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Stantec

October 27, 2004
File: 1634-00545

Township of Alfred and Plantagenet
205 Old Highway 17,
Plantagenet, Ontario
K0B 1L0

Attention: Mrs. Élise Campbell, Deputy Treasurer

Dear Mrs. Campbell:

Reference: Desktop review and Preliminary Optimization Study
Lefaivre Water Treatment Plant

Stantec Consulting Ltd. have been retained by the Township of Alfred and Plantagenet to conduct an optimization study with the objective of re-rating the Lefaivre Water Treatment plant. The study is being initiated following a request for supplementary water allocation for the community of Alfred.

As outlined in the proposal submitted on June 18, 2004, the objectives of the Optimization Study are to verify if the Lefaivre Water Treatment Plant is able to operate at its design capacity under all seasonal conditions, to assess the optimal plant performance, assuming that tube settlers are installed within the existing clarifier, to identify the modifications to various plant components in order to achieve this revised capacity, and to submit a preliminary capital and operation cost estimate associated with these modifications.

1.0 DESCRIPTION OF THE EXISTING LEFAIVRE WTP

The Lefaivre water treatment plant is located at 2017 Main Street, in the Community of Lefaivre, and serves the communities of Lefaivre, Alfred approximately 8 km south of Lefaivre and an area west of the Alfred community limits. The water treatment plant began operation in late 1991 and currently operates in accordance with the Ministry of the Environment (MOE) Certificate of Approval No. 9014-5JASMT, appended herewith in Appendix A. As denoted in the C of A, the water treatment facility is classified as a surface water treatment plant and is capable of treating water at a rated maximum daily flow is 2,900 m^3/d, including wastewater. The Lefaivre Water Treatment Plant consists of the following components:

1.1 Raw Water Intake

A 500 mm diameter polyethylene pipe approximately 120 m long with an intake crib surrounding a 900 mm diameter up-turned flared elbow (UTM zone 18, 508 450 E., 505 495 N.) to provide a maximum inlet velocity of 53 mm/s at the design maximum daily flow of 2,900 m^3/d. The intake includes a 50 mm diameter polyethylene pipe to feed sodium hypochlorite to the intake elbow for zebra mussel control.

1.2 Low Lift Pumping Station

Concrete block and steel clad building having dimensions 6.0 m x 6.0 m located immediately north of the main treatment plant building at the shore of the river housing the following:

- Wet well approximately 5.5 m long x 5.5 m wide x 4 m deep at average river level,
- Two (2) removable inlet screens,
- Four (4) vertical turbine low lift pumps each rated at approximately 12 m TDH as follows:
  - (a) Two (2) low lift pumps each rated at 33.3 L/s (one pump to act as standby)
  - (b) One (1) low lift pump rated at 14.7 L/s
  - (c) One (1) low lift pump rated at 8.8 L/s

1.3 Raw Water Transmission Main

Approximately 10 m of 200 mm diameter pipe to transmit raw water from the low lift pumping station to the WTP.

1.4 Water Treatment Plant

A metal clad building approximately 40 m x 15 m together with an adjoined brick and block building approximately 20.6 m x 8 m housing the laboratory workshop, garage, office and washroom facilities. The building is located approximately 300 m east of the County Road No. 15 and Main Street intersection and on the north side of Main Street and on the south shore of the Ottawa River.

1.4.1 Clarifier/Flocculator

One (1) solids recirculation – reactivator type clarifier/flocculator unit approximately 10.4 m diameter x 5 m deep with a by-pass, including flash chemical mixing, coagulation and sedimentation chambers with automatic sludge withdrawal and a clarifier upflow rate of 1.75 m/h.

1.4.2 High Rate Filters

Two (2) 3.65 m diameter x 3 m high double compartments (total 4 compartments) dual media (anthracite/sand) filters, each with a common integral backwash storage tank for automatic backwashing, backwash troughs, air surface wash and underdrain system each capable of operating at a filtration rate of 11.6 m/h or 5.8 m/h with both filters in operation.

1.4.3 Clearwell

One (1) clearwell with two (2) treated water cells each approximately 11 m long x 10 m wide x 3 m deep with a total volume of 660 m^3.

1.4.4 High Lift Pumps

Two (2) district high lift pumping installations for Lefaivre and Alfred area water distribution systems with a valved off connection between the two systems as follows:

1.4.4.1 Lefaivre System High Lift Pumps

- Two (2) end suction centrifugal pumps rated at 12.5 L/s at 31.7 TDH (one (1) standby);
- One (1) end suction centrifugal (fire) pump rated at 50 L/s at 79.2 TDH.

1.4.4.2 Alfred System High Lift Pumps

- Three (3) double suction centrifugal pumps rated at 15 L/s at 79.2 m TDH. (one (1) standby).

1.4.5 Chemical Feed System

Chemical feed system consisting of chemical pumps, storage tanks, piping and associated appurtenances to dose alum, polyelectrolyte, soda ash, fluoride and sodium hypochlorite solutions as follows:

1.4.5.1 Alum Feed System

- Two (2) chemical feed pumps (one duty, one standby) each rated at 37.8 Lph at 345 kPa dosing alum solution from day tank to raw water piping before the static mixer,
- One (1) 9,100 L liquid alum storage tank, and
- One (1) 450 L day tank.

1.4.5.2 Polyelectrolyte Feed System

- Two (2) chemical feed pumps (one duty, one spare) each rated at 37.8 Lph at 345 kPa dosing polyelectrolyte solution to either before the static mixer or to the flocculator zone inlet, and
- One (1) make-up system with a mixer and a 1,090 L tank and two (2) 1,090 L day tanks all complete with piping and controls.

1.4.5.3 Soda Ash Feed System

- One (1) chemical feed pump rated at 37.8 Lph at 345 kPa dosing soda ash solution to the raw water line at the low lift pumping station and/or before the static mixer ahead of the clearwell, and
- One (1) make-up system with a mixer and a 1,090 L tank, one (1) 1,090 L aging tank and one (1) 1,090 L day tank, complete with piping and controls.

1.4.5.4 Fluoride Feed System

- One (1) chemical feed pump rated at 3.78 Lph at 1,100 kPa drawing hydrofluosilicic acid from a shipping container on a weigh scale in a separate ventilated room and dosing solution before the static mixer ahead of the clearwell.

1.4.5.5 Sodium Hypochlorite Feed System

- Three (3) chemical feed pumps:
- One (1) for pre-chlorination dosing to either the raw water line at the low lift pumping station or the splitter box ahead of the filters rated at 7.56 Lph at 670 kPa,
- One (1) rated at 6.94 Lph at 670 kPa for post-chlorination before the static mixer ahead of the clearwells, and
- One (1) rated at 3.78 Lph at 1000 kPa for post-chlorination of the Alfred transmission main.
- Zebra mussel infestation control facilities complete with pre-chlorination line extending to the intake, including associated valves, piping and monitory and control systems,

- Three (3) day tanks complete with piping and controls, two (2) 450 L capacity and one (1) of 150 L capacity,
- Two (2) chlorine residual analyzers, one (1) pH analyzer, one (1) fluoride analyzer and one (1) turbidity analyzer complete with continuous sampling system and associated piping.

1.4.6 Metering

- Three (3) water meters located as follows:
- Two (2) water meters at water treatment plant, one (1) each for Lefaivre and Alfred treated water systems,
- One (1) water meter at an on-line valve chamber at the westerly limit of village of Alfred.

