches to provide high quality raw water and alignments of a new raw water intake. Alternatives considered included pre-treatment, new permanent raw water intake, and temporary pumping from the Niagara River. The study has concluded that temporary pumping is the preferred solution.

This study followed the Municipal Engineers Association's (MEA) "Municipal Class Environmental Assessment", and is designated as a Schedule "C" undertaking.

Major components of the Preferred Alternative recommended by this study are:

- Temporary Pumping Facility on the Niagara River north of the Sir Adam Beck Tunnel 2 intake
- New Raw Water Supply Main
- Connection to existing intake at the Niagara Falls Water Treatment Plant



Following review, interested persons should provide written comments to Mr. Robin Young (see contact information below) within 30 calendar day review period beginning on November 22, 2008 and ending December 23, 2008. The Study Report is available for public review at the following locations:

Niagara Region Office of the Regional Clerk 2201 St. David's Road Thorold, ON L2V 4T7 Telephone – 905 685-1571	City of Niagara Falls Clerk's Department 4310 Queen Street Niagara Falls, ON L2E 6X5 Telephone – 905 356-7521
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Hours 8:30 am to 4:30 pm

If concerns arise regarding this study, which cannot be resolved in discussion with Niagara Region, a person or party may request that the Minister of the Environment make an order for the study to comply with Part II of the Environmental Assessment Act (referred to as a Part II Order) which addresses individual environmental assessments. Requests must be received by the Minister of the Environment, 135 St. Clair Avenue West, Toronto, M4V 1P5 with a copy to the Niagara Region Project Manager. If no request is received prior to December 23, 2008, the recommendations of the study will proceed to be implemented as outlined in the Study Report.

With the exception of personal information, all comments received will be part of the public record. For further information, please contact one of the individuals identified below:

Mr. Robin Young, P. Eng., C. Chem
Project Manager
Water and Wastewater Services Division
3501 Schmon Parkway, P.O. Box 1042
Thorold, ON L2V 4T7
Phone: 905 685-4225, ext. 3740 or
1-800-263-7215 or TTY# 905 984-3613
Fax: 905 685-5205
Email: robin.young@niagararegion.ca

Mr. Eugene Chajka, P. Eng.,
Project Manager
Hatch Mott MacDonald
4342 Queen Street
Niagara Falls, ON
L2E 6W1
Phone: 905 357-6971
Fax: 905 357-6977
Email: Eugene.chajka@hatchmott.com

Niagara Region Website: www.niagararegion.ca

This notice was issued November 22, 2008

Public Information Centre (PIC) #1

**NIAGARA FALLS
WATER TREATMENT PLANT INTAKE RELOCATION
CLASS ENVIRONMENTAL ASSESSMENT**

PUBLIC INFORMATION CENTRE

**Wednesday, February 28, 2007
6:30 p.m. – 8:30 p.m.**

INTRODUCTION

The Regional Municipality of Niagara is proposing to relocate the intake of the Niagara Falls Water Treatment Plant. This proposed work is intended to ensure an adequate and high quality raw water supply for the plant when Ontario Power Generation (OPG) shuts down their Queenston-Chippawa Power Canal on the Welland River for maintenance, once the new power tunnel on the Niagara River is commissioned.

The Niagara Falls Water Treatment Plant services the City of Niagara Falls with a population of 79,000. It is located along the Welland River on Macklem Street across from Kings Bridge Park in the City of Niagara Falls. It has a rated capacity of 145.5 ML/d and has recently undergone a series of upgrades including an increase in storage capacity and the addition of UV Disinfection.

The plant currently draws water from the Welland River/Chippawa Creek upstream of it's point of confluence with the Niagara River, located just upstream of the Horseshoe Falls. Since the 1920's, water has been diverted from the Niagara River, up the Welland River, and into the Queenston – Chippawa Power Canal. Therefore, the Plant's raw water is actually water that has come from the Niagara River, originating in Lake Erie. Therefore, the Welland River normal flow has been artificially reversed due to the Queenston-Chippawa Power Canal. The current intake is located 150 m west of the confluence with the Niagara River, and 5 to 6 km east from the entrance of the Queenston-Chippawa Power Canal. It is 139 m long and 1200 mm in diameter; this includes an intake structure consisting of a timber apron and sheet piling sides, which does not meet current regional security standards.

CLASS ENVIRONMENTAL ASSESSMENT PROCESS

This Class Environmental Assessment (Class EA) is being undertaken in accordance with the requirements of a Schedule C project as detailed in the "Municipal Engineers Association Class Environmental Assessment for Water and Wastewater Projects (June 2000), which includes the following:

- | | |
|---------|---|
| Phase 1 | Problem Identification |
| Phase 2 | Evaluation of Alternative Solutions |
| Phase 3 | Evaluation of Alternative Design Concepts |
| Phase 2 | Prepare Environmental Study Report |
| Phase 5 | Design and Construction |

You are encouraged to review the information being presented, ask questions of Regional and Consultant personnel in attendance and provide any comments that you may have in writing on the Comment Sheets that

**Niagara Falls Water Treatment Plant
Intake Relocation
CLASS ENVIRONMENTAL ASSESSMENT**

**Wednesday, February 28, 2007
6:30 p.m. – 8:30 p.m.**

SIGN IN SHEET

Please sign in so that we know you have been here to review the materials on display, and in order for us to be able to communicate with you as the project moves forward.

NAME	ADDRESS	TELEPHONE NO.	E-MAIL ADDRESS
Dianne & Joe Chepp	3533 MAIN ST	295-4917	paradisepoint@ cogeco.ca
DAVE GILLIS	N PE	356-2241	Dgillis @niagara porter.com
JAY MASON	4230 FRONT NFO	905 228-0303	mrserace@ yahoo.com
JASON OATLEY	8554 PARLIAMENT AVE		joatley@sympatico.ca

Personal information on this form is collected in accordance with the Municipal Freedom of Information and Protection of Privacy Act, R.S.O. 1990, c. M. 56, as amended. Inquiries about the use and protection of personal information should be directed to the Region's Freedom of Information and Privacy Coordinator

Niagara / Region



**Hatch Mott
MacDonald**

NAME	ADDRESS	TELEPHONE NO.	E-MAIL ADDRESS
Niagara Tunnel Project			
 Hatch Mott MacDonald in association with HATCH ACRES Acting as Owner's Representative for  ONTARIO POWER GENERATION	Cate Mee Environmental/Third Party Manager 2520 Stanley Avenue, RR1 Suite 2 Niagara Falls, ON, L2E 6S4 Direct: 905-353-5528 Office: 905-353-5517 Fax: 905-353-5518 cmee@hatchacres.com		

Personal information on this form is collected in accordance with the Municipal Freedom of Information and Protection of Privacy Act, R.S.O. 1990, c. M. 56, as amended. Inquiries about the use and protection of personal information should be directed to the Region's Freedom of Information and Privacy Coordinator

**NIAGARA FALLS
WATER TREATMENT PLANT INTAKE RELOCATION
CLASS ENVIRONMENTAL ASSESSMENT**

WELCOME TO PUBLIC INFORMATION CENTRE
Wednesday, February 28, 2007
6:30 p.m. – 8:30 p.m.

COMMENT SHEET

The Region of Niagara is interested in hearing the community's comments, questions, and concerns regarding this project. Please take a few minutes to complete this brief comment sheet. All comments will be considered in the Class Environmental Assessment. Please use additional sheets, should you require more space to comment.

NAME: JAY MASON
ADDRESS: 4230 FRONT STREET, NIAGARA FALLS, ON L2G 6G8
PHONE: 905-228-0303 FAX: _____
E-MAIL: masepace@yahoo.com

1. Did the displays and discussion help you to understand more about the project?

☒ Yes

☐ No

2. Were your questions answered to your satisfaction?

☐ Yes

☒ No

3. I am:

☒
☐
☐
☐

Resident of Study Area
Resident Outside Study Area
Business Owner in Study Area
Business Owner Outside Study Area

☐
☒
☐

Elected Representative
Member of Concerned Agency
Other

4. I have reviewed the information provided on the proposed works provided at the Public Information Centre, and:

☐
☒
☐

I am satisfied with the project as presented
I am not satisfied with the project as presented
I have no opinion

5. Do you have any comments, concerns, or questions regarding the alternative locations for a new water treatment plant intake?

*I was more than slightly taken
aback by the fact the project
principles were "unaware" of
dumping of raw sewage upstream
of the proposed intakes. (see attached)
How is this possible?*

6. Do you have any further comments about the proposed project?

*Why was I not fully informed
about reversal of Welland River
before being asked to "comment"
on alternatives in December 2006?*

Please complete this Comment Sheet at your earliest convenience and either leave it at the meeting in the box provided, or return it by mail/fax no later than Thursday, March 15, 2007 to:

Regional Municipality of Niagara
3501 Schmon Parkway, P.O. Box 1042
Thorold, ON L2V 4T7

ATTENTION: Robin Young
Project Manager
Public Works Department
Water and Wastewater Services Division
FAX: (905) 685-5205

Thank you for your contribution to this project!

Notice: Personal information on this form is collected in accordance with the Municipal Freedom of Information and Protection of Privacy Act, R.S.O. 1990, c. M. 56, as amended. Inquiries about the use and protection of personal information should be directed to the Region's Freedom of Information and Privacy Coordinator.

**NIAGARA FALLS
WATER TREATMENT PLANT INTAKE RELOCATION
CLASS ENVIRONMENTAL ASSESSMENT**

PUBLIC INFORMATION CENTRE

Wednesday, February 28, 2007

6:30 p.m. – 8:30 p.m.

INTRODUCTION

The Regional Municipality of Niagara is proposing to relocate the intake of the Niagara Falls Water Treatment Plant. This proposed work is intended to ensure an adequate and high quality raw water supply for the plant when Ontario Power Generation (OPG) shuts down their Queenston-Chippawa Power Canal on the Welland River for maintenance, once the new power tunnel on the Niagara River is commissioned.

The Niagara Falls Water Treatment Plant services the City of Niagara Falls with a population of 79,000. It is located along the Welland River on Macklem Street across from Kings Bridge Park in the City of Niagara Falls. It has a rated capacity of 145.5 ML/d and has recently undergone a series of upgrades including an increase in storage capacity and the addition of UV Disinfection.

The plant currently draws water from the Welland River/Chippawa Creek upstream of it's point of confluence with the Niagara River, located just upstream of the Horseshoe Falls. Since the 1920's, water has been diverted from the Niagara River, up the Welland River, and into the Queenston – Chippawa Power Canal. Therefore, the Plant's raw water is actually water that has come from the Niagara River, originating in Lake Erie. Therefore, the Welland River normal flow has been artificially reversed due to the Queenston-Chippawa Power Canal. The current intake is located 150 m west of the confluence with the Niagara River, and 5 to 6 km east from the entrance of the Queenston-Chippawa Power Canal. It is 139 m long and 1200 mm in diameter; this includes an intake structure consisting of a timber apron and sheet piling sides, which does not meet current regional security standards.

CLASS ENVIRONMENTAL ASSESSMENT PROCESS

This Class Environmental Assessment (Class EA) is being undertaken in accordance with the requirements of a Schedule C project as detailed in the "Municipal Engineers Association Class Environmental Assessment for Water and Wastewater Projects (June 2000)", which includes the following:

- | | |
|---------|---|
| Phase 1 | Problem Identification |
| Phase 2 | Evaluation of Alternative Solutions |
| Phase 3 | Evaluation of Alternative Design Concepts |
| Phase 2 | Prepare Environmental Study Report |
| Phase 5 | Design and Construction |

You are encouraged to review the information being presented, ask questions of Regional and Consultant personnel in attendance and provide any comments that you may have in writing on the Comment Sheets that

are available. Completed Comment Sheets can be left at the meeting, or sent to the address below by March 15, 2007.

Mr. Robin Young, B. Eng., C. Chem
Project Manager
Public Works Department
Water and Wastewater Services Division
3501 Schmon Parkway, P.O. Box 1042
Thorold, ON L2V 4T7
Phone: 905 685-4225, ext. 3740
Fax: 905 685-5205

Following the PIC, the preferred solution will be selected in light of comments received from the public and review agencies; if the preferred solution is a Schedule 'C', we will proceed with a second PIC to review the preferred alternative design options, then an Environmental Assessment Report for the intake will be made available for public review for a thirty (30) days during which time, any objections or concerns that cannot be resolved through discussions with the Region may be forwarded to the Minister of the Environment by requesting a "Part II Order". The public will be notified of the publication of the Environmental Assessment Report through a newspaper notice at the appropriate time.

PROBLEM STATEMENT

It is OPG's intention to temporarily shutdown the Queenston-Chippawa Power Canal for maintenance at the completion of their new intake tunnel on the Niagara River. This shutdown will cause a reversal of flow in the Welland River allowing higher turbidity water to flow past the existing intake and into the Niagara Falls Water Treatment Plant. The problem statement for this study is therefore **"to maintain a high quality raw water supply to the Niagara Falls Water Treatment Plant when an operation change by OPG occurs"**. In addition, this may also provide **"an opportunity to provide an intake that meets current standards and design capacities"**.

ALTERNATIVE SOLUTIONS CONSIDERED

1. "Do Nothing" Alternative:

- Leave the existing water intake where it is and continue to draw Niagara River or Welland River water.

2. "Relocate the Intake to the Niagara River" Alternative:

- Build a new intake from the Niagara Falls Water Treatment Plant to the Niagara River; this included the examination of 4 possible alignments (Alternatives A, B, C, and D) for a proposed 1800 mm diameter pipe.

3. Pre-Treatment Alternative:

- Alternative A - Actiflo® → ballasted coagulation and sedimentation
- Alternative B - A pre-sedimentation tank

4. Temporary Pumping Alternative

- Using temporary pumping equipment only during periods of Power Canal shut-down

INVESTIGATION OF ALTERNATIVES

Each alternative solution for the intake was evaluated in terms of impacts on the natural and socio-economic environments, as well as technical merits and cost. The following are a series of impacts that were identified for each alternative solution.

1. "Do Nothing" Alternative

- No construction = no net adverse impacts.
- Impact on plant processes and potentially drinking water quality when raw water has a high and/or variable turbidity.
- *This alternative solution does not satisfy water quantity and quality requirements and therefore does not satisfy the problem statement.*

2. "Relocate Intake to Niagara River" Alternative

- Distance into Niagara River required to avoid turbidity plume/ice conditions is 200 to 500 m.
- Significant short-term disruption of fish habitat (except for Alt. D).
- Potential fish mortality (if blasting used).
- Loss of habitat due to intake footprint (compensation may be required).
- Tunneling or difficult marine construction required (except for Alt. D).
- Frazil ice may be a concern.
- Requires amendment to Permit to Take Water.

3. Pre-Treatment Alternative

- Potential impact on navigation due to new intake structure.
- Minor disruption and loss of aquatic habitat at intake location (compensation may be required).
- Location is feasible (land acquisition may be required).
- High degree of flexibility to deal with high and/or variable raw water turbidity.
- Large sludge volumes produced when raw water turbidity is high.

4. Temporary Pumping Alternative

- Minor disruption of parkland use during installation of temporary pipe.
- Significant noise emissions over a 3-7 month period.
- Operation likely to occur during summer tourist season.
- Reliability of supply is a concern.

ALTERNATIVE ALIGNMENTS FOR RELOCATING THE INTAKE TO THE NIAGARA RIVER

1. Alternative A - takes advantage of drawing water from Niagara River upstream of the future confluence of the Welland River flows. The intake pipe could follow Niagara Parkway alignment on the south side of the Welland River and cross the river in the proximity of the existing intake.
2. Alternative B - would draw water upstream of the Welland River confluence, similar to the previous alternative, but would be constructed in the bed of the Welland River.
3. Alternative C - would run directly from the Niagara River, through Kings Bridge Park to the WTP and draw water from the Niagara River upstream of the OPG intake tunnels.
4. Alternative D - would draw water from between the existing OPG intake tunnels on the Niagara River and run through the NPC lands to the WTP

EVALUATION OF ALTERNATIVE SOLUTIONS

As required by the Class Environmental Assessment Study process, each alternative was analyzed in terms of impacts on the natural and socio-economic environments including the following factors, as well as technical merits:

- Terrestrial, Vegetation and wildlife resources
- Technical and operational concerns
- Economic and social effects
- Public health
- Aesthetics and Recreational uses

In evaluating the alternative solutions, the following criteria were considered and the alternatives were assigned a low to high impact rating:

1. **Natural Environmental Impact** (Terrestrial Environment, Aquatic Environment including impacts to fish community and habitat) An alternative and a site should allow for the construction and operation of the new intake without significant impact on existing natural features.
2. **Social Impact** (Disruption to parklands, Noise, Impacts on Navigation, Aesthetics):
 - An alternative that will result in the least amount of impact to the existing residents, both during the construction phase and the future operation of the new intake.
 - An alternative that will not be obtrusive both in terms of appearance and operation.
 - An alternative that does not impede navigation.
3. **Economics** (Capital Cost): An alternative that provides a practical solution in terms of initial capital costs for all required infrastructure.
4. **Technical and Operational Concerns** (O&M considerations): An alternative that provides the most practical long-term solution in terms of operating and maintenance.

NEXT STEPS

Following receipt of comments from review agencies and the public on the evaluation of alternatives, the preferred solution will be selected and if the preferred solution is a Schedule 'C' a 2nd PIC will be held to review the preferred alternative design. Following the 2nd a Project File will be made available for public review for a 30 day period during which time any objections or concerns that cannot be resolved through discussions with the Region may be forwarded to the Minister of the Environment by requesting a "Part II Order". If no objections are expressed, the project may proceed to design, and ultimately to construction and commissioning.

The project is expected to proceed as follows:

➤ PUBLIC INFORMATION CENTRE (PIC)	February 28 th , 2007
➤ PIC COMMENTS DUE	March 15 th , 2007
➤ 2 ND PUBLIC INFORMATION CENTRE (PIC)	April 2007
➤ NOTICE OF CLASS EA COMPLETION	May 2007
➤ PROJECT FILE AVAILABLE FOR PUBLIC REVIEW	May - June 2007
➤ DESIGN	Spring/Summer 2007
➤ CONSTRUCTION	Fall/Winter 2007/2008
➤ COMMISSIONING	Summer 2008

Thank you for your interest and participation.

NIAGARA FALLS WATER TREATMENT PLANT INTAKE RELOCATION CLASS ENVIRONMENTAL ASSESSMENT

WELCOME TO THE PUBLIC INFORMATION CENTRE
Wednesday, February 28, 2007
6:30 p.m. – 8:30 p.m.

Please sign the list at the front table so that we know you have been here to review the materials on display, and in order for us to be able to communicate with you as the project moves forward.

BACKGROUND AND PURPOSE

The Regional Municipality of Niagara is proposing to relocate the intake of the Niagara Falls Water Treatment Plant. This proposed work is intended to ensure an adequate and high quality raw water supply for the plant when Ontario Power Generation (OPG) shuts down their Queenston-Chippawa Power Canal on the Welland River for maintenance, once the new power tunnel on the Niagara River is commissioned.

The Niagara Falls Water Treatment Plant services the City of Niagara Falls with a population of 79,000. It is located along the Welland River on Macklem Street across from Kings Bridge Park in the City of Niagara Falls. It has a rated capacity of 145.5 ML/d and has recently undergone a series of upgrades including an increase in storage capacity and the addition of UV Disinfection.

The plant currently draws water from the Welland River/Chippawa Creek upstream of it's point of confluence with the Niagara River, located just upstream of the Horseshoe Falls. Since the 1920's, water has been diverted from the Niagara River, up the Welland River, and into the Queenston – Chippawa Power Canal. Therefore, the Plant's raw water is actually water that has come from the Niagara River, originating in Lake Erie. Therefore, the Welland River normal flow has been artificially reversed due to the Queenston-Chippawa Power Canal. The current intake is located 150 m west of the confluence with the Niagara River, and 5 to 6 km east from the entrance of the Queenston-Chippawa Power Canal. It is 139 m long and 1200 mm in diameter; this includes an intake structure consisting of a timber apron and sheet piling sides, which does not meet current regional security standards.



**NIAGARA FALLS WATER TREATMENT PLANT
INTAKE RELOCATION
CLASS ENVIRONMENTAL ASSESSMENT**

CLASS ENVIRONMENTAL ASSESSMENT (CLASS EA)

This Class Environmental Assessment (Class EA) is being undertaken in accordance with the requirements of a Schedule C project as detailed in the "Municipal Engineers Association Class Environmental Assessment for Water and Wastewater Projects (June 2000).

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This Public Information Centre (PIC) provides stakeholders with an opportunity to meet the Project Team, review the study scope and discuss issues related to the project, including assessment of:

- (1) A wide range of options to ensure an adequate raw water supply to mitigate the effects due to Ontario Power Generation's operation and shutdown of the Queenston-Chippawa Power Canal.
- (2) Potential impacts of the improvements on the natural and social environments and mitigation measures.

Comment sheets are available for you to complete and either hand in before you leave, or return to the Project Team during the next two (2) weeks, and prior to
March 15, 2007.

Following the PIC, the preferred solution will be selected in light of comments received from the public and review agencies; if the preferred solution is a Schedule "C", we will proceed with a second PIC to review the preferred alternative solution, then a Project File for the intake will be placed on the public record for a thirty (30) day review period during which time, any objections or concerns that cannot be resolved through discussions with the Region may be forwarded to the Minister of the Environment by requesting a "Part II Order". The public will be notified of the publication of the Class EA Project File through a newspaper notice at the appropriate time.

NIAGARA FALLS WATER TREATMENT PLANT INTAKE RELOCATION CLASS ENVIRONMENTAL ASSESSMENT

WELCOME TO THE PUBLIC INFORMATION CENTRE
Wednesday, February 28, 2007
6:30 p.m. – 8:30 p.m.

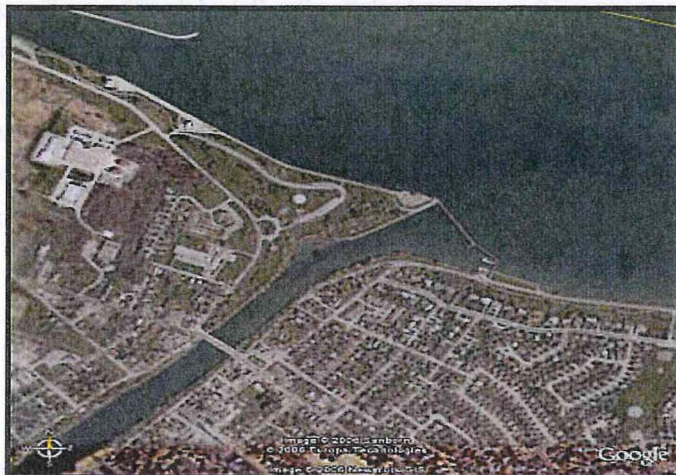
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**NIAGARA FALLS WATER TREATMENT PLANT
INTAKE RELOCATION
CLASS ENVIRONMENTAL ASSESSMENT**

CLASS ENVIRONMENTAL ASSESSMENT (CLASS EA)

This Class Environmental Assessment (Class EA) is being undertaken in accordance with the requirements of a Schedule C project as detailed in the "Municipal Engineers Association Class Environmental Assessment for Water and Wastewater Projects (June 2000).

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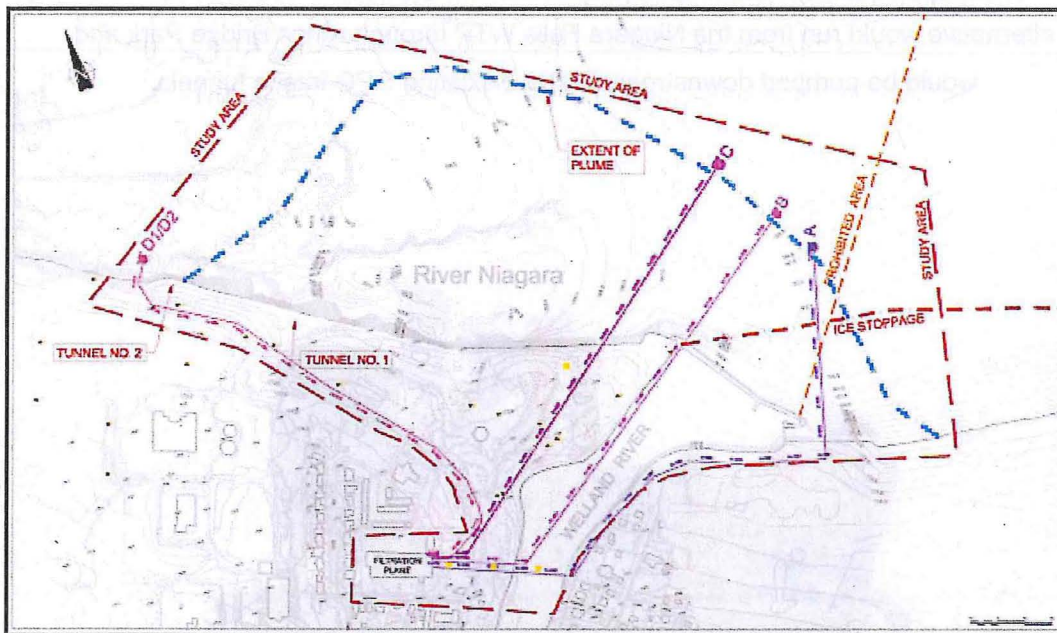
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NIAGARA FALLS WATER TREATMENT PLANT INTAKE RELOCATION CLASS ENVIRONMENTAL ASSESSMENT

“Relocate Intake to the Niagara River” Alternative

This alternative solution required the examination of a series of alternative alignments for a new intake to the Niagara Falls Water Treatment Plant. There are 4 potential alignments A, B, C, and D. All of these alignments needed to be located away from the ice stoppage location and outside the extent of a possible turbidity plume from the Welland River.



ALTERNATIVE ALIGNMENTS FOR RELOCATING THE INTAKE TO THE NIAGARA RIVER

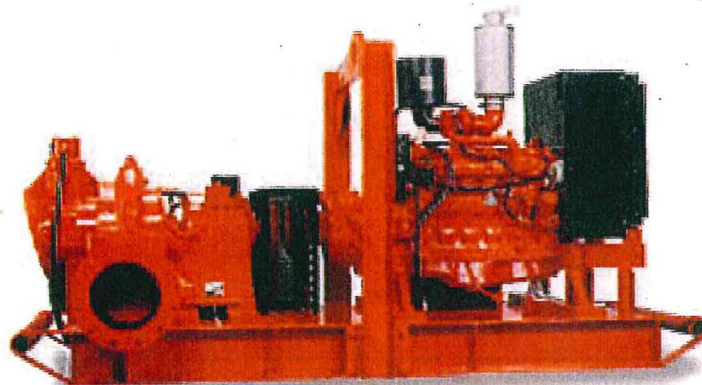
1. Alternative A - takes advantage of drawing water from Niagara River upstream of the future confluence of the Welland River flows. The intake pipe could follow Niagara Parkway alignment on the south side of the Welland River and cross the river in the proximity of the existing intake.
2. Alternative B - would draw water upstream of the Welland River confluence, similar to the previous alternative, but would be constructed in the bed of the Welland River.
3. Alternative C - would run directly from the Niagara River, through Kings Bridge Park to the WTP and draw water from the Niagara River upstream of the OPG intake tunnels.
4. Alternative D - would draw water from between the existing OPG intake tunnels on the Niagara River and run through the NPC lands to the WTP.

**NIAGARA FALLS WATER TREATMENT PLANT
INTAKE RELOCATION
CLASS ENVIRONMENTAL ASSESSMENT**

Temporary Pumping Alternative

This alternative solution requires raw water to be pumped from the Niagara River for the duration of the Queenston-Chippawa Power Canal maintenance activities which are estimated to last between 3-7 months beginning after the completion of the third

OPG intake tunnel in 2009. Critically silenced pumps would be utilized, and 7 operating pumps would be required with 1 stand by pump. The pipeline for this alternative would run from the Niagara Falls WTP through Kings Bridge Park and would be pumped downstream of the 2 existing OPG intake tunnels.



"Critically Silenced" 12" Portable Diesel Pump (7 required)

NIAGARA FALLS WATER TREATMENT PLANT INTAKE RELOCATION CLASS ENVIRONMENTAL ASSESSMENT

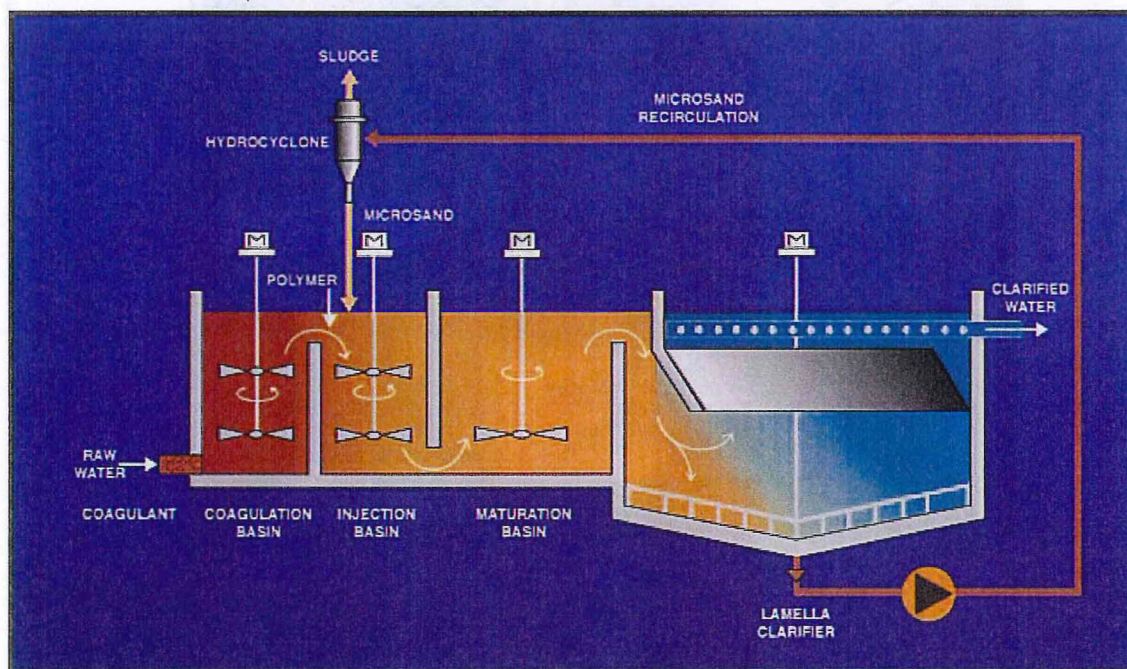
Pre-Treatment Alternative

This alternative solution is intended to be added onto the existing plant processes ahead of the WTP. It is intended to reduce water turbidity levels to < 30 NTU prior to treatment. This alternative would not require relocated the intake, rather improving the existing intake and extending it into the center of the Welland River for increased security.

Alternative A - Actiflo[®]

Actiflo[®] is a high rate settling process with a small footprint. It can provide a removal efficiency exceeding 90% for turbidity, color, algae and arsenic. It uses micro-sand as a seed for floc formation and as ballast to increase floc density and give a high settling velocity. It also utilizes plate settling to reduce the clarifier surface. For this installation, 3 units would be required at 49,500 m³/d each.

BALLASTED COAGULATION AND SEDIMENTATION



**NIAGARA FALLS WATER TREATMENT PLANT
INTAKE RELOCATION
CLASS ENVIRONMENTAL ASSESSMENT**

Alternative B - Pre-Sedimentation Tank

This alternative would provide an impoundment to provide pre-sedimentation, and the addition of a polyelectrolyte to cause fairly rapid settling and a reduction in suspended solids to a more 'normal' level, thereby allowing the treatment plant to function and perform as usual.

To maintain a plant capacity of 145,000 m³/day, the pre-treatment sedimentation process would consist of two cells, each 5m deep, 15m wide, and 45m long. A valve/diversion chamber on the intake line will allow high quality raw water to bypass the pre-sedimentation cells; a polymer feed system would be introduced, and powdered activated carbon could be applied to handle the possible higher organic loads resulting from the influx of Welland River water with a higher organic or minor contaminant loading.



**NIAGARA FALLS WATER TREATMENT PLANT
INTAKE RELOCATION
CLASS ENVIRONMENTAL ASSESSMENT**

PROBLEM STATEMENT

It is OPG's intention to temporarily shutdown the Queenston-Chippawa Power Canal for maintenance at the completion of their new intake tunnel on the Niagara River.

This shutdown will cause a reversal of flow in the Welland River allowing higher turbidity water to flow past the existing intake and into the Niagara Falls Water Treatment Plant. The problem statement for this study is therefore **“to maintain a high quality raw water supply to the Niagara Falls Water Treatment Plant when an operation change by OPG occurs”**. In addition, this may also provide **“an opportunity to provide an intake that meets current standards and design capacities”**.

ALTERNATIVE SOLUTIONS

1. “Do Nothing” Alternative:

- Leave the existing water intake where it is and continue to draw Niagara River or Welland River water.

2. “Relocate the Intake to the Niagara River” Alternative:

- Build a new intake from the Niagara Falls Water Treatment Plant to the Niagara River; this included the examination of 4 possible alignments (Alternatives A, B, C, and D) for a proposed 1800 mm diameter pipe.

3. Pre-Treatment Alternative:

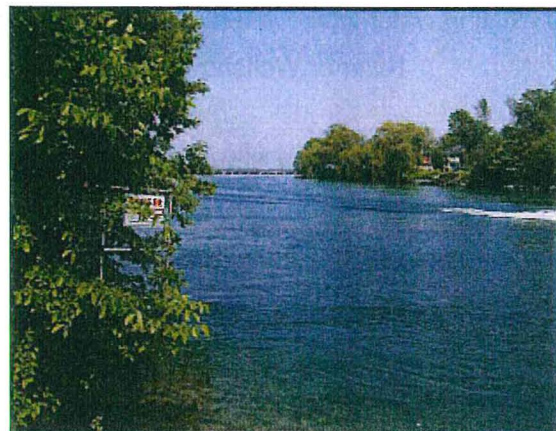
- Alternative A - Actiflocc → ballasted coagulation and sedimentation
- Alternative B - A pre-sedimentation tank

4. Temporary Pumping Alternative

**NIAGARA FALLS WATER TREATMENT PLANT
INTAKE RELOCATION
CLASS ENVIRONMENTAL ASSESSMENT**

“Do Nothing” Alternative

The “Do Nothing” alternative involves leaving the existing intake in its current location and continuing to operate it and the Niagara Falls Water Treatment Plant as usual, and dealing with changing water quality as it occurs with existing plant processes. The Plant will likely experience high and variable turbidity in the raw water, as this would otherwise reduce the capacity and possibly supply to the plant.



NIAGARA FALLS WATER TREATMENT PLANT INTAKE RELOCATION CLASS ENVIRONMENTAL ASSESSMENT

Potential Impacts of Alternative Solutions

Each alternative solution for the intake was evaluated in terms of impacts on the natural and socio-economic environments, as well as technical merits and cost. The following are a series of impacts that were identified for each alternative solution.

"Do Nothing" Alternative

- No construction = no net adverse impacts.
- Impact on plant processes and potentially drinking water quality when raw water has a high and/or variable turbidity.
- *This alternative solution does not satisfy water quantity and quality requirements and therefore does not satisfy the problem statement.*

"Relocate Intake to Niagara River" Alternative

- Length required to avoid turbidity plume/ice conditions is 200 to 500 m.
- Significant short-term disruption of fish habitat (except for Alt. D).
 - Potential fish mortality (if blasting used).
- Loss of habitat due to intake footprint (compensation may be required).
- Tunneling or difficult marine construction required (except for Alt. D).
 - Frazil ice may be a concern.
- Requires amendment to Permit to Take Water.

Pre-Treatment Alternative

- Potential impact on navigation due to new intake structure.
- Minor disruption and loss of aquatic habitat at intake location (compensation may be required).
 - Location is feasible (land acquisition may be required).
- High degree of flexibility to deal with high and/or variable raw water turbidity.
 - Large sludge volumes produced when raw water turbidity is high.

Temporary Pumping Alternative

- Minor disruption of parkland use during installation of temporary pipe.
 - Significant noise emissions over a 3-7 month period.
 - Operation likely to occur during Summer tourist season.
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NIAGARA FALLS WATER TREATMENT PLANT INTAKE RELOCATION CLASS ENVIRONMENTAL ASSESSMENT

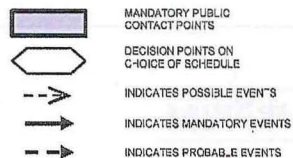
NEXT STEPS

- WITH INPUT FROM PUBLIC INFORMATION CENTRE, PREFERRED SOLUTION WILL BE SELECTED.
- IF PREFERRED SOLUTION IS A SCHEDULE 'C', A SECOND PUBLIC INFORMATION CENTRE WILL BE HELD TO REVIEW THE PREFERRED ALTERNATIVE DESIGN.
- PROJECT FILE WILL BE MADE AVAILABLE FOR PUBLIC REVIEW FOR 30 DAY PERIOD DURING WHICH TIME ANY OBJECTIONS OR CONCERNS THAT CANNOT BE RESOLVED THROUGH DISCUSSIONS WITH THE REGION OF NIAGARA MAY BE FORWARDED TO THE MINISTER OF ENVIRONMENT BY REQUESTING A "PART II ORDER".
- IF NO OBJECTIONS ARE EXPRESSED, PROJECT MAY PROCEED TO DESIGN, AND ULTIMATELY TO CONSTRUCTION AND COMMISSIONING.

- PROJECT IS EXPECTED TO PROCEED AS FOLLOWS:

• PUBLIC INFORMATION CENTRE (PIC)	February 28 th , 2007
• PIC COMMENTS DUE	March 15 th , 2007
• 2 ND PUBLIC INFORMATION CENTRE (PIC)	April 2007
• NOTICE OF CLASS EA COMPLETION	May 2007
• PROJECT FILE AVAILABLE FOR PUBLIC REVIEW	May - June 2007
• DESIGN	Spring/Summer 2007
• CONSTRUCTION	Fall/Winter 2008
• COMMISSIONING	Summer 2008

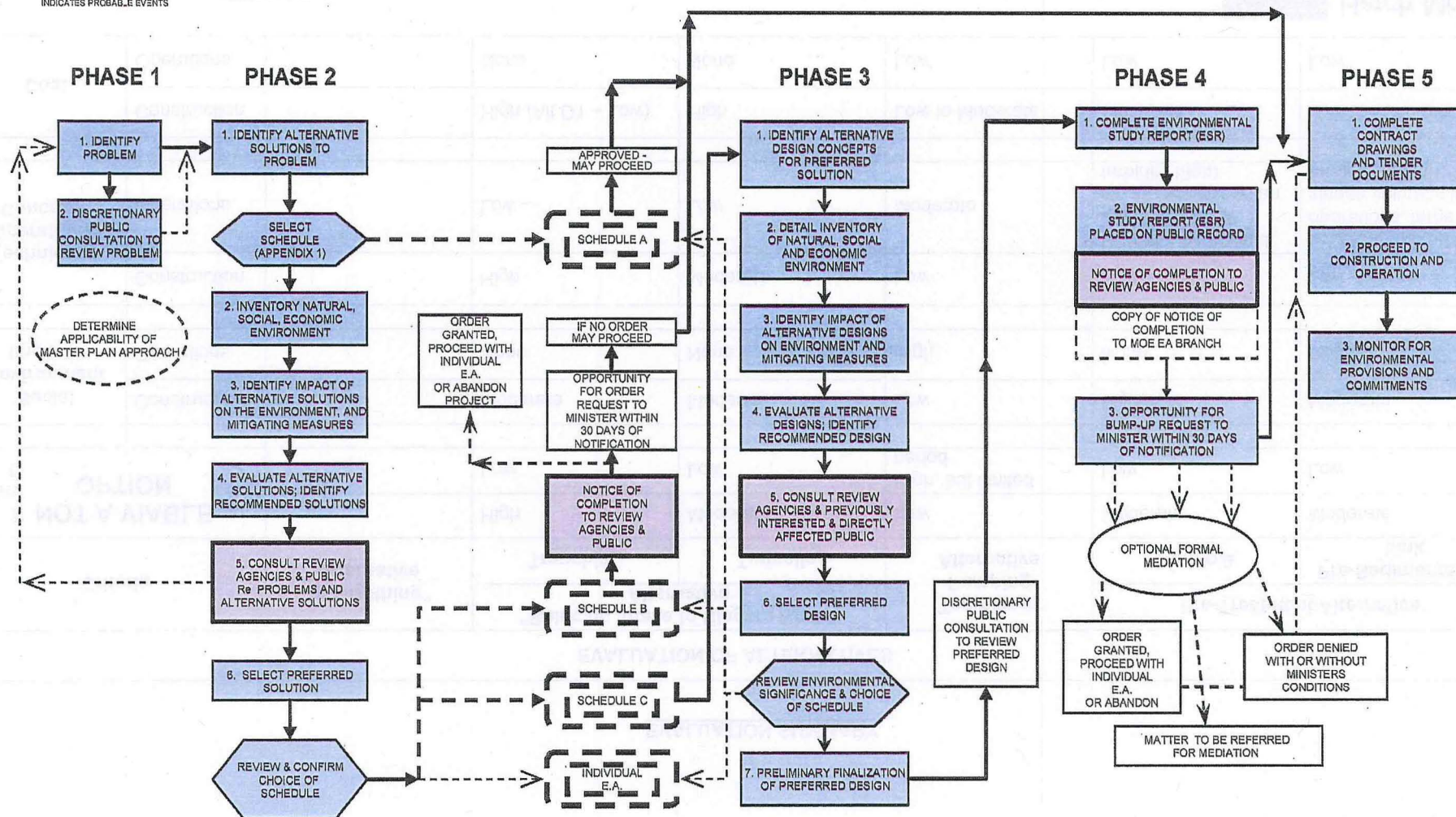




PLANNING & DESIGN PROCESS - CLASS EA FOR MUNICIPAL PROJECTS

BASED ON MUNICIPAL ENGINEERS ASSOCIATION, October 2000

Figure 1.2



**NIAGARA FALLS WATER TREATMENT PLANT
INTAKE RELOCATION
CLASS ENVIRONMENTAL ASSESSMENT**

EVALUATION SUMMARY

EVALUATION OF ALTERNATIVES							
Criteria		"Do Nothing" Alternative	"Relocate Intake to Niagara River" Alternative		Temporary Pumping Alternative	Pre-Treatment Alternative	
			Trenching	Tunneling		Actiflo [®]	Pre-Sedimentation tank
NOT A VIABLE OPTION			High	Moderate	Low	Moderate	Moderate
			Low	Low	High, but limited period	Low	Low
Social Environment Impacts	Construction		Moderate	Moderate	Low	Moderate	Moderate
	Operations		None	None	High	None	None
Technical & Operational Concerns	Construction		High	Moderate	Low	Low	Low
	Operations		Low	Low	Moderate	Low (during normal operation, large sludge volume when turbidity high)	Low (during normal operations, large sludge volumes when turbidity is high)
Cost	Construction		High (Alt D1 – Low)	High	Low to Moderate	Moderate	Low to Moderate
	Operations		None	None	Low	Low	Low

Public Information Centre (PIC) #2

NIAGARA REGION
PUBLIC WORKS DEPARTMENT
CLASS ENVIRONMENTAL ASSESSMENT STUDY

INTAKE RELOCATION
NIAGARA FALLS WATER TREATMENT PLANT
CITY OF NIAGARA FALLS

NOTICE OF PUBLIC INFORMATION CENTRE

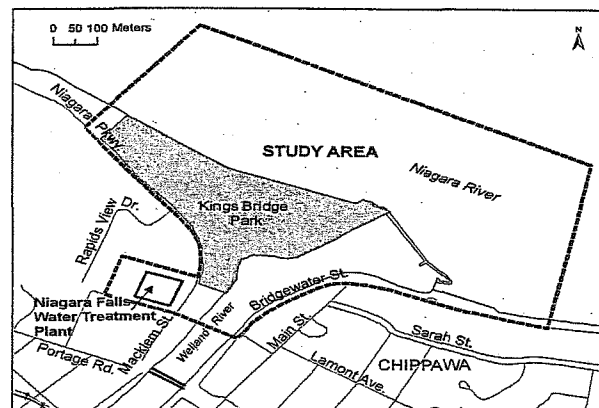
The Regional Municipality of Niagara plans to relocate the Niagara Falls Water Treatment Plant Intake currently located on the north bank of the Welland River (Chippawa Creek), approximately 500m west of the confluence with the Niagara River.

The Region is planning this relocation to provide reliable, high quality and consistent raw water upon the potential shut down of the Ontario Power Generation (OPG) power canal for maintenance purposes. The project is being planned in accordance with the requirements for Schedule 'C' of the Municipal Class Environmental Assessment.

As part of the Class EA planning process, a second Public Information Centre is being held to present the preferred alternative solution, including the process in determining the preferred solution, alternative design concepts of the preferred solution and the next steps. You are invited to attend this Public Information Centre to review the preferred solution, provide comments and discuss concerns you may have with representatives of Niagara Region. This Public Information Centre will be an informal meeting and you are invited to drop in at your convenience.

The Public Information Centre is scheduled for:

Date: Wednesday, May 16, 2007
Time: 6:30 P.M. to 8:30 P.M.
Location: Riverview Public School
3300 Cattell Drive
Niagara Falls, Ontario



If you are unable to attend this Public Information Centre and wish to obtain more information or provide written comments, please address your concerns to:

Mr. Robin Young, B. Eng., C. Chem
Project Manager
Public Works Department
Water and Wastewater Services Division
3501 Schmon Parkway, P.O. Box 1042
Thorold, ON L2V 4T7
Phone: 905 685-4225, ext. 3740
Fax: 905 685-5205
Email: robin.young@regional.niagara.on.ca

Mr. Eugene Chajka, P. Eng.
Project Manager
Hatch Mott MacDonald
4342 Queen Street
Niagara Falls, ON
L2E 6W1
Phone: 905 357-6971
Fax: 905 357-6977
Email: eugene.chajka@hatchmott.com

**NIAGARA FALLS
WATER TREATMENT PLANT INTAKE RELOCATION
CLASS ENVIRONMENTAL ASSESSMENT**

PUBLIC INFORMATION CENTRE #2

Wednesday, May 16, 2007

6:30 p.m. – 8:30 p.m.

