

FEASIBILITY STUDY – RAW WATER FOR AGRICULTURAL IRRIGATION PURPOSES

PROJECT REPORT

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Executive Summary

Background and Purpose

Agriculture is one of the most important industries in the Niagara Region, generating economic revenues estimated at 1.8 billion dollars per year. Providing irrigation infrastructure has been identified as a strategy to support the tender fruit, grape, greenhouse, and nursery productions in the northern part of the Region. The Region of Niagara has retained Stantec Consulting Ltd. to undertake a feasibility study for providing raw water for agricultural irrigation purposes.

The overall objective of this study was “to provide a single or a range of options for providing raw water to the agricultural community in a manner that is technical feasible, financially responsible, environmentally sustainable, and based on a workable and cost effective management.”¹

Existing Conditions

There are currently some 23,000 acres of land used for tender fruit, grape, greenhouse, and nursery productions in the five municipalities of Niagara-on-the-Lake, St. Catharines, Lincoln, Grimsby, and Pelham. However, the good tender fruit or grape land areas extend over 55,000 acres. There is, therefore, significant room for the expansion of high value crop production in the region.

A significant portion of tender fruit growers and some grape growers currently use irrigation, especially in areas below the Escarpment.

The Region is in an enviable position in terms of availability of water resources. Niagara-on-the-Lake is practically surrounded by water, providing various existing and potential irrigation supply sources. The area below the Escarpment is fairly close to Lake Ontario, and can conceivably use the lake for supplying an irrigation system. A large hydro diversion from the Welland Canal is discharged into Twelve Mile Creek, providing substantial flow on the west side of St. Catharines. The areas above the Escarpment may have access to good groundwater. Various streams pass through the region, and substantial rainfall during the spring provides opportunity for the storage of water and utilization during the summer irrigation season.

The region is also rich in natural and ecological resources. These include several ANSIs, woodlots, wetlands, and streams. Water taking and the construction of a major irrigation infrastructure may potentially impact these important resources.

¹ Regional Municipality of Niagara, Terms of Reference – Feasibility of Providing Raw Water for Agricultural Irrigation Purposes in Niagara, September 2004.

Irrigation Demands

Based on the available data, the peak irrigation demand of the region was estimated at 480,000 cubic meters per day (87,000 US gallon per minute or 4,600 acre-inches per day). The average annual irrigation demand of the Region was estimated at 13 million cubic meters (3.6 Billion US gallon or 11,000 acre-feet).

Irrigation Districts

Based on the locations of the different clusters of potential irrigation lands, the following irrigation districts were identified²:

- East Irrigation District – Niagara-on-the-Lake
- West Irrigation District – Grimsby, Lincoln and St. Catharines. Due to substantial elevation differences within this area, this district was subdivided into two zones:
 - Zone A: below the Escarpment
 - Zone B: above the Escarpment
- South District – Pelham

Permits and Approvals

Any proposed undertaking to supply irrigation water for agricultural purposes will involve a number of provincial and federal permits and approvals. The most fundamental and potentially most challenging of these is likely to be the approval to “take water” (Permit to Take Water). The application for the permit must satisfy a number of tests relating to the purpose and magnitude of the withdrawal, availability of supply, the prevention or minimization of impacts on other water users and the environment, and the demonstration that best management practices will be implemented in the conservation and use of the water.

In considering source options, larger watercourses offer greater certainty (than smaller supply sources) that the level of taking is not likely to interfere with other interests. Similarly taking of water during periods of higher flow can prevent or lessen impacts on the environment and other users.

The Great Lakes Charter and the Niagara Treaty are other key source selection and approval considerations. Source options that do not result in an intra-basin diversion of water and that avoid other issues relating to the bi-national sharing of water would involve less complexity.

² Irrigation “districts” are areas of irrigated lands that due to their geographical, political, or other characteristics can be irrigated by a common supply system.

Alternatives and Short-Listing

Two sets of alternatives were considered:

- **Source Alternatives:** These alternatives were Municipal Treated Water, Municipal Treated Wastewater, Welland Canal, Lake Gibson/Lake Moodie, Twelve Mile Creek, Queenston Reservoir, Outlet of OPG Tunnels, Niagara River, Lake Ontario (including Jordan Harbour), Groundwater, Supply from Off-Stream Reservoirs, and Other Surface Streams.
- **Distribution Alternatives:** The general distribution alternatives considered were pipeline distribution and open channel (ditch) distribution.

The source alternatives underwent an initial short-listing based on their applicability to each district/zone. They were then combined with distribution alternatives, if applicable, to form complete infrastructure alternatives. These were further analyzed based on their financial and non-financial implications.

General Conclusions

The study reached the following general conclusions:

- There is significant room for growth of high value crops in the Region. Difficulties in access to irrigation water may be preventing the expansion of high value agricultural production into the remaining suitable areas of the region.
- The ideal regional irrigation infrastructure will have an initial cost of approximately 100 million dollars. The cost, however, can be reduced to approximately 40 million dollars using open channel distribution (i.e. using the existing municipal drainage ditches)³.
- Any regional irrigation project is likely to require substantial financial support from the government.

Recommended Infrastructure for West District – Zone A

- The servicing of the irrigation areas of Zone A by two systems, one servicing the East side and one servicing the West side, is recommended due to its cost advantage.
- The recommended infrastructure will depend on the available funds for the irrigation project, as follows:

³ The financial figures stated in this report are based on limited data and may change once the actual size and locations of the service area are further examined.