1.4.7 Sludge and Backwash Water Handling System

- One (1) tank, 48 m^3 volume, for equalization of backwash flow;
- One (1) tank, 16m^2 with variable depth, for settling of backwash and clarifier solids;
- One (1) tank, 77 m^3 volume for decanting of supernatant from clarifier sludge and filter backwash water including recirculating piping to the low lift pumping station and discharge piping to the Ottawa River.

1.4.8 Standby Power Facility

- A 125 kW Diesel engine standby power generator set and associated equipment located in a separate room of the building enclosure.

1.4.9 Appurtenances

- Including piping, electrical and mechanical works, plumbing and ventilation, yard piping, instrumentation and control and metering equipment.

2.0 PROPOSED OPTIMIZATION

Upon review of the existing design capacity of the Lefaivre Water Treatment Facility, it has been determined that the plant is capable of being upgraded from 2,900 m^3/d to approximately 4,480 m^3/d. This increase in capacity is achieved through the installation of tube settlers and supports within the existing clarifier and the following process upgrades:

- Increase diameter of raw water inlet cone from 900mm diameter to 1200mm diameter, this in turn will decrease the inlet hydraulic velocity below 0.075m/s.
- Replacement of the two (2) existing submersible low-lift pumps with two (2) new 20HP low-lift pumps and modification of associated piping.
- In order to meet the Community of Alfred water demands, it is proposed to replace the impellers of the three (3) existing 30HP Alfred high-lift pumps or replace the existing high-lift pumps with two (2) new 40HP pumps. (pump upgrade selection shall be completed during final design stage)
- Additional modifications to the clarifier will include optimization of existing inlet piping to ensure safe hydraulic loading velocities in compliance with the manufacturers input and outlet weir to increase discharge capacity.
- Installation of baffles within existing clearwell, in order to achieve sufficient chlorine contact time in compliance with O. Reg. 170/03.

Please note that based on the information provided, the Lefaivre High Lift pump will not require any upgrades, as the additional pump capacity is dedicated to the Community of Alfred drinking water system.

In addition to the proposed process modifications the following upgrades will be required to ensure compliance with the Safe Drinking Water Act, Ontario Water Resources Act and the current electrical code.

<u>Coagulant feed system</u>

At the optimized rated plant capacity, coagulant demand will essentially be nearing the chemical feed pump rated capacity and as such leaving no flexibility. Therefore it is recommended to replace both coagulant feed pumps with a system capable of providing the required demand.

Reference: Desktop review and Preliminary Optimization Study
Lefaivre Water Treatment Plant

Sodium Hypochlorite feed system

Under the current operating conditions, during a clarifier bypass in the winter (emergency situation), water is discharged with a free chlorine residual of approximately 3.4 mg/L. Although the 3.4 mg/L free chlorine residual does not exceed the current water quality standards (4.0 mg/L), it has raised some concerns from local residents regarding taste and odor. As such upon completing the aforementioned process upgrades the free chlorine residual will not exceed 1.5 mg/L, under worst-case scenario, and therefore eliminating any concerns.

The following table outlines the free chlorine residual to be maintained within clearwell during normal operating and emergency conditions:

CT Requirements			
		Actual Capacity	**Optimized Capacity**
Baffling Factor	T_{10}/T	0.2	0.5
Normal operation – winter	(mgCl/L)	1.4	0.7
Normal operation – summer	(mgCl/L)	0.4	0.2
Clarifier closed – winter	(mgCl/L)	3.4	1.5
One cell closed - summer	(mgCl/L)	0.7	0.4

It is our recommendation to retain the existing Sodium Hypochlorite feed pumps, however replacement of the existing pump heads is anticipated.

Polymer feed system

In order to accommodate the increase rated capacity of the water treatment facility, it is recommended to replace both existing polymer chemical metering pumps and storage tanks to conform with the optimized flow requirements.

Soda Ash feed system

To accommodate the increase rated capacity of the water treatment facility, it is recommended to upgrade the soda ash feed system through the addition of two (2) new soda ash feed pumps and replacement of the storage and mixing tank.

Standby Power (Generator)

As outlined in the Electrical Service Load Study prepared by Stantec, appended herewith in Appendix C, the existing 125kW diesel generator is not capable of supporting the WTP's worst case scenario and as a result must be upgraded to at least a 150kW genset. Even though the 150kW genset will be sufficient for present upgrades, the genset will not allow for any further upgrades. Therefore it is our recommendation to upgrade the existing 125kW genset with a 200kW or 250kW genset. Please note that the propose genset has a larger foot print and as such would be installed in an exterior enclosure, outside of the existing building. The relocation of the genset will occur due to the inability to house the larger genset within the existing electrical room.

2.1 Plant Deficiencies

The following deficiencies have been identified during the review of the existing water treatment facility and should be addressed as part of the proposed upgrades:

- Upgrade polymer feed system, as both pumps are operated simultaneously as duty pumps and currently deficient of one (1) standby pump.
- Upgrade soda ash feed system, as there is only one (1) duty metering dosing pump and no standby pump.
- However not required, in order to properly account for wastewater production and/or requirement for treatment, it is recommended to install a flow meter on the existing sludge management and backwash water handling system discharge piping, to the Ottawa river.
- Although the existing SCADA system is capable of meeting the requirements of the proposed upgrades, it will in turn be limited to any further upgrades (ie. addition of future input/output points).
- The existing fire pump dedicated to service the Community of Lefaivre may not be compliant with fire flow demand and as such additional investigation may be required to properly address this noted deficiency.

Reference: Desktop review and Preliminary Optimization Study
Lefaivre Water Treatment Plant

3.0 DESIGN CRITERIA

The following documents were utilized in the review of the existing water treatment facility and evaluation of the design criteria for the proposed upgrades:

Ministry of the Environment, 1986, Guidelines for the design of Potable Water

Ministry of the Environment, May 2003, Ontario Regulation 170/03 made under the Safe Drinking Water Act, 2002 – Drinking Water Systems.

Ministry of the Environment, April 2003, Procedure for Disinfection of Drinking Water in Ontario.

4.0 COST ESTIMATE

Capital Costs

The following table summarizes the preliminary construction costs associated with the upgrades to the Lafaivre Water Treatment Plant; refer to Appendix B for further details:

Preliminary Construction Cost Estimate

Raw Water Intake	$ 20,000
Low Lift Pumps	$ 50,000
10.4 meter diameter Clarifier	$ 120,000
Clearwell in Lefaivre and Elevated Storage Tank in Alfred	$ 60,000
Alfred High Lift Pumps	$ 90,000
Standby Power (Generator)	$ 200,000
Chemical feed system	$ 160,000
Allen Bradley PLC	$ 30,000
Total Cost (excl. GST, Engineering & Contingencies)	$ 730,000

Operating Costs

Upon examining the operating costs for the proposed optimized plant, we can assume that the fixed costs, such as heating, chemical testing and labor, would not increase significantly, as there is no additional equipment to be maintained. While consumable, such as chemical reagents would increase proportionally to the total flowrate.

Reference: Desktop review and Preliminary Optimization Study
Lefaivre Water Treatment Plant

Based on 5.5 cents/kW/h, it is anticipated that electricity costs will increase by approximately $4,000 per year due to the increased capacity of the low lift pumps and two (2) Alfred high lift pumps. This increase will not be effective until the completion of plant optimization

While taking into account the operating costs, consumable and electricity, it is anticipated that the overall operation costs per resident will increase over the short term however will decrease as additional residents are serviced.