INTRODUCTION

The Regional Municipality of Niagara is proposing to relocate the intake of the Niagara Falls Water Treatment Plant. This proposed work is intended to ensure an adequate and high quality raw water supply for the plant when Ontario Power Generation (OPG) shuts down their Queenston-Chippawa Power Canal on the Welland River for maintenance, once the new power tunnel on the Niagara River is commissioned.

The Niagara Falls Water Treatment Plant services the City of Niagara Falls with a population of 79,000, plus a portion of Niagara-on-the-Lake and Thorold. It is located along the Welland River on Macklem Street across from Kings Bridge Park in the City of Niagara Falls. It has a rated capacity of 145.5 ML/d and has recently undergone a series of upgrades including an increase in storage capacity and the addition of UV Disinfection.

The plant currently draws water from the Welland River/Chippawa Creek west of its point of confluence with the Niagara River, located just upstream of the Horseshoe Falls. Since the 1920's, water has been diverted from the Niagara River, up the Welland River, and into the Queenston – Chippawa Power Canal. Therefore, the Welland River normal flow has been artificially reversed due to the Queenston-Chippawa Power Canal and the Plant's raw water is actually water that has come from the Niagara River, originating in Lake Erie. The current intake is located 150 m west of the confluence with the Niagara River, and 5 to 6 km east from the entrance of the Queenston-Chippawa Power Canal. The existing intake is 139 m long and 1200 mm in diameter; this includes an intake structure consisting of a timber apron and sheet piling sides, which does not meet current regional security standards.

CLASS ENVIRONMENTAL ASSESSMENT PROCESS

This Class Environmental Assessment (Class EA) is being undertaken in accordance with the requirements of a Schedule C project as detailed in the "Municipal Engineers Association Class Environmental Assessment for Water and Wastewater Projects (June 2000), which includes the following:

- | | |
|---------|---|
| Phase 1 | Problem Identification |
| Phase 2 | Evaluation of Alternative Solutions |
| Phase 3 | Evaluation of Alternative Design Concepts |
| Phase 4 | Prepare Environmental Study Report |
| Phase 5 | Design and Construction |

You are encouraged to review the information being presented, ask questions of Regional and Consultant personnel in attendance and provide any comments that you may have in writing on the Comment Sheets that are available.

**Niagara Falls Water Treatment Plant
Intake Relocation
CLASS ENVIRONMENTAL ASSESSMENT**

Wednesday, May 16, 2007
6:30 p.m. – 8:30 p.m.

SIGN IN SHEET

Please sign in so that we know you have been here to review the materials on display, and in order for us to be able to communicate with you as the project moves forward.

NAME	ADDRESS	TELEPHONE NO.	E-MAIL ADDRESS
Al & Penny Oleksuk	4083 Front St Niagara Falls, ON	905 2954517	
John Robbins Niagara Falls Review	4801 Valley Way NF. ON	905 - 358-5711 ext. 1155	jrobbins@nreview.com

Personal information on this form is collected in accordance with the Municipal Freedom of Information and Protection of Privacy Act, R.S.O. 1990, c. M. 56, as amended. Inquiries about the use and protection of personal information should be directed to the Region's Freedom of Information and Privacy Coordinator

Niagara  Region



**Hatch Mott
MacDonald**

**NIAGARA FALLS
WATER TREATMENT PLANT INTAKE RELOCATION
CLASS ENVIRONMENTAL ASSESSMENT**

**WELCOME TO PUBLIC INFORMATION CENTRE
Wednesday, May 16, 2007
6:30 p.m. – 8:30 p.m.**

COMMENT SHEET

The Region of Niagara is interested in hearing the community's comments, questions, and concerns regarding this project. Please take a few minutes to complete this brief comment sheet. All comments will be considered in the Class Environmental Assessment. Please use additional sheets, should you require more space to comment.

NAME: _____
ADDRESS: _____
PHONE: _____ FAX: _____
E-MAIL: _____

1. Did the displays and discussion help you to understand more about the project?

Yes

No

2. Were your questions answered to your satisfaction?

Yes

No

3. I am:

☐
☐
☐
☐

Resident of Study Area
Resident Outside Study Area
Business Owner in Study Area
Business Owner Outside Study Area

☐
☐
☐

Elected Representative
Member of Concerned Agency
Other

4. I have reviewed the information provided on the proposed works provided at the Public Information Centre, and:

☐
☐
☐

I am satisfied with the project as presented
I am not satisfied with the project as presented
I have no opinion

5. Do you have any comments, concerns, or questions regarding the preferred alternative solution for the new water treatment plant intake?

6. Do you have any further comments about the proposed project?

Please complete this Comment Sheet at your earliest convenience and either leave it at the meeting in the box provided, or return it by mail/fax no later than Thursday, May 31, 2007 to:

Regional Municipality of Niagara
3501 Schmon Parkway, P.O. Box 1042
Thorold, ON L2V 4T7

ATTENTION: Robin Young
Project Manager
Public Works Department
Water and Wastewater Services Division
FAX: (905) 685-5205

Thank you for your contribution to this project!

Notice: Personal information on this form is collected in accordance with the Municipal Freedom of Information and Protection of Privacy Act, R.S.O. 1990, c. M. 56, as amended. Inquiries about the use and protection of personal information should be directed to the Region's Freedom of Information and Privacy Coordinator.

Completed Comment Sheets can be left at the meeting, or sent to the address below by **May 31, 2007**.

Mr. Robin Young, B. Eng., C. Chem
Project Manager
Public Works Department
Water and Wastewater Services Division
3501 Schmon Parkway, P.O. Box 1042
Thorold, ON L2V 4T7
Phone: 905 685-4225, ext. 3740
Fax: 905 685-5205

Following the PIC, the preferred design concept will be selected in light of comments received from the public and review agencies, as well as further discussions with OPG. Then an Environmental Assessment Report will be completed and made available for public review for thirty (30) days during which time, any objections or concerns that cannot be resolved through discussions with the Region may be forwarded to the Minister of the Environment by requesting a "Part II Order". The public will be notified of the publication of the Environmental Assessment Report through a newspaper notice at the appropriate time.

PROBLEM STATEMENT

Upon completion of their new intake tunnel on the Niagara River, it is OPG's intention to temporarily shutdown the Queenston-Chippawa Power Canal for maintenance at the. This shutdown will cause a reversal of flow in the Chippawa Creek allowing higher turbidity water to flow past the existing intake and be drawn into the Niagara Falls Water Treatment Plant. The problem statement for this study is therefore **"to maintain a high quality raw water supply to the Niagara Falls Water Treatment Plant when an operation change by OPG occurs"**. In addition, this may also provide **"an opportunity to provide an intake that meets current standards and design capacities"**.

ALTERNATIVE SOLUTIONS CONSIDERED

1. "Do Nothing" Alternative:

- Leave the existing water intake where it is and continue to draw Niagara River or Welland River water.

2. "Relocate the Intake to the Niagara River" Alternative:

- Build a new intake from the Niagara Falls Water Treatment Plant to the Niagara River; this included the examination of 4 possible alignments (Alternatives A, B, C, and D) for a proposed 1800 mm diameter pipe.

3. Pre-Treatment Alternative:

- Alternative A - Actiflo® → ballasted coagulation and sedimentation
- Alternative B - A pre-sedimentation tank

4. Temporary Pumping Alternative

- Using temporary pumping equipment only during periods of Power Canal shut-down

ALTERNATIVE ALIGNMENTS FOR RELOCATING THE INTAKE TO THE NIAGARA RIVER

1. **Alternative A** - takes advantage of drawing water from Niagara River upstream of the future confluence of the Welland River flows. The intake pipe could follow Niagara Parkway alignment on the south side of the Welland River and cross the river in the proximity of the existing intake.
2. **Alternative B** - would draw water upstream of the Welland River confluence, similar to the previous alternative, but would be constructed in the bed of the Welland River.
3. **Alternative C** - would run directly from the Niagara River, through Kings Bridge Park to the WTP and draw water from the Niagara River upstream of the OPG intake tunnels.
4. **Alternative D** - would draw water from downstream of OPG intake tunnel #2 on the Niagara River and runs through the NPC lands to the WTP

SELECTION OF PREFERRED ALTERNATIVE SOLUTION

From the comments received from PIC #1 and evaluation of each alternative solution and alignment, it was determined that Alternative Solution #2 – “Relocate the Intake to the Niagara River” with Alternative Alignment D is the preferred solution. This was determined by evaluating each alternative solution on the basis of cost, natural environment impacts, social environment impacts and technical and operational concerns.

DESIGN CONCEPTS FOR ALTERNATIVE ALIGNMENT D

The proposed alignments were then considered for the preferred alternative solution. 3 possible design concepts for alternative alignment D were examined:

- “D1” - 1800 mm diameter gravity pipe, 1292 m long from the Water Treatment Plant to the downstream side of OPG Intake Tunnel #2, crossing over both OPG Intakes then into the Niagara River, this requires some excavation in the Niagara River to elevation 162.2m.
- “D2” - 1800 mm diameter gravity pipe, 1212 m long from the Water Treatment Plant to the area approximately 194 m downstream of OPG Intake Tunnel #2, where excavation to elevation 162.2 m has already been completed for the new OPG Intake Tunnel #3.
- “D3” - 1800 mm diameter gravity pipe, 1245 m long from the Water Treatment Plant to inside the existing cofferdam built for the new OPG Intake Tunnel #3.

A preliminary conceptual design was undertaken for each of the proposed alignments to determine how each would need to be constructed. Each proposed alignment was then evaluated on the basis of cost, natural environment impacts, social impacts and technical and operational concerns. However, OPG's current construction activities and future operations impact the viability of all design concepts; therefore, all design concepts require OPG review before a preferred design concept can be identified.

NEXT STEPS

Following receipt of comments from review agencies and the public, as well as, further discussions with OPG on the evaluation of each design concept, the EA will be finalized and the Project File completed. The Project File will then be made available for public review for a 30 day period during which time any objections or concerns that cannot be resolved through discussions with the Region may be forwarded to the Minister of the Environment by requesting a "Part II Order". If no objections are expressed, the project may proceed to design, and ultimately to construction and commissioning.

The project is expected to proceed as follows:

- | | |
|--|-----------------------------|
| ➤ PUBLIC INFORMATION CENTRE (PIC) #2 | May 16 th , 2007 |
| ➤ PIC COMMENTS DUE | May 31 st , 2007 |
| ➤ NOTICE OF CLASS EA COMPLETION | June 2007 |
| ➤ PROJECT FILE AVAILABLE FOR PUBLIC REVIEW | June - July 2007 |
| ➤ DESIGN | Summer/Fall 2007 |
| ➤ CONSTRUCTION | Winter 2007/2008 |
| ➤ COMMISSIONING | Summer 2008 |

* THIS SCHEDULE MAY BE DEPENDANT ON THE TIMING OF THE CONSTRUCTION OF THE OPG TUNNEL PROJECT.

Thank you for your interest and participation in this project.

NIAGARA FALLS WATER TREATMENT PLANT INTAKE RELOCATION CLASS ENVIRONMENTAL ASSESSMENT

WELCOME TO PUBLIC INFORMATION CENTRE #2

Wednesday, May 16, 2007

6:30 p.m. – 8:30 p.m.

Please sign the list at the front table so that we know you have been here to review the materials on display, and in order for us to be able to communicate with you as the project moves forward.

BACKGROUND AND PURPOSE

As you are aware, the Regional Municipality of Niagara is proposing to relocate the intake of the Niagara Falls Water Treatment Plant. This proposed work is intended to ensure an adequate and high quality raw water supply for the plant when Ontario Power Generation (OPG) shuts down their Queenston-Chippawa Power Canal on the Welland River for maintenance, once the new power tunnel on the Niagara River is commissioned.

The Niagara Falls Water Treatment Plant services the City of Niagara Falls with a population of 79,000, as well as the Port Robinson area of Thorold and a portion of Niagara-on-the-Lake. It is located along the Welland River on Macklem Street across from Kings Bridge Park in the City of Niagara Falls. It has a rated capacity of 145.5 ML/d and has recently undergone a series of upgrades including an increase in storage capacity and the addition of UV Disinfection.

The plant currently draws water from the Welland River/Chippawa Creek upstream of its point of confluence with the Niagara River, located just upstream of the Horseshoe Falls. Since the 1920's, water has been diverted from the Niagara River, up the Welland River, and into the Queenston – Chippawa Power Canal. Therefore, the Plant's raw water is actually water that has come from the Niagara River, originating in Lake Erie. Therefore, the Welland River normal flow has been artificially reversed due to the Queenston-Chippawa Power Canal. The current intake is located 150 m west of the confluence with the Niagara River, and 5 to 6 km east from the entrance of the Queenston-Chippawa Power Canal. It is 139 m long and 1200 mm in diameter; this includes an intake structure consisting of a timber apron and sheet piling sides, which does not meet current regional security standards.



**NIAGARA FALLS WATER TREATMENT PLANT
INTAKE RELOCATION
CLASS ENVIRONMENTAL ASSESSMENT**

CLASS ENVIRONMENTAL ASSESSMENT (CLASS EA)

This Class Environmental Assessment (Class EA) is being undertaken in accordance with the requirements of a Schedule C project as detailed in the "Municipal Engineers Association Class Environmental Assessment for Water and Wastewater Projects (June 2000).

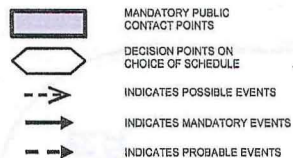
The Municipal Class Environmental Assessment establishes an approved planning process for municipalities to follow to satisfy the requirements of the Environmental Assessment Act for specified projects. Schedule C projects have the potential for significant environmental effects and must proceed under the full planning and documentation procedures specified in the Class Environmental Assessment. Schedule C projects require preparation of an Environmental Study Report and public review.

This Public Information Centre (PIC) provides stakeholders with an opportunity to meet the Project Team, review the study scope and discuss issues related to the project, including assessment of:

- (1) A wide range of options to ensure an adequate raw water supply to mitigate the effects due to Ontario Power Generation's operation and shutdown of the Queenston-Chippawa Power Canal.
- (2) Potential impacts of the improvements on the natural and social environments and mitigation measures.

Comment sheets are available for you to complete and either hand in before you leave, or return to the Project Team during the next two (2) weeks, and prior to
May 31, 2007.

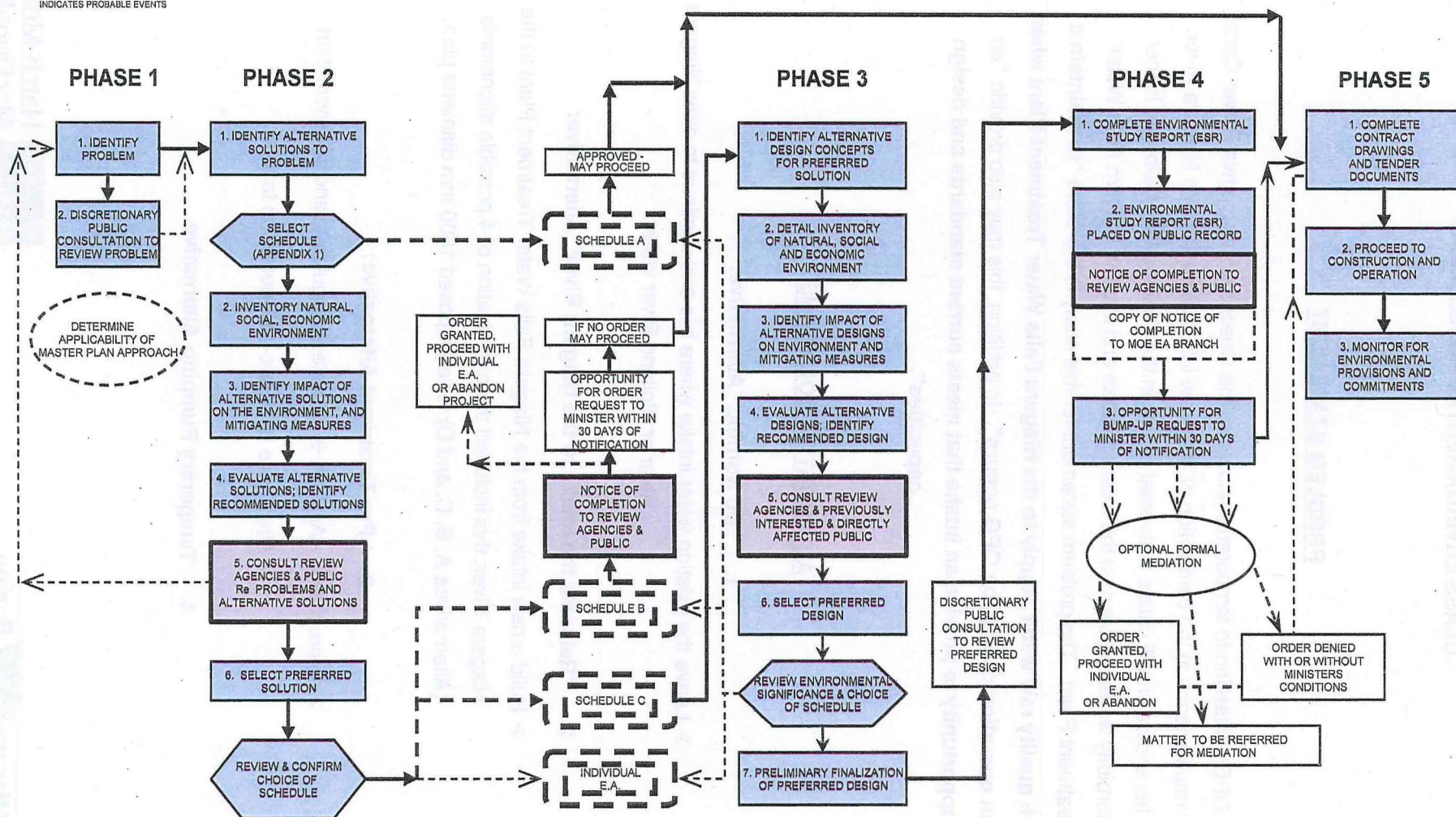
Following the PIC, the preferred solution will be finalized in light of any comments received and then a Project File for the intake will be completed and placed on the public record for a thirty (30) day review period during which time, any objections or concerns that cannot be resolved through discussions with the Region may be forwarded to the Minister of the Environment by requesting a "Part II Order". The public will be notified of the publication of the Class EA Project File through a newspaper notice at the appropriate time.



PLANNING & DESIGN PROCESS - CLASS EA FOR MUNICIPAL PROJECTS

BASED ON MUNICIPAL ENGINEERS ASSOCIATION, October 2000

Figure 1.2



**NIAGARA FALLS WATER TREATMENT PLANT
INTAKE RELOCATION
CLASS ENVIRONMENTAL ASSESSMENT**

PROBLEM STATEMENT

It is OPG's intention to temporarily shutdown the Queenston-Chippawa Power Canal for maintenance at the completion of their new intake tunnel on the Niagara River.

This shutdown will cause a reversal of flow in the Welland River allowing higher turbidity water to flow past the existing intake and into the Niagara Falls Water Treatment Plant. The problem statement for this study is therefore **"to maintain a high quality raw water supply to the Niagara Falls Water Treatment Plant when an operation change by OPG occurs"**. In addition, this may also provide **"an opportunity to provide an intake that meets current standards and design capacities"**.

ALTERNATIVE SOLUTIONS

1. "Do Nothing" Alternative:

- Leave the existing water intake where it is and continue to draw Niagara River or Welland River water.

2. "Relocate the Intake to the Niagara River" Alternative:

- Build a new intake from the Niagara Falls Water Treatment Plant to the Niagara River; this included the examination of 4 possible alignments (Alternatives A, B, C, and D) for a proposed 1800 mm diameter pipe.

3. Pre-Treatment Alternative:

- Alternative A - Actiflo® → ballasted coagulation and sedimentation
- Alternative B - A pre-sedimentation tank

4. Temporary Pumping Alternative

**NIAGARA FALLS WATER TREATMENT PLANT
INTAKE RELOCATION
CLASS ENVIRONMENTAL ASSESSMENT**

Criteria		“Do Nothing” Alternative	“Relocate Intake to Niagara River” Alternative			Temporary Pumping Alternative	Pre-Treatment Alternative	
			Alternatives A, B and C		Alternative D			
			Trenching	Tunneling			Actiflo	Pre-Sedimentation Tank
Natural Environment Impacts	Construction	NOT A VIABLE OPTION	High	Moderate	Low	Low	Moderate	Moderate
	Operations		Low	Low	Low	High, but limited period	Low	Low
Social Environment Impacts	Construction		Moderate	Moderate	Moderate	Low	Moderate	Moderate
	Operations		None	None	None	High	None	None
Technical & Operational Concerns	Construction		High	Moderate	Low	Low	Low	Low
	Operations		Low	Low	Low	Moderate	Low (During normal operation, large sludge volume when turbidity high)	Low (During normal operations, large sludge volumes when turbidity is high)
Cost	Construction		High	High	Low	Moderate	Moderate	Moderate
	Operations		None	None	None	High	Moderate	Moderate

**NIAGARA FALLS WATER TREATMENT PLANT
INTAKE RELOCATION
CLASS ENVIRONMENTAL ASSESSMENT**

Preferred Alternative Solution

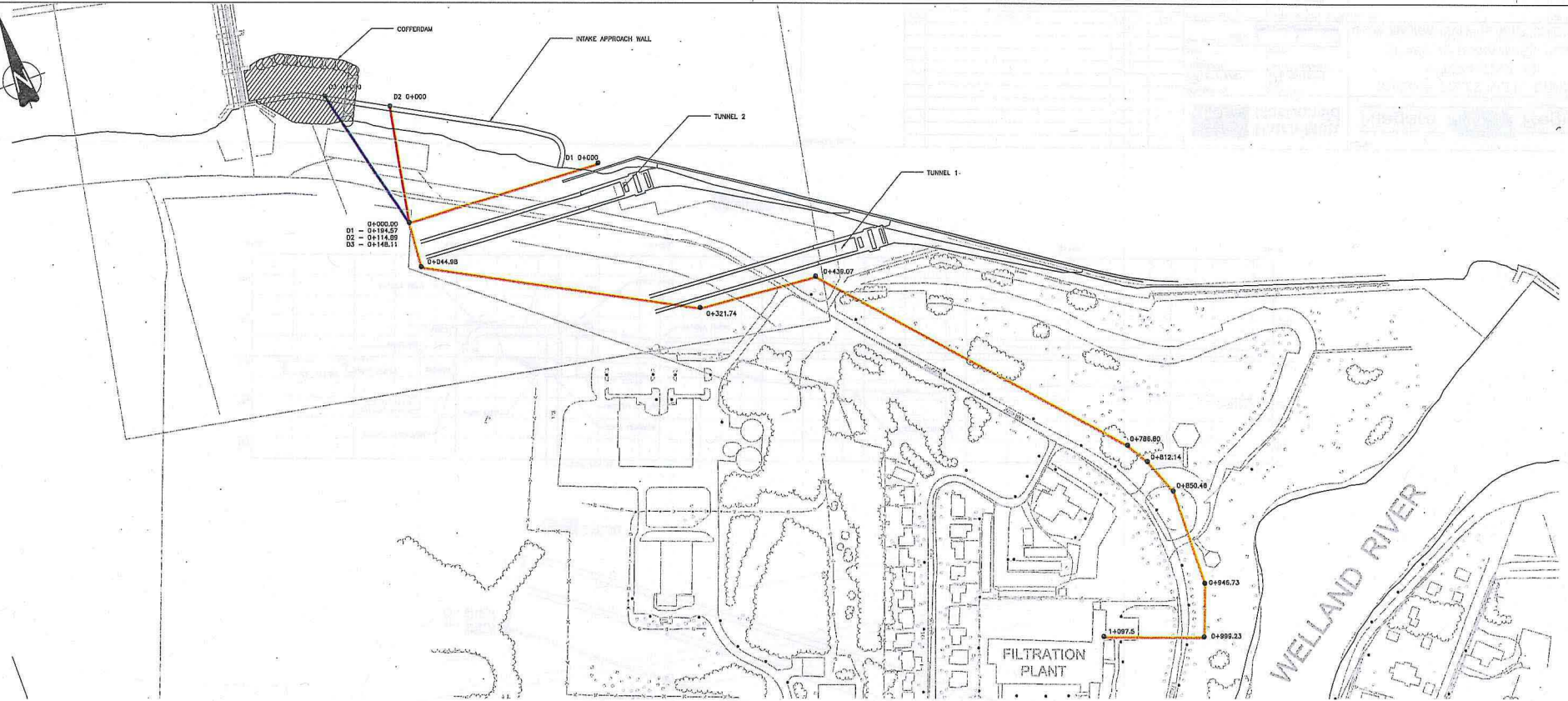
Using the Evaluation Summary , as well as, comments and feedback received from PIC #1, the preferred solution was determined to be the ***"Relocate the Intake to the Niagara River" Alternative,*** with a preferred alternative alignment of, ***Alternative D.***

Design Concepts for Alternative D

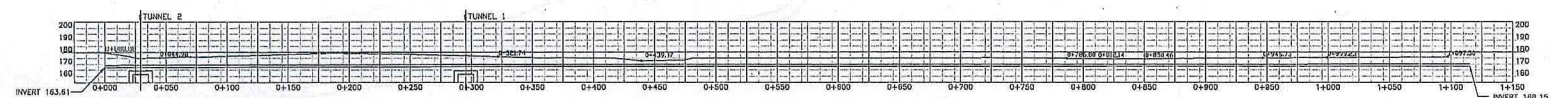
3 design concepts were developed for the preferred solution:

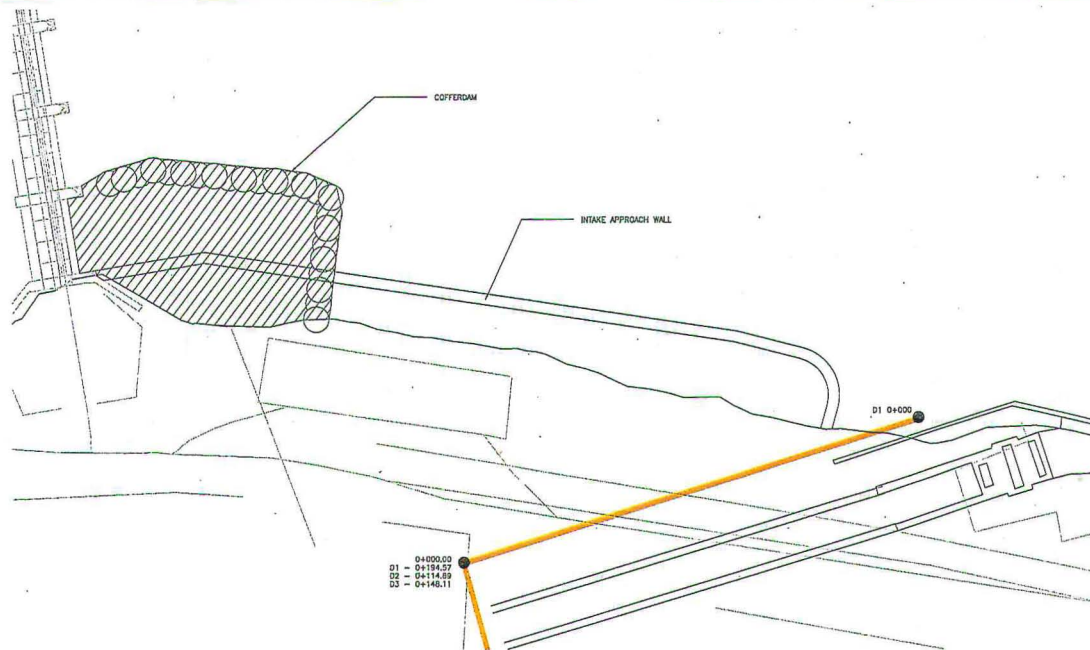
- "D1" – 1800 mm diameter gravity pipe, 1292 m long from the Water Treatment Plant to the downstream side of OPG Intake Tunnel #2, crossing over both OPG Intakes and coming out into the Niagara River at 162.2 m requiring excavation in the Niagara River.
- "D2" – 1800 mm diameter gravity pipe, 1212 m long from the Water Treatment Plant to the area approximately 194 m downstream of OPG Intake Tunnel #2, where excavation to 162.2 m has already been completed for the new OPG Intake Tunnel #3.
- "D3" – 1800 mm diameter gravity pipe, 1245 m long from the Water Treatment Plant to inside the existing cofferdam built for the new OPG Intake Tunnel #3.

OPG's operations impact the viability of all design concepts, therefore, all design concepts require OPG's review before a preferred design concept can be identified.

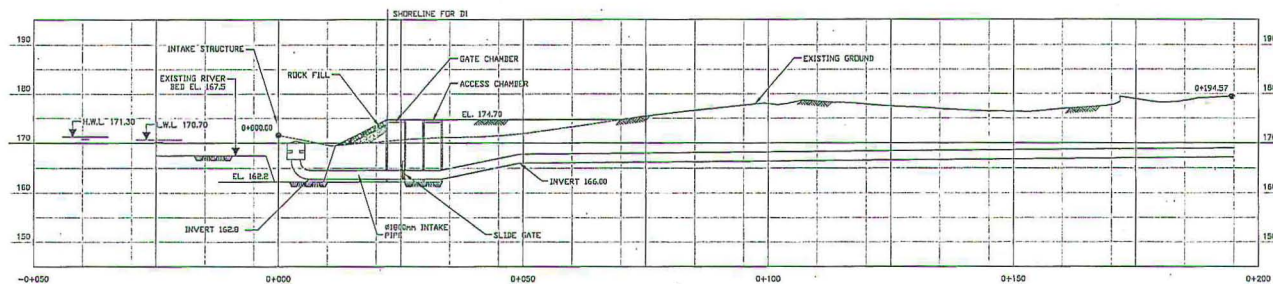


PLAN
SCALE: 1:2000





ALTERNATIVE D1
SCALE: 1:1000



ALTERNATIVE D1
SCALE: 1:500

ENGINEER STAMP:



CLIENT:



DESIGNED BY:
J.A.
DATE: 05/14/07

DRAWN BY:
K.K.
DATE: 05/14/07

CHECKED BY:

PROJECT MANAGER:

DATE:

DATE:

BAR SCALE: 1:500 = 1"

DWG SCALE(FULL SIZE):

NIAGARA FALLS W.T.P. INTAKE
ALTERNATIVE D1
INTAKE ALTERNATIVES PLAN
(FROM NIAGARA RIVER TO W.T.P. SCREEN ROOM)

REV. ISSUED FOR AUTH. BY DATE

ISSUE AUTHORIZATION

11111 PROJECT No:

230179

DWG No:

AS NOTED

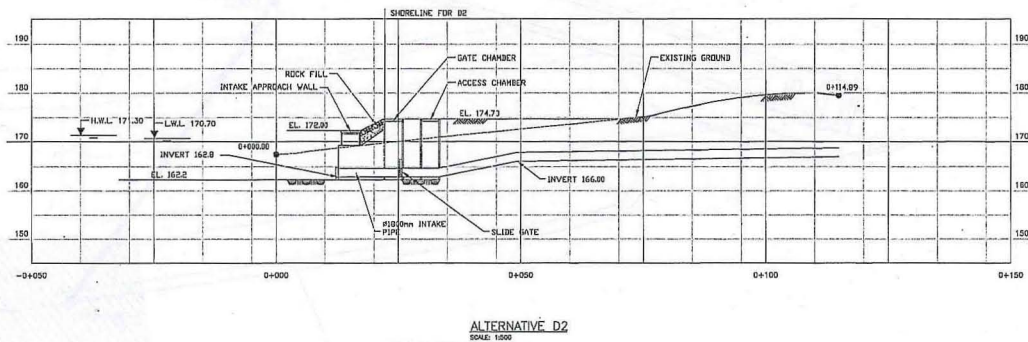
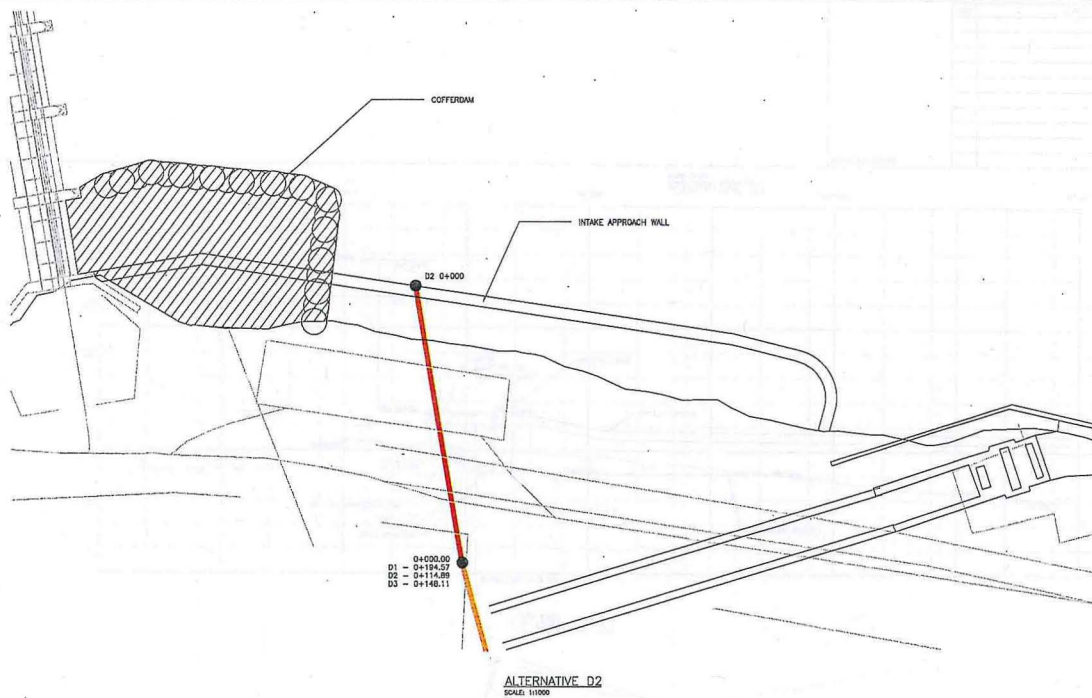
SHEET No. 1 REV No. 0

ANSI A1 (841mm x 594mm) FULL SIZE

FILE NAME:

USER NAME:

PLOT DATE:



ENGINEER STAMP:

REV.	ISSUED FOR	AUTH. BY	DATE
	ISSUE AUTHORIZATION		



DESIGNED BY:
J.A.
DATE: 05/14/07
CHECKED BY:
DATE:

DRAWN BY:
K.K.
DATE: 05/14/07
PROJECT MANAGER:
DATE:

CLIENT:

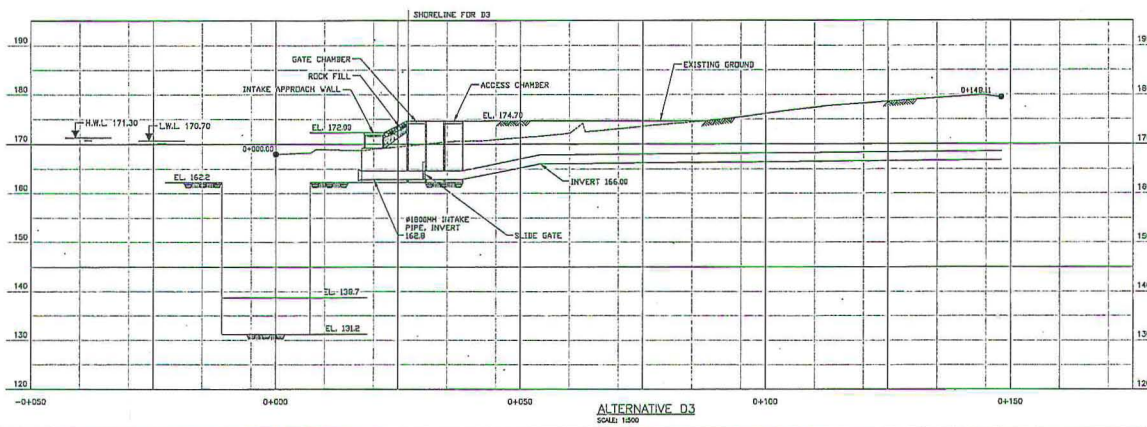
Niagara Region

NIAGARA FALLS W.T.P. INTAKE
ALTERNATIVE D2
INTAKE ALTERNATIVES PLAN
(FROM NIAGARA RIVER TO W.T.P. SCREEN ROOM)

DWG No: 230179
AS NOTED

SHEET No 1
REV No 0

ANSI A1 (841mm x 594mm) FULL SIZE



ALTERNATIVE D3
SCALE: 1:500

ENGINEER STAMP:

[illegible] Hatch Mott MacDonald

DESIGNED BY: D.A.	DRAWN BY: K.K.
DATE: 05/14/07	DATE: 05/14/07
CHECKED BY:	PROJECT MANAGER:

DATE:	DATE:
BAR SCALE:	1:1000 = 10 1:500 = 20 

HMM PROJECT No:	DWG SCALE(FULL S
230179	AS NOTED

CUENT:

Niagara Region

NIAGARA FALLS W.T.P. INTAKE
ALTERNATIVE D3
INTAKE ALTERNATIVES PLAN
(FROM NIAGARA RIVER TO W.T.P. SCREEN ROOM)

DWG No:	SIT No	REV No
	1	0

ANSI A1 (841mm x 594mm) FULL SIZE

PLOT DATE:

**NIAGARA FALLS WATER TREATMENT PLANT
INTAKE RELOCATION
CLASS ENVIRONMENTAL ASSESSMENT**

Criteria		"Relocate Intake to Niagara River" Alternative		
		D1 *	D2 *	D3 *
Natural Environment Impacts	Construction	Moderate	Moderate	Low
	Operations	Low	Low	Low
Social Environment Impacts	Construction	Moderate	Moderate	Moderate
	Operations	None	None	None
Technical & Operational Concerns	Construction	Moderate	Moderate	High
	Operations	Low	Low	Moderate
Life Cycle Costs (40 years)		\$4.2 M *	\$3.8 M *	\$3.9 M *

* Subject to further input and consultation with OPG.

NIAGARA FALLS WATER TREATMENT PLANT INTAKE RELOCATION CLASS ENVIRONMENTAL ASSESSMENT

NEXT STEPS

- WITH INPUT FROM THE PUBLIC INFORMATION CENTRE AND FURTHER DISCUSSIONS WITH OPG, A PREFERRED DESIGN CONCEPT WILL BE FINALIZED.
- PROJECT FILE WILL BE MADE AVAILABLE FOR PUBLIC REVIEW FOR 30 DAY PERIOD DURING WHICH TIME ANY OBJECTIONS OR CONCERNS THAT CANNOT BE RESOLVED THROUGH DISCUSSIONS WITH THE REGION OF NIAGARA MAY BE FORWARDED TO THE MINISTER OF ENVIRONMENT BY REQUESTING A "PART II ORDER".
- IF NO OBJECTIONS ARE EXPRESSED, PROJECT MAY PROCEED TO DESIGN, AND ULTIMATELY TO CONSTRUCTION AND COMMISSIONING.

- PROJECT IS EXPECTED TO PROCEED AS FOLLOWS:

- | | |
|---|------------------|
| • 2 ND PUBLIC INFORMATION CENTRE (PIC) | May 16, 2007 |
| • NOTICE OF CLASS EA COMPLETION | June 2007 |
| • PROJECT FILE AVAILABLE FOR PUBLIC REVIEW | June - July 2007 |
| • DESIGN | Summer 2007 |
| • CONSTRUCTION | Fall/Winter 2008 |
| • COMMISSIONING | Summer 2008 |



Public Information Centre (PIC) #3

**CLASS ENVIRONMENTAL ASSESSMENT STUDY
NOTICE OF PUBLIC INFORMATION CENTRE**

**INTAKE RELOCATION
NIAGARA FALLS WATER TREATMENT PLANT
CITY OF NIAGARA FALLS**

Niagara Region is making provisions for temporary relocation of the Niagara Falls Water Treatment Plant Intake currently located on the north bank of the Welland River (Chippawa Creek), approximately 500 m west of the confluence with the Niagara River.

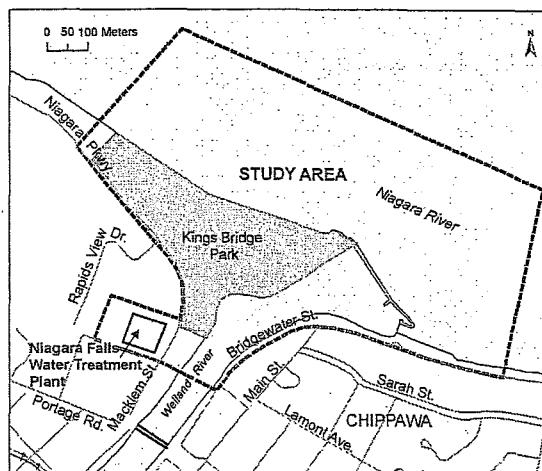
The Region is planning this potential relocation to provide reliable, high quality and consistent raw water should shut down of the Ontario Power Generation (OPG) power canal be required for maintenance purposes. The project is being planned in accordance with the requirements for Schedule 'C' of the Municipal Class Environmental Assessment.

As a result of discussions with OPG, who is a stakeholder in this Class EA planning process, a third Public Information Centre is being held to present the revised preliminary design of the preferred solution and the next steps. You are invited to attend this Public Information Centre to review the preferred solution, provide comments and discuss concerns you may have with representatives of Niagara Region. This Public Information Centre will be an informal meeting and you are invited to drop in at your convenience.

The Public Information Centre is scheduled for:

Date: Thursday, July 24, 2008
Time: 6:30 P.M. to 8:00 P.M.
Location: Niagara Falls Water Treatment Plant
3599 Macklem Street
Niagara Falls, Ontario

If you are unable to attend this Public Information Centre and wish to obtain more information or provide written comments, please address your concerns to:



Robin Young, P. Eng., C. Chem, Project Manager
Water and Wastewater Services Division
3501 Schmon Parkway, P.O. Box 1042
Thorold, ON L2V 4T7
Phone: 905 685-4225, ext. 3740, 1-800-263-7215
or TTY# 905 984-3613
Fax: 905 685-5205
Email: robin.young@regional.niagara.on.ca

Eugene Chajka, P. Eng., Project Manager
Hatch Mott MacDonald
4342 Queen Street
Niagara Falls, ON
L2E 6W1
Phone: 905 357-6971
Fax: 905 357-6977
Email: eugene.chajka@hatchmott.com

Niagara Falls Water Treatment Plant
Intake Relocation
CLASS ENVIRONMENTAL ASSESSMENT

Thursday, July 24, 2008
6:30 p.m. – 8:30 p.m.

SIGN IN SHEET

Please sign in so that we know you have been here to review the materials on display, and in order for us to be able to communicate with you as the project moves forward.

NAME	ADDRESS	TELEPHONE NO.	E-MAIL ADDRESS
DIANNE CHOPP	3533 MAIN ST	905-295-4947	paradisepoint@cogeco.ca
Brian Wright	NPCA	905-748-3135	see card
ED SKALA RMON	ST. GATH'S		

Personal information on this form is collected in accordance with the Municipal Freedom of Information and Protection of Privacy Act, R.S.O. 1990, c. M. 56, as amended. Inquiries about the use and protection of personal information should be directed to the Region's Freedom of Information and Privacy Coordinator



**NIAGARA FALLS
WATER TREATMENT PLANT INTAKE RELOCATION
CLASS ENVIRONMENTAL ASSESSMENT**

**WELCOME TO PUBLIC INFORMATION CENTRE #3
Thursday, July 24, 2008
6:30 p.m. – 8:30 p.m.**

COMMENT SHEET

The Region of Niagara is interested in hearing the community's comments, questions, and concerns regarding this project. Please take a few minutes to complete this brief comment sheet. All comments will be considered in the Class Environmental Assessment. Please use additional sheets, should you require more space to comment.

NAME: ED SKALA
ADDRESS: ST. CATH'S
PHONE: _____ FAX: _____
E-MAIL: ed.skala@yahoo.ca

1. Did the displays and discussion help you to understand more about the project?

☒ Yes

☐ No

2. Were your questions answered to your satisfaction?

☒ Yes

☐ No

3. I am:

☐

Resident of Study Area

☒

Resident Outside Study Area

☐

Business Owner in Study Area

☐

Business Owner Outside Study Area

☐

Elected Representative

☒

Member of Concerned Agency

☒

Other

4. I have reviewed the information provided on the proposed works provided at the Public Information Centre, and:

☒

I am satisfied with the project as presented

☐

I am not satisfied with the project as presented

☐

I have no opinion

5. Do you have any comments, concerns, or questions regarding the preferred alternative solution for the new water treatment plant intake?

6. Do you have any further comments about the proposed project?

Please complete this Comment Sheet at your earliest convenience and either leave it at the meeting in the box provided, or return it by mail/fax no later than Friday, August 8th, 2008 to:

Regional Municipality of Niagara
3501 Schmon Parkway, P.O. Box 1042
Thorold, ON L2V 4T7

ATTENTION: Robin Young
Project Manager
Public Works Department
Water and Wastewater Services Division
FAX: (905) 685-5205

Thank you for your contribution to this project!

Notice: Personal information on this form is collected in accordance with the Municipal Freedom of Information and Protection of Privacy Act, R.S.O. 1990, c. M. 56, as amended. Inquiries about the use and protection of personal information should be directed to the Region's Freedom of Information and Privacy Coordinator.