- If funding of \$45 million is available, we recommend two pipeline distribution system. There are five potential sources for the East System (Lake Moodie, Twelve Mile Creek, Welland Canal, Lake Ontario or Jordan Harbour). The costs of these alternative sources appear to be comparable, while they differ in their non-financial implications. The final choice between these alternative sources will require further investigations and consultations. The recommended source for the West System is Lake Ontario.
- If available funding is limited to approximately \$30 to 35 million, we recommend a pipeline distribution system for the West side with an intake in Lake Ontario and an open channel distribution system for the East Side supplied from Lake Moodie or Twelve Mile Creek.
- If available funding is substantially less than \$30 million a centralized irrigation supply and distribution system would become unfeasible. Low cost solutions may be available for irrigating the lands that are close to major water sources (Twelve Mile Creek or Lake Ontario). A program of assistance to construct Off Stream Reservoirs may be provided; however, due to the limited funding, this may be adopted by only a small percentage of the growers who are able to self-finance a substantial portion of the costs.
- Supply from off-stream reservoirs can be used as a solution to reduce the cost of the regional infrastructure where ponds already exist or for small isolated irrigation areas. These possibilities will need to be investigated in more detail in order to finalize the optimum combination of the alternatives, and take advantage of the existing infrastructure.

Recommended Infrastructure for West District – Zone B

- The recommended alternative is Supply from Groundwater Wells, conditional upon the results of a groundwater study.
- If the groundwater study does not support the adoption of this alternative, Supply from Off-Stream Reservoirs would become the recommended alternative. However, even a partial contribution from groundwater wells will substantially reduce the cost of the off-stream reservoirs.

Recommended Infrastructure for East District

- The recommended infrastructure for the East Irrigation District will depend on the available funds for the irrigation project, as follows:
 - If funding of \$45 million is available, we recommend the replacement of the existing irrigation system with a pipeline distribution system with supplies from the Welland Canal – upstream of Lock 2 or Niagara River, or a combination of the two.

- If available funding is limited to approximately \$20 million, we recommend full servicing of the existing open channel irrigation distribution network using a gravity feeder pipeline. The source of the system can be the Welland Canal – upstream of Lock 3 or 6, or the outlet of OPG Tunnels. The selected source will replace the existing supply sources.
- If available funding is limited to approximately \$6 million, we recommend the construction of a gravity feeder pipeline to extend irrigation servicing to the south-west area of the NOTL. The source of the gravity pipeline can be the Welland Canal – upstream of Lock 3 or 6, or the outlet of OPG Tunnels. In addition to the construction of the new gravity main, certain improvements in the existing systems should be implemented if one of these alternatives is selected.

Recommended Infrastructure for South District

- The recommended alternative is Supply from Groundwater Wells, conditional upon the results of a groundwater study.
- If the groundwater study does not support the adoption of this alternative, Supply from Off-Stream Reservoirs would become the recommended alternative. However, even a partial contribution from groundwater wells will substantially reduce the cost of the off-stream reservoirs.

Management of Irrigation Systems

- The recommended management system for each irrigation district at this point is management by municipal authorities, similar to the existing management structure of the Niagara-on-the-Lake system. An overall entity, likely within the Regional Municipality of Niagara, would be desirable to coordinate the work of the different irrigation districts and promote their common interests in areas such as financial and technical support.
- On-farm management of the irrigation systems will require a move toward accepted methods of irrigation scheduling. This will require an educational program prior to the construction phase, and possibly more irrigation research specific to the Region.

Financing

- National Water Supply Extension Program (NWSEP) is expected to be launched in Ontario shortly. This program may be a source of financing for some of the subsequent studies required for this project, for the on-farm irrigation infrastructure recommended for the areas above the Escarpment, and for the improvements to the existing component of the Niagara-on-the-Lake Irrigation System.

- Funding for a complete regional irrigation infrastructure does not exist at the present time and will need to be planned at senior government levels.

Recommended Next Steps

The following are the recommended next steps to follow up on this preliminary study:

1. **Initiation of Discussion on Financing:** Discussion on the level of support from the government and the farmers' ability to pay should be initiated immediately.
2. **Field Study:** A field study is required to fill the data gaps encountered during this feasibility study. A relatively detailed layout of the potential irrigated lands and improved demand estimates will provide sufficient data to finalize the layouts of the different transmission and distribution alternatives as well as cost estimates.
3. **Groundwater Study:** A groundwater study is needed to determine the potential supply capacities of aquifers under the irrigation areas of South District and West District - Zone B (areas above the Escarpment).
4. **Completion of Class Environmental Assessment Phase 2:** This step will include the following additional tasks:
 - a. **Further Consultations:**
 - i. with different levels of government regarding permit requirements.
 - ii. with growers regarding their participation in the project and their ability to pay for the irrigation service.
 - iii. with other major stakeholders, such as OPG, St. Lawrence Seaway Authority, and CN Rail regarding various alternatives that may require their approvals.
 - b. Analysis of the impacts of different alternatives on the natural and social environments.
 - c. Evaluation of short-listed alternatives using the above data and preparation of proposed Preferred Alternatives for discussion with stakeholders.
 - d. Public Information Centres.
 - e. Selection of Preferred Alternatives.

Feasibility Study – Raw Water for Agricultural Irrigation Purposes Project Report

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