Should you have any questions regarding the above information, please do not hesitate to call the undersigned.

Sincerely,

STANTEC CONSULTING LTD.

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Ministry of the Environment | Ministère de l'Environnement

Ontario

AMENDED CERTIFICATE OF APPROVAL
MUNICIPAL AND PRIVATE WATER WORKS
NUMBER 9014-5JASMT

The Corporation of the Township of Alfred and Plantagenet
PO Box 350
Plantagenet, Ontario
K0B 1L0

Site Location: Lefaivre Water Treatment Plant
2017 Main Street
Alfred and Plantagenet Township, United Counties of Prescott and Russell

You have applied in accordance with Section 52 of the Ontario Water Resources Act for approval of:

a surface water treatment plant, serving the hamlet of Lefaivre and the village of Alfred, located on the south side of the Ottawa River in the hamlet of Lefaivre, approximately 300 m east of the intersections of County Roads 24 and 15, rated at a maximum daily flow of 2,900 m^3/day, consisting of the following:

PROPOSED WATER WORK UPGRADES
(as per application for approval dated December 3, 2002)

Clearwell

- extend inlet piping at both treated water cells and install two sections of 3 m long perforated PVC diffuer pipe located at the cell corner opposite to the suction outlet;

- 300 mm diameter flap gate check valve at clearwell overflow pipe outlet inside storm manhole no. 1;

Residue Management System

- abandon the backwash water recirculation pipe to low lift pump station by removing a shear gate and plugging the pipe with a 300 diameter blank flange;

High Rate Filters

- 150 mm diameter filter-to-waste piping, at each of the 4 filter compartments, complete with air release valves and sampling taps;

- two (2) turbidity analyzers, one at each of filter effluent line;

Sodium Hypochlorite Feed System

- two (2) chemical feed pumps (duty and standby), each rated at 4.4 L/hr, for pre-chlorination dosing

sodium hypochlorite solution to one or a combination of: the raw water line at the low lift pumping station, the splitter box ahead of the filters, or the zebra mussel control injection point;

- two (2) chemical feed pumps (duty and standby), each rated at 4.4 L/hr, for post-chlorination dosing sodium hypochlorite solution before the static mixer ahead of the clearwells;

- two (2) chemical feed pumps (duty and standby), each rated at 1.4 L/hr, for post-chlorination dosing sodium hypochlorite solution to the Alfred transmittion main;

- three (3) 100 L day tanks, at each of the chlorination systems;

- 260 mm high concrete containment curb, at chlorine solution tanks area;

Soda Ash and Polyelectrolyte Feed Systems

- 240 mm high concrete containment curb, at polyelectrolyte and soda ash mixing tanks area;

- 230 mm high concrete containment curb, at polyelectrolyte and soda ash day tanks area;

including appurtenances, electrical, mechanical and instrumentation, all in accordance with the application for approval dated December 3, 2002, plans and supporting information submitted by Stantec Consulting Limited, consulting engineers.

EXISTING WATER WORKS

(as approved under Certificate of Approval No. 5025-5D2HRV issued August 16, 2002)

Raw Water Intake

- a 120 m long, 500 mm diameter polyethylene with an intake crib surrounding a 900 mm diameter up-turned flared elbow intake extending 100 m into the Ottawa River, located adjacent to the water treatment plant approximately 300 m east of County Road 15; including a 50 mm diameter polyethylene pipe to feed sodium hypochlorite solution to the intake for zebra mussel control;

Low Lift Pumping Station

- a concrete block and steel clad building having dimensions 6.0 m x 6.0 m located immediately north of the main treatment plant building at the shore of the Ottawa River (NAD 27; UTM Zone 18; 508195.00 E; 5053850.00 N) housing the following:

    - wet well approximately 5.5 m long x 5.5 m wide x 4 m deep at average river level,

    - two (2) removable inlet screens,

    - four (4) vertical turbine low lift pumps each rated at approximately 12 m total dynamic head (TDH) as follows:

- two (2) low lift pumps each rated at 33.3 L/s (one duty, one standby)
- one (1) low lift pump rated at 14.7 L/s
- one (1) low lift pump rated at 8.8 L/s

Raw Water Transmission Main

- approximately 10 m of 200 mm diameter pipe to transmit raw water from the low lift pumping station to the WTP, complete with chemical injection points for pH adjustment, coagulants and sodium hypochlorite, and in-line static mixer.

Water Treatment Plant

- a metal clad building approximately 40 m x 15 m together with an adjoined brick and block building approximately 20.6 m x 8 m housing the laboratory, workshop, garage, office and washroom facilities located approximately 300 m east of the intersection of County Road No. 15 and Main Street on the north side of Main Street, on the south shore of the Ottawa River (NAD27; UTM Zone 18; 508190.00 E; 5053800.00 N).

Clarifier/Flocculator

- one (1) solids recirculation – reactivator type clarifier/flocculator unit approximately 10.4 m diameter x 5 m deep with a by-pass, including flash chemical mixing, coagulation and sedimentation chambers with automatic sludge withdrawal and a clarifier upflow rate of 1.75 m/h.

High Rate Filters

- two (2) 3.65 m diameter x 3 m high double compartments (total 4 compartments) dual media (anthracite/sand) filters, each with a common integral backwash storage tank for automatic backwashing, backwash troughs, air surface wash and underdrain system each capable of operating at a filtration rate of 11.6 m/h or 5.8 m/h with both filters in operation.

Clearwell

- one (1) clearwell with two (2) treated water cells each approximately 11 m long x 10 m wide x 3 m deep with a total volume of 660 m^3.

High Lift Pumps

- two (2) district high lift pumping installations for Lefaivre and Alfred area water distribution systems with a valved off connection between the two systems as follows:
  - Lefaivre System High Lift Pumps

- two (2) end suction centrifugal pumps rated at 12.5 L/s at 31.7 TDH (one (1) standby);
- one (1) end suction centrifugal (fire) pump rated at 50 L/s at 79.2 TDH.

- Alfred System High Lift Pumps
  - three (3) double suction centrifugal pumps rated at 15 L/s at 79.2 m TDH. (one (1) standby).

Chemical Feed Systems

- chemical feed system consisting of chemical pumps, storage tanks, piping and associated appurtenances to dose alum, polyelectrolyte, soda ash, fluoride and sodium hypochlorite solutions as follows:

Alum Feed System
- two (2) chemical feed pumps (one duty, one standby) each rated at 37.8 Lph at 345 kPa dosing alum solution from day tank to raw water piping before the static mixer, one (1) 9,100 L liquid alum storage tank, and one (1) 450 L day tank.

Polyelectrolyte Feed System
- two (2) chemical feed pumps (one duty, one spare) each rated at 37.8 Lph at 345 kPa dosing polyelectrolyte solution to either before the static mixer or to the flocculator zone inlet, and one (1) make-up system with a mixer and a 1,090 L tank and two (2) 1,090 L day tanks all complete with piping and controls.

Soda Ash Feed System
- one (1) chemical feed pump rated at 37.8 Lph at 345 kPa dosing soda ash solution to the raw water line at the low lift pumping station and/or before the static mixer ahead of the clearwell, and one (1) make-up system with a mixer and a 1,090 L tank, one (1) 1,090 L aging tank and one (1) 1,090 L day tank all complete with piping and controls.

Fluoride Feed System
- one (1) chemical feed pump rated at 3.78 Lph at 1,100 kPa drawing hydrofluosilicic acid from a shipping container on a weigh scale in a separate ventilated room, dosing solution to the raw water main before the static mixer ahead of the clearwell.