NIAGARA FALLS WATER TREATMENT PLANT INTAKE RELOCATION CLASS ENVIRONMENTAL ASSESSMENT

WELCOME TO PUBLIC INFORMATION CENTRE #3

Thursday, July 24, 2008

6:30 p.m. – 8:30 p.m.

Please sign the list at the front table so that we know you have been here to review the materials on display, and in order for us to be able to communicate with you as the project moves forward.

BACKGROUND AND PURPOSE

As you are aware, the Regional Municipality of Niagara is proposing to relocate the intake of the Niagara Falls Water Treatment Plant. This proposed work is intended to ensure an adequate and high quality raw water supply for the plant when Ontario Power Generation (OPG) shuts down their Queenston-Chippawa Power Canal on the Welland River for maintenance, once the new power tunnel on the Niagara River is commissioned.

The Niagara Falls Water Treatment Plant services the City of Niagara Falls with a population of 79,000, as well as the Port Robinson area of Thorold and a portion of Niagara-on-the-Lake. It is located along the Welland River on Macklem Street across from Kings Bridge Park in the City of Niagara Falls. It has a rated capacity of 145.5 ML/d and has recently undergone a series of upgrades including an increase in storage capacity and the addition of UV Disinfection.

The plant currently draws water from the Welland River/Chippawa Creek upstream of it's point of confluence with the Niagara River, located just upstream of the Horseshoe Falls. Since the 1920's, water has been diverted from the Niagara River, up the Welland River, and into the Queenston – Chippawa Power Canal. Therefore, the Plant's raw water is actually water that has come from the Niagara River, originating in Lake Erie. Therefore, the Welland River normal flow has been artificially reversed due to the Queenston-Chippawa Power Canal. The current intake is located 150 m west of the confluence with the Niagara River, and 5 to 6 km east from the entrance of the Queenston-Chippawa Power Canal. It is 139 m long and 1200 mm in diameter; this includes an intake structure consisting of a timber apron and sheet piling sides, which does not meet current regional security standards.



**NIAGARA FALLS WATER TREATMENT PLANT
INTAKE RELOCATION
CLASS ENVIRONMENTAL ASSESSMENT**

CLASS ENVIRONMENTAL ASSESSMENT (CLASS EA)

This Class Environmental Assessment (Class EA) is being undertaken in accordance with the requirements of a Schedule C project as detailed in the "Municipal Engineers Association Class Environmental Assessment for Water and Wastewater Projects (June 2000).

The Municipal Class Environmental Assessment establishes an approved planning process for municipalities to follow to satisfy the requirements of the Environmental Assessment Act for specified projects. Schedule C projects have the potential for significant environmental effects and must proceed under the full planning and documentation procedures specified in the Class Environmental Assessment. Schedule C projects require preparation of an Environmental Study Report and public review.

This Public Information Centre (PIC) provides stakeholders with an opportunity to meet the Project Team, review the study scope and discuss issues related to the project, including assessment of:

- (1) A wide range of options to ensure an adequate raw water supply to mitigate the effects due to Ontario Power Generation's operation and shutdown of the Queenston-Chippawa Power Canal.
- (2) Potential impacts of the improvements on the natural and social environments and mitigation measures.

Comment sheets are available for you to complete and either hand in before you leave, or return to the Project Team during the next two (2) weeks, and prior to
August 8th, 2008.

Following the PIC, the preferred solution will be finalized in light of any comments received and then a Environmental Study Report for the intake will be completed and placed on the public record for a thirty (30) day review period during which time, any objections or concerns that cannot be resolved through discussions with the Region may be forwarded to the Minister of the Environment by requesting a "Part II Order". The public will be notified of the publication of the Class EA Project File through a newspaper notice at the appropriate time.

**NIAGARA FALLS WATER TREATMENT PLANT
INTAKE RELOCATION
CLASS ENVIRONMENTAL ASSESSMENT**

PROBLEM STATEMENT

It is OPG's intention to temporarily shutdown the Queenston-Chippawa Power Canal for maintenance at the completion of their new intake tunnel on the Niagara River.

This shutdown will cause a reversal of flow in the Welland River allowing higher turbidity water to flow past the existing intake and into the Niagara Falls Water Treatment Plant. The problem statement for this study is therefore **"to maintain a high quality raw water supply to the Niagara Falls Water Treatment Plant when an operation change by OPG occurs"**. In addition, this may also provide **"an opportunity to provide an intake that meets current standards and design capacities"**.

ALTERNATIVE SOLUTIONS

1. "Do Nothing" Alternative:

- Leave the existing water intake where it is and continue to draw Niagara River or Welland River water.

2. "Relocate the Intake to the Niagara River" Alternative:

- Build a new intake from the Niagara Falls Water Treatment Plant to the Niagara River; this included the examination of 4 possible alignments (Alternatives A, B, C, and D) for a proposed 1800 mm diameter pipe.

3. Pre-Treatment Alternative:

- Alternative A - Actiflo™ → ballasted coagulation and sedimentation
 - Alternative B → A pre-sedimentation tank

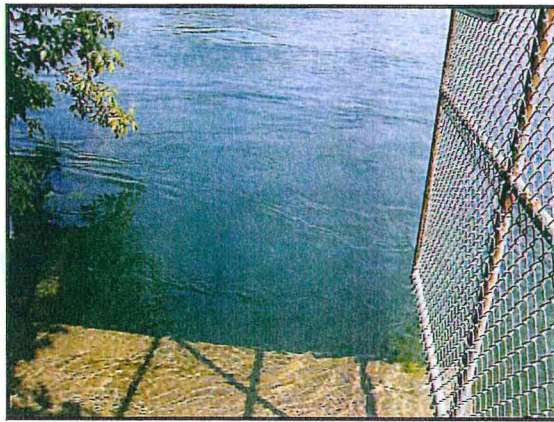
4. Temporary Pumping Alternative

- Temporary critically silenced pumps for duration of Queenston-Chippawa Power Canal shutdown
- Force main installed between pumping station and Niagara Falls Water Treatment Plant

**NIAGARA FALLS WATER TREATMENT PLANT
INTAKE RELOCATION
CLASS ENVIRONMENTAL ASSESSMENT**

“Do Nothing” Alternative

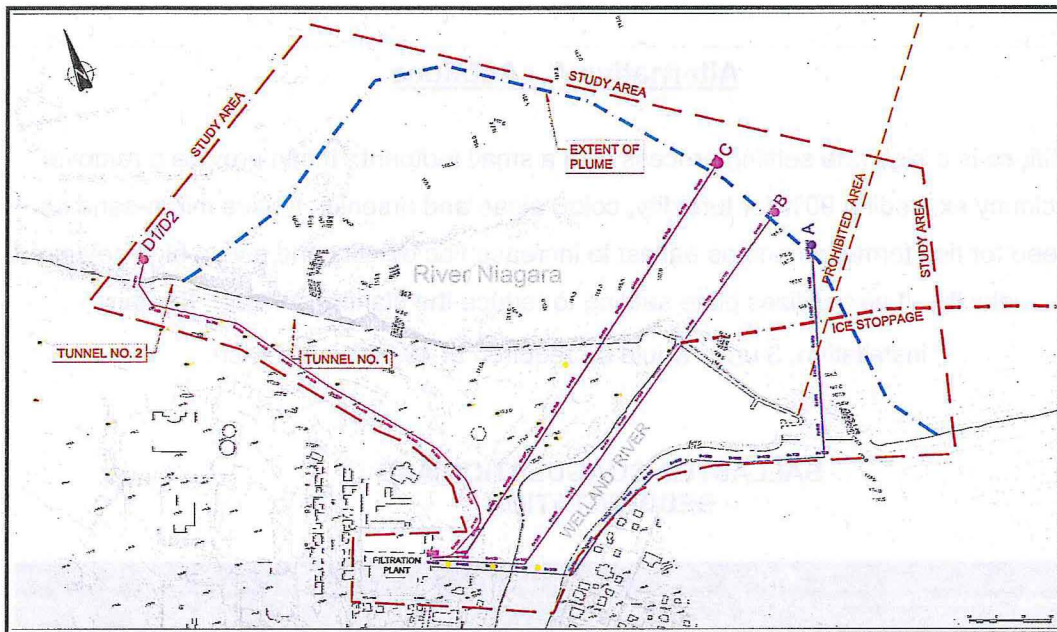
The “Do Nothing” alternative involves leaving the existing intake in its current location and continuing to operate it and the Niagara Falls Water Treatment Plant as usual, and dealing with changing water quality as it occurs with existing plant processes. The Plant will likely experience high and variable turbidity in the raw water, as this would otherwise reduce the capacity and possibly supply to the plant.



NIAGARA FALLS WATER TREATMENT PLANT INTAKE RELOCATION CLASS ENVIRONMENTAL ASSESSMENT

“Relocate Intake to the Niagara River” Alternative

This alternative solution required the examination of a series of alternative alignments for a new intake to the Niagara Falls Water Treatment Plant. There are 4 potential alignments A, B, C, and D. All of these alignments needed to be located away from the ice stoppage location and outside the extent of a possible turbidity plume from the Welland River.



ALTERNATIVE ALIGNMENTS FOR RELOCATING THE INTAKE TO THE NIAGARA RIVER

1. Alternative A - takes advantage of drawing water from Niagara River upstream of the future confluence of the Welland River flows. The intake pipe could follow Niagara Parkway alignment on the south side of the Welland River and cross the river in the proximity of the existing intake.
2. Alternative B - would draw water upstream of the Welland River confluence, similar to the previous alternative, but would be constructed in the bed of the Welland River.
3. Alternative C - would run directly from the Niagara River, through Kings Bridge Park to the WTP and draw water from the Niagara River upstream of the OPG intake tunnels.
4. Alternative D - would draw water from between the existing OPG intake tunnels on the Niagara River and run through the NPC lands to the WTP.

NIAGARA FALLS WATER TREATMENT PLANT INTAKE RELOCATION CLASS ENVIRONMENTAL ASSESSMENT

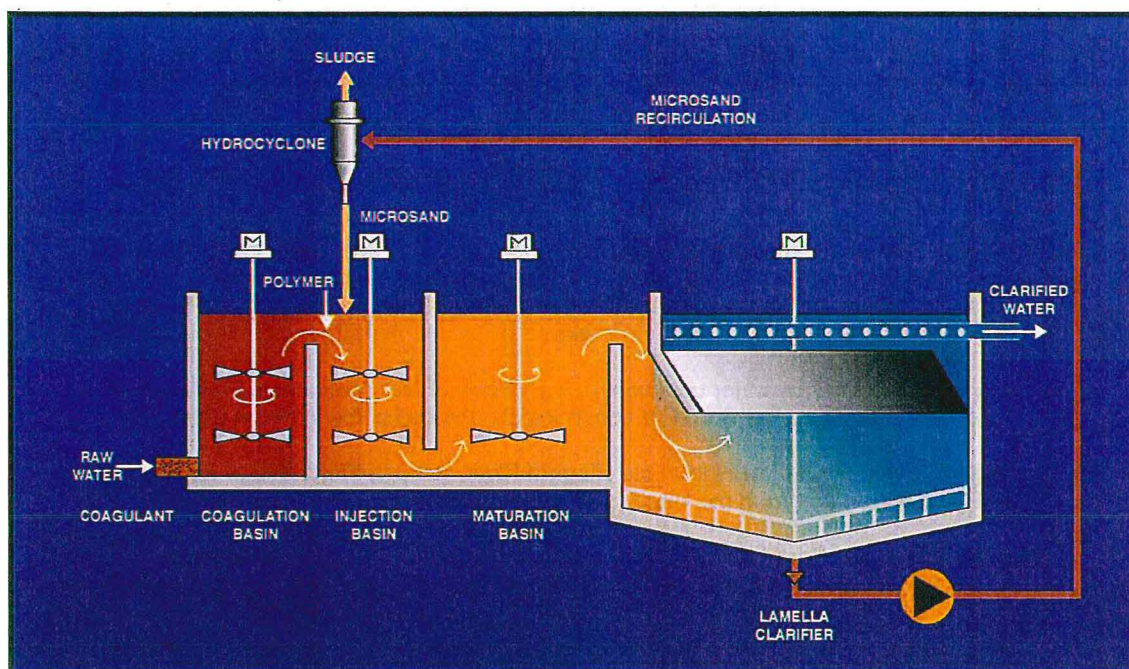
Pre-Treatment Alternative

This alternative solution is intended to be added onto the existing plant processes ahead of the WTP. It is intended to reduce water turbidity levels to < 30 NTU prior to treatment. This alternative would not require relocated the intake, rather improving the existing intake and extending it into the center of the Welland River for increased security.

Alternative A - Actiflo[®]

Actiflo[®] is a high rate settling process with a small footprint. It can provide a removal efficiency exceeding 90% for turbidity, color, algae and arsenic. It uses micro-sand as a seed for floc formation and as ballast to increase floc density and give a high settling velocity. It also utilizes plate settling to reduce the clarifier surface. For this installation, 3 units would be required at 49,500 m³/d each.

BALLASTED COAGULATION AND SEDIMENTATION

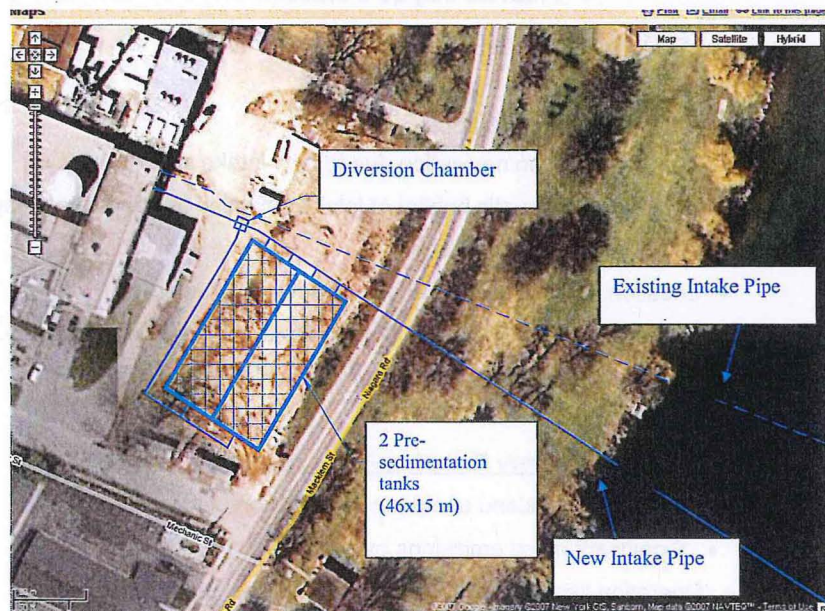


NIAGARA FALLS WATER TREATMENT PLANT INTAKE RELOCATION CLASS ENVIRONMENTAL ASSESSMENT

Alternative B - Pre-Sedimentation Tank

This alternative would provide an impoundment to provide pre-sedimentation, and the addition of a polyelectrolyte to cause fairly rapid settling and a reduction in suspended solids to a more 'normal' level, thereby allowing the treatment plant to function and perform as usual.

To maintain a plant capacity of 145,000 m³/day, the pre-treatment sedimentation process would consist of two cells, each 5m deep, 15m wide, and 45m long. A valve/diversion chamber on the intake line will allow high quality raw water to bypass the pre-sedimentation cells; a polymer feed system would be introduced, and powdered activated carbon could be applied to handle the possible higher organic loads resulting from the influx of Welland River water with a higher organic or minor contaminant loading.



NIAGARA FALLS WATER TREATMENT PLANT INTAKE RELOCATION CLASS ENVIRONMENTAL ASSESSMENT

Potential Impacts of Alternative Solutions

Each alternative solution for the intake was evaluated in terms of impacts on the natural and socio-economic environments, as well as technical merits and cost. The following are a series of impacts that were identified for each alternative solution.

"Do Nothing" Alternative

- No construction = no net adverse impacts.
- Impact on plant processes and potentially drinking water quality when raw water has a high and/or variable turbidity.
- *This alternative solution does not satisfy water quantity and quality requirements and therefore does not satisfy the problem statement.*

"Relocate Intake to Niagara River" Alternative

- Length required to avoid turbidity plume/ice conditions is 200 to 500 m.
 - Significant short-term disruption of fish habitat (except for Alt. D).
 - Potential fish mortality (if blasting used).
- Loss of habitat due to intake footprint (compensation may be required).
- Tunneling or difficult marine construction required (except for Alt. D).
 - Frazil ice may be a concern.
- Requires amendment to Permit to Take Water.

Pre-Treatment Alternative

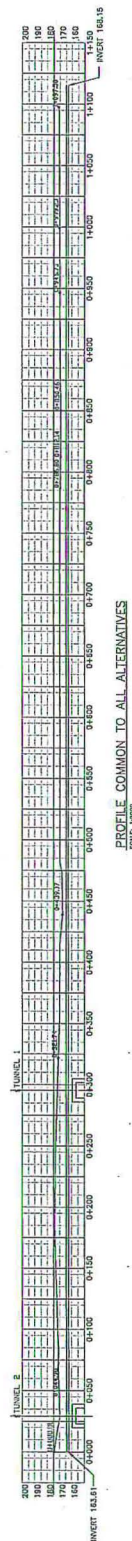
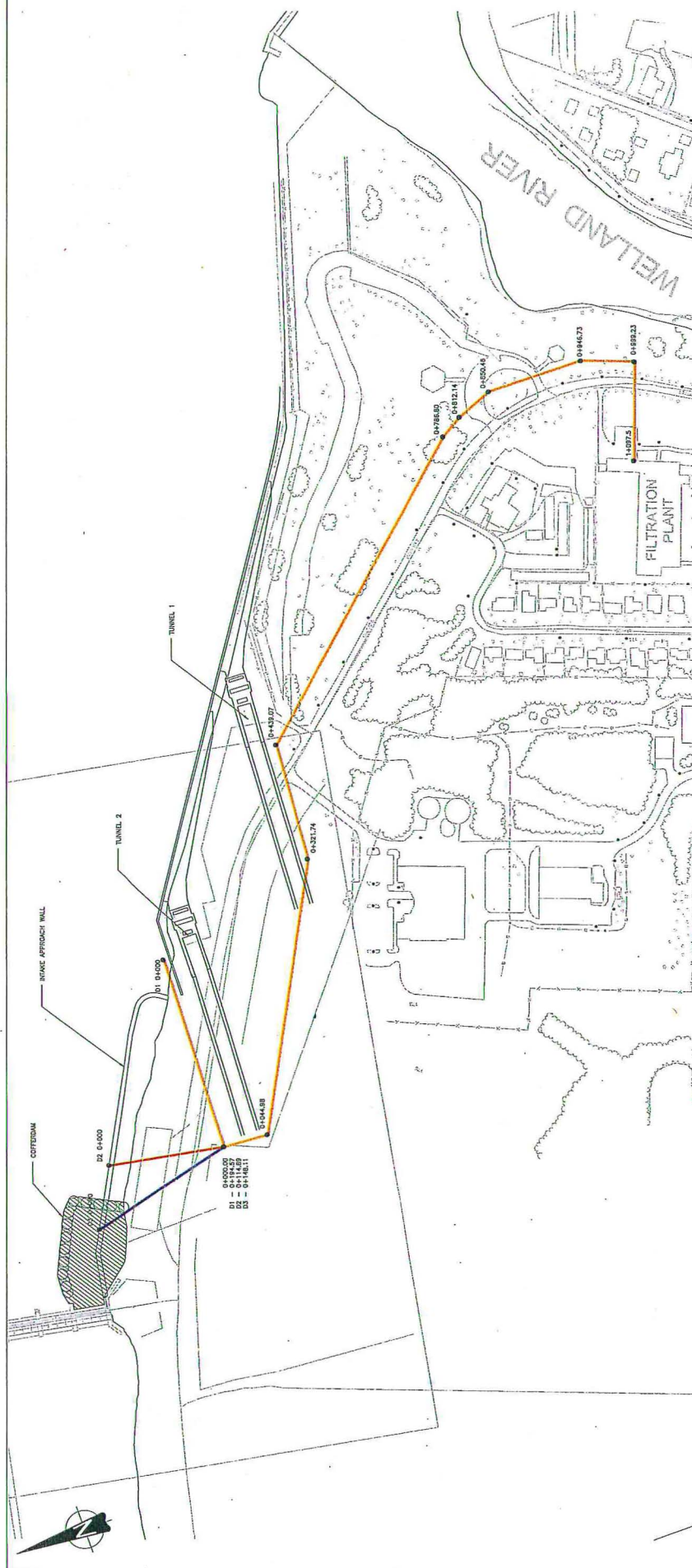
- Potential impact on navigation due to new intake structure.
- Minor disruption and loss of aquatic habitat at intake location (compensation may be required).
 - Location is feasible (land acquisition may be required).
- High degree of flexibility to deal with high and/or variable raw water turbidity.
 - Large sludge volumes produced when raw water turbidity is high.

Temporary Pumping Alternative

- Minor disruption of parkland use during installation of temporary pipe.
 - Significant noise emissions over a 3-7 month period.
 - Operation likely to occur during Summer tourist season.
 - Reliability of supply is a concern.

**NIAGARA FALLS WATER TREATMENT PLANT
INTAKE RELOCATION
CLASS ENVIRONMENTAL ASSESSMENT**

Criteria		“Do Nothing” Alternative	“Relocate Intake to Niagara River” Alternative			Temporary Pumping Alternative	Pre-Treatment Alternative	
			Alternatives A, B and C		Alternative D			
			Trenching	Tunneling			Actiflo™	Pre-Sedimentation Tank
Natural Environment Impacts	Construction	NOT A VIABLE OPTION	High	Moderate	Low	Low	Moderate	Moderate
	Operations		Low	Low	Low	Low	Low	Low
Social Environment Impacts	Construction		Moderate	Moderate	Moderate	Low	Moderate	Moderate
	Operations		None	None	None	Moderate	None	None
Technical & Operational Concerns	Construction		High	Moderate	Low	Low	Low	Low
	Operations		Low	Low	Low	Moderate	Low (During normal operation, large sludge volume when turbidity high)	Low (During normal operations, large sludge volumes when turbidity is high)
OPG Concerns	Construction		High	High	High	Low	None	None
	Operations		High	High	High	Moderate	None	None
Cost	Construction		High	High	Low	Moderate	Moderate	Moderate
	Operations		None	None	None	High	Moderate	Moderate



FILE NAME:

USER NAME:

PLOT DATE:

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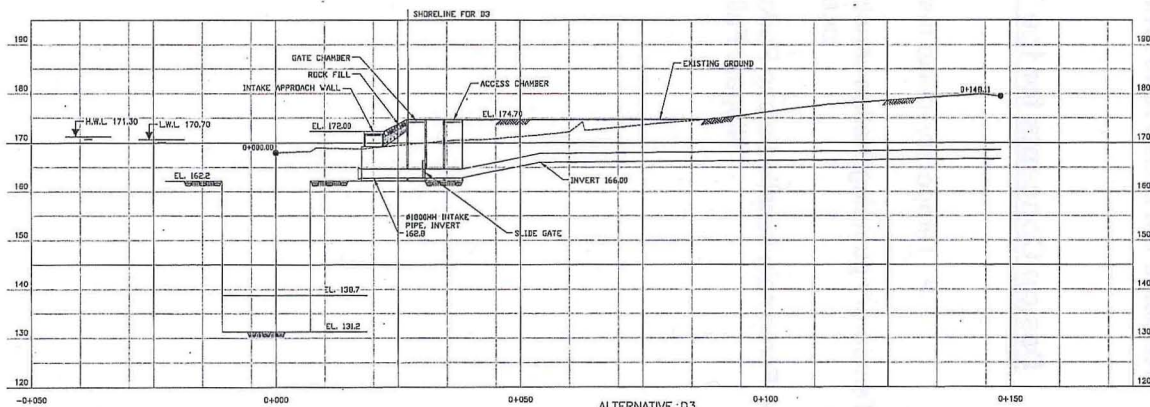


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ALTERNATIVE D3
SCALE: 1:1000



ALTERNATIVE D3
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**NIAGARA FALLS WATER TREATMENT PLANT
INTAKE RELOCATION
CLASS ENVIRONMENTAL ASSESSMENT**

Preferred Alternative Solution

Using the Evaluation Summary, the comments and feedback received from PIC #2, and OPG's review of the alternative solutions, the preferred solution was determined to be the

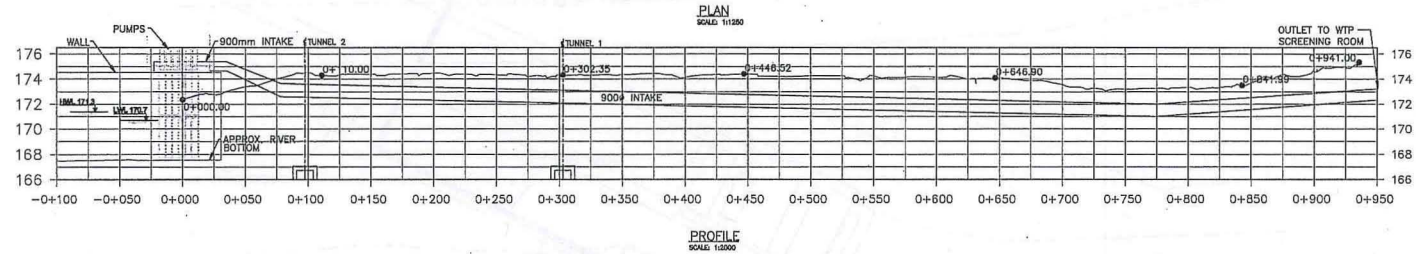
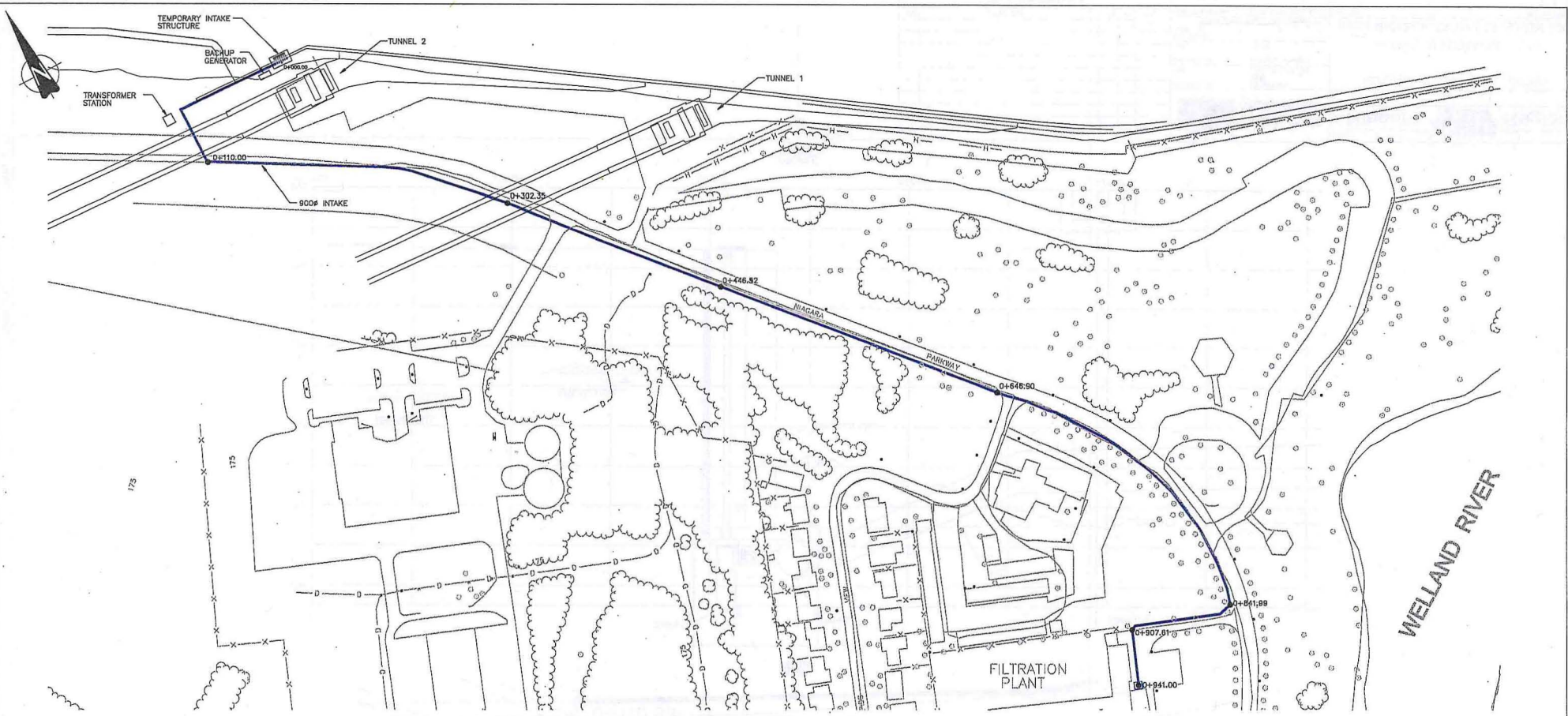
"Temporary Pumping" Alternative

with a preferred alternative alignment following the,
Relocate the Intake to the Niagara River" Alternative D. alignment

Design Concepts for the Temporary Pumping Alternative

- Temporary intake installed only for duration of pumping.
- Temporary pumping station consisting of seven (7) critically silenced pumps, with one stand-by pump.
- Forcemain installed along Parkway between temporary pumping station and Niagara Falls Water Treatment Plant.

FILE NAME:
USER NAME:
PLOT DATE:



ENGINEER STAMP:

DESIGNED BY:	DRAWN BY:
DATE:	DATE: 07/11/08
CHECKED BY:	PROJECT MANAGER:
DATE:	DATE:
BAR SCALE:	DWG SCALE(FULL SIZE):
1"=20'	AS NOTED
ISSUED FOR:	DATE:
ISSUE AUTHORIZATION	DATE:
230179	AS NOTED

CLIENT: **Niagara Region**

NIAGARA FALLS W.T.P. INTAKE

INTAKE ALTERNATIVE PLAN

(FROM NIAGARA RIVER TO W.T.P. SCREEN ROOM)

SIT No 1 REV No 0

ANSI A1 (841mm x 594mm) FULL SIZE

NIAGARA FALLS WATER TREATMENT PLANT INTAKE RELOCATION CLASS ENVIRONMENTAL ASSESSMENT

NEXT STEPS

- WITH INPUT FROM THE PUBLIC INFORMATION CENTRE AND FURTHER DISCUSSIONS WITH OPG, THE PREFERRED DESIGN CONCEPT WILL BE FINALIZED
- THE ENVIRONMENTAL STUDY REPORT (ESR) WILL BE MADE AVAILABLE FOR PUBLIC REVIEW FOR 30 DAY PERIOD DURING WHICH TIME ANY OBJECTIONS OR CONCERNS THAT CANNOT BE RESOLVED THROUGH DISCUSSIONS WITH THE REGION OF NIAGARA MAY BE FORWARDED TO THE MINISTER OF ENVIRONMENT BY REQUESTING A "PART II ORDER".
- IF NO OBJECTIONS ARE EXPRESSED, PROJECT MAY PROCEED TO DESIGN, AND ULTIMATELY TO CONSTRUCTION AND COMMISSIONING.

- PROJECT IS EXPECTED TO PROCEED AS FOLLOWS:

- | | |
|-----------------------------------|-------------------------|
| • NOTICE OF CLASS EA COMPLETION | August 2008 |
| • ESR AVAILABLE FOR PUBLIC REVIEW | August – September 2008 |
| • DESIGN | Fall/Winter 2009 |
| • CONSTRUCTION | Spring/Summer 2009 |
| • COMMISSIONING | Summer 2009 |



Appendix C
River Modeling

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Figure 9 – Maximum Extent of Contaminant Plume	Error! Bookmark not defined.

C.1 Introduction

When the direction of the Welland River near the Niagara River is reversed, any contaminants in the Welland River will be carried into the Niagara River. A numerical model of the confluence of the two rivers was used to predict the extent of this contaminant plume in the Niagara River and assist in determining an appropriate placement for the re-located intake.

C.2 Model Setup

C.2.1 *FLOW-3D*

The software package chosen for this project is *FLOW-3D*, developed by Flow Science Incorporated of Sante Fe, New Mexico, USA. *FLOW-3D* is a general purpose computer program for the numerical simulation of fluid flow and heat transfer using computational fluid dynamics (CFD) techniques. CFD methods transform Navier-Stokes equations of fluid dynamics into algebraic equations that are suitable for solving with a computer. *FLOW-3D* is a well-tested, reliable CFD software product developed and supported by Flow Science, Inc. It is designed to assist in investigation of the dynamic behavior of liquids and gases in a very broad range of applications. *FLOW-3D* has been designed for the treatment of time-dependent (transient) problems in one, two and three dimensions.

In 2005, Hatch Energy created a two dimensional *FLOW-3D* model of this section of the Niagara River for Ontario Power Generation (OPG). OPG granted permission for this model to be modified and used by Hatch Energy to assist in determining the extent of the contaminant plume that results from the potential reversal of the Welland River in the area of the Niagara River.

C.2.2 *Model Extents*

The flow domain modeled includes the Grass Island Pool (GIP) from the International Niagara Control Works (INCW) to the west and downstream end, to approximately 6 km upstream of the INCW. This covers an area of about 15 km² and consists of the key influential flow components in the domain; namely,

- inflow through the east and west channels around Grand Island,
- inflow from the reversed Welland River,
- intakes to the Robert Moses/Lewiston complex (NYPA) and Sir Adam Beck stations (SAB) (OPG) (including the new tunnel), and
- outflow through and around INCW.

The extent of the model area is shown in Figure 1, including the locations of the various inflow and outflow boundaries.

C.2.3 *Shallow Water Model*

The GIP ranges in depth from 0.6 to 4 m with an average depth of about 2.5 m. This is relatively shallow compared to GIP's horizontal dimensions. The extent of the contaminant plume will be principally dominated by large-scale flow patterns in the horizontal plane while flow patterns in the vertical plane are considered to have only a local and minor effect. It was, therefore, decided that while FLOW-3D is capable of modeling complex three-dimensional conditions, the 'shallow water model' feature of the package is appropriate. This neglects vertical accelerations in the flow domain and uses a 2D depth-averaged numerical model to simulate flow patterns in GIP, thus greatly simplifying the model setup and computation times while maintaining the accuracy of the solution.

A 3D model of the study area was developed in AutoCAD. This model includes the bathymetry of the GIP, the INCW and both the SAB and NYPA tunnel intakes. Due to the 2D nature of the model used in the simulation, some 3D features were rendered by FLOW-3D in two dimensions. The existing tunnels were modeled as open channels and the new tunnel was modeled as a mass sink. The mass sink is an object that withdraws fluid mass from the model, acting in much the way the new tunnel intake will. This allowed the model to operate more efficiently as a 2D model, while maintaining the appropriate flow characteristics.

C.2.4 *Flow Scenario*

The critical scenario in this study is the largest likely contaminant plume in the Niagara River. A large contaminant plume would limit the flexibility in siting a new intake and could potentially rule out some alternatives. When specifying the flow scenario to be used in the model, conditions were chosen such that a conservatively large contaminant plume would be simulated.

The largest contaminant plumes would be generated when the Welland River has a high discharge and the Niagara River has a low discharge. The flows in the Welland and Niagara Rivers are not dependant upon one another and can therefore be specified independently. Events with a 5-year return period were used in the simulation.

The distribution of flows in the Niagara River (flow over Niagara Falls, diverted to the Sir Adam Beck generating stations, diverted to the Moses Power Plant) is strictly regulated and varies by time of year and time of day. As well as having a generally lower flow in the Niagara River, the non-tourism flow distribution is thought to yield a larger contaminant plume. The flow distribution representative of non-tourism times was therefore used.

C.2.4.1 *Niagara River Flow*

Daily average discharge values for the Niagara River for a 75 year period (1926-2000) were used in assessing the 5-year low flow. A Weibull distribution was fit to the annual minimum flows, as shown in Figure 2. This yielded a 5-year low flow of 3,980 m³/s. The 2-year low flow, estimated by the same method, is 4,566m³/s.

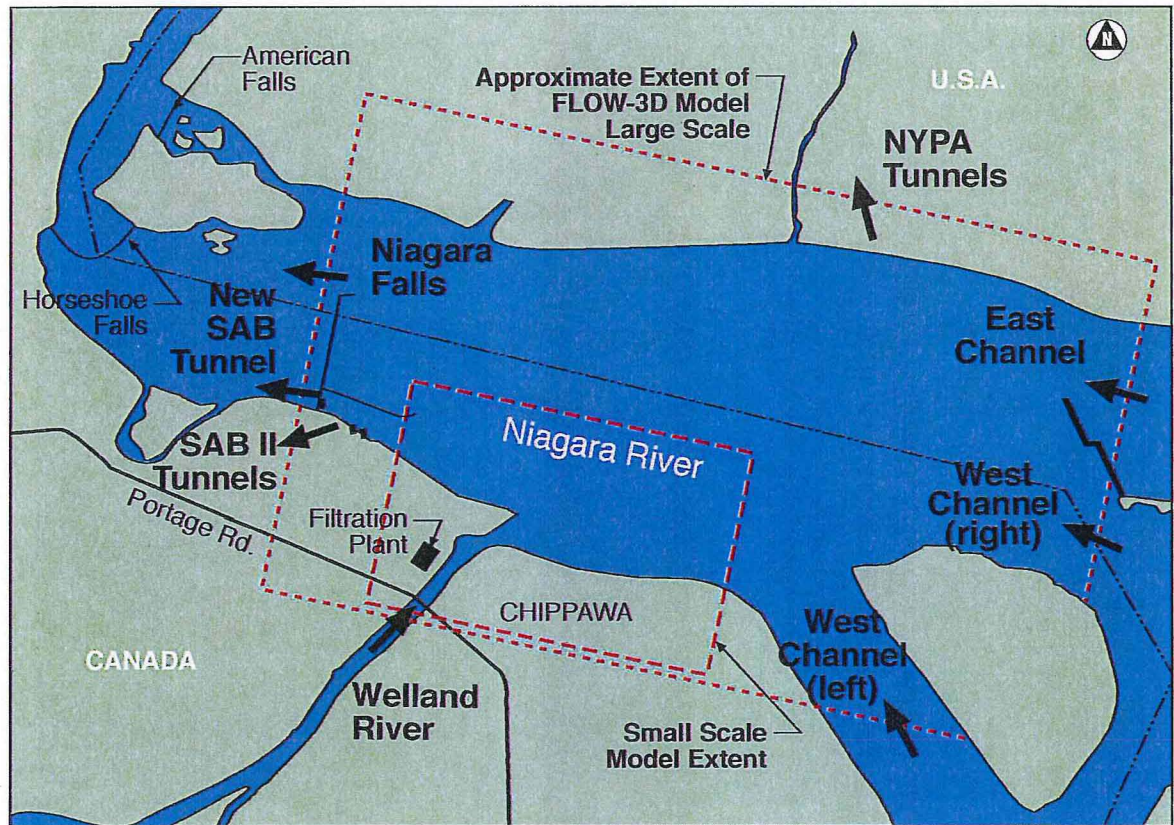
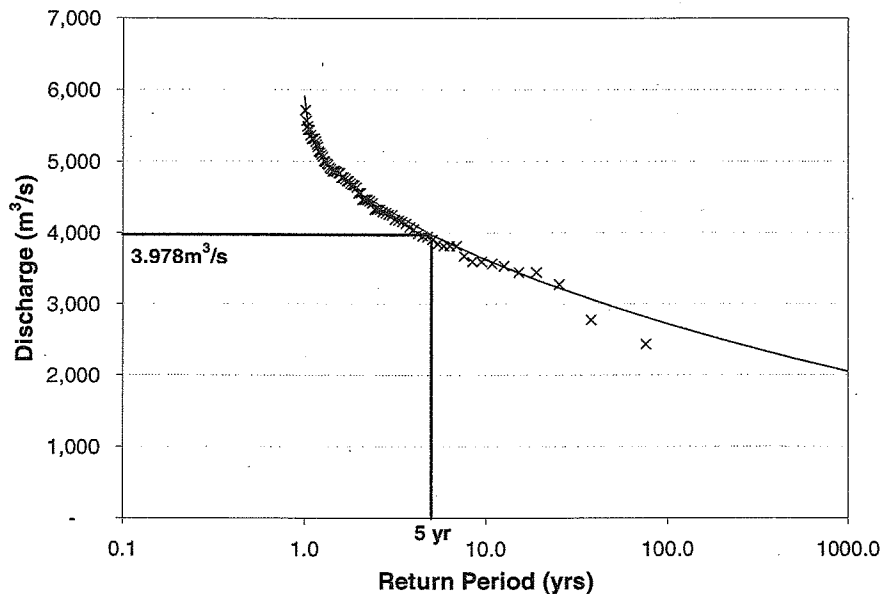


Figure 1 – Model Extents



**Figure 2 – Weibull Distribution of Annual Daily Minimum Flows
in the Niagara River, 1926 - 2000**

C.2.4.2 Welland River Flow

The Niagara Peninsula Conservation Authority estimates the 5-year flood flow for the Welland River at the Old Siphon to be about $178\text{m}^3/\text{s}$ ¹. This was prorated based on drainage area to the represent the discharge at the confluence of the Welland and Niagara Rivers. The discharge in the Welland River was modeled as the 5-year flow of $208\text{m}^3/\text{s}$. The 2-year flood, estimated by the same method, is $170\text{m}^3/\text{s}$.

C.2.5 Model Runs

CFD models rely on a grid system to define the area being modeled; the equations of fluid dynamics are solved at the boundaries of the cells. In FLOW-3D, a system of variable rectangular mesh blocks composed of individual cells are used to define the system. Each face of each mesh block has one boundary condition associated with it.

Two sets of model runs were performed: large and small scale, as pictured in Figure 1.

The large scale model was calibrated and run with a fairly coarse resolution. A series of 5 mesh blocks making up of a total of almost 200,000 cells was used to define the study area. Individual cells ranged in size from 30 m x 30 m in upstream areas furthest from the Welland River to 10 m x 10 m near the confluence of the Welland and Niagara Rivers. This coarse resolution reduces the run time but also limits the accuracy of the model. General flow patterns are correct, but detailed analysis of specific locations cannot be performed.

¹ Fax from Steve Miller, Jan 11, 2007, 'Rating Curve at Old Siphon'

Once the large scale model was calibrated and the large scale flow patterns in the GIP were established, a small scale model was set up in the area of concern. This model uses the flow field calculated by the large scale model as boundary conditions and allows for more precise analysis of the area modeled. A single mesh block was used with a 5 m x 5 m grid and a total of almost 300,000 cells. This fine resolution allowed for more detailed analysis of the confluence of the two rivers.

Zero mass, tracer particles were continuously initiated near the model boundary in the Welland River during the small scale model run. This allows for better visualisation of the flow field and the extent of mixing as the Welland River enters the Niagara River. These particles do not necessarily behave in precisely the same way as contaminants might; the particles move according to the fluid field only, without diffusion, settling, or any other parameters particular to contaminants.

C.2.6 Boundary Conditions

Seven boundary conditions were used to define the flow state in the large scale model, as listed in Table 1 and shown in Figure 1.

Table 1 Boundary Condition Descriptions

Inflow Boundary Conditions	Description	Outflow Boundary Conditions	Description
East Channel	East channel of Niagara River around Grand Island	NYPA Intakes	Both intakes were modeled by a single open channel
West Channel – Left	West channel of Niagara River around Grand Island, to the left of Navy Island	SAB Tunnels	Existing SAB Tunnels 1 and 2. Modeled as two open channels
West Channel – Right	West channel of Niagara River around Grand Island, to the right of Navy Island	New Tunnel	The new SAB tunnel is modeled as a mass sink
Welland River	The Welland River is reversed, flowing into the Niagara River	Niagara Falls	Outflow that passes through and around the INCW

All boundary conditions were defined as discharges. The discharge associated with each boundary was determined through a combination of historical data, the water sharing agreement

between Canada and the United States² and previous two-dimensional model runs of the SAB diversion system³. The values used as boundary conditions in the large scale model are summarized in Table 2.

Table 2 Boundary Condition Discharges

Inflow Boundary Condition	Discharge	Outflow Boundary Conditions	Discharge
Niagara River		Niagara Falls	2,832 m ³ /s
East Channel	1,592 m ³ /s	NYPA intake	574 m ³ /s
West Channel – right	1,194 m ³ /s	Sir Adam Beck intakes	
West Channel – left	1,194 m ³ /s	New Tunnel Flow	211 m ³ /s
Niagara River Total	3,980 m ³ /s	SAB II tunnel 1	285.5 m ³ /s
Welland River	208 m ³ /s	SAB II tunnel 2	285.5 m ³ /s
		Total SAB Flow	782 m ³ /s
Total Inflow	4,188 m³/s	Total Outflow	4,188 m³/s

C.2.7 Structures

C.2.7.1 Diffuser Structure

The diffuser structure at the mouth of the Welland River was not modeled. This greatly simplifies the model, but is also thought to be conservative. By removing the diffuser, the flow from the Welland River is allowed to pass unimpeded into the Niagara River. If the structure were in place, it is thought that hydraulic losses through the structure would reduce the energy of the flow and yield a smaller contaminant plume.

C.2.7.2 INCW

The INCW structure with the re-aligned ice accelerating wall was included in the model. The INCW consists of 13 gates: 4 shoreward of the ice accelerating wall and 9 on the opposite side (before the wall relocation, there were 3 gates shoreward of the wall and 10 on the opposite side). At a GIP water level of 171.0m (the target level in the model), OPG procedures indicate that 9.6 gates would be open to pass the required flow over Niagara Falls. In order to provide the most even flow over the falls, gates 1 through 4 (numbered from the shore outward) are fully opened, as well as gates 9 through 13. Gate 8 is 60% opened⁴.