Sodium Hypochlorite Feed System
- three (3) chemical feed pumps:

- one (1) for pre-chlorination dosing to one or a combination of: the raw water line at the low lift pumping station, the splitter box ahead of the filters, or the zebra mussel control injection point; rated at 7.56 Lph at 670 kPa,

- one (1) rated at 6.94 Lph at 670 kPa for post-chlorination before the static mixer ahead of the

clearwells, and

- one (1) rated at 3.78 Lph at 1000 kPa for post-chlorination of the Alfred transmission main

- and a zebra mussel infestation control facilities complete with pre-chlorination line extending to the intake, and including all associated valves, piping and monitory and control systems; three (3) sodium hypochlorite day storage tanks complete with piping and controls, two (2) 450 L capacity and one (1) of 150 L capacity

Water Quality Monitoring

- two (2) chlorine residual analyzers, one (1) pH analyzer, one (1) fluoride analyzer and one (1) turbidity analyzer complete with continuous sampling system and associated piping

Flow Metering

- three (3) water meters located as follows:

  - two (2) water meters at water treatment plant [one (1) each for Lefaivre and Alfred treated water systems]

  - one (1) water meter at an on-line valve chamber at the westerly limit of village of Alfred.

Residue Management System

- one (1) tank, 48 m^3 volume, for equalization of backwash flow;

- one (1) tank, 16m^2 with variable depth, for settling of backwash and clarifier solids;

- one (1) tank, 77 m^3 volume for decanting of supernatant from clarifier sludge and filter backwash water including recirculating piping to the low lift pumping station and discharge piping to the Ottawa River.

Sanitary Sewage System

- one (1) septic tank and tile bed system for W.T.P. sanitary sewage disposal.

Standby Power Facility

- a 125 kW Diesel engine standby power generator set and associated equipment located in a separate room of the building enclosure.

and including all piping, electrical and mechanical works, plumbing and ventilation, yard piping, instrumentation and control and metering equipment;

all in accordance with the Engineer's Report entitled "Township of Alfred-Plantagenet - Lefaivre Water

Treatment Plant - Engineer's Report", prepared by Stantec Consulting Limited and dated November, 2000, and any additional information and documentation that may have been provided in support of the Report.

For the purpose of this Certificate of Approval and the terms and conditions specified below, the following definitions apply:

(1) "certificate" means this entire certificate of approval document, issued in accordance with Section 52 of the *Ontario Water Resources Act*, and includes the schedules to it, if any, and any applications for approval for which certificates of approval have previously been issued, and supporting information to the applications;

(2) "Director" means any Ministry employee appointed as Director pursuant to Section 5 of the *Ontario Water Resources Act*;

(3) "Ministry" means the Ontario Ministry of the Environment;

(4) "Owner" means the Corporation of the Township of Alfred and Plantagenet, and includes its successors and assignees;

(5) "works" means the water works described in this certificate and in the supporting documentation included in the Engineer's Report for Water Works, to the extent approved by this certificate;

(6) "water treatment plant" means the entire water treatment system, including the water intake facilities, and any water storage facilities associated with the water treatment plant;

(7) "water treatment or distribution system" means a system for collecting, producing, treating, storing, supplying or distributing water that includes one or more water works;

(8) "quarter" means the three-month period beginning on January 1, April 1, July 1 and October 1 in each year;

(9) "maximum flow rate" means the maximum rate of water flow for which the plant or process unit was designed;

(10) "contact time" means the detention time T_{10} which is the time for 10% of the water (tracer) to pass through the process unit, storage reservoir or pipe;

(11) "operating authority" means the **Ontario Clean Water Agency**, hired by the Owner to operate the works, and includes any subsequent operating authority hired by the Owner in the future to operate the works.

You are hereby notified that this approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. PERFORMANCE

1.1 The Owner shall ensure that, subject to Conditions 3.1 through 3.14, the water treatment or distribution system is operated and maintained in such a manner, and with such facilities that water supplied to the consumers serviced by the system satisfies the requirements of the "Ontario Drinking Water Standards", dated January 2001, as amended from time to time.

1.2 The Owner shall ensure that, subject to Conditions 3.1 through 3.14, the water treatment plant is operated to treat water at a rate not exceeding the maximum flow rate of 2,900 m^3/d (total).

(a) The Owner shall have and maintain a valid Permit To Take Water;

(b) The Owner shall submit an application for an amendment to this certificate when the approved maximum flow rates exceed the flow rates specified in the valid Permit To Take Water.

1.3 The Owner shall ensure that the flows into the water treatment plant do not exceed the maximum flow rate(s) set out in Condition 1.2, except:

(a) where necessary to meet an unusual water demand for fighting a large fire, or

(b) where necessary for the purpose of maintenance of the works and essential to its efficient operation,

and provided that the treated water quality satisfies the requirements set out in the Ministry Procedure B13-3 entitled "Chlorination of Potable Water Supplies in Ontario", dated January 2001, as amended from time to time.

1.4 The Owner shall ensure that the disinfection facilities in the water treatment plant are operated and maintained in such a manner and with such facilities as is necessary to be in accordance with the Ministry Procedure B13-3 entitled "Chlorination of Potable Water Supplies in Ontario", dated January 2001, as amended from time to time.

1.5 The Owner shall ensure that the backwash/wastewater treatment facilities are operated and maintained in such a manner that the annual average concentration of suspended solids in the backwash/wastewater treatment facilities' effluent discharged to the Ottawa River does not exceed 25 mg/L, where "annual average concentration" means the arithmetic mean of all individual concentrations of a contaminant in the effluent sampled or measured, or both, during a calendar year.

2. MONITORING AND RECORDING

2.1 The Owner shall ensure that the following monitoring program is established and carried out:

(a) Install, maintain and operate a sufficient number of flow measuring devices to measure:

(i) the flow rate and daily quantity of water being taken from each source (well or intake) and conveyed to and through the water treatment plant, and

(ii) the flow rate of treated water supplied to the distribution system.

(b) Calibrate the flow measuring devices required by clause (a) above at regular intervals not exceeding one year to ensure their accuracy to within plus or minus 5% of actual rate of flow within the range of 10% to 100% of the full scale reading of the measuring devices, or as specified by the instrument manufacturer's instructions.

(c) Record the results of the flow measurements made in accordance with clause (a) above as total daily flow and as daily peak flows.

(d) Record the date, time, duration and cause of each occasion that the flow rate exceeds that specified in Condition 1.2.

(e) Install, maintain and operate continuous water quality analyzers and indicators with alarm systems, calibrated as specified by the instrument manufacturer's instructions or as in "Standard Methods for the Examination of Water and Wastewater" 20th Edition, 1998, or a more recently published edition, to monitor the following parameters at the indicated locations:

(i) free chlorine residual in treated water at the point(s) of entrance to the distribution system (quality control band: $\pm$ 0.05 mg/L at a chlorine concentration of 1.0 mg/L chlorine or a proportionately wider band where the plant stream being monitored routinely contains a higher concentration of chlorine),

(ii) turbidity of filtered water at the point(s) of discharge from each filter (quality control band: $\pm$ 0.1 NTU),

(iii) fluoride concentration in treated water at the point(s) of entrance to the distribution system (quality control band: $\pm$ 0.1 mg/L).

(f) Samples of raw water and treated water shall be collected and analyzed for parameters at the locations and frequencies in accordance with Regulation 459/00, Drinking Water Protection, Schedule 2, Sampling and Analysis Requirements, as amended from time to time.