² Treaty between Canada and the United States of America concerning the Diversion of the Niagara River, February 27, 1950

³ Niagara River Hydroelectric Development, Definition Engineering Phase 2, Hydrodynamic Modelling of Grass Island Pool to Queeston Conveyance System, October 1993, Document Number NAW130-P4D-29230-0001-00

⁴ Email from P. Larsen, Ontario Power Generation to J. Shaw, Hatch Energy, dated January 17, 2007

C.3 Results and Analysis

C.3.1 *Vector Plots/General Flow Patterns*

Vector plots of both the large and small scale results are included in Figures 3 and 4 respectively.

C.3.1.1 *Large Scale Vector Field*

The large scale flow patterns in the GIP are illustrated in Figure 3. The background is coloured by velocity magnitude with velocity vectors superimposed to illustrate the flow patterns. The discontinuities in the background colour occur at the edges of the mesh blocks and do not represent discontinuities in the model, only in the visualisation.

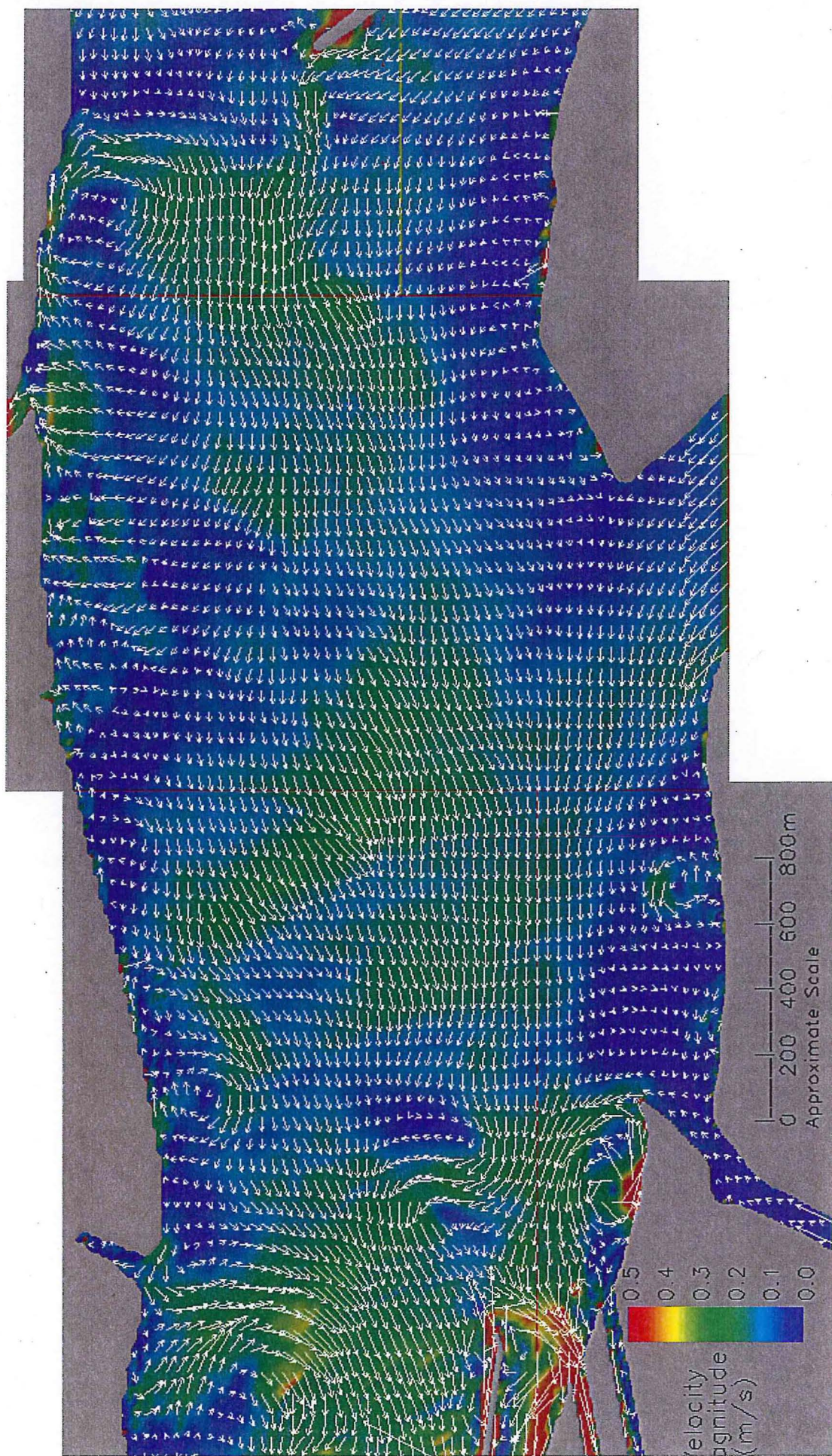
The velocity in the Welland River is very small with respect to the rest of model. This is accurate. When the Queenston Chippewa Power Canal (QCPC) is operating, the reversed section of the Welland River has a discharge of up to $700\text{m}^3/\text{s}$. The discharge modeled in this study is $208\text{m}^3/\text{s}$ (the 5-year flood), therefore velocities in the river can be expected to be much lower than they are when the QCPC are in operation.

As the flow from the Welland River enters the Niagara River, there is a small recirculation zone upstream of the confluence and a much larger one downstream. The bulk of the flow from the Welland River appears to be directed downstream, around this large recirculation zone, and eventually down the ice acceleration channel towards the SAB tunnels.

C.3.1.2 *Small Scale Vector Field*

Detailed flow patterns in the area of the confluence of the Welland and Niagara Rivers are illustrated in Figure 4. This model confirms the initial observations from the large scale model results, namely a small zone of recirculation is set up upstream of the confluence and a much large one downstream.

The small upstream recirculation zone is weak and intermittent. Very little flow from the Welland River appears to propagate upstream in the Niagara River. The bulk of the Welland River flow is directed around the large recirculation zone downstream of the confluence, into the ice acceleration channel and downstream towards the SAB tunnel intakes. This flow trajectory brings the water from the Welland River about 200 – 500m from the shore before entering the SAB tunnels.



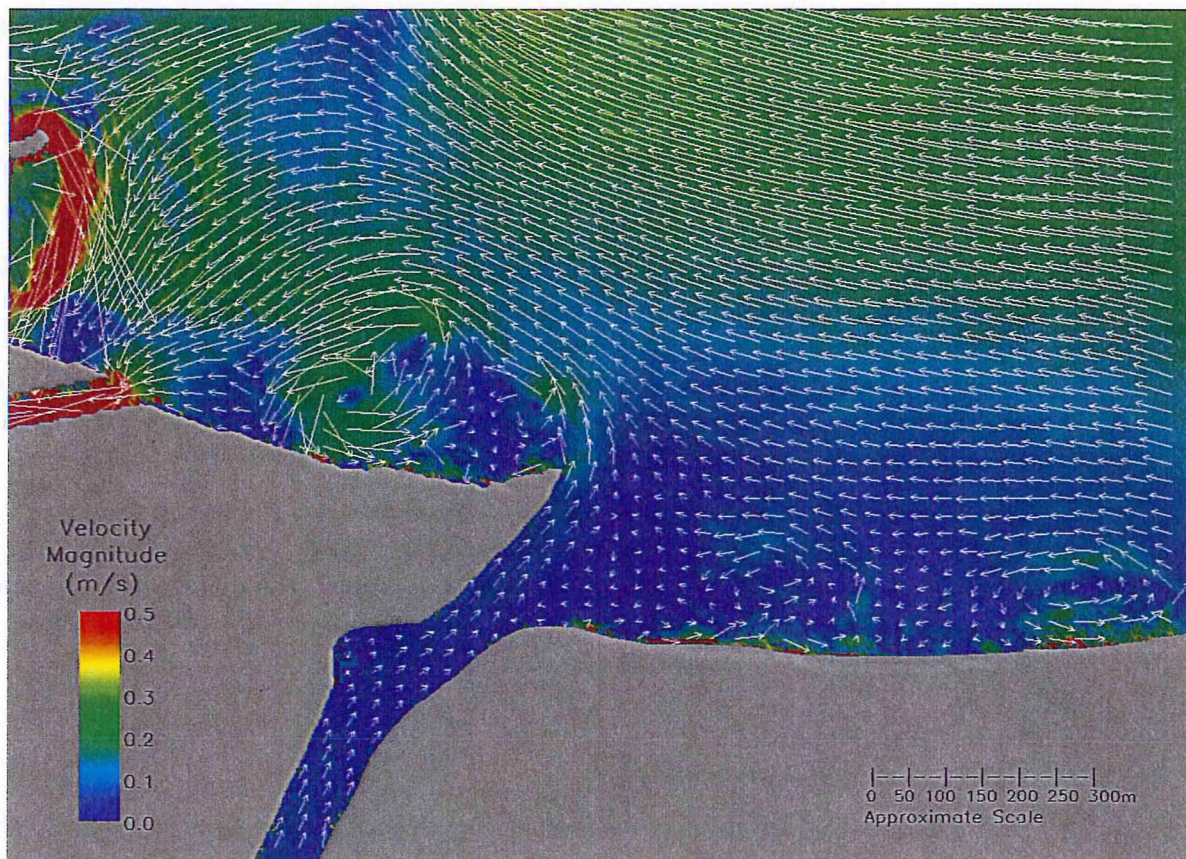


Figure 4 – Small Scale Model Vector Field

C.3.2 ParticleTracking

In the small scale model, zero mass, tracer particles were continuously initiated near the model boundary in the Welland River. This allows for better visualisation of the flow field and the extent of mixing as the Welland River enters the Niagara River. These particles do not necessarily behave in precisely the same way as contaminants might; the particles move according to the fluid field only, without diffusion, settling, or any other parameters particular to contaminants.

Snapshots of the particle locations as they traveled down the Welland River and mix with the Niagara River were recorded every minute of model time. The model was run for a total of approximately 2 hours and 45 minutes of model time. Figures 5 through 8 are individual snapshots typical for the simulation.

Very few of the particles (and thus very little of the water from the Welland River) is carried upstream of the confluence of the rivers, but the an intermittent recirculation zone upstream occasionally carries some of the contaminant upstream. A few particles (representing a low contaminant concentration) can be seen up to 400m upstream, while the area directly upstream

of the confluence can have intermittently high volumes of water from the Welland River (Figure 5).

Most of the particles (and thus most of the water from the Welland River) are taken into the first SAB tunnel. However, due to the turbulent nature of the flow, there are times when the contaminant plume can by-pass the tunnel intake and get carried downstream (Figure 6).

The size of the contaminant plume fluctuates significantly due to the turbulence inherent in fluid systems. The plume can extend to up to almost 500m from shore (Figure 7) or be as small as 200m (Figure 8). This means that if the intake were located, for example, 300m from the shoreline, it could have relatively clear Niagara Water for the majority of the time. However, transient slugs of water with very high turbidity could pass by the intake. The particles (representing the contaminants in the Welland River) can be seen to flow into the Niagara River in one minute time steps. The maximum extent of the contaminant plume is also marked on this animation. While, in general, this intake sight would have very clear Niagara River water, it is possible to have high concentrations of contaminants for short (several minute) durations.

The maximum extent of the particle plume is illustrated in Figure 9. This represents the approximate maximum extent of the particle plume in the 2.75 hours of model time. The alternative water intake layouts are also included in this figure. The majority of the particles are drawn into the first SAB intake tunnel, but a few do travel downstream. These are almost certainly drawn into the second SAB tunnel.

C.3.3 *Model Uncertainties*

With any modeling, the results of the model are only as good as the assumptions made while creating the model. Several assumptions were made in generating the model discussed herein that may limit the precision of the modeling results, including:

- Wind – There is no wind in the simulation. Because the GIP has such a large surface area and relatively shallow depth, wind can have a significant effect on the circulation patterns. Depending on the wind direction, this could either increase or decrease the size of the contaminant plume.
- Particles – The particles used in the model are tracer particles only and do not necessarily behave in precisely the same way as contaminants might; the particles move according to the fluid field only, without diffusion, settling, or any other parameters particular to contaminants.
- 2D – The model is two-dimensional. This is thought to be a reasonable simplification of the system, but it may introduce error, especially in terms of pollutant dispersion. All velocities are modeled as depth averaged, therefore vertical overturning or mixing that results in greater dispersal of contaminants is lost.

- Diffuser Structure – The diffuser structure at the mouth of the Welland River was not modeled. This is thought to be conservative, but nevertheless introduces a level of uncertainty in the results.
- Flow Scenario – Only one flow scenario was modeled. The scenario modeled is thought to be reasonably conservative, but it is conceivable that other flow scenarios result in equally large contaminant plumes.

C.3.4 *Possible Further Study*

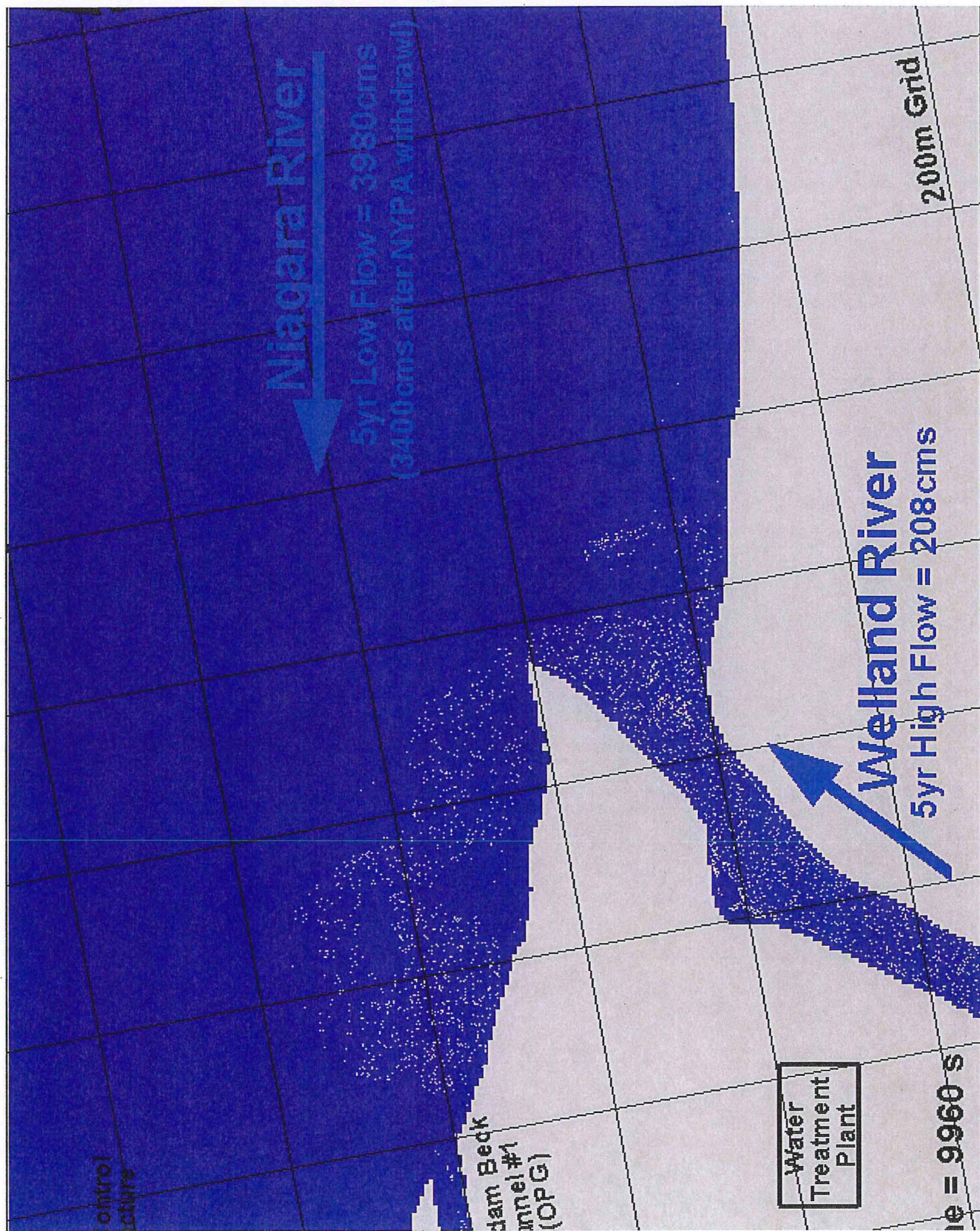
This study is thought to well define the potential for contaminants from the Welland River to propagate into the Niagara River. However, if further study is requested, other scenarios could be simulated. This could include:

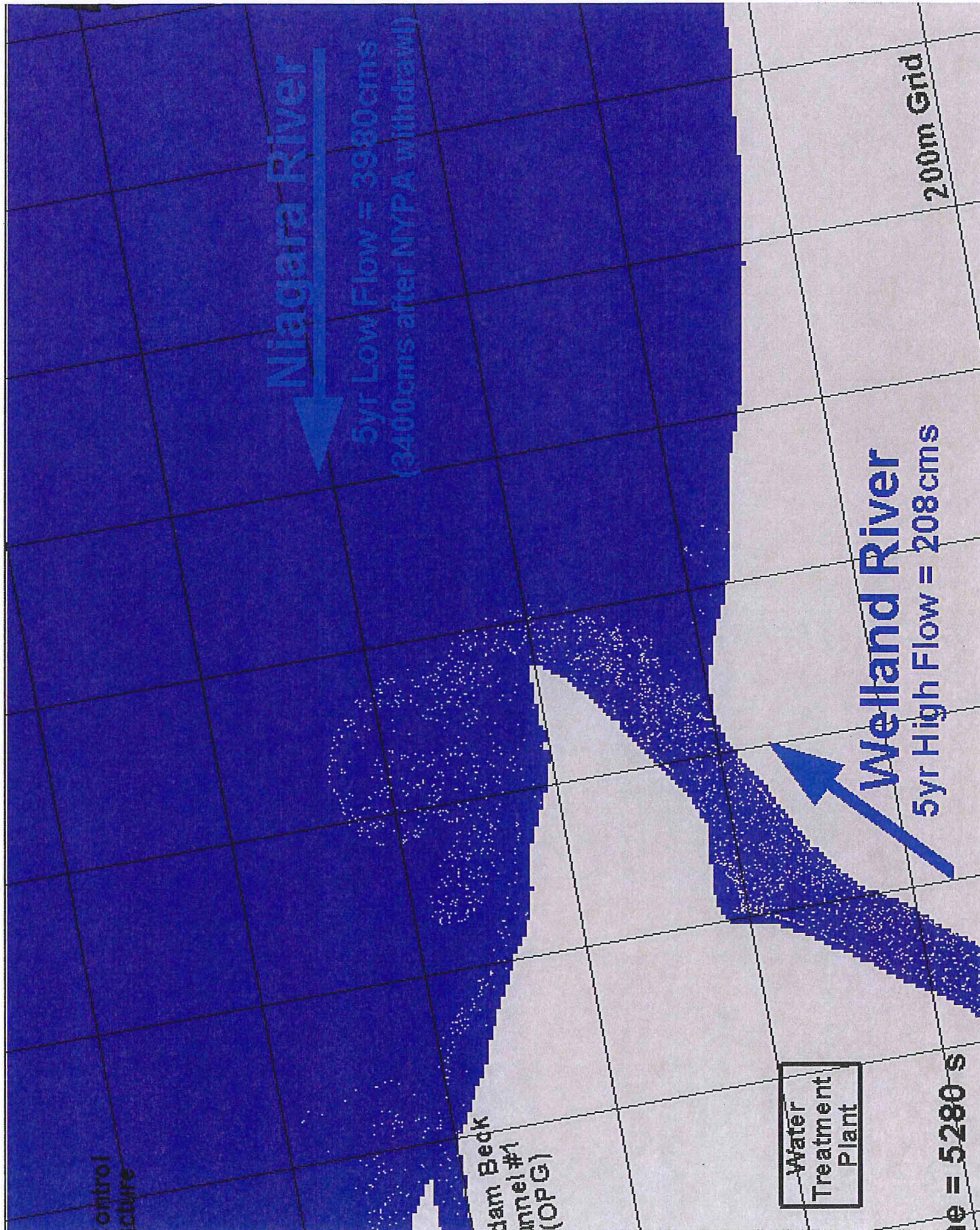
- Inclusion of the diffuser structure. It is thought that the inclusion of the diffuser structure may reduce the size of the contaminant plume.
- Selection of different flow values. The study was done relatively conservative flows (5-year high and low flows for the Welland and Niagara Rivers respectively). This could be reduced to 2-year events for the two rivers to yield more 'typical' results as opposed to the conservative case presented herein. Non-tourism flow cases could also be simulated.

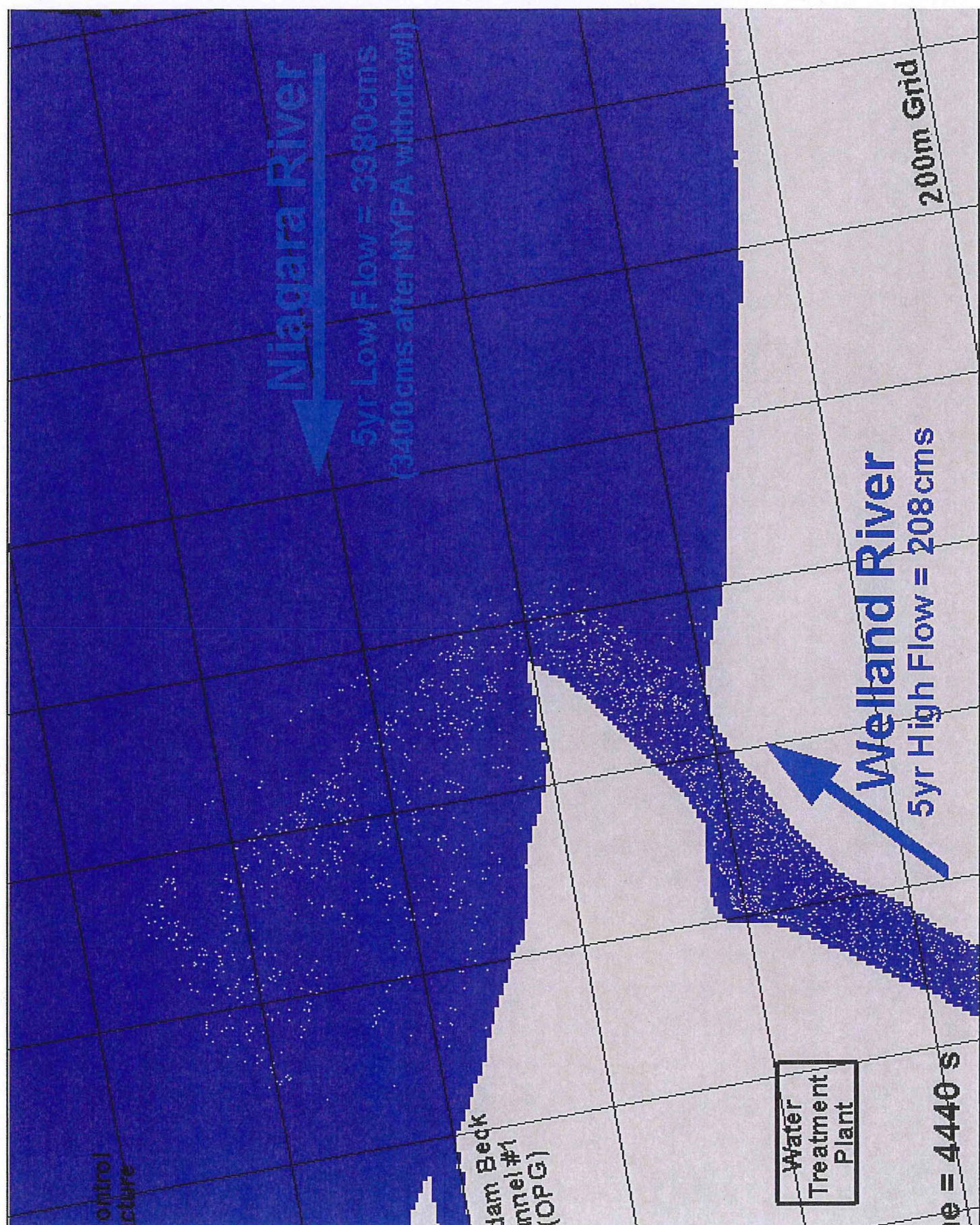
C.4 Recommendations

When flow direction in the Welland River is reversed, any contaminants present will be carried into the Niagara River. The size and extent of this contaminant plume is highly variable, with the potential to fluctuate significantly in both size and concentration. The estimated maximum extent of the contaminant plume is illustrated in Figure 9, subject to the uncertainties described in Section 3.3.

Due to the sensitivity of the plant capacity to contaminant loading, it is recommended that any relocated water intake structure not accompanied with an increased plant capacity be completely outside of this zone.







Niagara River

5yr Low Flow = 3380cms
(3400cms after NYPA withdrawal)

Welland River

5yr High Flow = 208cms

200m Grid

Water
Treatment
Plant

Dam Beck
unnel #1
(OPG)

Control
cture

ie = 4440 s

Niagara River

5yr Low Flow = 3980cms
(3400 cms after NYPA withdrawal)

Welland River
5yr High Flow = 208cms

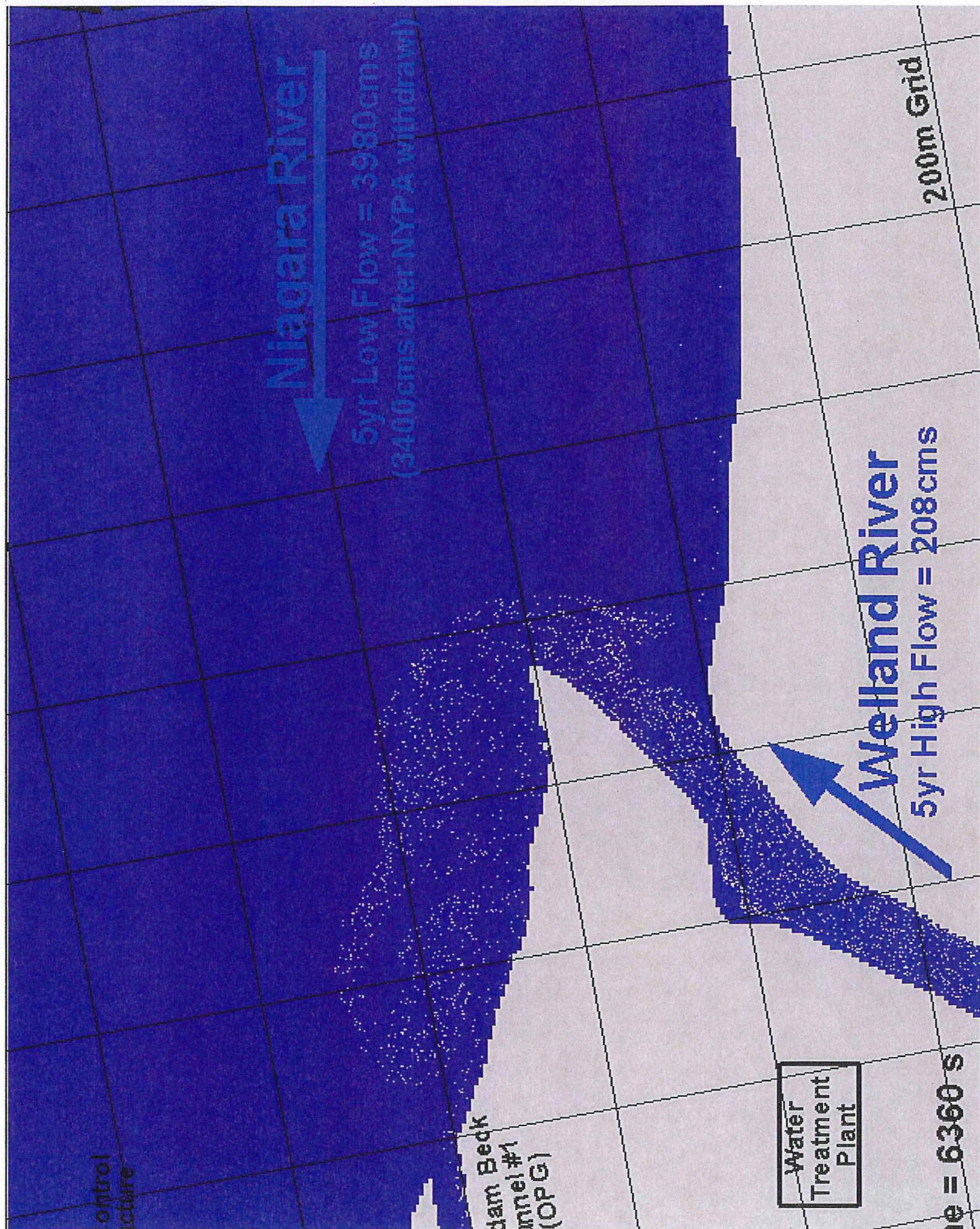
200m Grid

Water
Treatment
Plant

ie = 6360 s

Dam Beck
Channel #1
(OPG)

Control
Structure



Niagara River

5yr Low Flow = 3980cms
(3400cms after NYPA withdrawal)

Extent of Plume

Alternative C

Alternative B

Alternative A

Alternative D

Water Treatment Plant

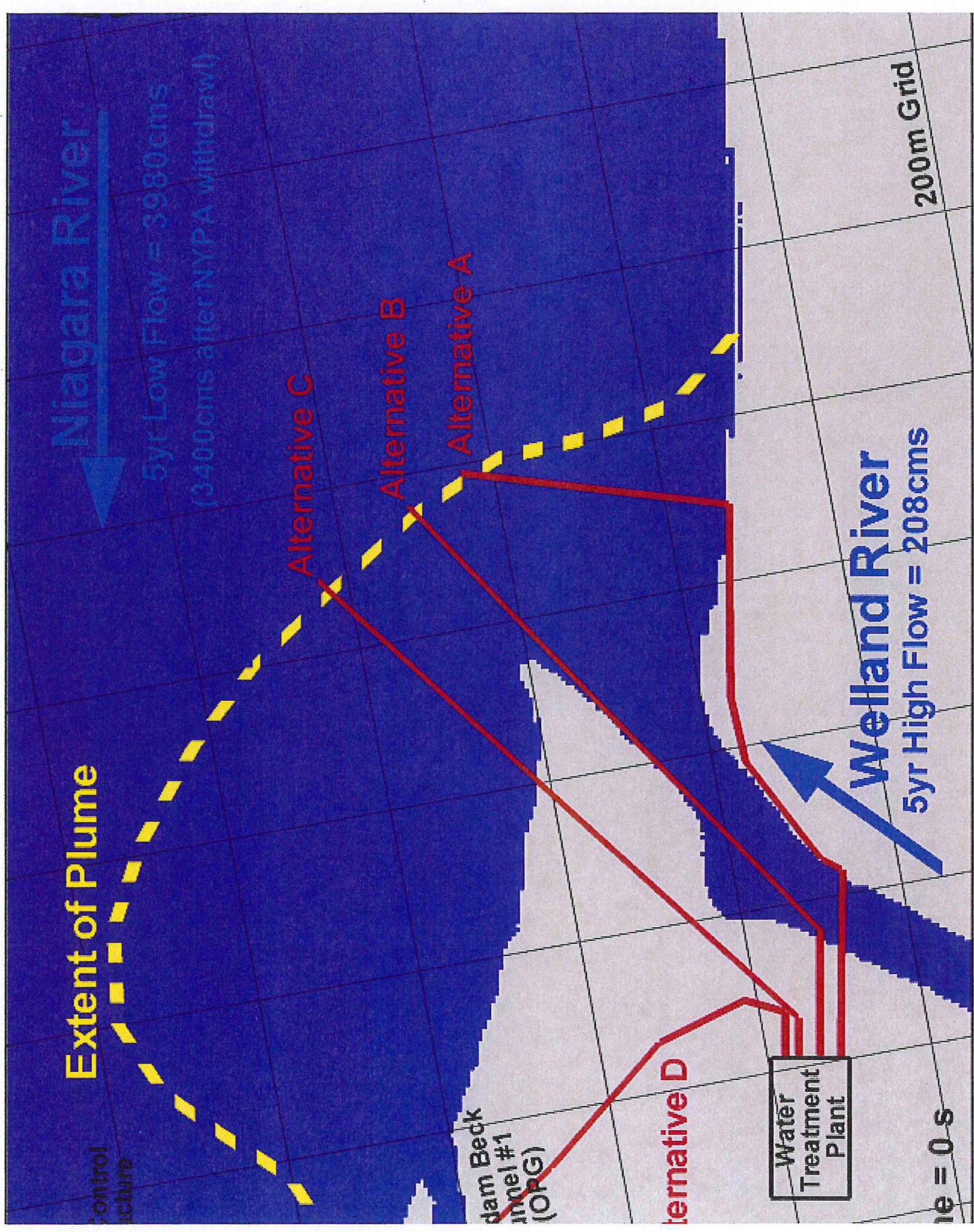
Welland River

5yr High Flow = 208cms

200m Grid

ie = 0 s

dam Beck
unnel #1
(OPG)



Appendix D
Geotechnical Investigations

**Preliminary Geotechnical Investigation
Niagara Falls Water Treatment Plant
Intake Relocation
City of Niagara Falls, Ontario**

Prepared for:

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HAGE00139527B
August 8, 2007

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Appendices:

Appendix A:

Notes on Sample Description, Borehole Location Plan, Borehole Logs

Appendix B:

Certificate of Analysis - Soil

1 Introduction

This report presents the results of a preliminary geotechnical investigation carried out for the proposed Niagara Falls Water Treatment intake relocation located in the City of Niagara Falls, Ontario.

The work was authorized by Mr. Robin Young of Niagara Region Public Works, Water & Wastewater Services ("Client").

It is understood that the proposed water intake improvement consists of the relocation of the existing Niagara Falls Water Treatment Plant (WTP) intake to provide a reliable, high quality and consistent water supply.

The purpose of this investigation was to determine the subsurface soil and groundwater conditions at the aforementioned locations by drilling four (4) boreholes and based on this information, to provide preliminary geotechnical engineering guidelines for the design and construction of the proposed water intake structure. Recommendations and/or comments regarding foundation type, allowable bearing pressures, groundwater conditions, and excavation and backfill were to be provided.

To assess the quality of the on site soils for disposal purposes, and to evaluate the likelihood of sulphate attack on the concrete, a limited soil sampling and chemical analysis was also carried out in conjunction with this preliminary geotechnical investigation.

The comments and recommendations given in this report are based on the assumption that the above-described design concept will proceed into construction. The final location of the proposed intake was not determined at the time of this investigation. Therefore, the results of this investigation must be considered for guidance purposes only. If changes are made either in the design phase or during construction, this office must be retained to review these modifications. The result of this review may be a modification of our recommendations or the requirement of additional field or laboratory work to check whether the changes are acceptable from a geotechnical viewpoint.

2 Site Description

The Niagara Falls Water Treatment Plant (WTP) is located on the west side of the Welland River and south side of the Niagara River in the City of Niagara Falls. The current Niagara Falls WTP intake is located on the north bank of the Niagara River (Chippawa Creek), approximately 500 m west of the Niagara River and Welland River intersection. The location of the site is shown on the site location plan (Drawing No. 1).

It is understood that the relocation of the WTP intake has been proposed to provide a consistent, reliable high quality raw water supply. The precise location of the new raw water intake was not known at the time of this study.

3 Procedure

The fieldwork for this investigation was carried out on July 6, 2007, and consisted of drilling four (4) sampled boreholes (BH A, BH B, BH C, and BH D) to a maximum depth of 5.0 m below existing grades at the approximate locations shown on the attached Borehole Location Plan (Drawing No. 1).

A representative of Trow was present throughout the drilling operations to monitor and direct the drill operations, and to record borehole information. Representative samples of the subsurface soils were recovered at regular intervals using conventional 50 mm O.D. split spoon sampling equipment driven in accordance with Standard Penetration Test procedures (ASTM D1496). All split spoon samples were returned to Trow's Hamilton laboratory for testing which included moisture content on selected samples, and Atterberg limits, sieve/hydrometer, and proctor test on one representative soil sample. The results of the moisture content tests are shown in the boreholes logs (Drawings 2 to 5 in Appendix A).

Additionally, three (3) soil samples were also collected from the boreholes and submitted to a certified analytical laboratory (Maxxam Analytics) for various chemical analyses including Petroleum Hydrocarbon (PHC) Fractions F2 to F4, and/or the Ministry of Environment (MOE) Regulation 153 Metals and Inorganics, and/or pH, and/or soluble sulphate. The results of the soil chemical analyses are presented in this report.

The groundwater conditions in the boreholes were closely monitored during and upon completion of drilling. Furthermore, in order to facilitate long term monitoring of groundwater conditions, two (2) piezometers were installed in Boreholes BH A and BH D advanced at the site. The piezometers were constructed of 50 mm diameter Schedule 40 PVC pipes. A 3.0 m long screen and an appropriate length of riser pipe were used in the piezometers. Details of the piezometers installations are provided on the borehole logs in Appendix A. The installation of a piezometer in Borehole BH B was not feasible due to the borehole cave-in.

The boreholes were advanced using continuous flight solid stem auger equipment owned and operated by a specialist contractor under the full time supervision of a member of Trow's engineering team.

The existing ground surface elevations at each of the borehole locations were surveyed by Trow. The ground surface elevation at the borehole locations were referenced to the following Temporary Benchmark (TBM):

TBM: Concrete Slab on the northwest of Borehole BH A.

Benchmark Elevation: Assumed El. 100.00 m above sea level.

4 Subsurface Conditions

The detailed soil conditions encountered in each borehole and the results of selected laboratory moisture content determinations and Atterberg limits are indicated on the borehole logs attached as Appendix A. It should be noted that the soil boundaries indicated on the borehole logs are inferred from non-continuous sampling and observations during drilling. These boundaries are intended to reflect approximate transition zones for the purpose of geotechnical design and should not be interpreted as exact planes of geological change. The "Notes on Sample Description" preceding the borehole logs form an integral part of and should be read in conjunction with this report.

The general soil stratigraphy at the sites, as revealed in the boreholes, comprises a topsoil layer overlying either fill material or native clayey silt till. A brief description of the various soil units is given in the following paragraphs.

4.1 Subsoils

4.1.1 Topsoil

An approximate 100 mm to 130 mm thick topsoil layer was encountered at ground surface at all borehole locations.

It should be noted that topsoil measurements were carried out at the widely spaced borehole locations only and were found to be variable. Therefore, topsoil quantities should not be established from the information provided at the borehole locations only. If required, a more detailed evaluation (involving more closely spaced shallow test pits) is recommended to accurately quantify the amount of topsoil to be removed for construction purposes.

4.1.2 Fill

A layer of fill material was encountered below the topsoil in the locations of Boreholes BH A, BH B, and BH C..

The fill material consisted of brown silty sand or clayey silt intermixed with topsoil or organics. Some gravel was encountered within the fill layer in some locations. The fill layer extended to a depth between 0.76 m and 2.0 m below the existing grades. In the location of Borehole BH B, a layer of possible fill consisting of gravel with crushed limestone was encountered under the clayey silt fill, which extended to the depth of the investigation approximately 4.4 m below the grade. Auger refusal was encountered at 4.4 m below the existing grade at Borehole BH B. This refusal was most likely due to fill consisting of boulders at that elevation.

4.1.3 Silty Clay/Clayey Silt Till

A native layer of silty clay till was encountered below the fill material in Boreholes BH A and BH C, extending to the depths of the boreholes 5.0 m and 4.3 m below the existing grades, respectively. In the location of Borehole BH D, however, a native layer of clayey silt till was encountered beneath the topsoil which extended to the depth of the borehole, 4.3 m below the existing grade.

With 'N' values ranging from 9 to 37 blows per 300 mm, the native layer is firm to hard.

The laboratory moisture content test results performed on samples of native silty clay/clayey silt ranged from 10 to 34 percent, indicating moist to wet conditions.

4.2 Groundwater

Groundwater conditions were assessed in the open boreholes during the course of the fieldwork.

Boreholes BH C and BH D remained open and dry upon completion of drilling. Free water was encountered in Boreholes BH A and BH B at depths approximately 2.1 m and 1.5 m below grades, respectively.

The observations at completion of drilling may not be representative of the true groundwater conditions at the site due to the short period of observation.

5 Engineering Discussion and Recommendations

5.1 General

It is understood that the relocation of raw water intake of the Niagara Falls WTP has been proposed. The current Niagara Falls WTP intake is located on the north bank of the Niagara River (Chippawa Creek), approximately 500 m west of Niagara River and Welland River intersection.

5.2 Trench Excavation and Groundwater Control

Excavations will be required for the proposed new water intake installation in the order of 2 m to 3 m below the existing grade. Based on the results of this preliminary geotechnical investigation, the excavation for the most part will generally be carried out within silty sand till or clayey silt fill material, or within native silty clay till or clayey silt till.

All construction work must be carried out in accordance with the latest edition of the Occupational Health and Safety Act (OHSA) and local regulations. With respect to the OHSA, the fill and any loose and soft soils should be considered as Type 3 soils, while compact and hard layers of silty clay or clayey silt till can be considered Type 2 soils. The weakest material in an excavation area will govern.

The OSHA requires that excavation slopes be cut at predetermined inclinations, based on the soil types. Locally, where loose/soft material is encountered, or within zones of persistent seepage at depth, it may be necessary to flatten the side slopes.

Based on the observations during and after the boreholes and piezometers installations, the volume of water to be anticipated is such that temporary pumping from the excavations should suffice to control groundwater. The dewatering system must be maintained until the excavation and backfilling are completed.

5.3 Backfill Considerations

Backfill material used for trench backfilling should be compactable fill, i.e. inorganic soil with its moisture content close to its optimum moisture content determined in a standard Proctor test. The excavated fill and native soils which are not mixed with topsoil or other obviously unsuitable materials may be reused as backfill. Materials found to be wet should be allowed to drain, or be mixed with imported dry soils before reusing.

Any organic or excessively wet or otherwise deleterious material should not be used for backfilling purposes. Any shortfall of suitable on-site excavated material can be made up with imported and approved materials.

In general, the overburden soils are not suitable for use in confined areas. Imported granular material conforming OPSS Granular 'B' Type 1 would be suitable for these purposes as well as in areas where free-draining characteristics are required.

All backfilling should be placed in maximum 300 mm horizontal lifts for granular fill and 200 mm for cohesive soils and uniformly compacted to the Niagara Region requirements or to a minimum of 95 % SPMDD up to 0.6 m below finished surface grades, and to a minimum of 98 % SPMDD above.

Backfill should be placed simultaneously on both sides of the intake structure. Heavy compactors, which generate large lateral stress, should be kept at a safe distance from the intake structure to avoid structural damage.

All backfill and compaction operations should be monitored by qualified geotechnical personnel to approve material, to evaluate placement operations, and to verify that the specified degree of compaction is being achieved throughout the fill.

Based on a proctor test carried out on a composite sample collected from native material on the site, a maximum dry density of 1986 kg/m^3 was achieved at an optimum moisture content of 12%.

5.4 Foundation Considerations

As per our information, the design of the proposed water intake has not been finalized, however, it is expected that the intake will be consisted of a pre-cast 1.8 m diameter concrete pipe, founded between 2 m and 3 m below the existing ground.

A summary of available bearing pressure in the locations of the boreholes in the site is provided in Table 1.

Table 1: Elevation and Allowable Bearing Pressure

Borehole	Depth / Elevation (m)	Available Bearing Pressure (kPa)	Depth / Elevation (m)	Available Bearing Pressure (kPa)
BH A	2 m (97.99 m)	50*	3 m (96.99)	50*
BH B	2 m (97.49 m)	50*	3 m (96.49 m)	50*
BH C	2 m (99.04 m)	125	3 m (98.04 m)	200
BH D	2 m (97.66 m)	200	3 m (96.66 m)	200

* Founding the intake pipe within the fill materials is not recommended.

The total and differential settlements of the pipe placed in accordance with the above recommendations, are expected to be less than 25 mm and 20 mm, respectively, if founded on undisturbed native soils.

It should be noted that the recommended bearing capacities have been calculated by Trow from the borehole information for the design stage only. The investigation and comments are necessarily ongoing as new information on underground conditions becomes available. For example, it should be appreciated that modifications to bearing levels may be required if unforeseen subsoil conditions are revealed after the excavation is exposed to full view or if final design decisions differ from those assumed in this report. For this reason this office should be retained to review final foundation drawings and to provide field inspections during the construction stage.

5.5 Bedding Considerations

It is anticipated that, for the most part, the proposed intake pipes can be founded within the firm to hard silty clay or clayey silt till. If loose fill is encountered, it should be compacted or sub-excavated to competent ground. No bearing capacity problems are envisaged for the water intake founded on the compacted fill or native soil. The pipe should be provided with granular bedding and cover material conforming to OPSS or Regional Municipality of Niagara Specifications for the type of pipe specified. The bedding materials should be Granular 'A'. The thickness of the bedding materials should conform to the OPSS or local standards.

The cover and bedding material should be placed in thin lifts not more than 150 mm thick and compacted to at least 98 % SPMDD or as specified by the Regional Municipality of Niagara. Particular attention should be given to ensure material placed beneath the bottom quadrants of the pipe is adequately compacted.