NOTE: Works which do continuous monitoring of chlorine residual or turbidity may do so instead of taking and analyzing grab samples as may be required by O. Reg. 459/00.

NOTE: Samples of raw water do not need to be analyzed for heterotrophic plate count or

background colonies.

(g) In addition to the sampling and analysis requirements of O. Reg. 459/00, collect and analyze:

(i) samples of raw water quarterly for the following parameter(s):

Organic Nitrogen
Dissolved Organic Carbon
Colour

(ii) samples of the backwash/wastewater treatment facilities' effluent at the point of discharge to the Ottawa River for at least the following parameters at the indicated frequencies:

Parameter	Type of Sample	Frequency
Suspended Solids	Composite*	Monthly

* Composite sample means a sample made up of at least three (3) individual samples collected at equal time intervals over a discharge event, the first sample being taken near the beginning and the last sample being taken near the end of the discharge event.

(h) The sampling required by clauses (f) and (g) above shall be performed in a manner that ensures samples have a composition which is representative of the water stream from which they are taken and also in accordance with the instructions provided by the accredited laboratory engaged to perform the analyses.

2.2 The Owner shall retain for a minimum of five (5) years from the date of their creation, all records and information related to or resulting from the monitoring, sampling and analyzing activities required by this certificate.

3. OPERATIONS AND MAINTENANCE

3.1 The Owner, when making decisions within its authority, shall consider the impact of these decisions on the drinking water supply source for water works approved by this Certificate.

3.2 The Owner shall ensure that, subsequent to repairs to the water supply or distribution system, or interruptions in the operation of the water supply resulting in negative pressure conditions in the distribution system, and prior to utilization of the affected parts of the works for the supply of potable water, the affected parts of the water supply or distribution system have been adequately disinfected in accordance with the Ministry Procedure B13-3 entitled "Chlorination of Potable Water Supplies in Ontario", dated January 2001, as amended from time to time.

3.3 The Owner shall ensure that there is an operator who holds a valid licence that is applicable to this type of water treatment plant and that is of the same class as or higher class than the class determined for the water treatment plant in accordance with O. Reg. 435/93, as amended from time to time, and who is

responsible for the operation of the water treatment plant.

3.4 The Owner shall exercise due diligence in ensuring that, at all times, the works and the relate equipment and appurtenances used to achieve compliance with this certificate are properly operated an maintained. Proper operation and maintenance shall include effective performance, adequate fundin adequate operator staffing and training, including training in all procedures and other requirements c this certificate and the Act and regulations, adequate laboratory facilities, process controls and alarm and the use of process chemicals and other substances that come in contact with water being treated, tha are suitable for the process, compatible with each other and appropriate for drinking water.

3.5 In addition to the requirements of Condition 3.4, the Owner shall ensure that all chemicals used in th treatment process and all materials contacting the water meet both the American Water Work Association (AWWA) quality criteria as set out in AWWA standards and the American Nationa Standards Institute (ANSI) safety criteria as set out in ANSI standard NSF/60 or NSF/61. For a chemicals used in the water treatment process and all materials contacting the water being treated, th Owner shall have evidence of current chemical and material product registration by a testing institutio accredited under the Standards Council of Canada Act or by the ANSI or, documents showing th Ministry is satisfied that the information provided by the product manufacturer indicates the chemical c material product will meet the criteria of the ANSI standards.

3.6 The Owner shall immediately discontinue use of any chemical upon written notice by the Director.

3.7 The Owner shall establish written procedures for the notification of the Medical Officer of Health an the Ministry required by O. Reg. 459/00, and shall ensure that these procedures are followed.

3.8 The Owner shall ensure that contingency plans and procedures are established and adequate equipmer and material are available for dealing with emergencies, upset conditions and equipment breakdowns i the works, and that such plans and procedures are implemented.

3.9 The Owner shall ensure that an operations manual that incorporates, at a minimum, the requirements o this certificate related to the works existing at the time of the issuance of the certificate, and any adopte operation and maintenance recommendations of the Engineer's Report based on which this certificat has been issued, is prepared, and ensure that the operations manual is kept up to date such that an relevant updates to the manual are completed prior to commissioning of any new works o implementation of any operational changes. Upon request, the Owner shall make the manual availabl for inspection by the Ministry personnel.

3.10 The Owner shall ensure that based on the raw water source characterization and the treatment proces the operations manual includes monitoring and reporting of the necessary raw water and in-proces parameters that are essential for control of the treatment process and for the assessment of th performance of the works. The manual shall also contain procedures that are required for adequat operation and maintenance of the monitoring equipment.

3.11 For all works constructed after December 2001, including all physical changes to any at that tim existing works, within one (1) year of substantial completion of the construction of the works/changes

the Owner shall ensure that drawings accurately showing the new works/changes as constructed (record drawings) are prepared and kept up-to-date, including timely incorporation of all modifications made to the works throughout its operational life.

3.12 The Owner shall ensure that a Process and Instrumentation Diagram (PID) for the entire water treatment plant is prepared and kept up-to-date, including timely incorporation of all modifications made to the works throughout its operational life.

3.13 The Owner shall keep a complete set of up-to-date record drawings and diagrams required to be prepared by Conditions 3.11 and 3.12, and all existing record drawings which are currently in retention throughout the operational life of the water works, and upon request, shall make them readily available for inspection by Ministry staff.

3.14 The Owner shall ensure that procedures are established and followed for receiving, responding to, and recording complaints about any aspects of the works, including recording the steps that were taken, if any, to determine the cause of complaint and the corrective measures taken to alleviate the cause and prevent its reoccurrence.

4. COMPLIANCE REPORT

4.1 (a) The Owner shall ensure that a written report detailing compliance with all terms and conditions of this approval is completed annually ("Compliance Report").

(b) The first Compliance Report shall cover a period commencing not later than January 18, 2002 to the end of that calendar year and shall be completed and made available not later than March 31 of the following year. Each subsequent Compliance Report shall be completed and made available not later than March 31 following the end of the calendar year to which the Compliance Report applies.

(c) A Compliance Report shall include, at a minimum, the following information:

(i) Under a heading of 'Compliance with Terms and Conditions of the Certificate of Approval', a statement as to compliance with all of the terms and conditions of the certificate and a detailed description of the measures taken to ensure compliance with the certificate, including any supporting data or other information;

(ii) In the event of any non-compliance during the reporting period, and under a heading of 'Non-Compliance with Terms and Conditions of the Certificate of Approval', details of the non-compliance as well as details of how and when any non-compliance was corrected;

(iii) A summary and discussion of the quantity of water supplied during the reporting period compared to the rated capacity specified in this certificate of approval, including monthly average and maximum daily flows;

(iv) A summary of records made under Condition 2.1 related to flow rate exceedances, and a summary of analytical results of sampling required by the certificate, including raw water and in-process parameters as specified in the operations manual in accordance with Condition 3.10; and

(v) A summary listing treatment chemicals used, including average dosage rates with special reference to any abnormal usages.

(d) The Compliance Report shall be signed by a person designated by the Council of the municipality that owns the works.

(e) Within three months of completion of the Compliance Report, the Owner shall confirm by a resolution of council that the Compliance Report has been presented to council.

(f) The Owner shall ensure that copies of the Compliance Report are available for inspection by any member of the public during normal business hours without charge and at the same location as that required by s.11 of O.Reg. 459/00 for reports under that regulation. Each 4th quarter report required under section 12 of that regulation shall include information about when the Compliance Report is required to be completed, an outline of the requirements for its contents, and the location where the completed report can be inspected.