Log of Borehole BH B

Project No. HAGE00139527B

Drawing No. 3

Project: Niagara Falls Water Treatment Plant Intake Relocation

Sheet No. 1 of 1

Location: Refer to Borehole Location Plan

Date Drilled: July 6, 2007

Auger Sample

Combustible Vapour Reading ☐

SPT (N) Value

Natural Moisture ☒

Dynamic Cone Test

Plastic and Liquid Limit ☐

Drill Type: Solid Stem Auger

Shelby Tube

Undrained Triaxial at
% Strain at Failure ☐

Datum: 100.00 meters

Field Vane Test

Penetrometer ☒

GWL	SOIL LOG	Soil Description	ELEV. m	DEPTH m	N Value				Combustible Vapour Reading (ppm)			Natural Unit Weight kN/m ³	
					20 40 60 80				250	500	750		
					Shear Strength MPa				Natural Moisture Content % Atterberg Limits (% Dry Weight)				
				0.1 0.2				10 20 30			SAMPLES		
		Topsoil	99.49	0									
		Fill	99.39										
		-clayey silt											
		-brown											
		-mixed with organics and topsoil											
		-some gravel											
		-moist											
			97.99	1									
			97.49	2									
		Fill											
		-gravel											
		-crushed limestone											
		-grey											
		-sizes up to 4"											
		-wet											
		-loose											
		-auger refusal at 4.4 m due to probable boulders											
		-no sample recovery beyond 2.0 m											
		-soil classification is based on auger cuttings.											
			95.09	4									
		End of Borehole											
		NOTES											
		1. This drawing is to be read with the subject report and project number as presented above.											
		2. Interpretation assistance by Trow is required before use by others.											
		3. Borehole advanced by solid stem auger equipment to a depth of 4.4m.											
		4. Auger refusal was encountered at 4.4m.											
		5. Borehole backfilled upon completion of drilling.											
		6. Upon completion of drilling water was encountered at 1.5 m.											

LAGWGL02 BOREHOLE LOGS.GPJ NEW.GDT 8/10/07



428 Millen Road
Hamilton, Ontario, L8E 3N9
Telephone: (905) 664-3300
Fax: (905) 662-4144

Time	Water Level (m)	Depth to Cave (m)
July 6, 2007	1.5	1.9

6 Environmental Testing

The disposal of any excavated material is regulated by the Ontario Ministry of Environment (MOE). A limited soil sampling and analysis was carried out in conjunction with this preliminary geotechnical investigation.

Chemical analysis of selected soil samples for various parameters was conducted to assess the quality of soil on the site and to evaluate the likelihood of sulphate attack on the concrete.

Three soil samples from Boreholes BH A and BH C were submitted to the laboratory for chemical analysis as follow:

Table 2: Summary of Borehole Soil Samples Submitted for Chemical Analyses

Borehole ID.	Sample ID.	Depth (m)	Analysis
BH A	BH A – 2 1/2	0.76	Metals and Inorganics
BH A	BH A - 5	1.5	PHC F2-F4 ⁽¹⁾
BH C	BH C – 12 1/2	3.80	pH, soluble sulphate

(1) PHC F2 – F4: Petroleum Hydrocarbon Fractions F2 to F4

The assessment criteria, Site Condition Standards (SCS), applicable to a given site in Ontario are established under subsection 168.4(1) of the Environmental Protection Act. Tabulated generic criteria are provided in “Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act” (“the SGWS Standards”), Ministry of the Environment (MOE), March 2004. For assessment purposes, Trow selected the MOE Table 1 SCS for “All other Type of Property Use”. Where criteria were not available under Table 1 (i.e. PHC Fractions F2 to F4 in soil) the results were compared to the MOE Table 2 SCS (applicable to sites with potable groundwater).

Based on the results of the chemical analysis, all tested metal and inorganic parameters were below the laboratory detection limits or below the MOE Table 1 SCS. The concentrations of PHC Fractions F2 to F4 were below the MOE Table 2 SCS.

As per the results of the chemical analysis of the soil, the concentrations of soluble sulphate in the soil sample analyzed is 190 ug/g (~ 0.02%) indicating insignificant likelihood of sulphate attack on concrete.

The results of these analyses are attached to this report as Appendix C.

NOTES ON SAMPLE DESCRIPTIONS

1. All sample descriptions included in this report follow the Canadian Foundation Engineering Manual soil classification system. This system follows the standard proposed by the International Society for Soil Mechanics and Foundation Engineering. Laboratory grain size analyses provided by Trow also follow the same system. Different classification systems may be used by others; one such system is the Unified Soil Classification. Please note that, with the exception of those samples where a grain size analysis has been made, all samples are classified visually. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.

ISSMFE SOIL CLASSIFICATION

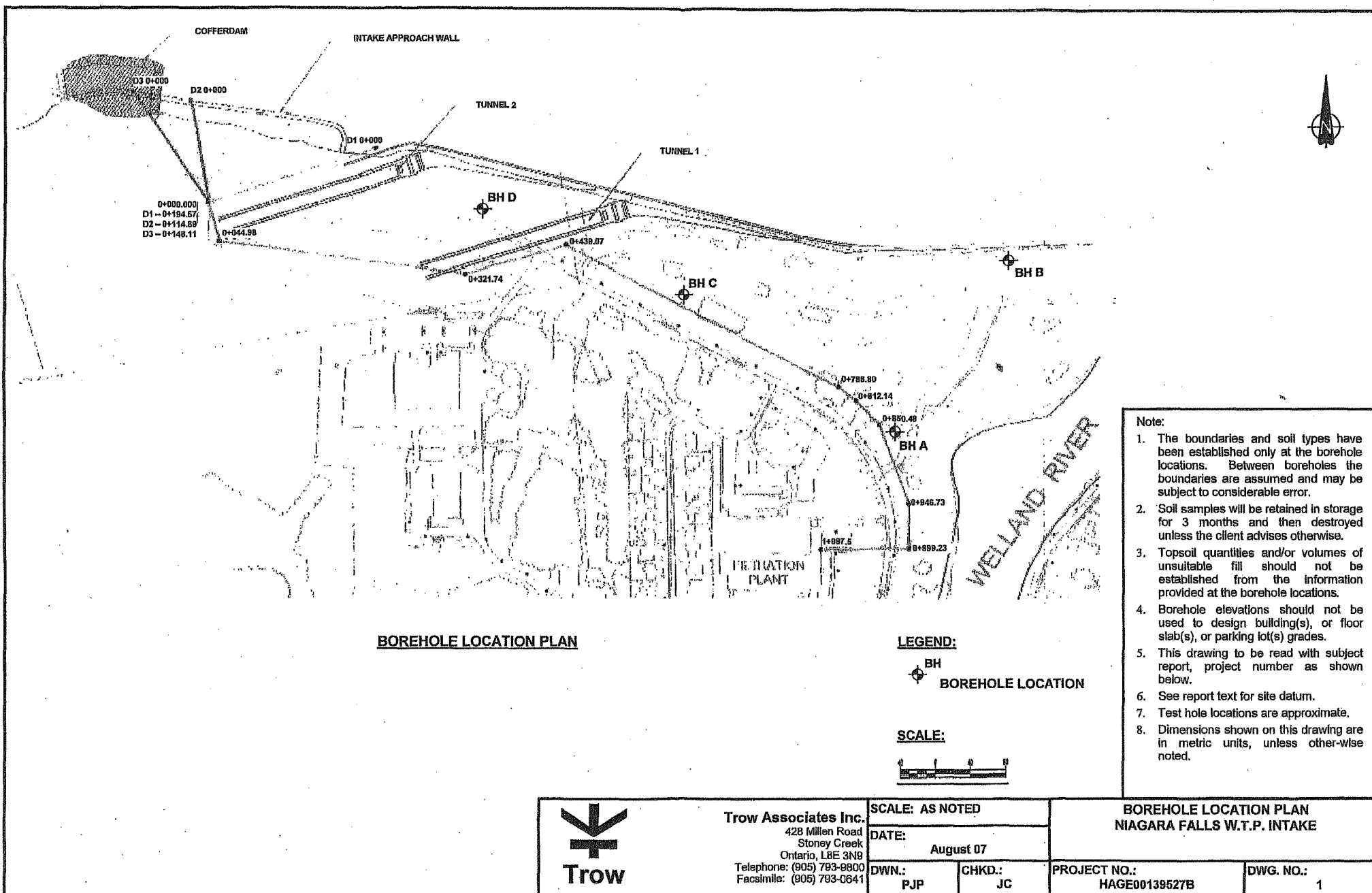
CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse		
	0.002	0.006	0.02	0.06	0.2	0.6	2.0	6.0	20	60	200

EQUIVALENT GRAIN DIAMETER IN MILLIMETRES

CLAY (Plastic) to SILT (Non Plastic)	FINE	MEDIUM	COARSE	FINE	COARSE
	SAND			GRAVEL	

UNIFIED SOIL CLASSIFICATION

2. **Fill:** Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstructions such as wood, large concrete pieces or subsurface basements, floors, tanks, etc., none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional geotechnical site investigation.
3. **Till:** The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (60 to 200 mm) or boulders (over 200 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.



Log of Borehole BH A

Project No. HAGE00139527B

Drawing No. 2

Project: Niagara Falls Water Treatment Plant Intake Relocation

Sheet No. 1 of 1

Location: Refer to Borehole Location Plan

Date Drilled: July 6, 2007

Auger Sample ☐

Combustible Vapour Reading ☐

SPT (N) Value ☐

Natural Moisture ☒

Drill Type: Solid Stem Auger

Dynamic Cone Test ☐

Plastic and Liquid Limit ☐

Datum: 100.00 meters

Shelby Tube ☐

Undrained Triaxial at % Strain at Failure ☐

Field Vane Test ☐

Penetrometer ☐

GWL	Soil Description	ELEV. m	Depth m	N Value				Combustible Vapour Reading (ppm)			S	Natural Unit Weight kN/m ³
				20	40	60	80	250	500	750		
				Shear Strength MPa				Natural Moisture Content % Atterberg Limits (% Dry Weight)				
				0.1	0.2			10	20	30		
	Topsoil	99.99	0									
	Fill	99.89										
	-silty sand											
	-brown											
	-mixed with some gravel and topsoil at 0.76m		1	8				X				
	-changing to sandy silt with clay seams at 3.0m			12					X			
	-very moist becoming wet at 2.3m		2	4						X		
		97.89										
			3	3							X	
		96.19		9		▲		X		○		
	Silty Clay Till		4									
	-brown											
	-layered											
	-moist											
	-firm											
		94.99	5									
	End of Borehole											
	NOTES 1. This drawing is to be read with the subject report and project number as presented above. 2. Interpretation assistance by Trow is required before use by others. 3. Borehole advanced by solid stem auger equipment to a depth of 5.0m. 4. Borehole backfilled upon completion of drilling. 5. Upon completion of drilling water was encountered at 2.1m. 6. Shelby tube sample was collected at depth 4.1m to 5.0 m.											

LAGWGL02 BOREHOLE LOGS.GPJ NEW.GDT 8/10/07



428 Millen Road
Hamilton, Ontario, L8E 3N9
Telephone: (905) 664-3300
Fax: (905) 662-4144

Time	Water Level (m)	Depth to Cave (m)
July 6, 2007	2.1	

Log of Borehole BH B

Project No. HAGE00139527B

Drawing No. 3

Project: Niagara Falls Water Treatment Plant Intake Relocation

Sheet No. 1 of 1

Location: Refer to Borehole Location Plan

Date Drilled: July 6, 2007

Auger Sample

SPT (N) Value

Dynamic Cone Test

Shelby Tube

Field Vane Test

Combustible Vapour Reading

Natural Moisture

Plastic and Liquid Limit

Undrained Triaxial at

% Strain at Failure

Penetrometer

Drill Type: Solid Stem Auger

Datum: 100.00 meters

GWL	Soil Description	ELEV. m	DEPTH m	N Value				Combustible Vapour Reading (ppm)			SAMPLING	Natural Unit Weight kN/m ³		
				Shear Strength				Natural Moisture Content %						
				20	40	60	80	250	500	750				
				MPa				Atterberg Limits (% Dry Weight)						
				0.1		0.2		10			20		30	
	Topsoil	99.49	0											
	Fill	99.39												
	-clayey silt													
	-brown													
	-mixed with organics and topsoil													
	-some gravel													
	-moist													
		97.99	1											
		97.49	2											
	Fill													
	-gravel													
	-crushed limestone													
	-grey													
	-sizes up to 4"													
	-wet													
	-loose													
	-auger refusal at 4.4 m due to probable boulders													
	-no sample recovery beyond 2.0 m													
	-soil classification is based on auger cuttings.													
		95.09	4											
	End of Borehole													
	NOTES													
	1. This drawing is to be read with the subject report and project number as presented above.													
	2. Interpretation assistance by Trow is required before use by others.													
	3. Borehole advanced by solid stem auger equipment to a depth of 4.4m.													
	4. Auger refusal was encountered at 4.4m.													
	5. Borehole backfilled upon completion of drilling.													
	6. Upon completion of drilling water was encountered at 1.5 m.													

LAGWGL02 BOREHOLE LOGS.GPJ NEW.GDT 8/10/07



428 Millen Road
Hamilton, Ontario, L8E 3N9
Telephone: (905) 664-3300
Fax: (905) 662-4144

Time	Water Level (m)	Depth to Cave (m)
July 6, 2007	1.5	1.9

Log of Borehole BH C

Project No. HAGE00139527B

Drawing No. 4

Project: Niagara Falls Water Treatment Plant Intake Relocation

Sheet No. 1 of 1

Location: Refer to Borehole Location Plan

Date Drilled: July 6, 2007

Auger Sample



Combustible Vapour Reading



Drill Type: Solid Stem Auger

SPT (N) Value



Natural Moisture



Datum: 100.00 meters

Dynamic Cone Test



Plastic and Liquid Limit



Shelby Tube



Undrained Triaxial at



Field Vane Test



% Strain at Failure



Penetrometer



ELEV. m	Soil Description	DEPTH m	N Value				Combustible Vapour Reading (ppm)			Natural Unit Weight kN/m³
			20	40	60	80	250	500	750	
			Shear Strength MPa				Natural Moisture Content % Atterberg Limits (% Dry Weight)			
			0.1	0.2			10	20	30	
101.04	Topsoil	0								
100.91	Fill									
	-silty sand									
	-brown									
100.28	-mixed with organics and topsoil	1								
	Silty Clay Till									
	-brown									
	-layered, some sand seams									
	-some clayey silt at 3.0m									
	-moist									
	-stiff to very stiff, becoming hard at 3.8m									
		2								
		3								
		4								
96.74	End of Borehole									
NOTES 1. This drawing is to be read with the subject report and project number as presented above. 2. Interpretation assistance by Trow is required before use by others. 3. Borehole advanced by solid stem auger equipment to a depth of 4.3m. 4. Borehole backfilled upon completion of drilling. 5. Upon completion of drilling water was not encountered.										

LAGWGL02 BOREHOLE LOGS.GPJ NEW.GDT 8/10/07



428 Millen Road
Hamilton, Ontario, L8E 3N9
Telephone: (905) 664-3300
Fax: (905) 662-4144

Time	Water Level (m)	Depth to Cave (m)
July 6, 2007	No free water	

Log of Borehole BH D

Project No. HAGE00139527B

Drawing No. 5

Project: Niagara Falls Water Treatment Plant Intake Relocation

Sheet No. 1 of 1

Location: Refer to Borehole Location Plan

Date Drilled: July 6, 2007

Auger Sample

SPT (N) Value

Dynamic Cone Test

Shelby Tube

Field Vane Test

Combustible Vapour Reading

Natural Moisture

Plastic and Liquid Limit

Undrained Triaxial at

% Strain at Failure

Penetrometer

Drill Type: Solid Stem Auger

Datum: 100.00 meters

SAMPLING	ELEV. m	Soil Description	N Value				Combustible Vapour Reading (ppm)			Natural Unit Weight kN/m ³
			MPa				Natural Moisture Content % Atterberg Limits (% Dry Weight)			
			20	40	60	80	250	500	750	
			Shear Strength							
			0.1 0.2				10 20 30			
0	99.66	Topsoil								
	99.53	Clayey Silt Till								
		-brown								
		-layered								
		-sand seams								
		-moist								
		-hard becoming stiff at 3.8m								
1										
2										
3										
4										
5	95.36	End of Borehole								
NOTES 1. This drawing is to be read with the subject report and project number as presented above. 2. Interpretation assistance by Trow is required before use by others. 3. Borehole advanced by solid stem auger equipment to a depth of 4.3m. 4. Borehole backfilled upon completion of drilling. 5. Upon completion of drilling water was not encountered.										

LAGWGL02 BOREHOLE LOGS.GPJ NEW.GDT 8/10/07



428 Millen Road
Hamilton, Ontario, L8E 3N9
Telephone: (905) 664-3300
Fax: (905) 662-4144

Time	Water Level (m)	Depth to Cave (m)
July 6, 2007	No free water	

Appendix B:
Certificate of Analysis - Soil

Your Project #: HAGE00139527B
Your C.O.C. #: 5599**Attention: James Clunas**
Trow Associates Inc
428 Millen Rd
Stoney Creek, ON
L8E 3N9

Report Date: 2007/07/20

CERTIFICATE OF ANALYSIS**MAXXAM JOB #: A772599**
Received: 2007/07/13, 10:41Sample Matrix: Soil
Samples Received: 3

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Method Reference
Hot Water Extractable Boron	1	2007/07/19	2007/07/19	CAM SOP-00408	EPA 3050B
Free Cyanide	1	N/A	2007/07/17		EPA 9012 modified
Conductivity	1	N/A	2007/07/19	CAM SOP-0414	APHA 2510
Chromium (VI) in Soil	1	2007/07/17	2007/07/17	Ont SOP 0104	EPA 7196
Petroleum Hydrocarbons F2-F4 in Soil	1	2007/07/17	2007/07/17	CAM SOP-00316	CCME CWS
Mercury in Soil by CVAA	1	2007/07/19	2007/07/19	CAM SOP-00453	EPA 7470
Acid Extr. Metals (aqua regia) by ICPMS	1	2007/07/19	2007/07/19	CAM SOP-00447	EPA 6020
MOISTURE	1	N/A	2007/07/16	Ont SOP-0114	MOE HANDBOOK(1983)
MOISTURE	1	N/A	2007/07/17	Ont SOP-0114	MOE HANDBOOK(1983)
pH CaCl2 EXTRACT	2	N/A	2007/07/19	Ont SOP-0067	4500-H+B
Sodium Adsorption Ratio (SAR)	1	2007/07/13	2007/07/19	Ont SOP 0072	EPA 6010
Sulphate (20:1 Extract)	1	N/A	2007/07/19		

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

SAMANTHA LYONS, Project Manager
Email: samantha.lyons@maxxamanalytics.com
Phone# (905) 817-5700 Ext:5797

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. SCC and CAEAL have approved this reporting process and electronic report format.

For Service Group specific validation please refer to the Validation Signature Page

Total cover pages: 1

Maxxam Job #: A772599
Report Date: 2007/07/20

Trow Associates Inc
Client Project #: HAGE00139527B
Project name:
Sampler Initials:

O'REG 153 METALS & INORGANICS COMPLETE (SOIL)

Maxxam ID		T45806		
Sampling Date				
COC Number		5599		
	Units	NF-BHA-2.5	RDL	QC Batch

INORGANICS				
Conductivity	mS/cm	0.568	0.002	1304587
Free Cyanide	ug/g	<0.01	0.01	1302395
Moisture	%	8.4	0.2	1302388
Available (CaCl2) pH	pH	7.34		1304537
Sodium Adsorption Ratio	N/A	0.444	N/A	1299786
METALS				
Acid Extractable Antimony (Sb)	ug/g	<0.2	0.2	1304614
Acid Extractable Arsenic (As)	ug/g	3	1	1304614
Acid Extractable Barium (Ba)	ug/g	40	0.5	1304614
Acid Extractable Beryllium (Be)	ug/g	0.3	0.2	1304614
Hot Water Ext. Boron (B)	ug/g	0.50	0.01	1304589
Acid Extractable Cadmium (Cd)	ug/g	0.1	0.1	1304614
Acid Extractable Chromium (Cr)	ug/g	11	1	1304614
Chromium (VI)	ug/g	<0.05	0.05	1301476
Acid Extractable Cobalt (Co)	ug/g	6.0	0.1	1304614
Acid Extractable Copper (Cu)	ug/g	13	0.5	1304614
Acid Extractable Lead (Pb)	ug/g	17	1	1304614
Acid Extractable Mercury (Hg)	ug/g	0.08	0.05	1304616
Acid Extractable Molybdenum (Mo)	ug/g	0.9	0.5	1304614
Acid Extractable Nickel (Ni)	ug/g	11	0.5	1304614
Acid Extractable Selenium (Se)	ug/g	<0.5	0.5	1304614
Acid Extractable Silver (Ag)	ug/g	<0.2	0.2	1304614
Acid Extractable Thallium (Tl)	ug/g	0.06	0.05	1304614
Acid Extractable Vanadium (V)	ug/g	18	5	1304614
Acid Extractable Zinc (Zn)	ug/g	53	5	1304614
RDL = Reportable Detection Limit QC Batch = Quality Control Batch				

Maxxam Job #: A772599
Report Date: 2007/07/20

Trow Associates Inc.
Client Project #: HAGE00139527B
Project name:
Sampler Initials:

RESULTS OF ANALYSES OF SOIL

Maxxam ID		T45807	T45808		
Sampling Date					
COC Number		5599	5599		
	Units	NF-BHA-5	NF-BHC-12.5	RDL	QC Batch

INORGANICS					
Moisture	%	14		0.2	1301232
Available (CaCl2) pH	pH		7.93		1304514
Soluble (20:1) Sulphate (SO4)	ug/g		190	10	1304655
RDL = Reportable Detection Limit QC Batch = Quality Control Batch					

Maxxam Job #: A772599
Report Date: 2007/07/20

Trow Associates Inc
Client Project #: HAGE00139527B
Project name:
Sampler Initials:

PETROLEUM HYDROCARBONS (CCME)

Maxxam ID		T45807		
Sampling Date				
COC Number		5599		
	Units	NF-BHA-5	RDL	QC Batch

F2-F4 PHC				
F2 (C10-C16 Hydrocarbons)	ug/g	60	10	1301561
F3 (C16-C34 Hydrocarbons)	ug/g	200	10	1301561
F4 (C34-C50 Hydrocarbons)	ug/g	190	10	1301561
Reached Baseline at C50	ug/g	Yes		1301561
Surrogate Recovery (%)				
o-Terphenyl	%	78		1301561

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Job #: A772599
Report Date: 2007/07/20

Trow Associates Inc
Client Project #: HAGE00139527B
Project name:
Sampler Initials:

Package 1	10.0°C
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Each temperature is the average of up to three cooler temperatures taken at receipt

GENERAL COMMENTS

Results relate only to the items tested.

Trow Associates Inc
Attention: James Clunas
Client Project #: HAGE00139527B
P.O. #:
Project name:

Quality Assurance Report
Maxxam Job Number: MA772599

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
1301232 AYU	RPD	Moisture	2007/07/16	4.3		%	50
1301476 VRO	MATRIX SPIKE	Chromium (VI)	2007/07/17		95	%	75 - 125
	QC STANDARD	Chromium (VI)	2007/07/17		99	%	85 - 115
	Spiked Blank	Chromium (VI)	2007/07/17		98	%	75 - 125
	Method Blank	Chromium (VI)	2007/07/17	<0.05		ug/g	
	RPD	Chromium (VI)	2007/07/17	NC		%	35
1301561 NCI	MATRIX SPIKE	o-Terphenyl	2007/07/17		94	%	30 - 130
		F2 (C10-C16 Hydrocarbons)	2007/07/17		101	%	60 - 130
		F3 (C16-C34 Hydrocarbons)	2007/07/17		101	%	60 - 130
		F4 (C34-C50 Hydrocarbons)	2007/07/17		101	%	60 - 130
	Spiked Blank	o-Terphenyl	2007/07/17		91	%	30 - 130
		F2 (C10-C16 Hydrocarbons)	2007/07/17		94	%	60 - 130
		F3 (C16-C34 Hydrocarbons)	2007/07/17		94	%	60 - 130
		F4 (C34-C50 Hydrocarbons)	2007/07/17		94	%	60 - 130
	Method Blank	o-Terphenyl	2007/07/17		89	%	30 - 130
		F2 (C10-C16 Hydrocarbons)	2007/07/17	<10		ug/g	
		F3 (C16-C34 Hydrocarbons)	2007/07/17	<10		ug/g	
		F4 (C34-C50 Hydrocarbons)	2007/07/17	<10		ug/g	
	RPD	F2 (C10-C16 Hydrocarbons)	2007/07/17	NC		%	50
		F3 (C16-C34 Hydrocarbons)	2007/07/17	NC		%	50
		F4 (C34-C50 Hydrocarbons)	2007/07/17	NC		%	50
1302388 VPA	RPD	Moisture	2007/07/17	19.1		%	50
1302395 CP	MATRIX SPIKE	Free Cyanide	2007/07/17		93	%	75 - 125
	Spiked Blank	Free Cyanide	2007/07/17		103	%	75 - 125
	Method Blank	Free Cyanide	2007/07/17	<0.01		ug/g	
	RPD	Free Cyanide	2007/07/17	NC		%	35
1304587 DMA	QC STANDARD	Conductivity	2007/07/19		103	%	85 - 115
	Method Blank	Conductivity	2007/07/19	<0.002		mS/cm	
	RPD	Conductivity	2007/07/19	2.8		%	35
1304589 ADA	QC STANDARD	Hot Water Ext. Boron (B)	2007/07/19		100	%	77 - 121
	Method Blank	Hot Water Ext. Boron (B)	2007/07/19	<0.01		ug/g	
1304614 VIV	MATRIX SPIKE	Acid Extractable Antimony (Sb)	2007/07/19		99	%	75 - 125
		Acid Extractable Arsenic (As)	2007/07/19		104	%	75 - 125
		Acid Extractable Barium (Ba)	2007/07/19		110	%	75 - 125
		Acid Extractable Beryllium (Be)	2007/07/19		98	%	75 - 125
		Acid Extractable Cadmium (Cd)	2007/07/19		107	%	75 - 125
		Acid Extractable Chromium (Cr)	2007/07/19		109	%	75 - 125
		Acid Extractable Cobalt (Co)	2007/07/19		108	%	75 - 125
		Acid Extractable Copper (Cu)	2007/07/19		102	%	75 - 125
		Acid Extractable Lead (Pb)	2007/07/19		99	%	75 - 125
		Acid Extractable Molybdenum (Mo)	2007/07/19		107	%	75 - 125
		Acid Extractable Nickel (Ni)	2007/07/19		106	%	75 - 125
		Acid Extractable Selenium (Se)	2007/07/19		106	%	75 - 125
		Acid Extractable Silver (Ag)	2007/07/19		100	%	75 - 125
		Acid Extractable Thallium (Tl)	2007/07/19		100	%	75 - 125
		Acid Extractable Vanadium (V)	2007/07/19		112	%	75 - 125
		Acid Extractable Zinc (Zn)	2007/07/19		103	%	75 - 125
	QC STANDARD	Acid Extractable Antimony (Sb)	2007/07/19		90	%	75 - 125
		Acid Extractable Arsenic (As)	2007/07/19		109	%	75 - 125
		Acid Extractable Barium (Ba)	2007/07/19		102	%	75 - 125
		Acid Extractable Beryllium (Be)	2007/07/19		107	%	75 - 125
		Acid Extractable Cadmium (Cd)	2007/07/19		99	%	75 - 125
		Acid Extractable Chromium (Cr)	2007/07/19		104	%	75 - 125
		Acid Extractable Cobalt (Co)	2007/07/19		102	%	75 - 125
		Acid Extractable Copper (Cu)	2007/07/19		98	%	75 - 125

Trow Associates Inc
Attention: James Clunas
Client Project #: HAGE00139527B
P.O. #:
Project name:

Quality Assurance Report (Continued)

Maxxam Job Number: MA772599

QA/QC Batch Num Init	QC Type	Parameter	Date Analyzed yyyy/mm/dd	Value	Recovery	Units	QC Limits
1304614 VIV	QC STANDARD	Acid Extractable Lead (Pb)	2007/07/19		101	%	75 - 125
		Acid Extractable Molybdenum (Mo)	2007/07/19		95	%	75 - 125
		Acid Extractable Nickel (Ni)	2007/07/19		99	%	75 - 125
		Acid Extractable Selenium (Se)	2007/07/19		113	%	50 - 150
		Acid Extractable Silver (Ag)	2007/07/19		99	%	75 - 125
		Acid Extractable Thallium (Tl)	2007/07/19		88	%	75 - 125
		Acid Extractable Vanadium (V)	2007/07/19		109	%	75 - 125
	Method Blank	Acid Extractable Zinc (Zn)	2007/07/19		99	%	75 - 125
		Acid Extractable Antimony (Sb)	2007/07/19	<0.2		ug/g	
		Acid Extractable Arsenic (As)	2007/07/19	<1		ug/g	
		Acid Extractable Barium (Ba)	2007/07/19	<0.5		ug/g	
		Acid Extractable Beryllium (Be)	2007/07/19	<0.2		ug/g	
		Acid Extractable Cadmium (Cd)	2007/07/19	<0.1		ug/g	
		Acid Extractable Chromium (Cr)	2007/07/19	<1		ug/g	
		Acid Extractable Cobalt (Co)	2007/07/19	<0.1		ug/g	
		Acid Extractable Copper (Cu)	2007/07/19	<0.5		ug/g	
		Acid Extractable Lead (Pb)	2007/07/19	<1		ug/g	
		Acid Extractable Molybdenum (Mo)	2007/07/19	<0.5		ug/g	
		Acid Extractable Nickel (Ni)	2007/07/19	<0.5		ug/g	
		Acid Extractable Selenium (Se)	2007/07/19	<0.5		ug/g	
		Acid Extractable Silver (Ag)	2007/07/19	<0.2		ug/g	
		Acid Extractable Thallium (Tl)	2007/07/19	<0.05		ug/g	
		Acid Extractable Vanadium (V)	2007/07/19	<5		ug/g	
		Acid Extractable Zinc (Zn)	2007/07/19	<5		ug/g	
	RPD	Acid Extractable Antimony (Sb)	2007/07/19	NC		%	35
		Acid Extractable Arsenic (As)	2007/07/19	NC		%	35
		Acid Extractable Barium (Ba)	2007/07/19	5.0		%	35
		Acid Extractable Beryllium (Be)	2007/07/19	NC		%	35
		Acid Extractable Cadmium (Cd)	2007/07/19	NC		%	35
		Acid Extractable Chromium (Cr)	2007/07/19	1.3		%	35
		Acid Extractable Cobalt (Co)	2007/07/19	2.3		%	35
		Acid Extractable Copper (Cu)	2007/07/19	3.1		%	35
		Acid Extractable Lead (Pb)	2007/07/19	0.6		%	35
		Acid Extractable Molybdenum (Mo)	2007/07/19	NC		%	35
		Acid Extractable Nickel (Ni)	2007/07/19	0.5		%	35
		Acid Extractable Selenium (Se)	2007/07/19	NC		%	35
		Acid Extractable Silver (Ag)	2007/07/19	NC		%	35
1304616 MC	MATRIX SPIKE	Acid Extractable Mercury (Hg)	2007/07/19		99	%	75 - 125
		Acid Extractable Mercury (Hg)	2007/07/19		101	%	75 - 125
	QC STANDARD	Acid Extractable Mercury (Hg)	2007/07/19	<0.05		ug/g	
	Method Blank	Acid Extractable Mercury (Hg)	2007/07/19				
	RPD	Acid Extractable Mercury (Hg)	2007/07/19	NC		%	35
	MATRIX SPIKE	Soluble (20:1) Sulphate (SO4)	2007/07/19		106	%	75 - 125
		Soluble (20:1) Sulphate (SO4)	2007/07/19		99	%	80 - 120
		Soluble (20:1) Sulphate (SO4)	2007/07/19		99	%	80 - 120
		Soluble (20:1) Sulphate (SO4)	2007/07/19	<10		ug/g	
		Soluble (20:1) Sulphate (SO4)	2007/07/19	7.5		%	N/A

N/A = Not Applicable
NC = Non-calculable
RPD = Relative Percent Difference
QC Standard = Quality Control Standard
SPIKE = Fortified sample

Validation Signature Page

Maxxam Job #: A772599

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Christina Nervo

CHRISTINA NERVO, Scientific Services

Suzana Popovic

SUZANA POPOVIC, Supervisor, Hydrocarbons

Troy Carriere

TROY CARRIERE, B.Sc., C.Chem, Scientific Specialist

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(B), signing the reports. SCC and CAEAL have approved this reporting process and electronic report format.

Appendix E
Archaeological Assessment

Stage 2 Archaeological Assessment
Niagara Falls Water Treatment Plant Intake Relocation
Class Environmental Assessment,
Niagara Falls, Niagara Region, Ontario

Submitted to:

Niagara Region

3501 Schmon Parkway, P.O. Box 1042
Thorold, Ontario L2V 4T7
Tel.: (905) 685-1571
Fax: (905) 685-5205

Prepared by:

ARCHAEOLOGICAL SERVICES INC.

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Archaeological License P057
CIF 057-367-2007
ASI File 07EA-100

July 2007

**ARCHAEOLOGICAL SERVICES INC.
ENVIRONMENTAL ASSESSMENTS**

PROJECT PERSONNEL

Project Director:

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Partner and Senior Archaeologist
Manager, Environmental Assessments

Field Director:

Sara Cherubin, M.Sc.
Staff Archaeologist

Field Archaeologists:

Wilrick Banda, B.A.
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Matt Black, B.A.
Andrew Douglas, B.A.
Andrew Riddle, M.A.
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Artifact Analysis:

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Research Archaeologist

Artifact Processing:

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Laboratory Technician

Report Writer and Graphics:

Danielle Macdonald

Report Reviewer:

Carla Parslow, Ph.D.
Assistant Manager, Environmental Assessments

Stage 2 Archaeological Assessment

Niagara Falls Water Treatment Plant Intake Relocation Class Environmental Assessment, Niagara Falls, Niagara Region, Ontario

1.0 INTRODUCTION

Archaeological Services Inc. (ASI) was contracted by the Region of Niagara's Water and Wastewater Services Division, Thorold, Ontario, to conduct a Stage 2 archaeological assessment for the Niagara Falls Water Treatment Plant Intake Relocation Class Environmental Assessment, Niagara Falls, Niagara Region, Ontario (Figure 1). The assessment was conducted on Alternative D, the preferred alternative for the relocation project. A Stage 1 archaeological assessment of the property was completed in April 2007 outlining the background research of the property (ASI 2007).

This Stage 2 assessment was conducted under the project direction of Mr. Robert Pihl, ASI, under an archaeological license (P057) issued to Mr. Pihl. Fieldwork was conducted by Ms. Sara Cherubin (P233), ASI, in accordance with the Ontario Heritage Act (2005).

Permission to access the study area and to carry out all activities necessary for the completion of the Stage 2 assessment was granted to ASI on May 9, 2007, by the Niagara Region.

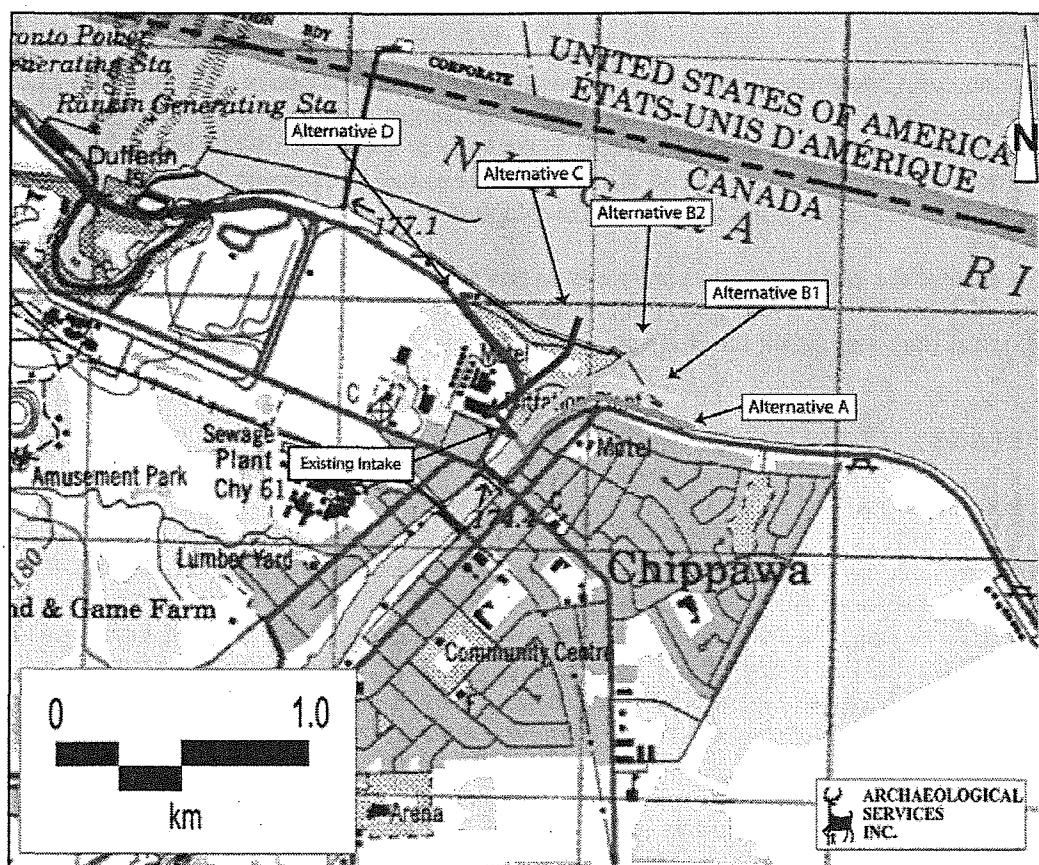


Figure 1: Location of the study area (NTS map Niagara 30 M/3 and 30 M/6)

2.0 SUMMARY OF STAGE 1 ASSESSMENT

The Stage 1 archaeological assessment was conducted by ASI in April 2007 (ASI 2007). Background research was completed to identify any archaeological sites previously registered within the study area and to assess its archaeological site potential.

The study corridor is situated within the Haldimand Clay Plain physiographic region of southern Ontario (Chapman and Putnam 1984: 156-159). The Haldimand Clay Plain, which includes all of the Niagara Peninsula south of the Niagara Escarpment, is a large, predominantly flat region of glacial lake sediment deposits. The majority of the surface material is lacustrine clay, although sand deposits do occur in places, and there are areas where glacial till protrudes above or is imbedded with the clay. The study corridor is located within a large region covered by nearshore and outwash deposits of sand and silt, associated with glacial Lake Lundy. The study area is located along the Niagara River near the mouth of the Welland River.

The Ontario Archaeological Sites Database (OASD) maintained by the Ministry of Culture indicates that 33 sites have been registered within approximately two kilometres of the study area (ASI 2007: Table 1). Among these sites are numerous Aboriginal sites and Euro-Canadian sites. Included in the Aboriginal sites are lithic scatters dating from the Early Archaic to the Early Woodland period, as well as an Archaic/Early Woodland burial. Although none of the registered sites are within the study area, their close proximity indicates that there is potential for the identification of Aboriginal archaeological remains on the property.

The assessment for historic site potential indicated that preferred Alternative D crosses over Lots 191 and 192, formerly owned by the Macklem family, in the former Township of Willoughby (Page 1876). Furthermore, the study area is located adjacent to the historic village of Chippawa, an important town in the Niagara frontier during the War of 1812. Based on the historic assessment, the study area has potential for the discovery of historic Euro-Canadian archaeological remains.

A field review of the study area was conducted on April 9, 2007, and it confirmed that the study area for the Niagara Falls Water Treatment Plant Intake Relocation Class Environmental Assessment has archaeological site potential for the study area, including preferred Alternative D.

3.0 STAGE 2 ASSESSMENT

3.1 Methodology

In accordance with the determination of archaeological site potential completed as part of the Stage 1 assessment, the proposed study area of the preferred alternative for the Niagara Falls Water Treatment Plant Intake Relocation Class Environmental Assessment has been subject to Stage 2 archaeological field survey under the field direction of Ms. Sara Cherubin (P233), ASI (Figure 2). Alternative D was the preferred alternative assessed in the Stage 2 assessment. Field assessment was conducted on May 15, June 19 and 20, 2007. The weather was overcast, warm, and breezy on all three days.

Areas of confirmed archaeological site potential were assessed by test pit excavation at five metre intervals. Test pits were excavated to sterile subsoil, and all test pit fills were screened through six millimetre mesh to facilitate artifact recovery. All test pits were back-filled, and their locations recorded on the field map. Any factors that precluded the excavation of test pits (e.g., slope, drainage, previous disturbance) were noted, and the areas mapped and photographed. Where necessary, areas of disturbance

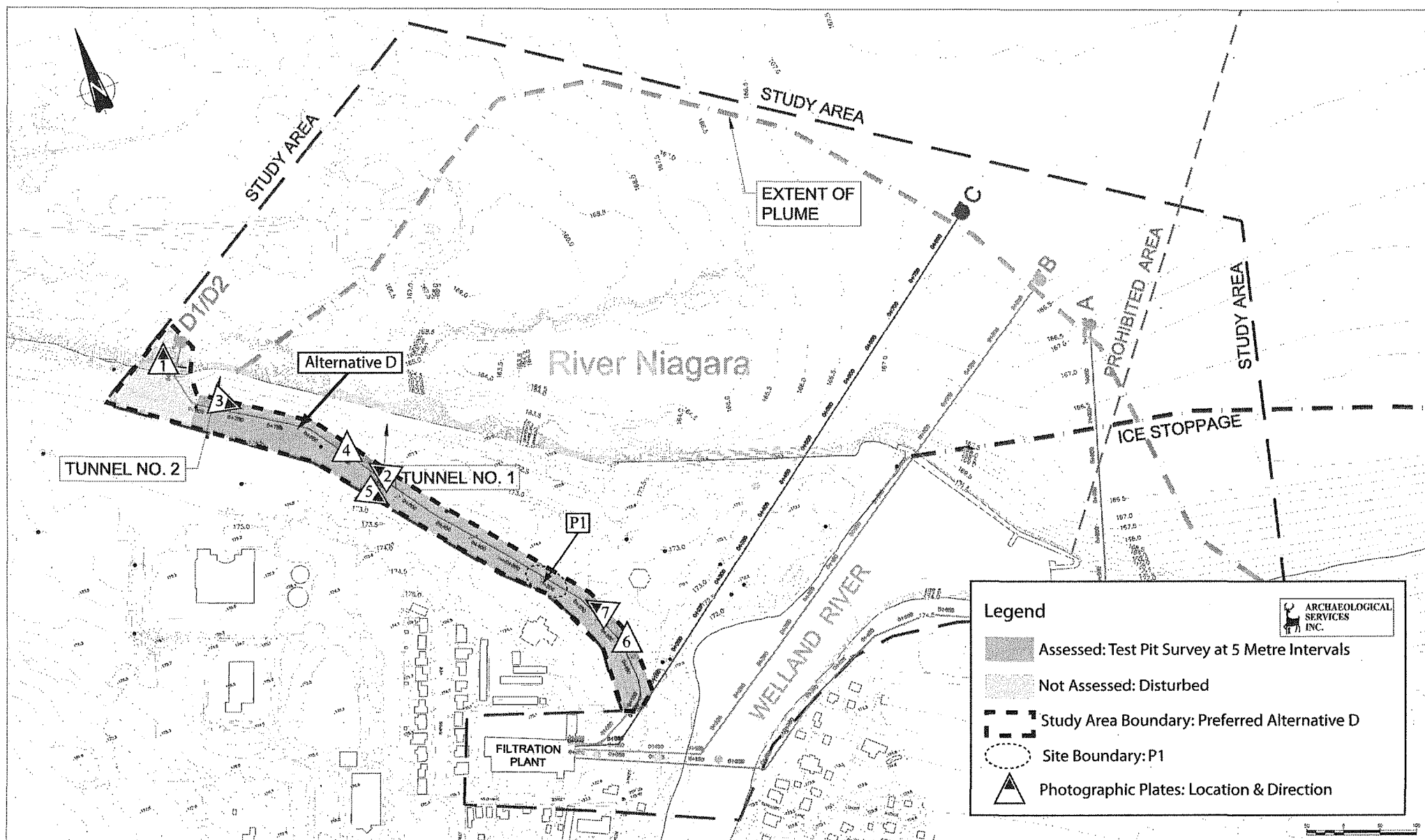


Figure 2: Niagara Falls Water Treatment Plant Intake Relocation Class Environmental Assessment, Niagara Falls, Niagara Region, Ontario - Results of the Stage 2 Assessment

were confirmed by the excavation of test pits at judgmental intervals. Field activities, photographs and observations were recorded.

3.2 Field Results

The area assessed for preferred Alternative D contains a water treatment station with associated grounds, and a grass and tree covered lawn. The test pit excavation was limited to a 10 metre corridor as defined by the primary locate sheet.

The western portion of the preferred Alternative D contains the grounds for a water treatment station (Plate 1). This area is heavily disturbed and was therefore not tested.

The remainder of preferred Alternative D is a flat, grass covered area, interspersed with blossoming deciduous and coniferous trees (Plate 2). The western half of the preferred Alternative D is disturbed with sewer pipes, indicated by the presence of manhole covers (Plate 3). This area was test pitted at five metre intervals. The disturbed soil profiles revealed topsoil depths of 5-10 centimetres overlying grey clay with concentrations of gravel (Plate 4). No archaeological material was found in this area.

The eastern half of the grass covered lawn was also subjected to test pit survey at five metre intervals (Plate 5). This portion of the lawn is undisturbed, with brown topsoil ranging from 20-30 centimetres overlying pale yellow clay sub-soil (Plate 6). In this area the site P1 was discovered (AgGs-320) (Figure 3).