5. UPGRADING REQUIREMENTS

5.1 Subject to Condition 5.2 below, the Owner shall implement the following physical improvements to the works, in keeping with recommendations of the Engineers' Report and related correspondence:

The following work shall be completed before **July 1, 2003**:

(a) All works and measures necessary to ensure that appropriate free chlorine residual and associated contact time calculated at the plant rated capacity with the unit processes providing contact time at a minimum operating level and under limiting temperature and pH conditions meet requirements of the "Procedure B13-3 Chlorination of Potable Water Supplies in Ontario", including but not limited to:

(i) All works necessary to ensure that the effective chlorine contact time downstream of the filters is sufficient to provide 0.5 log inactivation of giardia cysts and 2 log inactivation of viruses.

(ii) eliminate the discharge of settled backwash water to the low lift pump station or provide adequate treatment to ensure the removal or inactivation of giardia and giardia cysts.

The following work shall be completed before **December 31, 2003**:

(b) All works and measures necessary to ensure the effective treatment and integrity of the works, including but not limited to:

(i) install backflow prevention on the reservoir overflow piping

(ii) provide sampling taps on each filter discharge line

(ii) provide spill containment for all chemical storage systems

(iv) install turbidity meters on each filter effluent line

(v) install filter-to-waste capability for each filter

(vi) install duplicate chlorination chemical feed pumps complete with alarms, controls and automatic switchover

5.2 The Owner shall not construct or allow the construction of any portion of the works necessary to comply with the requirements of Condition 5.1 above for which an approval under the *Ontario Water Resources Act* or the *Environmental Protection Act* is required unless a complete application for approval of such portion of the works, including detailed design drawings, specifications and a design brief containing detailed design calculations, has been submitted to and approved by the Director.

5.3 The Owner shall ensure that a complete application for approval under Section 52 of the *Ontario Water Resources Act*, and if necessary, under Section 9 of the *Environmental Protection Act*, is submitted to the Director for each item listed in Condition 5.1 above for which an approval is required at a date which will allow the Owner to obtain approval for the required physical upgrades to the works, and implement the upgrades on or before the compliance date stipulated in Condition 5.1 above.

6. SUBSEQUENT ENGINEERS' REPORTS

6.1 The Owner shall ensure that not later than **March 31, 2003** a Second Engineer's Report, prepared in accordance with the Ministry publication "Terms of Reference for Second and Subsequent Engineers' Reports for Water Works" current at the time of the preparation of the Report, is submitted to the Director.

6.2 The Owner shall ensure that each subsequent Engineer's Report, required by O. Reg. 459/00 to be submitted to the Director not later than the third anniversary of the submission of the previous report, is prepared in accordance with the Ministry publication "Terms of Reference for Second and Subsequent Engineers' Reports for Water Works" current at the time of the preparation of the Report.

7. REVOCATION OF EXISTING APPROVALS

7.1 The descriptions of the approved works and conditions of approval in this certificate apply in place of all

existing descriptions and conditions in the certificates of approval under the *Ontario Water Resources Act* for water works which are part of the works approved by this certificate.

7.2 Notwithstanding Condition 7.1 above, the original applications for approval, including design calculations, engineering drawings and reports prepared in support of the existing certificate(s) of approval whose descriptions of the approved works and conditions are now replaced pursuant to Condition 7.1 above, shall form part of this certificate.

7.3 Where an existing certificate of approval referred to in Condition 7.1 above applies to works in addition to the works approved by this certificate, it shall continue to apply to those additional works.

8. INFORMATION

8.1 The requirements in this certificate shall not be construed as limiting in any way the ability of the Ministry to request or require the Owner to furnish any information related to compliance with this certificate, as limiting in any way the authority of the Ministry to require certain steps be taken, or as evidence of the fulfillment of the obligation to report or notify of non-compliance where reporting or notification is required by a statute, regulation, order or other approval.

8.2 In the event the Owner provides the Ministry with information, records, documentation or notification in accordance with this certificate ("Information"),

(a) the receipt of the Information by the Ministry;

(b) the acceptance by the Ministry of the Information's completeness or accuracy; or

(c) the failure of the Ministry to prosecute the Owner or to require the Owner to take any action, under this certificate or any statute or regulation in relation to the Information;

shall not be construed as an approval, excuse or justification by the Ministry of any act or omission of the Owner relating to the Information, amounting to non-compliance with the certificate.

9. CHANGE OF OWNERSHIP

9.1 The Owner shall notify the Manager of the local District office of the Ministry in writing of any of the following changes within 30 days of the change occurring:

(a) change of owner or operating authority, or both;

(b) change of address of owner or operating authority or address of new owner or operating authority;

(c) change of partners where the owner or operating authority is or at any time becomes a

partnership, and a copy of the most recent declaration filed under the *Partnerships Registration Act* shall be included in the notification to the Manager of the local District office of the Ministry;

(d) change of name of the corporation where the owner or operating authority is or at any time becomes a corporation, other than a municipal corporation, and a copy of the most current "Initial Notice or Notice of Change" (Form 1, 2 or 3 of O.Reg. 189, R.R.O. 1980, as amended from time to time), filed under the *Corporations Information Act* shall be included in the notification to the Manager of the local District office of the Ministry;

9.2 In the event of any change in ownership of the works, other than change to a successor municipality, the Owner shall notify in writing the succeeding owner of the existence of this certificate, and a copy of such notice shall be forwarded to the Manager of the local District office of the Ministry.

9.3 The Owner shall ensure that all communications made pursuant to Conditions 9.1 and 9.2 will refer to this certificate's number.

10. INTERPRETATION (Severability and Conflicts)

10.1 The requirements of this certificate are severable. If any requirement of this certificate, or the application of any requirement of this certificate to any circumstance, is held invalid, the application of such requirement to other circumstances and the remainder of this certificate shall not be affected thereby.

10.2 In all matters requiring the interpretation and implementation of this certificate, the conditions of the certificate shall take precedence, followed by the documentation submitted in support of the applications associated with any previously issued certificates of approval for works which are part of the works approved by this certificate.

The reasons for the imposition of these terms and conditions are as follows:

1. Conditions 1.1, and 1.4 are included so that the water quality delivered by the water treatment plant satisfies the current Ontario Drinking Water Standards in order to protect public health and so that the water is aesthetically acceptable.

2. Conditions 1.2 and 1.3 are included so that the flow rate of water through the works is within the approved treatment capacity of the works.

3. Condition 1.5 is imposed to set out the maximum concentration of suspended solids which is allowed in any waste discharge to the receiving water body. This limit is established to minimize the environmental impact to the receiver.

4. Conditions 2.1 and 2.2 related to the flow metering, sampling and monitoring program are imposed so

that all pertinent data are available for the works performance evaluation and so that the works is operated and maintained at the level consistent with the design objectives, and is effective in producing water of an acceptable quality at all times.

5. Conditions 3.1 through 3.9 and 3.11 through 3.14 are included so that the works will be operated, maintained, funded, staffed and equipped in a manner enabling compliance with the terms and conditions of this certificate and that the Owner can deal with contingency and/or emergency situations.

6. Condition 3.10 is included so that adequate information is available to allow proper control of the treatment process in order to achieve the desired water quality and efficiency of the treatment process.