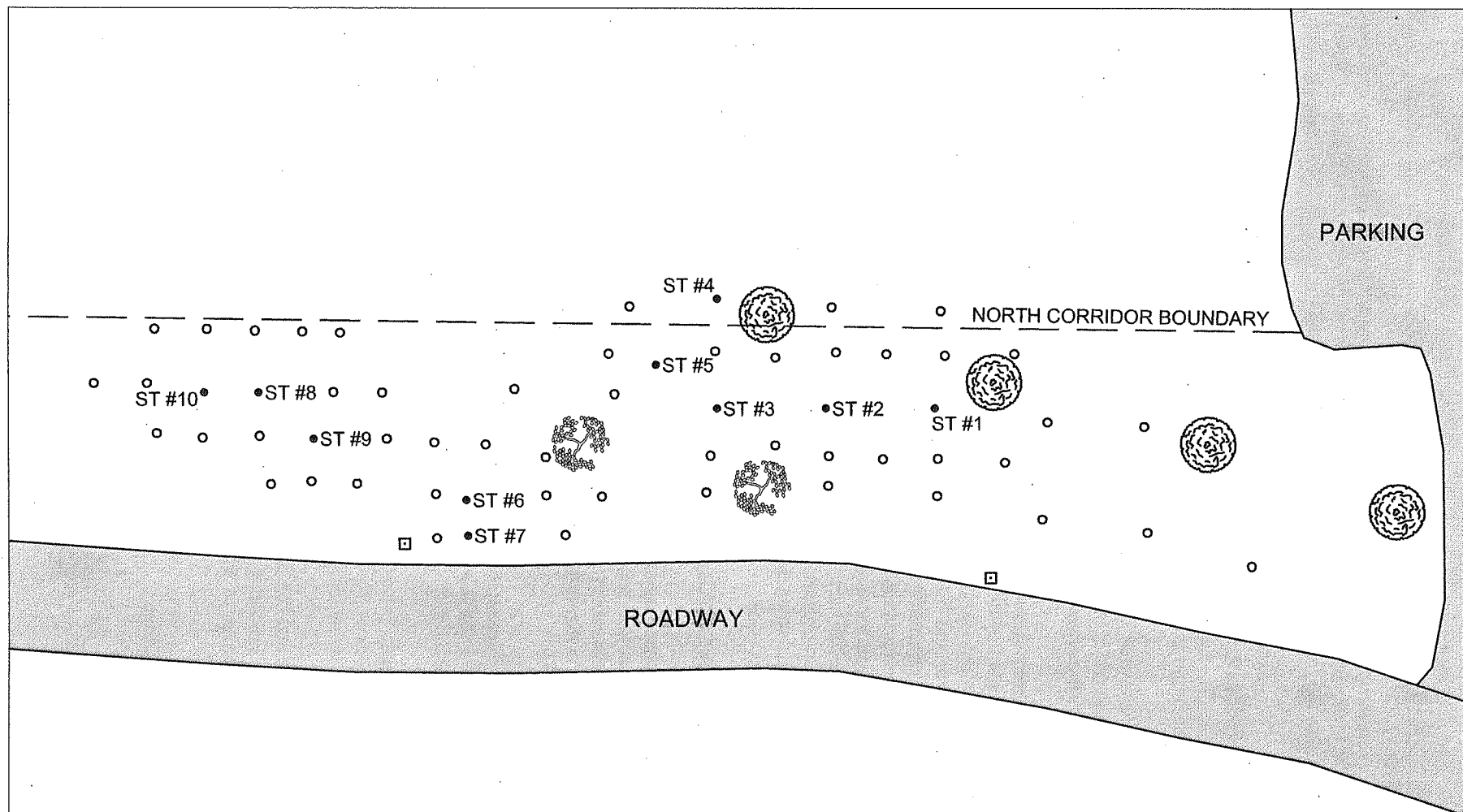
3.3 P1 (AgGs-320)

The site P1 was discovered in the eastern portion of preferred Alternative D, in the undisturbed soil of the grass covered lawn (Plate 7) (GPS 17T 0658673 4769524). The topography of the site is very flat, with some trees in the vicinity, and is located approximately 250 metres from the Welland River.

P1 is a lithic scatter, with some historic debris found in one test pit and some faunal remains found in another (Figure 3). The site's stratigraphy consists of brown sand-clay to a depth between 30-50 centimetres overlying yellow-brown subsoil. A total of 58 test pits were dug at the site, 10 of which uncovered archaeological materials. The area around each positive test pit was intensified to locate the extent of the deposits. The catalogue detailing the artifacts from P1 is listed in the Appendix (section 7.0).

The positive test pits range across the site with no obvious clustering and there was no distinct concentration of artifacts in any single test pit (Figure 3). Lithic material was recovered in test pits 1-10 and the rate of lithic artifact recovery in the positive test pits ranged from 1-2 artifacts per test. Both faunal remains and lithic material was recovered from test pit 3. Test pit 9 contained both historic building material and lithic artifacts suggesting that there is some historic disturbance at the site.

The materials recovered from P1 are primarily lithic artifacts. The lithic assemblage is composed of debitage, with no diagnostic tools within the collection. The debitage assemblage includes shatter (flake fragments), secondary knapping and secondary retouch flakes. All of the pieces are from later stages of lithic manufacture, suggesting that the site may have been a locale where final lithic manufacture or tool re-sharpening took place.



Archaeological
Services
Inc.



- ST #2 - POSITIVE TEST PIT
- NEGATIVE TEST PIT
- LAMP POST

-  CHERRY TREE
-  TREE

0 15m
SCALE

DATE:
July 2, 2007

DRAWN BY: S.F.
FILE: 07EA-100_test_plts

FIGURE 3: NIAGARA FALLS WATER TREATMENT PLANT INTAKE RELOCATION - LOCATION OF TEST PITS

All of the lithics recovered from P1 were manufactured on Onondaga chert. Onondaga chert outcrops are located along the northeastern shore of Lake Erie to the south of the Hamilton (Ellis and Deller 1990:17). This chert has a fine to medium crystallinity, making it an excellent rock for flintknapping (Eley and von Bitter 1989).

The faunal discovered at the site consists of a single mammal limb bone, broken into four pieces. These pieces mend together to create a larger bone fragment. The bone is from a juvenile of an undetermined mammal species of a small to medium size.

The historic debris recovered in test pit 9 includes two iron nails and some unidentifiable burnt material. The unidentifiable material is the result of burning activity, possibly from a kiln or a hearth, however the thermal alteration is so extreme that it is impossible to identify the original material.

The nails found at P1 were manufactured by machine cutting. The transition from hand wrought nails to machine cut nails took place from 1790-1830, a change which increased the efficiency of nail production and decreased the waste material (Nelson 1968). The early machine cut nails (1790-1810) were cut from a nail plate fed into a shear and the nail heads were manufactured by hand. The heads of later cut nails (1810-present) were manufactured by machine, producing flat nail heads. By the 1850's wire nails were introduced and are still being manufactured today as the most popular nail form. Despite the introduction of wire nails, cut nails continued to be manufactured for numerous decades. Unfortunately, the nails recovered from P1 (AgGs-320) are obscured by rust making it impossible to identify the features which determined the date of manufacture. However, the heads of the nails are flat and appear to be machine cut, suggesting that they were manufactured after 1810.

4.0 SUMMARY AND CONCLUSIONS

The previous Stage 1 archaeological assessment determined that the study area had potential for the identification of Aboriginal and historic archaeological sites where archaeological site potential has not been compromised by more recent disturbance. This determination was based on the identification of numerous registered sites in the vicinity, intensive historic land use, and the proximity to the Niagara and Welland Rivers (ASI 2007).

In accordance with this determination of archaeological site potential, a Stage 2 archaeological assessment of the Niagara Falls Water Treatment Plant Intake Relocation was undertaken in accordance with Ministry of Culture *Standards and Guidelines for Consulting Archaeologists (final draft)* (2006).

The area designated Alternate D was assessed by test pit survey. One Aboriginal sub-surface lithic scatter was identified in the study area. The site has been registered as P1 (AgGs-320). No other archaeological remains were found in the remainder of the study area.

Preliminary results suggest that the sub-surface lithic scatter identified in P1 (AgGs-320), may represent a significant archaeological resource that demonstrates potential to provide insight into the land-use patterns and cultural knowledge of Aboriginal people in the Niagara Region.

It is therefore recommended that:

1. A Stage 3 archaeological assessment should be conducted on P1 (AgGs-320) to further investigate the site's cultural heritage value in accordance with the draft *Standards and Guidelines for Consulting Archaeologists* (2006).
2. No additional archaeological work is recommended for the remainder of preferred Alternate D. The area can be considered clear of further archaeological concern.
3. If any additional areas beyond the limits of the detail design are required for the construction of temporary roadway, parking lots, storm water management ponds, staging areas, etc., or a different alternative is chosen, it is recommended that these lands be subject to a Stage 2 archaeological assessment prior to disturbance.

The above recommendations are subject to Ministry approval, and it is an offence to alter any archaeological site without Ministry of Culture (MCL) concurrence. No grading or other activities that may result in the destruction or disturbance of any of the archaeological sites documented by this assessment are permitted until notice of MCL approval has been received.

The following Ministry of Culture conditions also apply:

- Should deeply buried archaeological remains be found on the property during construction activities, the Manager, Heritage Operations Unit, Ontario Ministry of Culture, should be notified immediately.
- In the event that human remains are encountered during construction, the proponent should immediately contact both the Ontario Ministry of Culture and the Registrar or Deputy Registrar of the Cemeteries Regulation Unit of the Ontario Ministry of Government Services, Consumer Protection Branch at (416) 326-8404 or toll-free at 1-800-889-9768.

The documentation related to the archaeological assessment will be curated by ASI until such a time that arrangements for their ultimate transfer to Her Majesty the Queen in right of Ontario, or other public institution, can be made to the satisfaction of the Region of Niagara, the Ministry of Culture, and any other legitimate interest groups.

5.0 REFERENCES CITED

Archaeological Services Inc.

- 2007 Stage 1 Archaeological Assessment. Niagara Falls Water Treatment Plant Intake Relation Class Environmental Assessment, Niagara Falls, Niagara Region, Ontario. Unpublished report submitted to Niagara Region, and on file with the Ministry of Culture.

Chapman, L.J. and F. Putnam

- 1984 *The Physiography of Southern Ontario*, Ontario Geological Survey Special Volume 2. Government of Ontario, Ministry of Natural Resources: Toronto.

Page, H.R.

- 1876 *Historical Atlas of Lincoln and Welland, Ontario*. Toronto.

Nelson, L.H.

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Ministry of Culture

- 2006 *Standards and Guidelines for Consulting Archaeologists (final draft)*. Toronto: Cultural Programs Branch, Archaeology and Planning Unit.

6.0 PHOTOGRAPHY

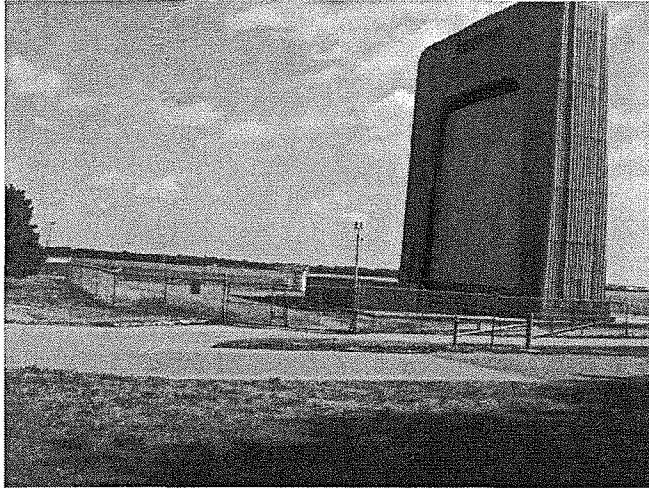


Plate 1: View northeast at water treatment station.



Plate 2: View northwest at grass covered lawn.



Plate 3: View southeast at disturbed area of grass covered lawn, note manhole cover.

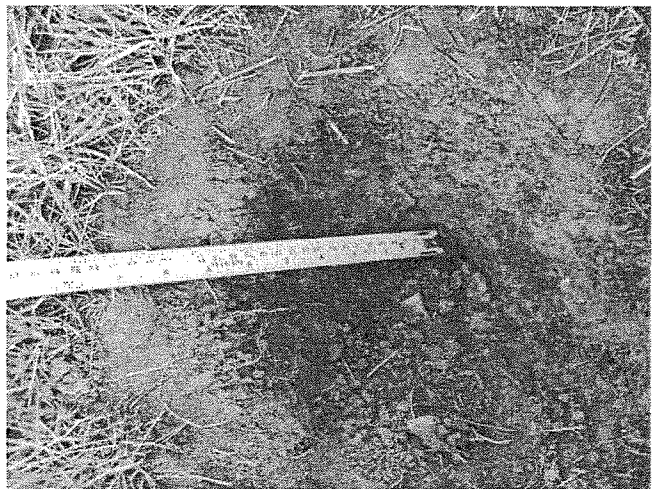


Plate 4: View of disturbed soil profile in western portion of grass covered lawn.

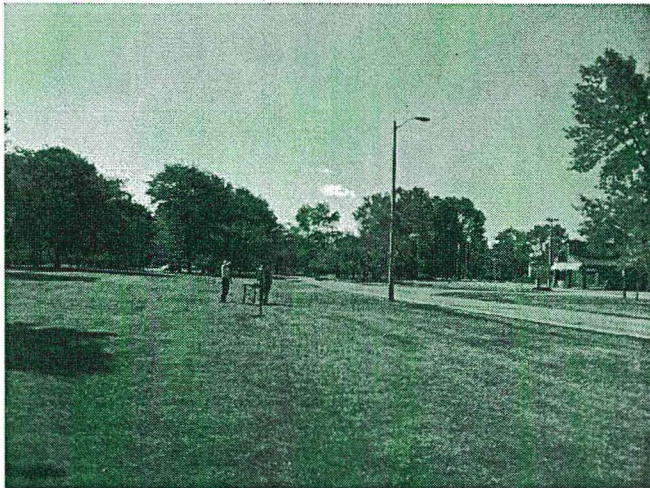


Plate 5: View southeast at test pit survey of eastern portion of grass covered lawn

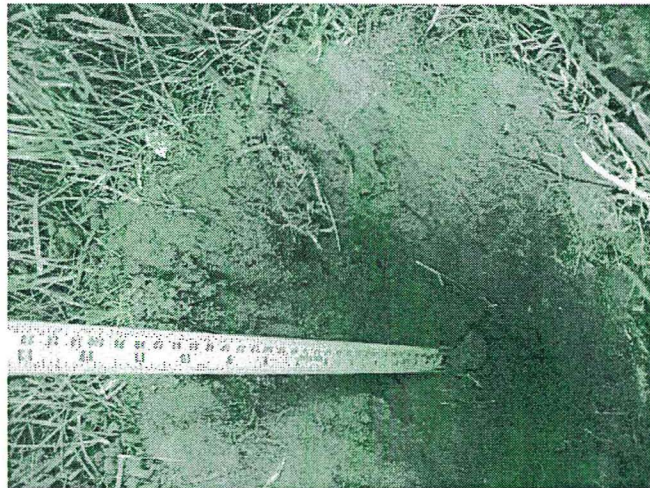


Plate 6: Soil profile of undisturbed section of grass covered lawn.

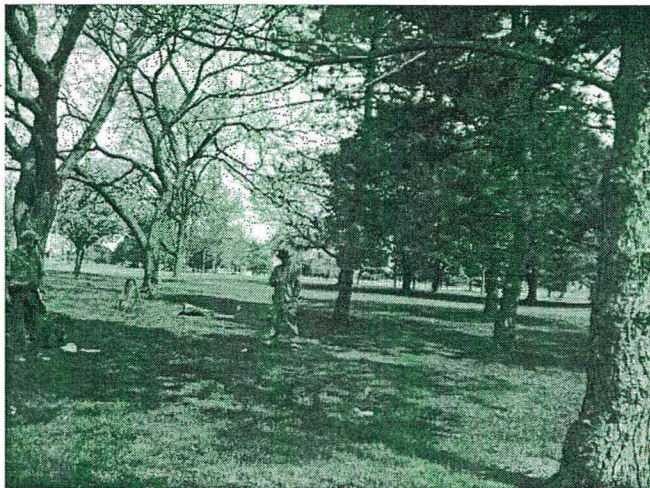


Plate 7: View northwest at P1 (AgGs-320)

7.0 APPENDIX

Lithic Catalogue - P1 (AgGs-320)									
Cat. #	Location	Test Pit #	Layer	Category	Qty	Type	Material	Burnt	Comments
L1	Test pit	1	topsoil	Lithic	1	Shatter	Onondaga		medial flake fragment
L2	Test pit	2	topsoil	Lithic	2	Shatter	Onondaga		
L3	Test pit	3	topsoil	Lithic	1	Secondary knapping flake	Onondaga		complete
L4	Test pit	3	topsoil	Lithic	1	Secondary retouch flake	Onondaga		proximal fragment
L5	Test pit	4	topsoil	Lithic	1	Shatter	Onondaga		distal fragment
L6	Test pit	5	topsoil	Lithic	1	Shatter	Onondaga		distal fragment
L7	Test pit	6	topsoil	Lithic	1	Shatter	Onondaga		distal fragment
L8	Test pit	7	topsoil	Lithic	1	Secondary knapping flake	Onondaga	Yes	proximal fragment
L9	Test pit	8	topsoil	Lithic	1	Secondary retouch flake	Onondaga		proximal fragment
L10	Test pit	8	topsoil	Lithic	1	Secondary knapping flake	Onondaga		complete
L11	Test pit	9	topsoil	Lithic	2	Shatter	Onondaga	Yes	one piece burnt
L12	Test pit	10	topsoil	Lithic	1	Shatter	Onondaga		medial fragment

Historic Catalogue - P1 (AgGs-320)												
Cat #	Location	Test Pit #	Layer	Category	Qty	Class	Sub-Class	Type	Material	Portion	Burnt	Comments
H1	Test pit	9	topsoil	Historic	2	Architectural	Building component	Machine Cut Nail	Ferrous Metal	Incomplete		
H2	Test pit	9	topsoil	Historic	3	Indeterminate	Indeterminate	Unidentifiable	Indeterminate	Indeterminate	Yes	burnt waste product

Faunal Catalogue - P1 (AgGs-320)												
Cat #	Location	Test Pit #	Layer	Category	Qty	Class	Type	Age	Element	Portion	Body Region	Comments
F1	Test pit	3	topsoil	Faunal	4	Mammal	Indeterminate	juvenile	Limb bone	Incomplete	Extremity	all four pieces mend together

Suite 500, 4342 Queen Street
Niagara Falls, Ontario, Canada L2E 7J7
Tel 905 374 5200 ♦ Fax 905 374 1157

Appendix B

Letter from the OPG

April 17, 2018

Lisa Vespi, P.Eng.
Senior Project Manager, Water and Wastewater Services
Regional Municipality of Niagara

Subject: Water Treatment Plant Intake –Sir Adam Beck Power Canal Refurbishment Project (2021 – 2022)

Dear Lisa:

On behalf of Ontario Power Generation (OPG), I thank you and your team for the recent discussions concerning the Sir Adam Beck (SAB) Power Canal Refurbishment Project and its potential impact on the existing Regional Municipality of Niagara (RMON) Water Treatment Plant (WTP) intake located in Chippawa, Ontario.

OPG recognizes that the return of the Welland River flow to its natural state represents an unacceptable risk for a fresh water intake for the RMON, and remains committed to working collaboratively to find a viable, economical solution.

To give you and your team a clear understanding of the challenges ahead, we have provided the options and risks outlined in 2008, when the SAB Power Canal Refurbishment Project was first introduced, and why those alternatives are no longer feasible today.

Background:

In 2007, partial condition assessment of the SAB Power Canal was completed and rehabilitation work was planned for 2010-2011. Ultimately, the project was deferred until a later date.

In anticipation of the original 2010-2011 SAB Power Canal Refurbishment Project, a 2008 Class EA Study was generated by RMON. Various alternatives with respect to moving the existing WTP intake were examined. The options included a) Do Nothing, b) Permanent/Temporary Intake Relocation, and c) Pre-treatment Options.

The 2008 Class EA Study further recognized opportunities in undertaking the work, including 1.) the ability to increase security of intake, 2.) the ability to have a back-up intake if the new one was taken out of service, and 3.) improving the efficiency of the WTP. Within the 2008 Class EA study, there were four Intake Relocation Alternatives presented and categorized as A through D. Note Alternative D was further divided into D1, D2 and D3.

RMON Public Works (P. Baker) advised OPG (D. Norton) in a June 4, 2007 letter, that relocating the WTP intake to an area downstream of the OPG Power Tunnels (Area D) was the most suitable means of mitigating the impacts to the WTP supply.

On July 5, 2007, a response to the Region given by OPG, advised that it *"is not in favour, and cannot support any of the WTP Intake D alternatives"* ... for several reasons, including:

- *“Any interference with the operation of the Sir Adam Beck diversion intakes for flow reductions or outages to facilitate construction or maintenance of the WTP intake could result in significant production losses and revenue impact to OPG”*
- *“Any interference with the operation of the International Niagara Control Works (INCW), such as gate closures to facilitate construction or maintenance of the WTP intake could compromise OPG’s ability to meet the 1950 Treaty, 1993 Directive or ice management requirements”*

After further discussions, OPG conceded to allowing a temporary intake at Area D1.

At that time, SAB Power Canal maintenance activities were expected to last 3 to 7 months and to be undertaken during tourist, non-ice season only. The use of a temporary intake would mean less impact than a permanent solution based on what was known at that time.

Since the project did not move forward, all OPG/Region work was put on hold until further notice.

In January 2017, OPG formally notified a number of key stakeholders, including RMON, of its plan to initiate the SAB Power Canal Refurbishment Project. RMON hired consultant EIS to review options including the Temporary Intake at area D1, per the 2008 Class EA Study recommendation.

At a site visit in November 2017, and a scoping meeting in January 2018, RMON (via EIS consultant) recommended further exploration of using a temporary floating barge with a Pump System in area D1 that could be coupled/decoupled to electric power and a buried piping system.

Shortly thereafter, OPG expressed concerns that locating a Temporary Water Intake in Area D was no longer a viable option due to additional factors that were not present in 2008. These factors include:

- In 2008, it was believed that the SAB Power Canal outage would have taken place over a 3 to 7 month window during the traditional Niagara Falls Tourist season (April to October). As a result, there would be no concerns with impacting ice breaking operations.
- In 2018, it is believed that the SAB Power Canal outage may span over winter months as additional OPG project work is planned and scheduled, (e.g. upgraded G1 & G2 units at Beck I GS, Hydro One project work at SAB I). A barge or other temporary works, including the originally proposed platform, would be impacted by, and interfere with, normal ice discharges and ice breaking operations.
- In 2008, the third diversion tunnel (T3) was not yet constructed. Therefore, experience with its operation was unknown at that time. Modeling its operation, aspects of ice management with a third tunnel in-service and reconfiguration of Approach/Accelerator wall were factors under consideration at the time of the 2008 Class EA Study. However, no practical experience with its operation had been realized.
- Experience with T3 operation, combined with day-to-day International Control Dam (ICD) gate operations, has indicated that the draw from T3 impacts the management of river ice. Under current operations, large amounts of ice are now being drawn toward the Canadian shoreline and directly into the channel feeding Tunnel 3. This would severely impact any temporary barge or platform in winter months in area D (not to mention interference with any ongoing ice breaking operations).
- Gates 1 to 4 at the International Control Works (INCW) are used for ice management to establish a flushing channel and to discharge ice build up in front of T1, T2 and T3 intakes. Any domestic water intake equipment in this area may suffer significant damage or destruction based on the timing of gate operations and subsequent ice floes.

ONTARIOPOWER GENERATION

- The emergency boat refuge immediately downstream of T2 intake is a safe haven for ice breaking vessels. It was also designed with the intent to be available all-season for use as an emergency launch point for emergency first responders.
- There is concern that any new water intake on the Niagara River may require the approval, consultation, or at minimum, a notification to the International Board of Commission (INBC).
- OPG will not assume responsibility for additional monitoring or control of water elevations to satisfy the operation of the RMON water intake.

We trust that the above information provides further context to our most recent concerns with respect to locating any type of intake in Area D, as outlined in the 2008 Class EA study.

On behalf of OPG, I look forward to continue working together with RMON to find a viable, economical solution.

Sincerely,



Project Manager – Canal Rehab
Project Management Office - Renewable Generation

Appendix C

Geotechnical Report



PALMER
ENVIRONMENTAL
CONSULTING
GROUP INC.

74 Berkeley Street, Toronto, ON M5A 2W7
Tel: 647-795-8153 | www.pecg.ca

Technical Memorandum

Date: July 8, 2019

Project #: 180541

To: Lisa Vespi, P.Eng., PMP, Niagara Region

1815 Sir Issac Brock Way, Thorold, ON L2V 4T7

Re: **Geotechnical Technical Memorandum in Support of an Environmental Assessment
Amendment - Niagara Falls WTP Water Intake, Niagara Falls, ON**

Palmer Environmental Consulting Group Inc. (PECG) was retained by Niagara Region (Client) to undertake a geotechnical investigation in support of an Environmental Assessment (EA) Amendment for a proposed new water intake to the Niagara Falls Water Treatment Plant (WTP). The WTP is located at 3599 Macklem Street, Niagara Falls, Ontario.

This Technical Memorandum is meant to support the EA amendment, and is not intended for engineering design. It may be necessary to carry out additional borings and reporting before the recommendations of this report can be relied upon. The boreholes advanced were located along the potential alignment of the transmission main from the proposed new pumping station to the Niagara Falls WTP. This technical memo provides a summary of subsurface conditions as well as general recommendations on the alignment method of construction.

The site investigation and recommendations follow generally accepted practice for geotechnical consultants in Ontario. Laboratory testing for most part follows ASTM or CSA Standards or modifications of these standards that have become standard practice in Ontario. Third party use of this memo without PECG's consent is prohibited. The limitations to the memo as presented form an integral part of the memo and they must be considered in conjunction with this memo.

1. Site and Regional Geology

The Site is located in a suburban environment and along existing roadways or within Niagara Parks land. The study area is situated within the Haldimand Clay Plain physiographic region of Southern Ontario (Chapman and Putnam, 1984). The topography in this region is flat lying, and is typically comprised of a mixture of shallow lacustrine and glacial till sediments over Silurian bedrock.

Memorandum

Page 2 | July 8, 2019

Geotechnical Technical Memorandum in Support of an Environmental Assessment Amendment -
Niagara Falls WTP Water Intake, Niagara Falls, ON



A review of available Ontario surficial geology mapping for the site indicates that the overburden materials are comprised of stratified silt and clay, with minor sand to sand and gravel (Ontario Geological Survey, 2010) and glacial till deposits. Bedrock geology mapping indicates that the site is underlain by the Guelph Formation dolostone unit (Ontario Geological Survey, 2011).

2. Field Investigation and Testing

The field work for the geotechnical investigation was carried out from Dec. 5, 2018 to March 6, 2019 by drilling specialists subcontracted to PEGC, during which time twelve (12) boreholes (BH18-L1 to BH18-L7, BH18-P1, and BH18-S1 to BH18-S4) were advanced at the locations shown on the attached Borehole Location Plan, **Drawing 1**. The boreholes were drilled to depths ranging from 6.7 to 23.8m below the existing ground surface.

Boreholes BH18-S1, BH18-S2, and BH18-S4 were advanced into bedrock below overburden. Upon encountering auger refusal in the bedrock, the drill casing was sealed into bedrock and then the bedrock was sampled by diamond core drilling.

3. Subsurface Conditions

3.1 Soil Conditions

The soil stratigraphy at the Site is generally comprised of 130 to 300mm of topsoil, underlain by fill materials extending to about 0.4 to 2.4m below the existing ground surface (Elev. 171.8 to 173.8m). Upper clayey silt till to silty clay till deposits were encountered below the fill materials and extended to about 4.2 to 7.1m below the existing ground surface (Elev. 166.8 to 170.5m), which in turn are underlain by clayey silt to silty clay deposits extending to about 6.7 to 13.4m below the existing ground surface (Elev. 161.1 to 167.8m). Boreholes BH18-L1 to BH18-L7 and BH18-P1 were terminated in these deposits. Silt deposits were encountered in Boreholes BH18-S1 to BH18-S4 below the clayey silt/silty clay deposits and extended to about 10.2 to 11.7m below the existing ground surface (Elev. 162.3 to 162.9m). This is underlain by sandy silt till deposit extending to about 12.2 to 13.4m below the existing ground surface (Elev. 160.6 to 161.4m). Layers of silty sand, organic silt, lower clayey silt till and sand/sand and gravel were also encountered at various locations and depths in Boreholes BH18-S1 to BH18-S4. Bedrock was encountered in Boreholes BH18-P1 and BH18-S1 to BH18-S4 at depths ranging from 12.2 to 15.3m below the existing ground surface (Elev. 159.0 to 161.1m). The bedrock was verified by rock core drilling in Boreholes BH18-S1, BH18-S2 and BH18-S4.

3.2 Groundwater Conditions

Seven (7) monitoring wells (50 mm dia.) and one open corehole were installed to monitor stabilized groundwater levels. The stabilized groundwater levels were measured on February 19, March 21 and April 5, 2019. The monitoring well (and corehole) installation details and the measured groundwater levels are shown in the borehole logs and summarized in **Table 1**.

Table 1: Monitoring Well Details and Water Levels

Monitoring Well ID	Screen Interval (mBGS)	Water Level Depth (mBGS)/Elevation (m)		
		February 19, 2019	March 21, 2019	April 5, 2019
BH18-L2	3.1 ~ 6.1	2.32/172.2	2.28/172.3	2.09/172.5
BH18-L4	3.1 ~ 6.1	1.47/172.7	1.31/172.8	1.34/172.8
BH18-L6	4.6 ~ 6.1	-	1.58/172.4	1.52/172.5
BH18-P1	10.4 ~ 13.4	3.11/171.5	3.01/171.6	2.96/171.6
BH18-S1*	13.4 ~ 20.4	3.16/170.8	3.03/171.0	2.87/171.1
BH18-S2	12.2 ~ 18.3	2.24/170.8	2.19/170.9	2.02/171.1
BH18-S4	14.0 ~ 20.0	-	3.64/171.0	3.41/171.2
BH18-S4A	10.8 ~ 13.8	-	3.60/170.9	3.39/171.1

Note: mBGS = meter below ground surface

* Corehole in bedrock left open, depth of open corehole indicated in Screen Interval column.

It should be noted that the groundwater levels can vary and are subject to seasonal fluctuations and in response to weather events.

4. Discussion and Recommendations

It is understood that the proposed design will consist of new water intake from the Niagara River, a new pumping station, and a transmission main to Niagara Falls Water Treatment Plant (likely tunneling and open cut sections). Boreholes BH18-S1 to BH18-S4 are located at or near the conceptual design shaft locations. Boreholes BH18-L1 to BH18-L7 are along the potential alignment of the watermain, and BH18-P1 is at or near the proposed new pumping station location.

Open cut methods are generally considered for the installation of watermain from Niagara River to the new pumping station and from the new pumping station to Niagara Falls WTP. The section of the proposed transmission main undercrossing Welland River will be installed by tunneling.

4.1 Open Cut Sections

Based on information from the boreholes along the open cut sections of the proposed watermain, the topsoil and fill materials are considered to be not suitable to support the pipe. The native soils encountered at the

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site are capable of providing adequate pipe support provided that all fill materials, disturbed or other objectionable materials are removed. Conventional Class "B" bedding with a minimum thickness of 150mm below the pipe invert is recommended. Where weak or other unsuitable soils are encountered at the proposed pipe invert elevation, the unsuitable materials should be sub-excavated and replaced using conventional Class "B" bedding. In this case, the recommended minimum thickness of granular bedding below the invert of the pipes is 300 mm. Geotechnical inspection is required to confirm suitable founding conditions.

The compacted granular base and the cover material for the pipe should consist of OPSS 1010 Granular "A" type material. All granular materials should be placed in loose lifts of 150mm thickness and then compacted. The granular bedding and cover materials should be compacted to 100% of Standard Proctor Maximum Dry Density (SPMDD) at a placement water content within $\pm 2\%$ of the materials optimum. Care should be exercised when compacting the cover material on top of the pipes to avoid damaging them.

Excavation of the overburden can be carried out with heavy hydraulic excavators. Provisions must be made in the excavation contract for the removal of possible boulders in till or obstructions in the fill materials. All excavations must be carried out in accordance with the most recent Occupational Health and Safety Act (OHSA). In accordance with OHSA, the fill materials and sandy/silty (till) soils would be classified as Type 3 Soils above the groundwater table and Type 4 Soil below the groundwater table. The clayey silt (till) to silty clay (till) are Type 2 Soils above the groundwater table and Type 3 Soils below the groundwater table. At any given trench location, the soil type with the highest type number governs.

Unsupported excavations would be temporarily stable for a few days at an angle of 1.5H:1V in the existing fill materials and clayey silt (till) to silty clay (till). Vertical cuts in any of the soil types should be supported with shoring and bracing to safeguard the stability of the sides of the trenches. All shoring designs should be in accordance with the 4th Edition of the Canadian Foundation Engineering Manual and must be reviewed by a professionally qualified geotechnical engineer.

The clayey silt (till) to silty clay (till) encountered are expected to have low permeability. The excavation within low permeability soils could be dewatered by gravity drainage towards perimeter ditches surrounding the excavation and the removal of collected water with sump pumps.

4.2 Tunnelling

Tunnelling through the dolostone bedrock is expected for the installation of the watermain beneath the Welland River. To preserve the stability of the roof of the tunnel, as a minimum measure the sound rock cover above the tunnel invert should be maintained at least 2 times the tunnel diameter and the rock between the 10 and 2 o'clock positions should receive full support within the tail shield immediately following tunnelling.

The selection of the equipment and method to remove the bedrock, advance the tunnel and type of temporary ground support should be the contractor's choice. In the selection of these, the contractor should



consider the bedrock condition, the strength range of the intact dolostone rock which was tested to range between about 53 and 512 MPa, based on which the rock is classified as “strong” to “extremely strong”. Consideration should also be given to the fact that the rock mass contains layers of clay and dolomite/calcite veins, and may contain solution enhanced voids (i.e. karst). For the advancement of the tunnel, methods such as tunnel boring machine and microtunnel boring machine could be considered.

We understand that the excavations to the base of the shafts are likely to be vertical due to the limited space at this site. Vertical cuts in the overburden soils should be supported with shoring. Circular and rectangular shafts are often constructed in the dolostone bedrock. The upper overburden and weathered rock portion of the shafts might be constructed using cast-in-place concrete ring segments sunk down from the top of the excavation (caisson sinking method), or alternatively, using contiguous caisson (secant pile wall) method. Shafts constructed in this manner would be essentially watertight.

4.3 Environmental Quality of Excavated Soils and Hydrogen Sulphide Gas

Soil samples were collected by PEGC to assess the requirements for soil disposal/reuse. PEGC collected nine (9) sets of soil samples, one (1) each from Boreholes BH18-S1 to BH18-S4, BH18-P1, BH18-L1, BH18-L2, BH18-L4 and BH18-L6. The samples were submitted under chain of custody to ALS Laboratories, a CALA certified laboratory, for parameters listed in Ontario Regulation 153/04 as amended. Collected samples were analyzed for Metals & Inorganics, and compared against MECP Table 1: Full Depth Generic Site Condition Standards and Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition.

Based on analytical results, none of the samples tested exceeded Table 3 standards. However, electric conductivity (EC) in samples BH18-S1/SS2 and BH18-L2/SS2 were detected in exceedance of Table 1 standards. Sodium adsorption ratio (SAR) in samples BH18-S1/SS2, BH18-L2/SS2 and BH18-L4/SS2 were detected in exceedance of Table 1. Barium (Ba) in samples BH18-L2/SS2 and BH18-L4/SS2 were detected in exceedance of Table 1 standards.

Based on the results, the following disposal options may be considered:

- 1) The soils generated at the tested sample depth with no identified exceedances of Table 1 could be reused on site, or be disposed or reused at a site that would accept the soils based on the analytical results.
- 2) The soils generated near Boreholes BH18-S1, BH18-L2 and BH18-L4 may be re-used only for on-site backfill.

Should construction at the site require excavation and off-site disposal of excess materials, additional environmental soil testing may be required to determine soil disposal classification depending on the receiving site requirements. Excavated soil with debris or otherwise aesthetically impacted that requires off-site disposal may require disposal as waste.

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Olfactory evidence of the presence of hydrogen sulfide gas (H₂S) was noted during bedrock hydrogeology testing on Borehole BH18-S1. As such, the presence of pockets of H₂S should be expected during construction. H₂S is a colourless, combustible, highly toxic gas, and appropriate care, proper ventilation systems and monitoring of gas are essential in all confined bedrock excavations, particularly for shafts and tunnels.

5. Certification

We trust that the information contained in this Technical Memorandum is satisfactory. Should you have any questions, please do not hesitate to contact this office.

This Technical Memorandum was prepared and reviewed by the undersigned:

Prepared By:

A handwritten signature in black ink, appearing to read 'Ted Pan'.

Ted Pan, B.Sc., EIT
Geotechnical Project Manager

Reviewed By:

A handwritten signature in blue ink, appearing to read 'Chi Cheng (Dennis) Tseng'.

Chi Cheng (Dennis) Tseng, M.Sc., P.Eng.
Senior Geotechnical Engineer

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General Comments and Limitations of Report

PECG should be retained for a general review of the final design and specifications to verify that this Technical Memorandum [report] has been properly interpreted and implemented. If not accorded the privilege of making this review, PECG will assume no responsibility for interpretation of the recommendations in the report.

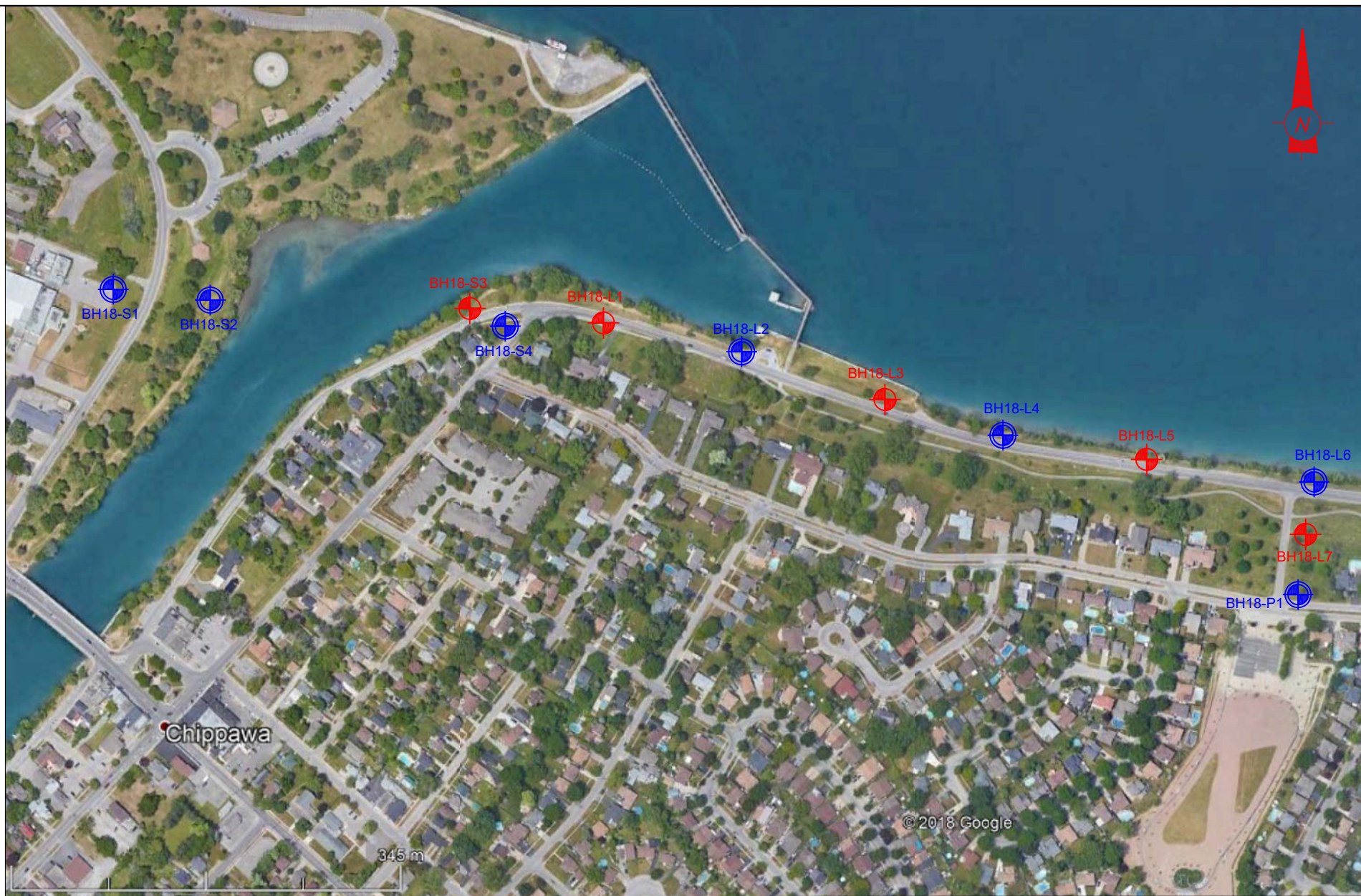
The comments given in this report are intended only for the guidance of design engineers. The number of boreholes and test pits required to determine the localized underground conditions between boreholes and test pits affecting construction costs, techniques, sequencing, equipment, scheduling, etc., would be much greater than has been carried out for design purposes. Contractors bidding on or undertaking the works should, in this light, decide on their own investigations, as well as their own interpretations of the factual borehole and test pit results, so that they may draw their own conclusions as to how the subsurface conditions may affect them. This work has been undertaken in accordance with normally accepted geotechnical engineering practices.

This report is intended solely for the Client named. The material in it reflects our best judgment in light of the information available to PECG at the time of preparation. Unless otherwise agreed in writing by PECG, it shall not be used to express or imply warranty as to the fitness of the property for a particular purpose. No portion of this report may be used as a separate entity, it is written to be read in its entirety.

The conclusions and recommendations given in this report are based on information determined at the test hole locations. The information contained herein in no way reflects on the environment aspects of the project, unless otherwise stated. Subsurface and groundwater conditions between and beyond the test holes may differ from those encountered at the test hole locations, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the site investigation. The benchmark and elevations used in this report are primarily to establish relative elevation differences between the test hole locations and should not be used for other purposes, such as grading, excavating, planning, development, etc.

The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. PECG accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

We accept no responsibility for any decisions made or actions taken as a result of this report unless we are specifically advised of and participate in such action, in which case our responsibility will be as agreed to at that time.



LEGEND

-  Borehole Location
-  Monitoring Well Location

Client: Niagara Region		Project No.: 180541	Drawing No.: 1
Drawn: TP	Approved: DT	Title: Borehole and Monitoring Well Location Plan	
Date: June, 2019	Scale: As shown	Project: Geotechnical Technical Memorandum in Support of an Environmental Assessment Amendment	
Original Size: Letter	Rev: TP	 PALMER ENVIRONMENTAL CONSULTING GROUP INC. 74 Berkeley Street Toronto, Ontario M5A 2W7	

Appendix D

Archaeological Assessment

Original Report:

Stage 1 & 2 Archaeological Assessment

Niagara Falls Water Treatment Plant Intake Alignment Project

Located on Part of Lots 23 and 24, Concession 1 and Part of Lot 24,
Concession 2, Geographic Township of Willoughby, Lincoln County,
Now in the City of Niagara Falls, Regional Municipality of Niagara,
Ontario

Project # SCB191025

Archaeological Consulting License # P141 (Austin)

P.I.F. # P141-0333-2019 (Stage 1 & 2)

Prepared for:
Environmental Infrastructure Solutions Inc.
600 Alden Road, Suite 300, Markham, Ontario L3R 0E7

15-Jul-19

Stage 1 & 2 Archaeological Assessment

Niagara Falls Water Treatment Plant Intake Alignment Project

**Located on Part of Lots 23 and 24, Concession 1 and Part of Lot 24, Concession 2,
Geographic Township of Willoughby, Lincoln County, Now in the City of Niagara
Falls, Regional Municipality of Niagara, Ontario**

Project # SCB191025

Prepared for:

Environmental Infrastructure Solutions Inc.
600 Alden Road, Suite 300, Markham, Ontario L3R 0E7

Prepared by:

Wood Environment & Infrastructure Solutions, a Division of Wood Canada Limited
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15-Jul-19

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Third-party disclaimer

Any disclosure of this report to a third party is subject to this disclaimer. The report was prepared by Wood at the instruction of, and for use by, our client named on the front of the report. It does not in any way constitute advice to any third party who is able to access it by any means. Wood excludes to the fullest extent lawfully permitted all liability whatsoever for any loss or damage howsoever arising from reliance on the contents of this report. We do not however exclude our liability (if any) for personal injury or death resulting from our negligence, for fraud or any other matter in relation to which we cannot legally exclude liability.

Executive Summary

Wood Environment & Infrastructure ("Wood") was retained by Environmental Infrastructure Solutions Inc. (the Client) to conduct a Stage 1 & 2 archaeological assessment in support of the Niagara Falls Water Treatment Plant Intake Alignment Project. This assessment was triggered under the Planning Act, R.S.O. 1900 and was conducted prior to development. The property is located along Niagara Parkway from Ives Gateway to Main St, in the City of Niagara Falls, Ontario ("study area"). The study area was historically located on Part of Lots 23 and 24, Concession 1 and Part of Lot 24, Concession 2, in the Township of Willoughby, Lincoln County (Appendix A: Figures 1, 2 and 3). The study area is approximately 3.33 hectares (8.24 acres) in size.

The Stage 1 & 2 archaeological assessment was carried out in accordance with the Ontario Ministry of Tourism, Culture and Sport's ("MTCS") *Standards and Guidelines for Consultant Archaeologists* (2011), under an Ontario Professional Licence to Conduct Archaeological Fieldwork (P141) held by Shaun Austin, Senior Advisor at Wood. The project information was acknowledged by the MTCS on 1 April 2019 with the approval of PIF number P141-0333-2019 (Stage 1 & 2). Permission to conduct the property inspection was granted to Wood by the Client on 2 May 2019. Permission to conduct the property inspected included all required archaeological fieldwork activities, including the recovery and removal of artifacts.