7. Condition 4.1 is included so that the Owner will regularly review compliance with the terms and conditions of this certificate, be alerted to its obligations with respect to any non-compliance, and allow the public enhanced participation in monitoring compliance.

8. Condition 5.1 is included to require the Owner to implement improvements to the works necessary for the works to be capable of providing safe drinking water in accordance with Ontario Regulation 459/00 and Ontario Drinking Water Standards in a consistent and reliable manner.

Note: The requirement to implement the improvements to the works identified in Condition 5.1 is based on the minimum treatment requirements applicable to all water supplies using surface waters as a source of raw water, and should it at any time be determined that the waters used as a source of raw water by the works have an increased potential for the presence of parasite cysts, the Owner may be required to provide further improvements to the works.

9. Conditions 5.2 and 5.3 are included so that the Owner is aware that Condition 5.1, which identifies the requirements for improvements to the works, does not constitute an approval for the implementation of the improvements, and before undertaking any of the improvements, the Owner must apply for and obtain Director's approval under Section 52 of the *Ontario Water Resources Act*.

10. Conditions 6.1 and 6.2 are included to set specific dates for the submission of a second and subsequent engineers' reports, which are required by Ontario Regulation 459/00.

11. Conditions 7.1 through 7.3 are included to stipulate that this certificate replaces all previous approvals for the works being the subject of this certificate, and that the existing approvals remain in force for the purpose of any works which are not subject to this certificate (e.g., a distribution system or its portions, including any in-distribution storage facilities not associated with a water treatment process).

12. Conditions 8.1 and 8.2 are included to emphasize the distinction between the requirements of this certificate and other legal requirements with which the Owner is required to comply.

13. Conditions 9.1 through 9.3 are included so that the Ministry records are kept accurate and current with respect to approved works, and so that subsequent owners of the works are made aware of the certificate and continue to operate the works in compliance with it.

14. Conditions 10.1 and 10.2 are included to clarify how the certificate is to be judicially interpreted, and specifically, to clarify that the requirements of the certificate are severable and that they prevail over supporting documentation.

This Certificate of Approval revokes and replaces Certificate(s) of Approval No. 5025-5D2HRV issued on August 16, 2002.

In accordance with Section 100 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, as amended, you may by written notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 101 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, provides that the Notice requiring the hearing shall state:

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the works are located;

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
2300 Yonge St., 12th Floor
P.O. Box 2382
Toronto, Ontario
M4P 1E4

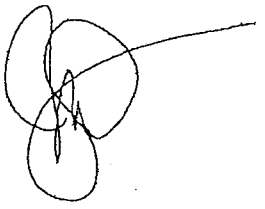
AND

The Director
Section 52, *Ontario Water Resources Act*
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

* Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca

The above noted water works are approved under Section 52 of the Ontario Water Resources Act.

DATED AT TORONTO this 28th day of February, 2003



Mohamed Dhalla, P.Eng.
Director
Section 52, *Ontario Water Resources Act*

EL/

c: District Manager, MOE Kingston
Area Supervisor, MOE Cornwall
Jean Hebert, P. Eng., Stantec Consulting Ltd.
Manager, Drinking Water, Wastewater and Watershed Standards Section, Standards Development Branch

TABLE NO. 3 - PRELIMINARY MAXIMUM DAY CAPACITY ASSESSMENT
(including Hydraulic Loading Review)

Lefaivre/Alfred Water Treatment Plant - Township of Alfred and Plantagenet

Item No.	Equipment Components at the Existing WTP	Component's Actual Capacity Utilized (m^3/d)	Component's Maximum Capacity (m^3/d)	Optimization of WTP's Capacity Based on Maximum Clearwell Capacity (m^3/d)	Preliminary Cost Estimates to Upgrade WTP (i.e. in $000)	Proposed Modifications
1	Raw Water Intake	2,900	4,122	4,442	20	Replace 900 mm diameter inlet cone by 1,200 mm cone
2	Screen	2,900	5,520	4,442	Nil	Nil
3	Low Lift Pumps	2,900	4,028	4,442	50	Replace smaller pumps by two 20 HP pumps
4	10.4 m diameter Clarifier (1)	2,900 (i.e. @ 1.75 m/h without tube settlers)	5,800 (i.e. @ 3.5 m/h with tube settlers)	4,442 (i.e. @ 2.67 m/h with tube settlers)	120	Provide supports and tube settlers, modify inlet piping and collection weir
5	3.65 m diameter Filters (2)	2,900 (i.e. @ 5.9 m/h)	4,520 (i.e. @ 9.0 m/h)	4,442 (i.e. @ 8.84 m/h)	Nil	Nil
6	Clearwell in Lefaivre and Elevated Storage in Alfred)	2,860	4,442	4,442	60	Provide masonry block baffles inside clearwell, relocate static mixer prior to clearwell, and raise overflow level
7	High Lift Pumps:					
	Combined Total	2,856	2,998	4,442		
	*Lefaivre Pumps (2) ***	*1,080*	*1,134*	*1,080*	Nil	Nil
	*Alfred Pumps (3) ***	*1,776*	*1,864*	*3,302*	90	Replace pump volute at all pumps, or provide two 60 HP pumps
8	Transmission Main (Lefaivre to Alfred)	1,814	10,603	3,302	Nil	Operating pressure within portion of main within Lefaivre would increase from 98 to 112 PSI. Water hammer conditions are to be verified.
9	Main service entrance	2,900	8,700	4,442	Nil	Nil
10	125 kW Generator	2,900	3,200	4,442	200	Replace generator (no building modification included)
11	Chemical feed system	2,900	3,100	4,442	160	Two new soda ash pumps, two new coagulant pumps, two new polymer pumps, associated storage and confinement facilities, pump head replacement at six chlorine feed
12	Allen-Bradley PLC based SCADA system	2,900	N/A	4,442	30	Minimum upgrade to cover additional alarms from new feed pumps
	Total Capital Cost				730	

In summary, the installation of tube settlers as well as the provision of modifications (incl. appurtenances) to the intake, the clearwell, the low lift pumps and the high lift pumps, *the capacity of the WTP could be increased by 1,542 m^3/d*. **The proposed modifications would result in an additional residual population of 1,616 people or 636 equivalent lots based on 2.54 people per lot.**

Note:

* Fire flow at each community is assumed to be 50 L/s for two hours

** It is assumed that all additional flow is dedicated to Alfred, except 60 m^3/d for plant internal use

Compiled by
Stantec Consulting Ltd
Revised October 20th, 2004

File: W/active/1634_00545_lef_wtp_optimization/planning/1634_00545_lef_alf_main_041004.rev.xls

stantec.com

Memo

Stantec

To:	Fern Dicaire Stantec	From:	Anthony Grigaitis Stantec
File:	1634-00545	Date:	October 21, 2004

Reference: Lefaivre/Alfred Water Treatment Plant, Electrical Service Load Study

We have performed an Electrical Load Study to confirm if the existing main electrical service entrance and the existing Standby Emergency Generator can support the additional loads proposed for the upgrade. The upgrades are required to Optimize the Water Treatment Plant's (WTP's) capacity based on the Maximum Clearwell Capacity.

The existing WTP's electrical distribution splits non-essential loads (space heating, hoists, domestic Hot Water Tanks, lighting, and general purpose receptacles) from the essential loads (control, process and pumping).

Existing Normal Power Demand

The main service entrance (normal power) feeds both non-essential loads and essential loads. The main electrical service entrance is rated at 3x100kVA, 400A-347/600V, 3 Phase, 4 Wire. In conformance with the Electrical Safety Code, 80% loading of the main service entrance only permits 320A-347/600V loading.