The Stage 1 property inspection and Stage 2 test-pit survey were directed by Matthew Muttart (R1208), with the assistance of Victoria Lamond of Wood on 6 May 2019. The weather during the Stage 1 property inspection and Stage 2 test-pit survey was sunny and warm with an approximate temperature of 18 degrees Celsius. Weather conditions did not impede the property inspection or property assessment in any way.

The Stage 1 background study indicated that undisturbed portions of the subject property have archaeological potential and warrant Stage 2 property assessment for three principal reasons: 1) the presence of a natural water source—the Niagara River and the Welland River—directly to the north and east; 2) the known presence of two archaeological sites within a 1-km radius; and 3) the close proximity of an historical settlement area (Chippawa Village) and numerous historical transport routes, including the Niagara Parkway.

On the basis of the Stage 1 property inspection and a review of recent land use history, Wood has identified that: 30.3% (1.01 hectares) of the study area does not require Stage 2 assessment as archaeological potential has been removed by construction activities related to the Niagara Parkway (i.e. paved and/or asphalted roads/pathways); and, 69.7% (2.32 hectares) of the study area ostensibly has archaeological potential and warrants Stage 2 assessment.

The areas identified as having archaeological potential were systematically test pitted at 5-m intervals. All test pits were a minimum of 30 cm in diameter and dug to a minimum of 5 cm into the subsoil. Soil fills were screened through 6-mm mesh screens in order to facilitate artifact recovery. Test-pit profiles were examined for cultural deposits prior to the test pits being fully backfilled and any sod caps being replaced and tamped down by foot.

No cultural artifacts were encountered in any of the test pits. Archaeological materials were not recovered and no archaeological sites were identified during the Stage 2 property assessment.

In light of these results, the following recommendation is made, subject to the conditions outlined below and the advice on compliance with legislation contained in Section 5.0:

- 1) The study area, as shown in Appendix A: Figures 6 and 7, requires no further archaeological assessment.

The above recommendation is subject to Ministry of Tourism, Culture and Sport approval, and it is an offence to alter any of the study area without Ministry of Tourism, Culture, and Sport concurrence.

No grading or other activities that may result in the destruction or disturbance of the study area is permitted until notice of Ministry of Tourism, Culture, and Sport approval has been received.

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APPENDIX B: PHOTOGRAPHS

APPENDIX D: ASSESSOR QUALIFICATIONS

APPENDIX E: LIMITATIONS

Project Personnel

Project Director:	Shaun Austin, Ph.D. (P141)
Project Manager:	Cara Howell, B.A. (R180)
Field Director:	Matthew Muttart, M.A. (R1208)
Field Technician:	Victoria Lamond, B.A.
Report Preparation:	Matthew Muttart, M.A.
Graphics:	Steve LaBute (CAD)
Report Reviewers:	Shaun Austin, Ph.D. (P141) Jason Seguin, M.A. (P354)

1.0 Project Context

1.1 Development Context

Wood Environment & Infrastructure ("Wood") was retained by Environmental Infrastructure Solutions Inc. (the Client) to conduct a Stage 1 & 2 archaeological assessment in support of the Niagara Falls Water Treatment Plant Intake Alignment Project. This assessment was triggered under the Planning Act, R.S.O. 1900 and was conducted prior to development. The property is located along Niagara Parkway from Ives Gateway to Main St, in the City of Niagara Falls, Ontario ("study area"). The study area was historically located on Part of Lots 23 and 24, Concession 1 and Part of Lot 24, Concession 2, in the Township of Willoughby, Lincoln County (Appendix A: Figures 1, 2 and 3). The study area is approximately 3.33 hectares (8.24 acres) in size.

The Stage 1 & 2 archaeological assessment was carried out in accordance with the Ontario Ministry of Tourism, Culture and Sport's ("MTCS") *Standards and Guidelines for Consultant Archaeologists* (2011), under an Ontario Professional Licence to Conduct Archaeological Fieldwork (P141) held by Shaun Austin, Senior Advisor at Wood. The project information was acknowledged by the MTCS on 1 April 2019 with the approval of PIF number P141-0333-2019 (Stage 1 & 2). Permission to conduct the property inspection was granted to Wood by the Client on 2 May 2019. Permission to conduct the property inspected included all required archaeological fieldwork activities, including the recovery and removal of artifacts.

The Stage 1 property inspection and Stage 2 test-pit survey were directed by Matthew Muttart (R1208), with the assistance of Victoria Lamond of Wood on 6 May 2019. The weather during the Stage 1 property inspection and Stage 2 test-pit survey was sunny and warm with an approximate temperature of 18 degrees Celsius. Weather conditions did not impede the property inspection or property assessment in any way.

This report presents the results of the Stage 1 background study and Stage 2 property assessment and makes pertinent recommendations.

1.2 Scope of Work

This Stage 1 & 2 archaeological assessment was carried out in accordance with the Terms of Reference provided in Wood's work agreement dated 29 November 2018 and the *Standards and Guidelines for Consultant Archaeologists* (MTCS 2011).

A Stage 1 archaeological assessment is a systematic qualitative process executed in order to assess the archaeological potential of a property based on its historical use and its potential for early Euro-Canadian (early settler) and pre-contact Aboriginal occupation. The objectives of a Stage 1 background study are: 1) to provide information about the property's geography, history, previous archaeological fieldwork and current land condition; 2) to evaluate in detail the property's

archaeological potential which will support recommendations for Stage 2 property assessment for all or parts of the property if warranted; and, 3) to recommend appropriate strategies for Stage 2 property assessment if warranted.

The scope of work for the Stage 1 background study consisted of the following tasks:

- Contacting the MTCS to determine if recorded archaeological sites exist in the vicinity (1-km radius) of the property, through a search of the Ontario Archaeological Sites Database maintained by that Ministry;
- Contacting the MTCS to determine if there are any known reports of previous archaeological field work within a radius of 50 m around the study area;
- A desktop review of the study area's physical setting to determine its potential for both historic and pre-contact human occupation, including its topography, hydrology, soils, and proximity to important resources and historical settlements and transportation routes;
- A review of the potential for historic period occupation as documented in historical atlases and other archival sources;
- A visual inspection of the study area in order to gather first-hand and current evidence of the property's physical setting, and to aid in delineating areas where archaeological potential may have been impacted or removed by previous land-use practices.

The scope of work for the Stage 2 archaeological assessment consisted of the following tasks:

- Organizing public underground utility locates. In addition, Wood retained a private utility locator to clear underground utilities;
- A test pit survey conducted at 5-m intervals of areas of archaeological potential employing strategies that adhere to the technical standards for Stage 2 archaeological assessments as prescribed by the MTCS (2011);
- Mapping, photographing and other relevant graphics; and,
- Preparing a report of findings with recommendations regarding the need for further archaeological work if deemed necessary.

Sites discovered during a Stage 2 assessment that are determined to have cultural value or interest may be recommended for a Stage 3 site-specific assessment.

2.0 Stage 1 Background Study

As part of the Stage 1 archaeological assessment, Wood searched MTCS's PastPort system to determine if archaeological sites have been registered within 1 km of the property (Section 2.1.1), and if previous archaeological assessments have been carried out within a 50-m radius (Section 2.1.2). Secondly, the principal determinants of archaeological potential—proximity to water, topography, drainage, soils, and proximity to important resources and historical settlements and transportation routes—were examined to evaluate the property's overall archaeological potential (Sections 2.1, 2.1.3, 2.2, and 2.2.1). Thirdly, the specific potential for historic period archaeological resources was assessed through an examination of available historical maps and other archival sources (Section 2.2).

2.1 Archaeological Context

2.1.1 Registered Archaeological Sites

Wood conducted the requisite Stage 1 background research. First, Wood searched the MTCS PastPort system to ascertain if previously registered archaeological sites have been identified near the study area.

In Ontario, information concerning archaeology sites is stored in the Ontario Archaeological Sites Database (OASD) maintained by the MTCS. This database contains archaeological registered sites within the Borden system. Under the Borden system, Canada has been divided into grid blocks based on longitude and latitude. A Borden block is approximately 13 km east to west, and approximately 18.5 km north to south. Each Borden block is referred to by a four-letter designation and sites located within the block are numbered sequentially as they are found. The subject property is located within the AgGs Borden Block. On the basis of a search of the OASD through PastPort on 29 April 2019, there are two registered archaeological sites within a 1-km radius. Table 1 provides a summary of these sites.

Table 1: Registered Archaeological Sites within a 1-km Radius					
Borden Number	Site Name	Cultural Affiliation	Site Type	Development Review Status	Researcher
AgGs-285	-	Other	Findspot	No Further CHVI	Shaun Austin (2007)
AgGs-320	-	Aboriginal	Campsite	Further CHVI (Stage 3 recommended)	Robert Pihl (2007)

2.1.2 History of Archaeological Investigations

Wood completed a search for reports directly on PastPort on 29 April 2019. Based on this search (by address, lot and concession and above-mentioned archaeological sites), no archaeological assessments have been conducted within 50 m of the subject lands.

2.1.3 Environmental Context

The study area (Appendix A: Figures 1–3) is situated in the Haldimand Clay Plain physiographic region of Ontario (Chapman and Putnam 1984: 113). This region spans an area of approximately 350,000 hectares (865,000 acres) and is situated between the Niagara Escarpment and Lake Erie.

Within the Haldimand Clay Plain a number of environmental sub-regions have been described, including the Niagara Slough Clay Plains, the Fort Erie Coast, and the Niagara River Valley (MacDonald 1980). Geologically, this region is characterized by flat and poorly drained clays (Chapman and Putnam 1984: 156), although it includes several distinctive landforms including dunes, cobbles, clay and sand beaches, limestone pavements, and backshore wetland basins. The distribution and nature of these sub-regions, and the specific environmental features they contain, have influenced land use in the region throughout history and prehistory.

The Niagara River Valley is well known for the broad and fast flowing Niagara River, bordered by shelved dolostone and limestone pavements and low clay-plain bluffs. Below the bluffs on the Fort Erie moraine the river has aggraded a floodplain approximately 400 m wide. In contrast, below the bluffs on the Buffalo moraine, the river has eroded the bank and the floodplain is much narrower.

The Niagara Slough Clay Plain is characterized by slough and ridge patterning on a gently rolling plain of heavily compacted, poorly drained, acidic clay soils. In this sub-region, the wet, mesic clay plain forests are today dominated by oaks, including swamp white oak.

The Lake Erie Coast, on the other hand, is characterized by diverse landforms indicative of Holocene and on-going coastal processes, including dunes, cobbles, clay and sand beaches, limestone pavements, and back-shore wetland basins. Vegetation in this environmental sub-region is characterized by deciduous forests situated atop sand ridges and dunes associated with poorly-drained, back-shore, wetland basins, and the coastal marsh. The latter two areas are well-adapted to changing water levels. Sand ridges support forests of red oak, sugar maple, and American beech. Back-shore wetland basins contain deciduous swamps of silver maple, red ash and yellow birch (MacDonald 1980).

It is crucial to consider the proximity of water sources in any evaluation of archaeological potential because the availability of water is arguably the single most important determinant of human land use, past and present. The *Standards and Guidelines for Consultant Archaeologists* (MTCS 2011)

lists proximity to water as one of the prime indicators of potential for the presence of archaeological sites. Distance from potable water has been one of the most commonly used variables for predictive modeling of site location. Water, both potable and non-potable, also facilitated the transportation of people and goods and served to focus animal and vegetable resources. According to the *Standards and Guidelines for Consultant Archaeologists* (MTCS 2011), lands within 300 m of an extant or formerly mapped river or creek have potential for the presence of early Aboriginal and Euro-Canadian archaeological sites. The Welland River and Niagara River bank the study area to the east and north respectively (Appendix A: Figures 1, 2 and 3).

In summary, a review of the archaeological context supports a conclusion of overall archaeological potential and the need for a Stage 2 assessment. Natural water sources are located within 100 m of the study area (Appendix A: Figure 2). Moreover, we have direct evidence that this general area had been exploited by pre-contact Aboriginal peoples in that two sites have previously been registered within a 1-km radius.

2.2 Historical Context

2.2.1 A Cultural History for Southern Ontario

The majority of interpretations of pre-contact Aboriginal adaptations in Ontario derive from the analysis and interpretation of stone tools. Stone tools are made from specific types of rocks that fracture in ways that can be controlled, so that they are easily shaped into useful forms. These rocks include chert, chalcedony, quartzite, petrified wood, and volcanic glass, known as obsidian. Most stone tools found in southern Ontario are formed from types of chert that outcrop in local limestone formations, such as: Onondaga and Haldimand cherts, found near the north shore of Lake Erie; Kettle Point chert, which outcrops near Lake Huron; and Collingwood chert, which outcrops along the Niagara Escarpment near Georgian Bay.

Stone tools used as spear tips and arrowheads are the most commonly studied tool type. These are referred to as projectile points. As projectile point technology changed over time, styles and shapes of points changed also. Studying these changing point types has resulted in the development of a chronological framework for pre-contact times prior to 3,000 years ago, when First Nations groups began to make clay pottery. Later periods are defined both by point types and pottery characteristics. Radiocarbon dating of archaeological sites can only be done when organic materials are collected from those sites, so the dating of most sites is done by comparing the artifacts from dated sites to those from undated sites. The following is an overview of the pre-contact history of southern Ontario as understood by archaeologists.

The cultural history of southern Ontario began approximately 11,000 years ago when the glaciers had melted, and the land was re-exposed. The land was quickly settled by bands of hunters and gatherers who are thought to have been large game hunters. These people used large spear

points that are distinctively shaped with long central grooves, called “flutes”. Archaeologists have defined a number of point types that date to this time, including Gainey, Barnes, Crowfield, and Hi-Lo types. This period is referred to as the Paleo-Indian Period and it is thought to have lasted until approximately 9,000 years ago.

After 9,500 years ago, there was a long period when the climate was variable, and the bare lands left by the glaciers were becoming re-forested, resulting in patchier, more diverse ecozones. During this time, which lasted until 3,000 years ago, people were adapting to diverse environmental settings. There appears to have been more reliance on local stone for making tools and more variable tool manufacturing technologies. The adoption of a spear-throwing board, known as an atlatl, was an important innovation, resulting in the ability to throw smaller darts with more force. Projectile points from this period, called the Archaic Period, are commonly side or corner-notched and are smaller than those of the preceding period. The Archaic adaptation is generally thought to have centred on localized resources, often forest resources, and groups of people are thought to have been less mobile, an adaptation that continued to develop until the arrival of Europeans.

In southern Ontario, the Archaic Period is divided into the Early, Middle and Late Archaic. Early point types include serrated Nettling and Bifurcate Base points. Middle types include Brewerton Corner Notched and Otter Creek, and Late types include Lamoka, Genesee, Crawford Knoll, and Innes. Most of these are named after sites where they were first identified.

The Archaic Period is followed by the Woodland Period. The major technological change in the Early Woodland Period is the introduction of pottery. During this time, people are thought to have developed more community organization and the manufacture of clay pottery is thought to indicate less residential mobility. Burial sites dating to this time often display evidence of ceremonial activities. Projectile points made at this time include much smaller types, probably used as arrow tips. Point types include Meadowood and Kramer and early ceramics were crudely made vessels with conoidal (pointed) bases. The Early Woodland Period transitioned into the Middle Woodland Period approximately 2,400 years ago.

During the Middle Woodland Period in southern Ontario community and kin identity became more deeply entrenched, and more sedentary communities developed. Point types made at this time include Saugeen, Vanport, and Snyders. Ceramic vessels were conoidal in shape and were decorated with stamped designs in the soft clay. The Middle Woodland Period transitioned into the Late Woodland Period A.D. 500–900 with the earliest direct evidence for agriculture.

The Late Woodland Period saw the development of recognizable Iroquoian and Algonkian cultures in southern Ontario, characterized by the intensification of agriculture and the increased utilization of corn. Greater sedentism led to increasing settlement populations and greater

complexity of settlement organization. Sites dating to this time are often found on terraces overlooking the floodplains of large rivers. Iroquoian villages tended to be small, palisaded compounds with longhouses occupied by families. As the Late Woodland Period progressed, more intercommunity communication and integration became necessary to maintain the sedentary agricultural way of life. Later Iroquoian villages were larger and more heavily palisaded, and longhouses were larger also.

When European explorers and missionaries arrived in southern Ontario in the early seventeenth century, they described the local Iroquoian social organization as being under the direction of elected chiefs. Tribal confederacies and allegiances resulted in intertribal warfare, which was only made worse by the European presence. Three Ontario Iroquoian confederacies, the Huron, Petun, and Neutral, were driven from their traditional territories before the middle of the seventeenth century.

Archaeologists tend to describe a period of transition from Late Woodland to Historic times as “proto-historic”. The dating of this period is variable and may be different from site to site within a region as it describes a time when local First Nations were acquiring European trade goods indirectly through other Aboriginal middlemen rather than directly from European traders. This period was generally very short and is often difficult to differentiate archaeologically from later historic times, when trade goods were widely available, but it usually is identified by evidence of an intact traditional cultural adaptation with occasional European items used in traditional ways.

Table 2: Simplified Cultural Chronology of Southern and Eastern Ontario

Period	Complexes/Cultures, Some Diagnostic Artifacts
Early Paleo-Indian (9000–8500 B.C.)	Small nomadic hunter-gatherer bands. Early Paleo-Indian (EPI) rarely found in Eastern Ontario. Gainey, Barnes, Crowfield fluted points.
Late Paleo-Indian (8500–7500 B.C.)	Small nomadic hunter-gatherer bands. Hi-Lo, Holcombe points, Lanceolate Bifaces.
Early Archaic (7500–6000/4500 B.C.)	Small nomadic hunter-gatherer bands. Nettling, Stanley/Neville points.
Middle Archaic (6000/4500–2500 B.C.)	Transition to territorial settlements. Seasonal round of subsistence introduced. Thebes (6000–5000 B.C.), Otter Creek points (4500–3000 B.C.). Brewerton Complex (3000–2500 B.C.) . Brewerton points. Laurentian Complex (6000 B.C.–2500 B.C.) (Eastern Ontario)
Late Archaic (2500–1000 B.C.)	More numerous territorial hunter-gatherer bands, increasing use of exotic materials and artistic items for grave offerings, regional trade networks. Narrowpoint Complex (2500–1850 B.C.) . Lamoka points. Broadpoint Complex (1850–1650 B.C.) . Adder Orchard, Genesee points. Smallpoint Complex (1650–1000 B.C.) . Crawford Knoll, Innes points. Terminal Archaic (1100–1000 B.C.) Glacial Kame Complex . Hind points.

Table 2: Simplified Cultural Chronology of Southern and Eastern Ontario

Period	Complexes/Cultures, Some Diagnostic Artifacts
Early Woodland (1000–400 B.C.)	Pottery introduced. Meadowood Notched points, Meadowood Cache Blades, Kramer, Adena points. Meadowood Complex (1000–400 B.C.).
Middle Woodland (400 B.C.–A.D. 500/900)	Middlesex Complex (650–400 B.C.). Introduction of true cemeteries. Saugeen, Snyders, Vanport, Port Maitland points. Point Peninsula Complex (Southcentral and Eastern Ontario) Saugeen Complex (southeast of Lake Huron and the Bruce Peninsula, London area, and possibly as far east as the Grand River) Couture Complex (Lake St. Clair and the western end of Lake Erie). Burial ceremonialism.
Transitional Woodland (A.D. 500–900)	Agriculture introduced. Levanna, Jacks Reef points. Princess Point Complex (Eastern end of Lake Erie and the western end of Lake Ontario). Rivière au Vase Phase of the Younger / Western Basin Tradition (Lake St. Clair and western end of Lake Erie) Sandbanks Complex (Kingston area).
Late Woodland (A.D. 900–1650)	Tribal differentiation. Transition to settled village life. Dewaele, Glen Meyer Tanged, Triangular Nanticoke, Notched Nanticoke, Triangular Daniels/Madison points. Ontario Iroquoian and St. Lawrence Iroquoian Traditions (Southcentral and Eastern Ontario, respectively). Algonkian Western Basin Tradition (Lake St. Clair and the western end of Lake Erie).
Early Post-Contact (A.D. 1650–1763)	Iroquoian, Algonkian migrations and resettlement. French exploration and colonization
Late Post-Contact (A.D. 1763–1867)	Iroquoian, Algonkian migrations and resettlement. British and other European immigration increases.

Archaeologically, the years since the arrival of Europeans are referred to as the Historic Period. In southern Ontario, significant Historic sites are those that have an affiliation with an important historic event, figure, or family, but can also be anything dating to the original European settlement of a region. Often, these sites date to before A.D. 1830.

2.2.2 Review of Historical Records

Historically, the study area was located within the Township of Willoughby, Lincoln County. When the Province of Upper Canada was formed in 1791 it was partitioned into four districts – Eastern, Midland, Home and Western. The Home District was reorganized in 1798, and lands were annexed to form the Niagara district. The Niagara district consisted of Haldimand and Lincoln Counties, with the study area falling within the Second Riding of Lincoln County (in 1851 Welland County would be created and separated from Lincoln).

The Township of Willoughby was first surveyed informally by Philip R. Frey in 1787, and the first map of the surveyed area was published in 1791. The Crown survey used a Front and Rear special survey system between 1783 and 1813 (Dean and Matthews 1969). Active settlement in Willoughby Township commenced prior to the completion of the Crown survey of 1813. In 1784, immediately following the American Revolution, United Empire Loyalists, specifically members and relatives of the Butler's Rangers under the command of Col. John Butler settled in the area.

The closest historic community to the study area is the Village of Chippawa. Established in 1792, Chippawa was originally located approximately at the southern end of the study area. The First permanent non-Indigenous settler in Chippawa was Thomas Cummings, who took up land on the south side of the Welland River 1783. Chippawa housed a post office and was mainly utilized historically for shipbuilding and foundry work (Bond 1964; Jackson 1997).

The Battle of Chippawa during the War of 1812 was fought roughly 2 km south of the study area. This battlefield is registered as a National Historic Site of Canada.

Historical records and mapping were examined for evidence of early Euro-Canadian use of the study area. The 1862 *Tremaine's Map of the County Lincoln and Welland* was examined to determine the potential for historic archaeological evidence within the study area. Both Lots 23 and 24, Concession 1 are under the ownership of J. Cummings. There is no name associated with Lot 24, Concession 2 (Appendix A: Figure 4). Apart from the Village of Chippawa immediately to the west and several early roadways, historical features are not illustrated within or close to the study area.

In addition, the 1876 *Illustrated Historical Atlas of Lincoln and Welland* (Page 1876, Appendix A: Figure 5) was examined. In 1876, Lots 23 and 24, Concession 1 were owned by Richard Walsh; Lot 24, Concession 2 was under the ownership of Chippawa Village as granted by Thomas Cummings and the Bank of Upper Canada (Abstract/Parcel Register Book: Niagara South / Niagara 30 (59), Chippawa; Plan 251 Page 5). In addition to several historical roadways, structural features near or within the study area consist of the Chippawa Village infrastructure and two small buildings associated with an agricultural field.

In summary, a review of the historical context supports a conclusion of overall archaeological potential and the need for a Stage 2 assessment due to the proximity of historic settlements, most notably Chippawa Village, and early transportation routes, including the Niagara Parkway.

2.2.3 Historic Plaques

There are no historical plaques located within the study area, however there are two plaques located within 1 km. The first is located near the entrance to King's Bridge Park on the Niagara Parkway, just east of the bridge over the Welland River. This plaque was erected by the Ontario Archaeological and Historic Sites Board and reads:

FORT CHIPPAWA 1791

The fortifications which stood on this site were built in 1791 to protect the southern terminus of the Niagara portage road and serve as a forwarding depot for government supplies. Known also as Fort Welland, the main structure consisted of a log blockhouse surrounded by a stockade. During the War of 1812 several bloody engagements were fought in this vicinity including the bitterly contested Battle of Chippawa, July 5, 1814 and possession of the fort frequently changed hands. A barracks, storehouse, officers' quarters and earthworks were added in 1814–15 but shortly thereafter Fort Chippawa was abandoned and fell into decay.

The second plaque is located in Chippawa, in the square at the south end of the bridge over the Welland River. It was erected by the Ontario Archaeological and Historic Sites Board, Department of Public Records and Archives of Ontario and reads:

THE FOUNDING OF CHIPPAWA

In 1792–94 a village grew up near Fort Chippawa on Chippawa Creek at the end of the new portage road from Queenston. In 1793 the creek was renamed the Welland River, but the village, where a post-office was opened before 1801, remained "Chippawa". It was largely destroyed 1813–14 when British and American forces fought for control of the Welland River. Portage traffic revived after the war and continued until Chippawa became an outlet for the original Welland Canal from 1829 to 1833. A horse-powered railway, the first in Upper Canada, was built to Niagara Falls in 1837–39. Chippawa was incorporated as a village in 1849, and in 1970 became part of the City of Niagara Falls.

2.3 Stage 1 Property Inspection

2.3.1 Methodology

The Stage 1 property inspection was conducted by Matthew Muttart (R1208) of Wood on 6 May 2019 to confirm archaeological site potential and to determine the degree to which development and landscape alteration have affected that potential. The weather was sunny and warm and did not impede the inspection in any way.

The Stage 1 property inspection included a walk-through of the entire property, which measures approximately 3.33 hectares (8.24 acres). The property inspection was thoroughly photo-documented. Field observations were recorded on aerial maps and field forms. All land conditions were recorded as shown in Appendix A: Figure 6 and Appendix B: Photographs 1–10.

2.3.2 Results

The study area consists of landscaped greenspace and roadways and paved or asphalted pathways and sidewalks. Archaeological potential has been removed within the roadways and paved or asphalted pathways and sidewalks (Appendix A: Figure 6 and Appendix B: Photographs 1–10). The remainder of the study area, consisting of landscaped greenspace, has archaeological potential and warrants Stage 2 assessment (Appendix A: Figure 6).

2.4 Stage 1 Analysis and Conclusions

The study area appears to have been in use largely as residential and parkland south of the Niagara Parkway, and as landscaped greenspace shoring the Niagara River onto the Parkway.

The Stage 1 background study indicates that undisturbed portions of the subject property have archaeological potential and warrant Stage 2 property assessment for three principal reasons: 1) the presence of a natural water source—the Niagara River and the Welland River—directly to the north and east; 2) the known presence of two archaeological sites within a 1-km radius; and 3) the close proximity of an historical settlement area (Chippawa Village) and numerous historical transport routes, including the Niagara Parkway.

On the basis of the Stage 1 property inspection and a review of recent land use history, Wood has identified that: 30.3% (1.01 hectares) of the study area does not require Stage 2 assessment as archaeological potential has been removed by construction activities related to the Niagara Parkway (i.e. paved and/or asphalted roads/pathways); and, 69.7% (2.32 hectares) of the study area ostensibly has archaeological potential and warrants Stage 2 assessment.

The required Stage 2 survey method is test pitting at 5-m intervals; ploughing of this non-agricultural urban parkland in preparation for pedestrian survey is not viable in areas adjacent to the Niagara River and is not warranted throughout as these lands will remain as greenspace for years to come (S & G Standard 1d, MTCS 2011).

3.0 Stage 2 Property Assessment

3.1 Methodology

The Stage 2 property assessment was conducted on 6 May 2019 with advance permission-to-enter obtained from the Client. This permission extended to the recovery and removal of artifacts. The Stage 2 test-pitting programme was conducted under the direction of Matthew Muttart (R1208), with the assistance of Victoria Lamond. The weather was sunny and warm, 18°C and did not impede the assessment in any way.

As per Wood's safety standards, test pits were not advanced within 1 m of any buried utility services; however, the Wood's crew was able to conform to a 5-m interval grid within all areas of archaeological potential. All test pits were a minimum of 30 cm in diameter and dug to a minimum of 5 cm into the subsoil. Soil fills were screened through 6-mm mesh screens to facilitate artifact recovery. Test-pit profiles were examined for cultural deposits prior to the test pits being fully backfilled and any sod caps being replaced and tamped down by foot.

The Wood field crew photo-documented the assessment (Appendix A: Figure 7; and Appendix B: Photographs 11–21).

3.2 Record of Finds

3.2.1 Field Conditions within Areas of Archaeological Potential

The areas deemed to have archaeological potential during the Stage 1 assessment were subjected to test pitting at 5-m intervals (Appendix A: Figure 7; Appendix B: Photographs 11–21). These areas correspond to 2.32 hectares or 69.7% of the overall study area. Although a poorly drained section portion of the study area contained small pools of standing water (1.62 acres/ 0.06 hectares as noted on Figure 7 in Appendix A and Appendix B: Photographs 13 and 14), this did not impede our ability to test throughout at 5-m intervals.

Soil integrity was variable between the areas south and north of the Niagara Parkway. Soils south of the Parkway contained approximately 30 cm of moderately compacted brown loamy topsoil over a red/orange clay subsoil (Appendix A: Figure 7, Appendix B: Photographs 11, 12 and 16). Soils north of the Parkway contained approximately 20 cm of moderately compacted brown/grey silty loam topsoil over a brown/grey clay subsoil. Roughly 60% of both the topsoil and the subsoil north of the Parkway contained gravel. Thus it can be inferred that the lands north of the Parkway have been thoroughly compromised by imported fill, likely associated with erosion control efforts along the Niagara River (Appendix A: Figure 7, Appendix B: Photographs 18, 19, 20 and 21).

The following table provides the inventory of documentary records accumulated as part of this assessment.

Table 3: Inventory of Documentary Record		
Study Area	Map and Photo(s)	Field Notes
Part of Lots 23 and 24, Concession 1 and Part of Lot 24, Concession 2, Geographic Township of Willoughby, County of Lincoln, Now in the City of Niagara Falls, Regional Municipality of Niagara, Ontario	Copies of 2 historical maps, 21 Stage 1 & 2 photographs and 2 aerial photographs	Stage 1 & 2 photo logs and field notes

3.3 Stage 2 Analysis and Conclusions

The portions of the property identified as having archaeological potential (69.7% corresponding to 2.32 hectares) were systematically test pitted at 5-m intervals. No cultural artifacts were encountered in any of the test pits and no archaeological sites were identified.

4.0 Recommendations

In light of the results presented above, the following recommendation is made, subject to the conditions outlined below and the advice on compliance with legislation contained in Section 5.0:

- 1) The study area, as shown in Appendix A: Figures 6 and 7, requires no further archaeological assessment.

The above recommendation is subject to Ministry of Tourism, Culture and Sport approval, and it is an offence to alter any of the study area without Ministry of Tourism, Culture, and Sport concurrence.

No grading or other activities that may result in the destruction or disturbance of the study area is permitted until notice of Ministry of Tourism, Culture, and Sport approval has been received.

5.0 Advice on Compliance with Legislation

- a) This report is submitted to the Minister of Tourism, Culture and Sport as a condition of licensing in accordance with Part IV of the *Ontario Heritage Act, R.S.O. 1990, c 0.18*. The report is reviewed to ensure that it complies with the standards and guidelines that are issued by the Minister, and that the archaeological fieldwork and report recommendations ensure the conservation, protection and preservation of the cultural heritage of Ontario. When all matters relating to archaeological sites within the project area of a development proposal have been addressed to the satisfaction of the Ministry of Tourism, Culture and Sport, a letter will be issued by the ministry stating that there are no further concerns with regard to alterations to archaeological sites by the proposed development.
- b) It is an offence under Sections 48 and 69 of the *Ontario Heritage Act* for any party other than a licensed archaeologist to make any alteration to a known archaeological site or to remove any artifact or other physical evidence of past human use or activity from the site, until such a time as a licensed archaeologist has completed archaeological fieldwork on the site, submitted a report to the Minister stating that the site has no further cultural heritage value or interest, and the report has been filed in the Ontario Public Register of Archaeological Reports referred to in Section 65.1 of the *Ontario Heritage Act*.
- c) Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48 (1) of the *Ontario Heritage Act*. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with Section 48 (1) of the *Ontario Heritage Act*.
- d) The *Funeral, Burial and Cremation Services Act, 2002, S.O. 2002, c.33* requires that any person discovering human remains must notify the police or coroner and the Registrar of Cemeteries at the Ministry of Consumer Services.

6.0 Assessor Qualifications

This report was prepared and reviewed by the undersigned, employees of Wood. Wood is one of North America's leading engineering firms, with more than 50 years of experience in the earth and environmental consulting industry. The qualifications of the assessors involved in the preparation of this report are provided in Appendix D.

7.0 Closure

This report was prepared for the exclusive use of Environmental Infrastructure Solutions Inc. and is intended to provide a Stage 1 & 2 archaeological assessment of the study area. The property was historically located on Part of Lots 23 and 24, Concession 1 and Part of Lot 24, Concession 2, in the Township of Willoughby, Lincoln County, now in the City of Niagara Falls, Regional Municipality of Niagara, Ontario.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of the third party. Should additional parties require reliance on this report, written authorization from Wood will be required. With respect to third parties, Wood has no liability or responsibility for losses of any kind whatsoever, including direct or consequential financial effects on transactions or property values, or requirements for follow-up actions and costs.

The report is based on data and information collected during the Stage 1 background study and Stage 2 property inspection conducted by Wood. It is based solely a review of historical information, a property reconnaissance conducted on 6 May 2019 and data obtained by Wood as described in this report. Except as otherwise maybe specified, Wood disclaims any obligation to update this report for events taking place, or with respect to information that becomes available to Wood after the time during which Wood conducted the archaeological assessment. In evaluating the property, Wood has relied in good faith on information provided by other individuals noted in this report. Wood has assumed that the information provided is factual and accurate. In addition, the findings in this report are based, to a large degree, upon information provided by the current owner/occupant. Wood accepts no responsibility for any deficiency, misstatement or inaccuracy contained in this report as a result of omissions, misinterpretations or fraudulent acts of persons interviewed or contacted.

Wood makes no other representations whatsoever, including those concerning the legal significance of its findings, or as to other legal matters touched on in this report, including, but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation and change. Such interpretations and regulatory changes should be reviewed with legal counsel.

This report is also subject to the further Standard Limitations contained in Appendix E.

We trust that the information presented in this report meets your current requirements. Should you have any questions, or concerns, please do not hesitate to contact the undersigned.

Respectfully Submitted,

**Wood Environment & Infrastructure,
a Division of Wood Canada Limited**

Prepared by,



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Senior Archaeologist

Reviewed by,



Shaun Austin, Ph.D. (P141)
Associate Archaeologist

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Internet sources:

Brown, Alan

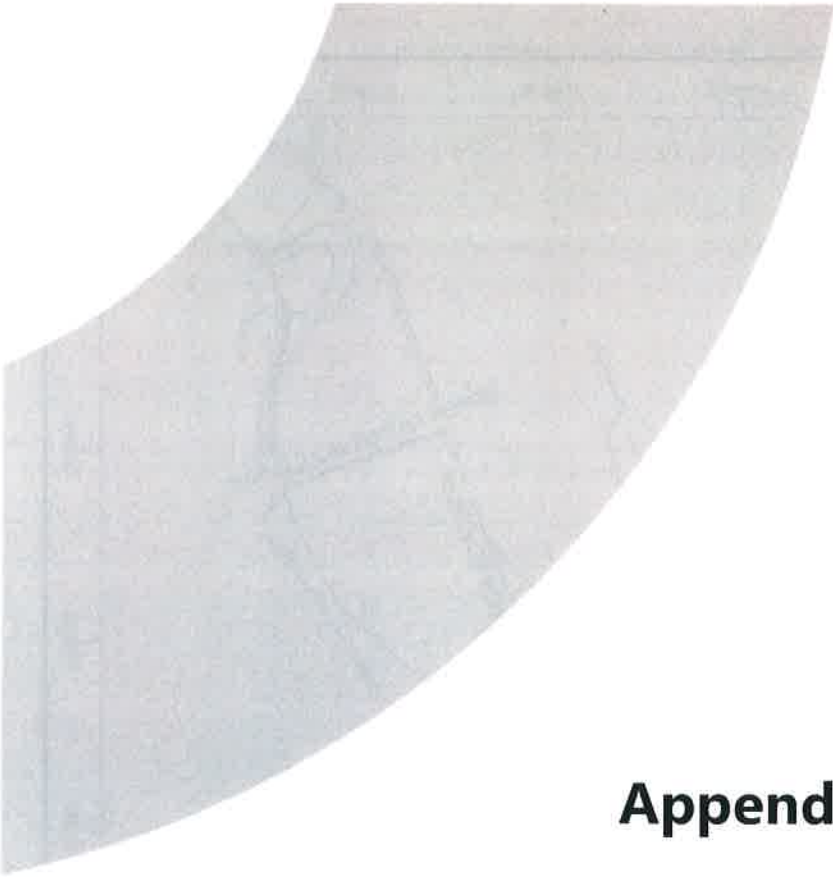
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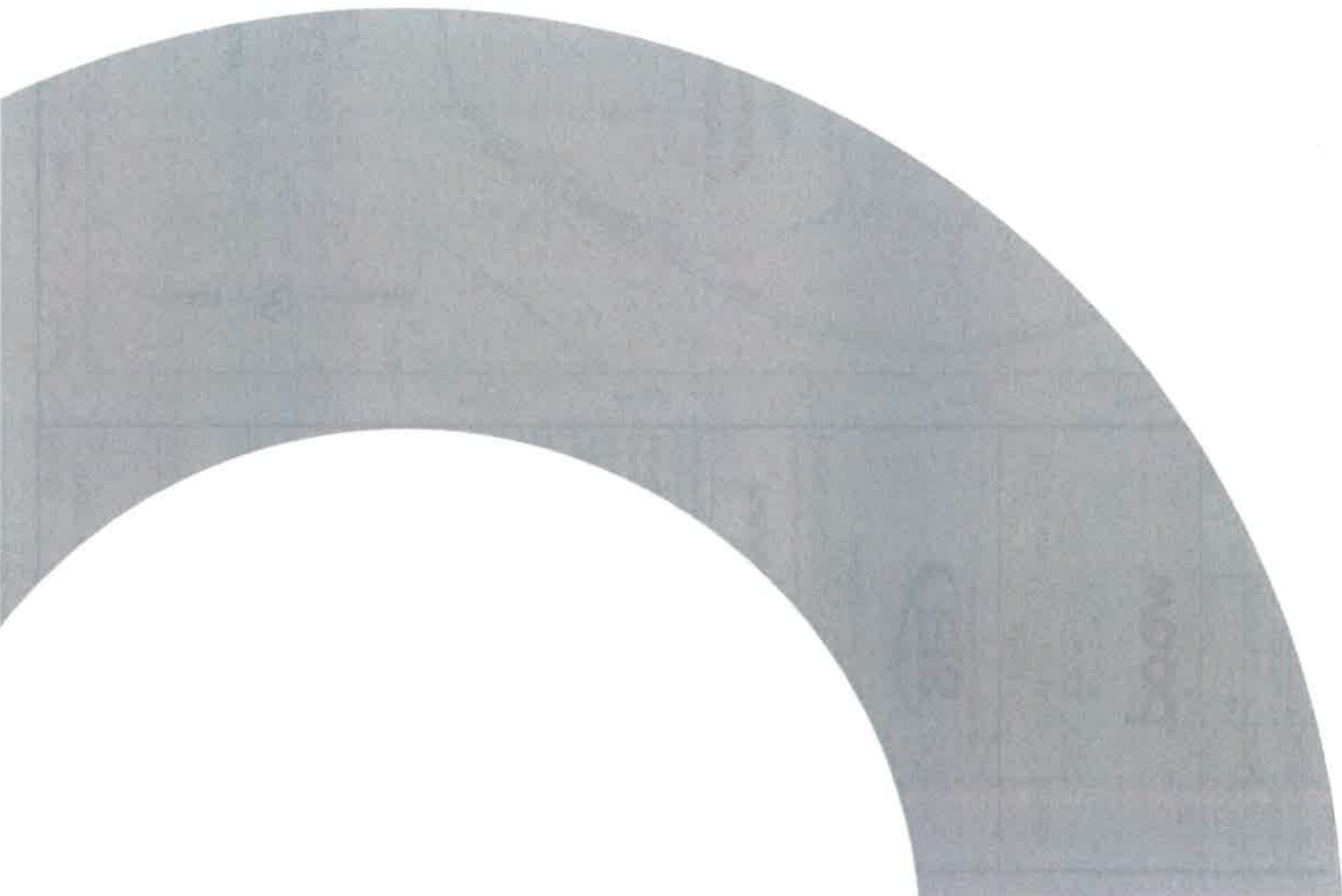
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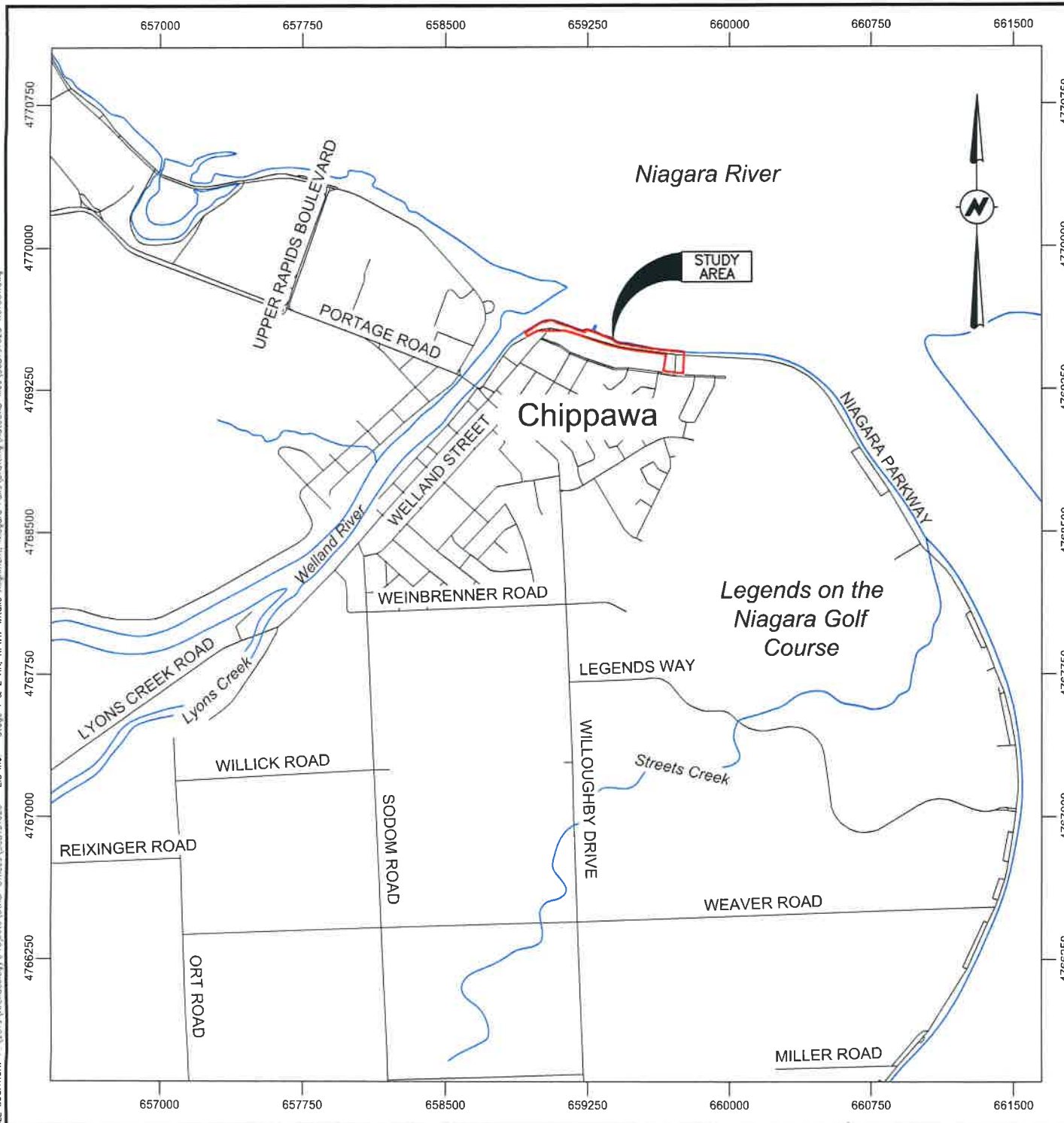
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Appendix A

Figures



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 STAGE 1 & 2 ARCHAEOLOGICAL ASSESSMENT
 NFWTP INTAKE ALIGNMENT
 NIAGARA FALLS, ONTARIO

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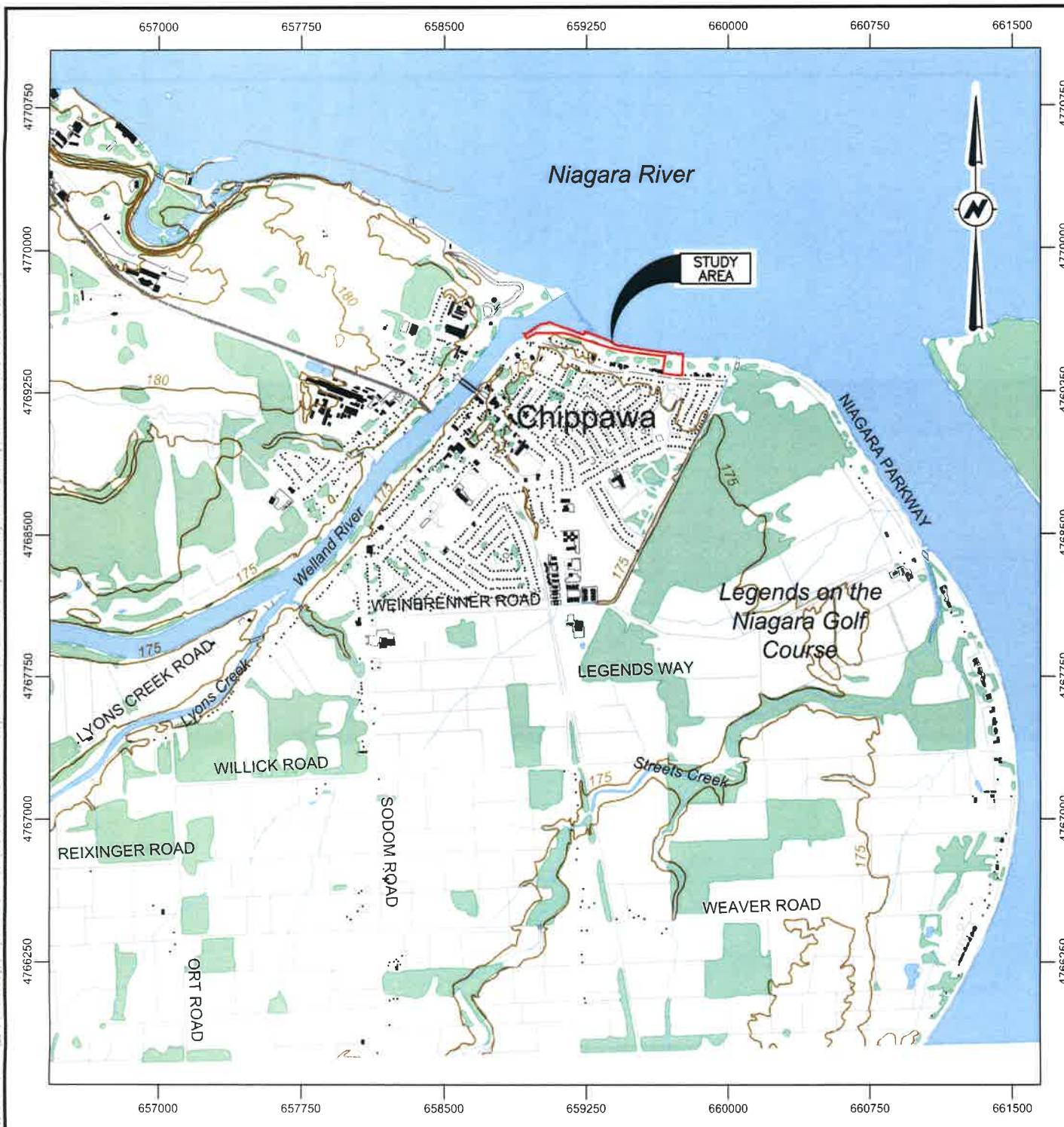
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STAGE 1 & 2 ARCHAEOLOGICAL ASSESSMENT
 NFWTP INTAKE ALIGNMENT
 NIAGARA FALLS, ONTARIO

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TOPOGRAPHIC MAP SHOWING
 LOCATION OF STUDY AREA

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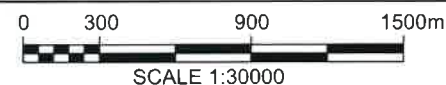
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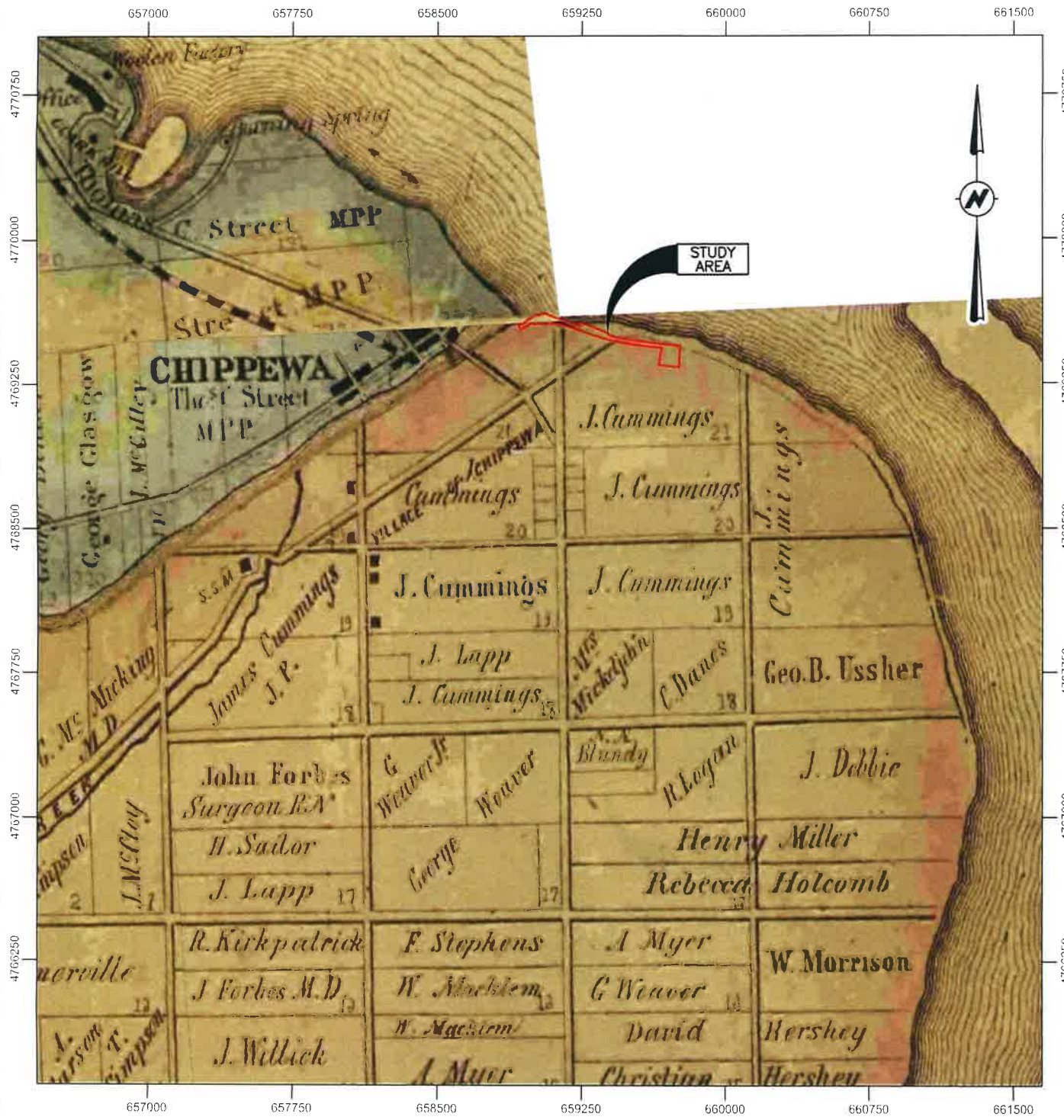
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 MARKHAM, ONTARIO, L3R 0E7



Wood
Environment & Infrastructure Solutions
 3450 HARVESTER ROAD, SUITE 100
 BURLINGTON, ONTARIO, L7N 3W5
 905-335-2353

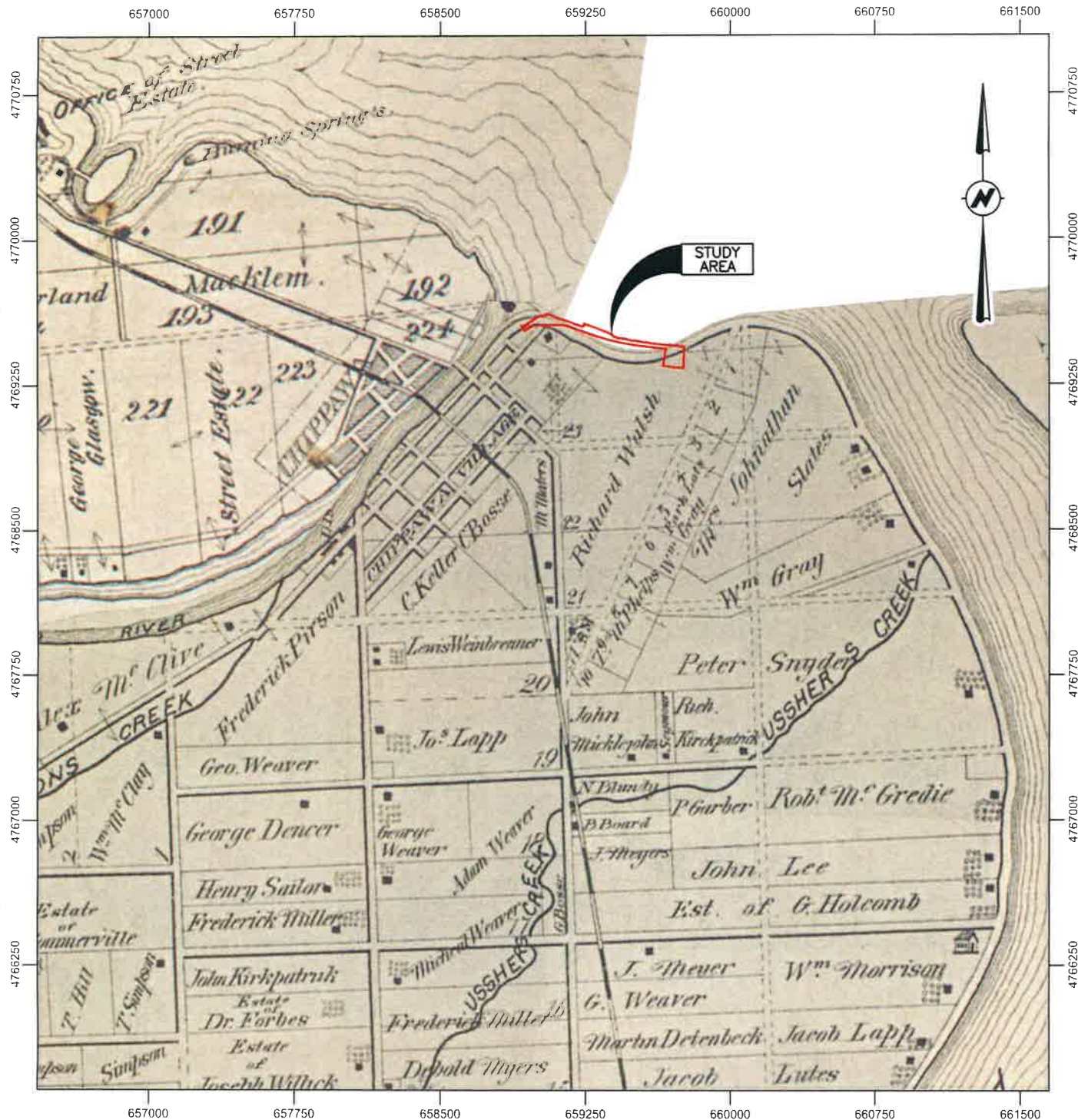
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DWN BY:	CHK'D BY:	DATE:
SJL	MM	JUNE 18, 2019
DATUM:	PROJECTION:	PROJECT No:
NAD83	UTM Zone 17	SCB191025
REV No:		FIGURE No:
0		3



PROJECT: STAGE 1 & 2 ARCHAEOLOGICAL ASSESSMENT NFWTP INTAKE ALIGNMENT NIAGARA FALLS, ONTARIO		
TITLE: 1862 TREMAINE MAP OF LINCOLN AND WELLAND COUNTIES		
LEGEND: STUDY AREA		
NOTES: THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS REPORT No. SCB191025. ALL LOCATIONS ARE APPROXIMATE. ORIGINAL PAPER SIZE: 8½ x 11. REFERENCES: G.R. & G.M. TREMAINE, 1862; CANMAP STREETFILES V2008.4.		
 SCALE 1:30000		
Environmental Infrastructure Solutions Inc. 600 ALDEN ROAD, SUITE 300 MARKHAM, ONTARIO, L3R 0E7 ENVIRONMENTAL INFRASTRUCTURE SOLUTIONS INC.		
Wood Environment & Infrastructure Solutions 3450 HARVESTER ROAD, SUITE 100 BURLINGTON, ONTARIO, L7N 3W5 905-335-2353 		
DWN BY: SJL	CHK'D BY: MM	DATE: JUNE 18, 2019
DATUM: NAD83	PROJECTION: UTM Zone 17	PROJECT No: SCB191025
REV No: 0		FIGURE No: 4

DATE PLOTTED: 5/18/2019 4:35:51 PM
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PROJECT: STAGE 1 & 2 ARCHAEOLOGICAL ASSESSMENT NFWTP INTAKE ALIGNMENT NIAGARA FALLS, ONTARIO		
TITLE: 1876 HISTORICAL ATLAS OF LINCOLN AND WELLAND COUNTIES		
LEGEND: STUDY AREA		
NOTES: THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS REPORT No. SCB191025. ALL LOCATIONS ARE APPROXIMATE. ORIGINAL PAPER SIZE: 8½ x 11. REFERENCES: H.R. PAGE & Co., 1876; CANMAP STREETFILES V2008.4.		
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Environmental Infrastructure Solutions Inc. 600 ALDEN ROAD, SUITE 300 MARKHAM, ONTARIO, L3R 0E7		
EIS ENVIRONMENTAL INFRASTRUCTURE SOLUTIONS INC.		
Wood Environment & Infrastructure Solutions 3450 HARVESTER ROAD, SUITE 100 BURLINGTON, ONTARIO, L7N 3W5 905-335-2353		
wood.		
DWN BY: SJL	CHK'D BY: MM	DATE: JUNE 18, 2019
DATUM: NAD83	PROJECTION: UTM Zone 17	PROJECT No: SCB191025
REV No: 0		FIGURE No: 5

DATE: 14/06/2019 14:00:00
PROJECT: STAGE 1 & 2 ARCHAEOLOGICAL ASSESSMENT
DRAWN BY: SJL
CHECKED BY: MM
DATE: 14/06/2019 14:00:00



PROJECT:
STAGE 1 & 2 ARCHAEOLOGICAL ASSESSMENT
NFWTP INTAKE ALIGNMENT
NIAGARA FALLS, ONTARIO

TITLE
STAGE 1 RESULTS WITH PHOTOGRAPH
LOCATIONS AND DIRECTIONS

LEGEND

- STUDY AREA
- PHOTOGRAPH LOCATION, VIEWING DIRECTION, AND PLATE NUMBER
- AREA OF ARCHAEOLOGICAL POTENTIAL
- OSTENSIBLY INTACT AREA OF ARCHAEOLOGICAL POTENTIAL (STAGE 2 TESTING REQUIRED)
- AREA OF NO ARCHAEOLOGICAL POTENTIAL
- DISTURBED - PAVED OR ASPHALTED ROAD/PATHWAY (NO FURTHER ASSESSMENT REQUIRED)

NOTES:
THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE
WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS
REPORT No. SCB191025
ALL LOCATIONS ARE APPROXIMATE.
ORIGINAL PAPER SIZE: 11 x 17.
REFERENCES:
2018 AERIAL PHOTOGRAPHS BY THE REGION OF NIAGARA;
CANMAP STREETFILES V2008.4

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SCALE 1:3000

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wood.

DWN BY:	SJL	CHKD BY:	MM	DATE:	JUNE 18, 2019
DATUM:	NAD83	PROJECTION:	UTM Zone 17	PROJECT No:	SCB191025
REV No:	0			FIGURE No:	6



PROJECT:

TITLE:

LEGEND

PHOTOGRAPH LOCATION, VIEWING DIRECTION, AND
PLATE NUMBER

AREA OF ARCHAEOLOGICAL POTENTIAL

SATURATED SOILS - AREA OF POOR DRAINAGE (TEST PITTED AT 5m INTERVALS)

AREA OF NO ARCHAEOLOGICAL POTENTIAL

NOTES:

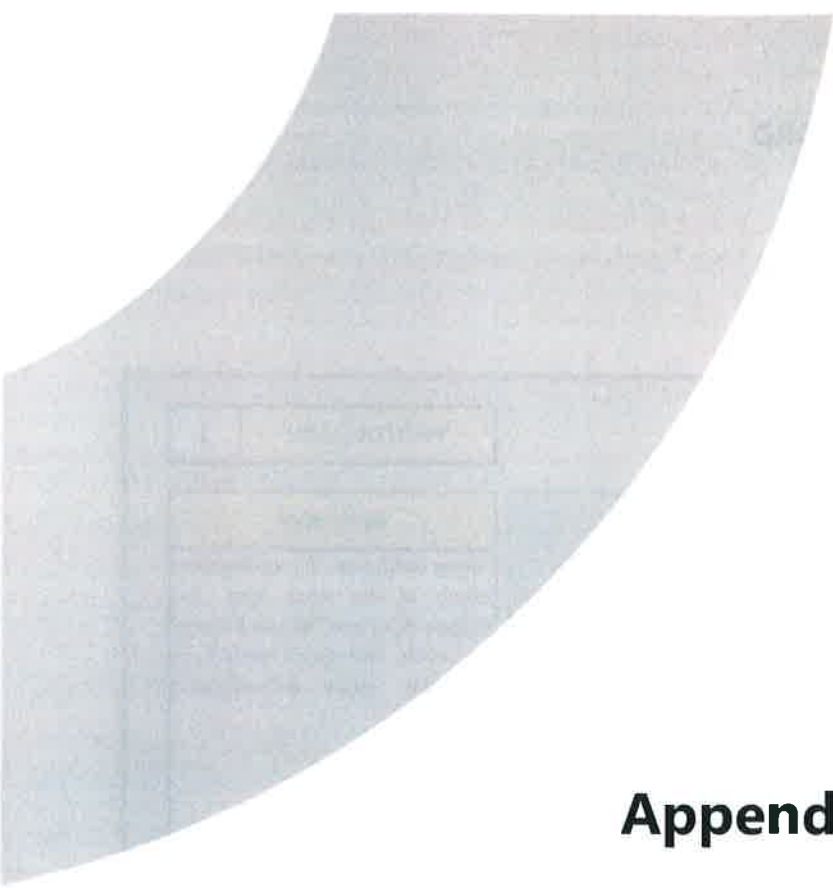
ALL LOCATIONS ARE APPROXIMATE

ORIGINAL PAPER SIZE: 11 x 17

REFERENCES:
2018 AERIAL PHOTOGRAPHS BY THE REGION OF NIAGARA;
GAMMA STREETFILES V2018-4



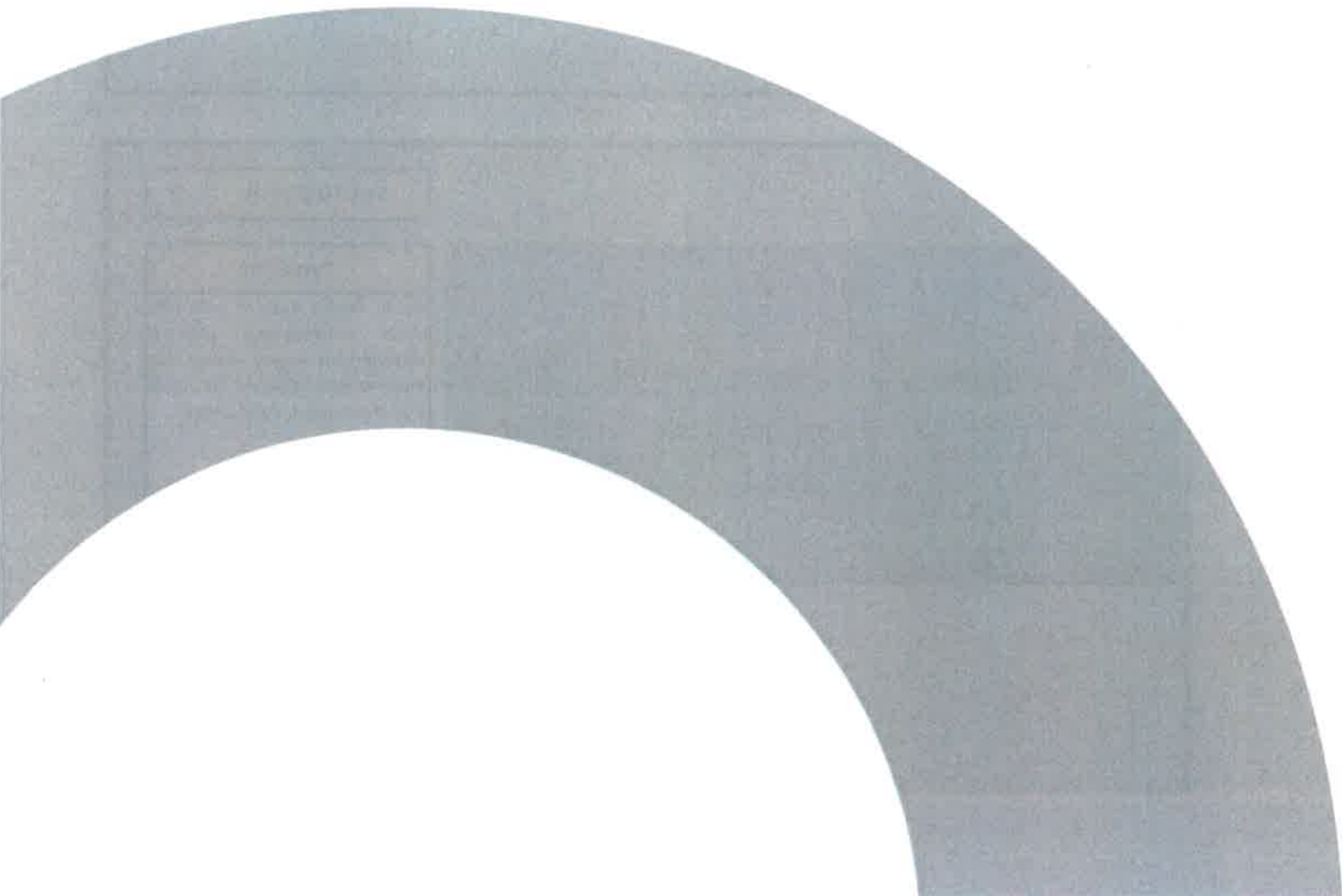
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wood.

Appendix B

Photographs



APPENDIX B - PHOTOGRAPHIC RECORD**PROJECT NO.** SCB191025**PROJECT** Stage 1 and 2 Archaeological Assessment**LOCATION** Niagara Falls, Ontario

PHOTOGRAPH	1
	
Description Facing North from the southeastern extent of the study area. The Niagara River and Niagara Parkway are visible. Manicured lawns have ostensibly intact archaeological potential.	

PHOTOGRAPH	2
	
Description Facing North. Area of ostensibly intact archaeological potential although it is visually evident that there is poor drainage as noted from the standing water present.	

APPENDIX B - PHOTOGRAPHIC RECORD**PROJECT NO.** SCB191025**PROJECT** Stage 1 and 2 Archaeological Assessment**LOCATION** Niagara Falls, Ontario

	<table border="1"><tr><td>PHOTOGRAPH</td><td>3</td></tr></table>	PHOTOGRAPH	3
PHOTOGRAPH	3		
	<table border="1"><tr><td>Description</td></tr><tr><td>Facing east across Ives Gateway. Area of ostensibly intact archaeological potential, however there is visually evidence of a drainage ditch.</td></tr></table>	Description	Facing east across Ives Gateway. Area of ostensibly intact archaeological potential, however there is visually evidence of a drainage ditch.
Description			
Facing east across Ives Gateway. Area of ostensibly intact archaeological potential, however there is visually evidence of a drainage ditch.			

	<table border="1"><tr><td>PHOTOGRAPH</td><td>4</td></tr></table>	PHOTOGRAPH	4
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	<table border="1"><tr><td>Description</td></tr><tr><td>Facing northeast. Area of ostensibly intact archaeological potential although it is visually evident that there is poor drainage as noted from the standing water present.</td></tr></table>	Description	Facing northeast. Area of ostensibly intact archaeological potential although it is visually evident that there is poor drainage as noted from the standing water present.
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APPENDIX B - PHOTOGRAPHIC RECORD

PROJECT NO. SCB191025

PROJECT Stage 1 and 2 Archaeological Assessment

LOCATION Niagara Falls, Ontario

	<table border="1"> <tr> <td>PHOTOGRAPH</td> <td>5</td> </tr> </table>	PHOTOGRAPH	5
PHOTOGRAPH	5		
	<table border="1"> <tr> <td>Description</td> </tr> <tr> <td>Facing East from the northeastern extent of the study area. Evidence of irrigation drainage is noted. Area of ostensibly intact archaeological potential.</td> </tr> </table>	Description	Facing East from the northeastern extent of the study area. Evidence of irrigation drainage is noted. Area of ostensibly intact archaeological potential.
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		<table border="1"> <tr> <td>PHOTOGRAPH</td> <td>6</td> </tr> </table>	PHOTOGRAPH	6
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		<table border="1"> <tr> <td>Description</td> </tr> <tr> <td>Facing North. Drainage culvert in line with Ives Gateway.</td> </tr> </table>	Description	Facing North. Drainage culvert in line with Ives Gateway.
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APPENDIX B - PHOTOGRAPHIC RECORD**PROJECT NO.** SCB191025**PROJECT** Stage 1 and 2 Archaeological Assessment**LOCATION** Niagara Falls, Ontario

	PHOTOGRAPH	7
	Description Facing east along the Niagara Parkway. Area of ostensibly intact archaeological potential.	

	PHOTOGRAPH	8
	Description Facing west along the Niagara Parkway. Area of ostensibly intact archaeological potential.	

APPENDIX B - PHOTOGRAPHIC RECORD**PROJECT NO.** SCB191025**PROJECT** Stage 1 and 2 Archaeological Assessment**LOCATION** Niagara Falls, Ontario**PHOTOGRAPH****9****Description**

Facing west along the Niagara Parkway. Area of ostensibly intact archaeological potential.

**PHOTOGRAPH****10****Description**

Facing north along the Niagara Parkway. Area of ostensibly intact archaeological potential.

APPENDIX B - PHOTOGRAPHIC RECORD**PROJECT NO.** SCB191025**PROJECT** Stage 1 and 2 Archaeological Assessment**LOCATION** Niagara Falls, Ontario**PHOTOGRAPH****11****Description**

Typical test pit South of Niagara Parkway. Test pits were characterized by an average of 30cm of moderately compacted brown loamy topsoil with a red/orange clay subsoil. All test-pits advanced were devoid of cultural materials.

**PHOTOGRAPH****12****Description**

Typical test pit South of Niagara Parkway. Test pits were characterized by an average of 30cm of moderately compacted brown loamy topsoil with a red/orange clay subsoil. All test-pits advanced were devoid of cultural materials.

APPENDIX B - PHOTOGRAPHIC RECORD**PROJECT NO.** SCB191025**PROJECT** Stage 1 and 2 Archaeological Assessment**LOCATION** Niagara Falls, Ontario**PHOTOGRAPH****13****Description**

Saturated test pit displaying water logged area unable to drain above water intake. See figure 7.

**PHOTOGRAPH****14****Description**

Saturated test pit. See Figure 7.

APPENDIX B - PHOTOGRAPHIC RECORD**PROJECT NO.** SCB191025**PROJECT** Stage 1 and 2 Archaeological Assessment**LOCATION** Niagara Falls, Ontario**PHOTOGRAPH****15****Description**

View of study area and crew shovel testing at 5-m intervals, looking North, along Niagara Parkway.

**PHOTOGRAPH****16****Description**

Typical test pit South of Niagara Parkway. Test pits were characterized by an average of 30cm of moderately compacted brown loamy topsoil with a red/orange clay subsoil. All test-pits advanced were devoid of cultural materials.

APPENDIX B - PHOTOGRAPHIC RECORD**PROJECT NO.** SCB191025**PROJECT** Stage 1 and 2 Archaeological Assessment**LOCATION** Niagara Falls, Ontario

	<table border="1"><tr><td>PHOTOGRAPH</td><td>17</td></tr></table>	PHOTOGRAPH	17
PHOTOGRAPH	17		
<table border="1"><tr><td>Description</td></tr><tr><td>View of study area and crew shovel testing at 5-m intervals, looking Northwest, North of Niagara Parkway</td></tr></table>		Description	View of study area and crew shovel testing at 5-m intervals, looking Northwest, North of Niagara Parkway
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	<table border="1"><tr><td>PHOTOGRAPH</td><td>18</td></tr></table>	PHOTOGRAPH	18
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<table border="1"><tr><td>Description</td></tr><tr><td>Typical test pit North of Niagara Parkway. Test pits were characterized by an average of 20cm of moderately compacted brown/grey silty loam topsoil with a brown/grey clay subsoil with 60% gravel inclusions throughout both layers likely associated with the shoring of the Niagara River. All test-pits advanced were devoid of cultural materials.</td></tr></table>		Description	Typical test pit North of Niagara Parkway. Test pits were characterized by an average of 20cm of moderately compacted brown/grey silty loam topsoil with a brown/grey clay subsoil with 60% gravel inclusions throughout both layers likely associated with the shoring of the Niagara River. All test-pits advanced were devoid of cultural materials.
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APPENDIX B - PHOTOGRAPHIC RECORD**PROJECT NO.** SCB191025**PROJECT** Stage 1 and 2 Archaeological Assessment**LOCATION** Niagara Falls, Ontario

PHOTOGRAPH	19		
<table border="1"><thead><tr><th>Description</th></tr></thead><tbody><tr><td>Typical test pit North of Niagara Parkway. Test pits were characterized by an average of 20cm of moderately compacted brown/grey silty loam topsoil with a brown/grey clay subsoil with 60% gravel inclusions throughout both layers likely associated with the shoring of the Niagara River. All test-pits advanced were devoid of cultural materials.</td></tr></tbody></table>		Description	Typical test pit North of Niagara Parkway. Test pits were characterized by an average of 20cm of moderately compacted brown/grey silty loam topsoil with a brown/grey clay subsoil with 60% gravel inclusions throughout both layers likely associated with the shoring of the Niagara River. All test-pits advanced were devoid of cultural materials.
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PHOTOGRAPH	20		
<table border="1"><thead><tr><th>Description</th></tr></thead><tbody><tr><td>Typical test pit North of Niagara Parkway. Test pits were characterized by an average of 20cm of moderately compacted brown/grey silty loam topsoil with a brown/grey clay subsoil with 60% gravel inclusions throughout both layers likely associated with the shoring of the Niagara River. All test-pits advanced were devoid of cultural materials.</td></tr></tbody></table>		Description	Typical test pit North of Niagara Parkway. Test pits were characterized by an average of 20cm of moderately compacted brown/grey silty loam topsoil with a brown/grey clay subsoil with 60% gravel inclusions throughout both layers likely associated with the shoring of the Niagara River. All test-pits advanced were devoid of cultural materials.
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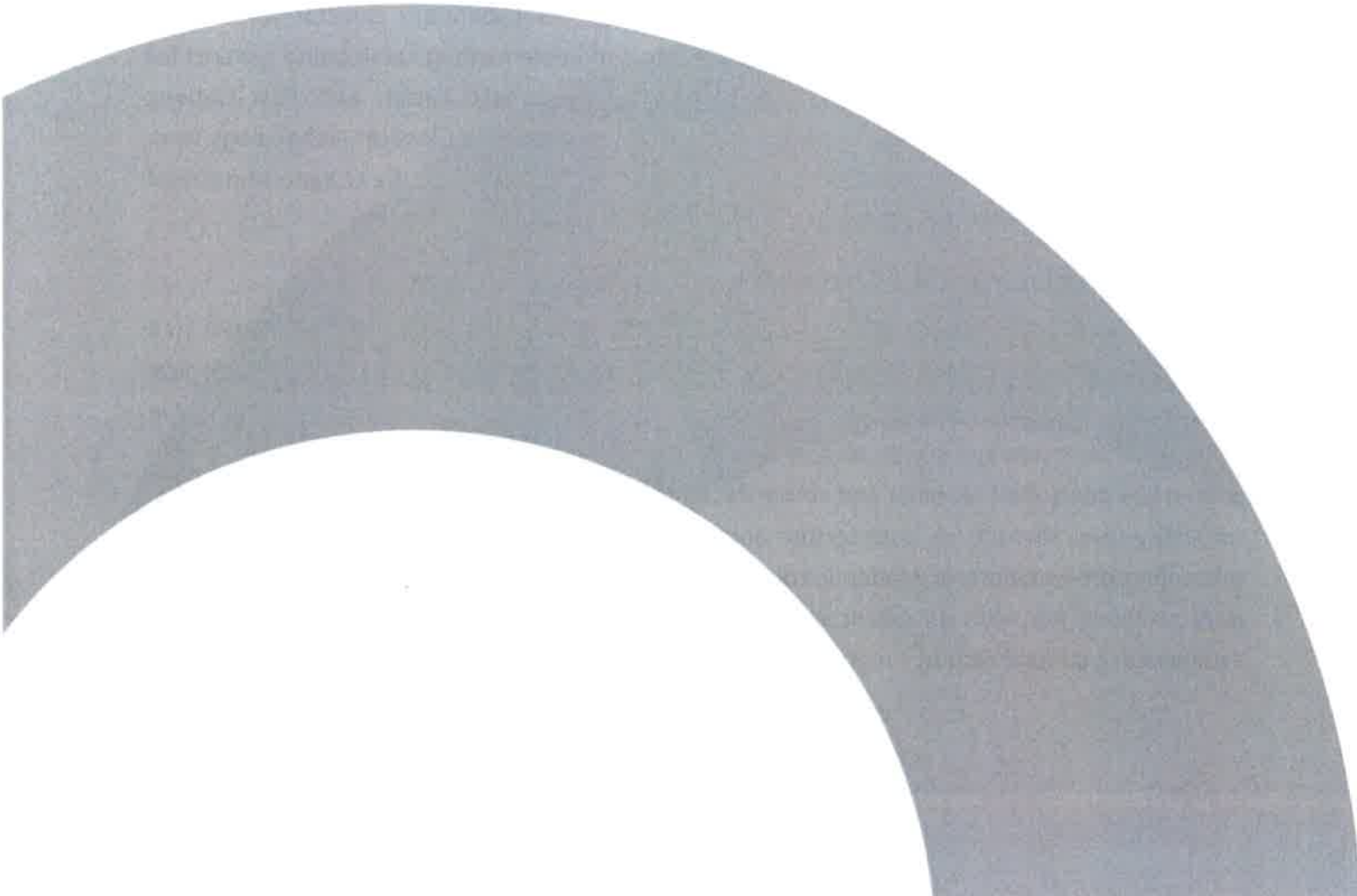


APPENDIX B - PHOTOGRAPHIC RECORD**PROJECT NO.** SCB191025**PROJECT** Stage 1 and 2 Archaeological Assessment**LOCATION** Niagara Falls, Ontario

	<table><tr><td>PHOTOGRAPH</td><td>21</td></tr></table>	PHOTOGRAPH	21
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Appendix C

Assessor Qualifications



Assessor Qualifications

Dr. Shaun Austin, Ph.D. – Associate Archaeologist

Dr. Austin is the Senior Archaeology Advisor of Wood's cultural heritage resources group and is based in the Wood's Hamilton Office. He has been working in Canadian archaeology and heritage since 1976 and as an archaeological and heritage consultant in Ontario since 1987. He is a dedicated cultural heritage consultant with repeated success guiding projects through to completion to the satisfaction of the development proponent, the cultural heritage community and all other stakeholder groups. His areas of interest and expertise include pre-contact Aboriginal lithics and ceramics. Dr. Austin holds a Professional Archaeology License (P141) issued by the Ontario Ministry of Tourism, Culture and Sport, is MTO RAQs certified in Archaeology/Heritage and is a member of the Ontario Association of Professional Archaeologists.

Cara Howell B.A. – Senior Archaeologist

Ms. Howell has been working in consulting archaeology since 1999. During this time she has acquired a full range of archaeological skills, from background research to Stage 4 excavation. She has developed a comprehensive understanding of all aspects of material culture and has a specialized interest in historic Euro-Canadian artifacts. As Laboratory Director for Wood's Archaeology Group, she was instrumental in creating and implementing cataloguing systems for all types of recovered artifacts. Ms. Howell also serves as lead liaison with First Nations communities. She holds a B.A. in Physical Anthropology and a B.A. in Classical Archaeology from McMaster University, and an Applied Research License (R180) issued by the Ontario Ministry of Tourism, Culture and Sport.

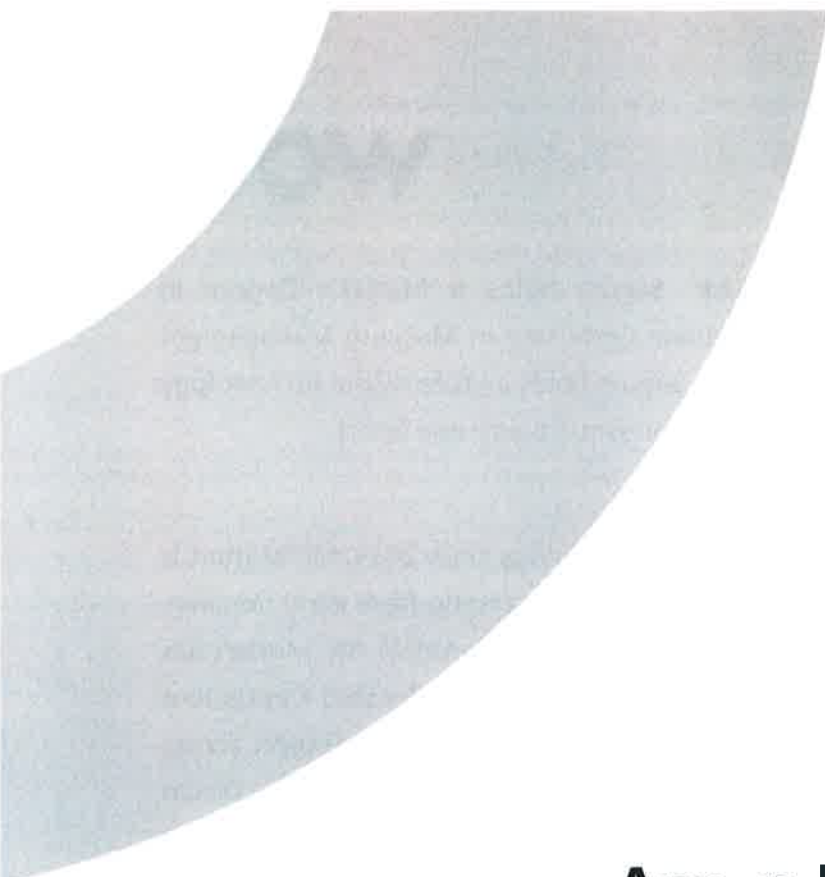
Jason Seguin, M.A. – Senior Archaeologist

Mr. Seguin has been engaged in archaeology since 2004. Mr. Seguin has conducted stage 1 to 4 archaeological assessments including background searches, field surveys, archaeological excavations, analysis of cultural artifacts, laboratory work and reporting. Mr. Seguin is involved in project management and supervision as well as being an archaeological laboratory director. Mr. Seguin has developed research and communication skills through editing field reports, teaching university level students in both lecture and seminar environments, as well as preparing and presenting presentations at academic conferences. Mr. Seguin's education and work experience have provided him with an extensive knowledge base, consisting of theoretical and practical experience in cultural resource management in Canada and Central America, as well as curatorial,

archival and museum management experience. Mr. Seguin holds a Master's Degree in Anthropology from Trent University, and a Post-Graduate Certificate in Museum Management and Curatorship from Sir Sandford Fleming College. Mr. Seguin holds a Professional Archaeology License (License P354) issued by the Ontario Ministry of Tourism, Culture and Sport.

Matthew Muttart, M.A. – Intermediate Archaeologist

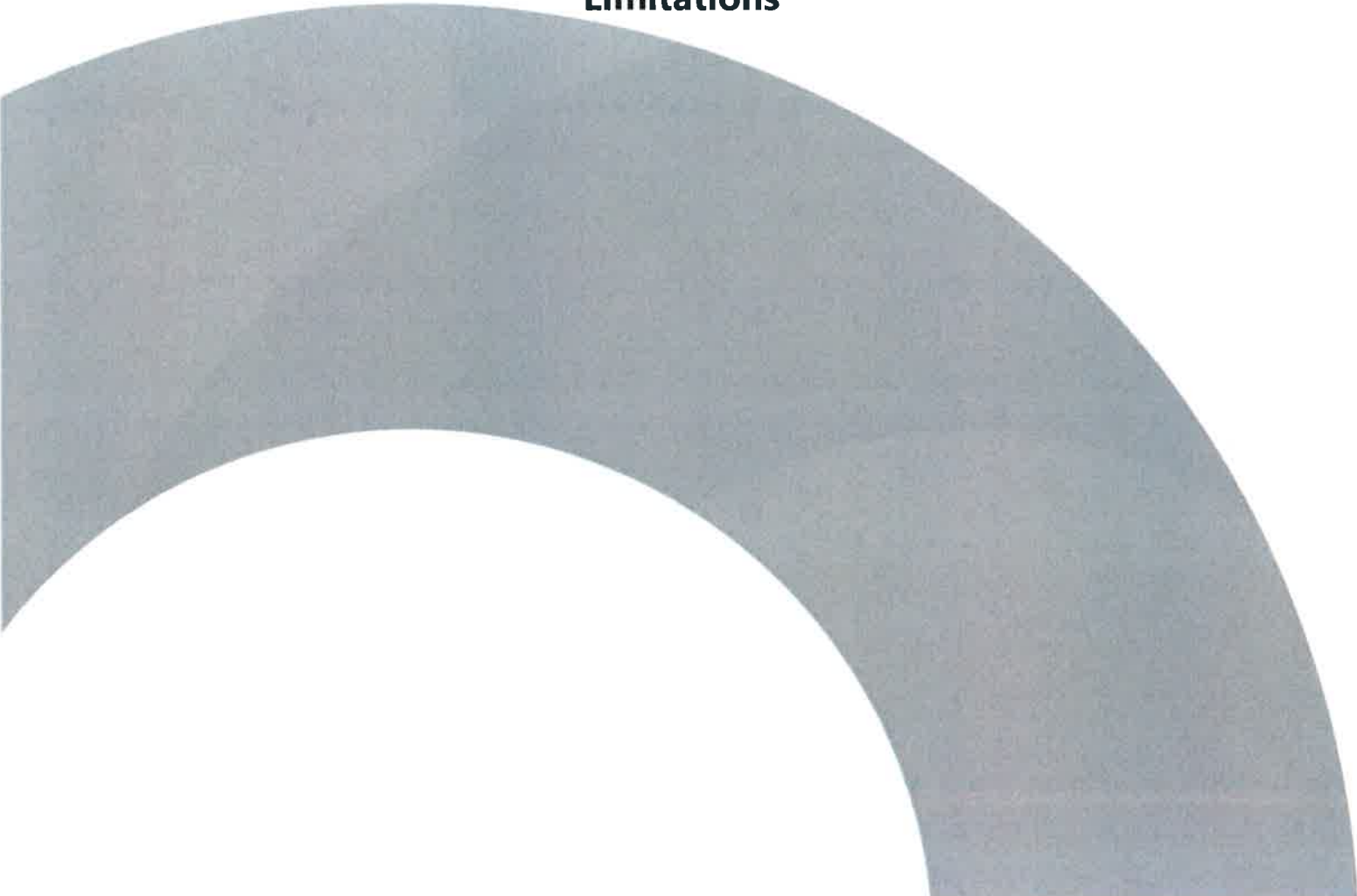
Mr. Muttart has been working in consulting and academic archaeology since 2014. Mr. Muttart is a practiced field director with experience in archaeological projects ranging from early hominin, First Nation, and Euro-Canadian sites in Canada, the United States, and Tanzania. Mr. Muttart has direct field work for archaeological studies of large study corridor projects located throughout Ontario; notably, a Stage 2 study in support of the Wataynikaneyap Transmission Project across multiple remote Northern Ontario Locations, A Stage 2 study in support of TCPL corridor maintenance from Thunder Bay through Timmins, and Stage 3 archaeological investigations for the development of the Nation Rise Wind Farm outside of Ottawa. Mr. Muttart holds a Master's Degree in Biological Archaeology from Colorado State University, and an Applied Research License (R1208) issued by the Ontario Ministry of Tourism, Culture and Sport.



wood.

Appendix D

Limitations



Limitations

1. The work performed in the preparation of this report and the conclusions presented are subject to the following:
 - (a) The Standard Terms and Conditions which form a part of our Professional Services Contract;
 - (b) The Scope of Services;
 - (c) Time and Budgetary limitations as described in our Contract; and,
 - (d) The Limitations stated herein.
2. No other warranties or representations, either expressed or implied, are made as to the professional services provided under the terms of our Contract, or the conclusions presented.
3. The conclusions presented in this report were based, in part, on visual observations of the Study Area. Our conclusions cannot and are not extended to include those portions of the Study Area which were not reasonably available, in Wood Environment & Infrastructure's opinion, for direct observation.
4. The potential for archaeological resources, and any actual archaeological resources encountered, at the Study Area were assessed, within the limitations set out above, having due regard for applicable heritage regulations as of the date of the inspection.
5. Services including a background study and fieldwork were performed. Wood Environment & Infrastructure's work, including archival studies and fieldwork, were completed in a professional manner and in accordance with the Ministry of Tourism, Culture and Sport's guidelines. It is possible that unforeseen and undiscovered archaeological resources may be present at the Study Area.
6. The utilization of Wood Environment & Infrastructure's services during the implementation of any further archaeological work recommended will allow Wood Environment & Infrastructure to observe compliance with the conclusions and recommendations contained in the report. Wood Environment & Infrastructure's involvement will also allow for changes to be made as necessary to suit field conditions as they are encountered.
7. This report is for the sole use of the parties to whom it is addressed unless expressly stated otherwise in the report or contract. Any use which any third party makes of the report, in whole or in part, or any reliance thereon, or decisions made based on any information or conclusions in the report, is the sole responsibility of such third party. Wood Environment & Infrastructure accepts no responsibility whatsoever for damages or loss of any nature or kind suffered by any such third party as a result of actions taken or not taken or decisions made in reliance on the report or anything set out therein.
8. This report is not to be given over to any third-party other than a governmental entity, for any purpose whatsoever without the written permission of Wood Environment & Infrastructure, which shall not be unreasonably withheld.

Appendix E

Technical Agency Consultation

Appendix F

Public Consultation