Stantec performed a snap shot load check on October 8, 2004 at 8:00AM. Continuous monitoring over a period of time was not performed, therefore exact peak demand is only estimated. We measured current readings for normal power demand at the main service entrance board's main 400A breaker. The readings were performed for normal operation, normal operation with space heating, and worst case operation with space heating.

These readings are summarized in table 1.

Note, the plant operator mentioned severe voltage drops of 500V-520V from 600V (representing a 15% voltage drop) when the IVACO Steel Rolling Mill in L'Orignal turns on its production process. These voltage fluctuations last approximately 30 seconds. The local Utility (Hydro One Networks) can not prevent these voltage fluctuations on it's distribution lines. The WTP's pump starter contactors do not function effectively at this reduced voltage, and results in shutdown of the pump motors. Stantec did not witness these voltage drops during our site visit.

For the purpose of this report, normal plant operation is assumed to include one Low Lift pump, one Lefaivre high lift pump, one Alfred High lift Pump, controls and other process feed pumps, and space heating (during the winter).

Table 1 – Existing Normal Power Load Snap Shot, October 21, 2004 at 8:00AM

Location	*Load Description*	*Phase A*	*Phase B*	*Phase C*
Measured at Main Board at 400A Main Breaker (Normal Power)	***Normal plant operation (with no space heating)***	55.5 A	54.1 A	57.5 A
	Normal plant operation (with normal space heating)	90.8 A	89.7 A	91.5 A
	Normal plant operation (with space heating on Hi)	108.7 A	115.5 A	111.3 A

The existing main service entrance is sized to accommodate the WTP's current running load of approximately 112 Amps (which includes space heating). The existing running load represents 35% of the available 320 Amps.

Existing Essential Power Demand

The essential power is provided by a 125kW Standby Generator located inside the WTP's South-East Corner. The Generator is rated at 225A – 125kW-150KVA, 347/600V, 3 Phase, 3 Wire. The essential power is fed to the MCC via a 225A automatic transfer switch.

Stantec performed a snap shot load check on October 8, 2004 at 8:00AM. Continuous monitoring over a period of time was not performed, therefore exact peak demand is only estimated. We measured current readings for essential power demand at the MCC's 225A main Breaker. The readings were performed for normal plant operation, normal operation with the fire pump, and worst case operation with the fire pump.

Reference: Lefaivre/Alfred Water Treatment Plant, Electrical Service Load Study.

Table 2 – Existing Essential Power Load Snap Shot, October 21, 2004 at 8:15AM

Location	*Load Description*	*Phase A*	*Phase B*	*Phase C*
Measured at MCC at 225A Main Breaker (Essential Power)	***Normal plant operation***	61.5 A	59.5 A	58.8 A
	Normal plant operation (with H.L. P-8 and Fire Pump P-10)	70.9 A	63.3 A	59.9 A
	Worst Case Scenario (with H.L. P-6, H.L. P-7, Fire Pump P-10, and L.L P-1, P-2, P-3 and P-4)	99 A (peak inrush 121 A)	98 A (peak inrush 119 A)	96 A (peak inrush 118 A)

The existing 125kW generator will support the worst case operation scenario including H.L. Pumps P-6, H.L. P-7, Fire Pump P-10, and L.L Pumps P-1, P-2, P-3 and P-4, and 7.5kW plant of process load. But generator loading simulations for this scenario indicate that the generator is loaded at 79.3% of available kW, and 65.52% of available kVA. Refer to Appendix A – *Lefaivre/Alfred WTP (Existing Loads)* for the Generator Load Profile and Generator Set Sizing statistics.

This represents the maximum loading permitted to allow the auto-transformer starting of the largest (30HP) pump. There is no extra capacity to support the additional loads proposed for the WTP optimization upgrade, unless load shedding is implemented to remove less critical process loads.

Proposed Essential Power Demand

Additional electrical loads proposed for the upgrade could include:

1) Replacing the three (3) existing 30HP Alfred High Lift Pumps (P-5, P-6 and P-7) with two (2) new 60HP pumps (P-5 and P-6 of which only one shall operate at any time). These pumps shall have reduce voltage solid state starters (soft start)

2) Replacing the two (2) existing 3HP Low Lift pumps (P-1 and P-2) with two (2) new 20HP pumps (of which only one pump shall operate at any time). These pumps shall have Full Voltage non reversing starters (FVNR).

3) New miscellaneous small process loads (5-10kW).

Reference: Lefaivre/Alfred Water Treatment Plant, Electrical Service Load Study.

We estimate Table 3 to represent the new plant's maximum operating essential power demand at 347/600V, 3PH.

Table 3 – Proposed Worst Case Essential Power Demand

Load Description	*Max. Continuous Load (Amps)*	*Worst Case Start Load (Amps)*
Existing 7.5HP Hi Lift Pump P-8	9A	9 A
Existing 30HP Fire Pump P-10	32	32
Proposed 20HP Low Lift Pump P-1 or P-2	22A	22 A
Proposed Process loads	16 A	16 A
Proposed 60HP P-5 or P-6	62A	186 A (with soft starter @ 300% current inrush)
Total System Load	**141 A**	**265 A**

The existing 125kW generator will not support the WTP's worst case operation scenario of one (1) existing 7.5HP H.L. Pump, the existing 30A Fire Pump, one (1) new 20HP L.L. Pump, 15kW of Process loads, and one (1) new H.L. 60HP Pump. The generator would have to be upgraded to a least a 150kW genset. A 150kW generator would be loaded at 70.06% of available kW, and 93.08% of available kVA. Refer to Appendix B – *Lefaivre/Alfred WTP (Upgraded Worst-Case 60HP Start)* for the Generator Load Profile and Generator Set Sizing statistics.

Note, the WTP's generator room dimensions are only 3600mm x 4625mm. A new 150kW generator and fuel system could not fit in this room. Hence, the generator and fuel system would be have to be mounted in an outdoor sound attenuated enclosure.

Reference: Lefaivre/Alfred Water Treatment Plant, Electrical Service Load Study.

The budget price for an outdoor enclosed 150kW diesel generator 347/600 volt, 250 amp automatic bypass transfer switch, new cables to MCC, New 250A breaker in MCC, 750 Gallon double wall fuel tank, battery and charger, Hospital grade silencer and flex, upsized generator exhaust and intake ventilation, start up and load test on site is $125,000.00. Add Approximately $8,000.00 for the demolition of the existing generator engine, transfer switch and cables, fuel system, ventilation system etc. Note, this price does not include taxes or Engineering services.

However, if the Township is planning any other significant future upgrades, in addition to the optimization upgrades currently proposed, we would recommend upgrading the Generator to 200kW or 250kW rather than 150kW.

The budget price for an outdoor enclosed 250kW diesel generator 347/600 volt, 400 amp automatic transfer switch, new cables to MCC, new 400A main breaker in MCC, 1000 Gallon double wall fuel tank, battery and charger, Hospital grade silencer and flex, upsized generator exhaust and intake ventilation, start up and load test on site is $150,000.00. Add Approximately $8,000.00 for the demolition of the existing generator engine, transfer switch and cables, fuel system, ventilation system etc. Note, this price does not include taxes or Engineering services.

Should you require additional information or clarification, please do not hesitate to contact the undersigned.

Yours very truly,

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Jean Hebert, P.Eng
Michael Theoret

APPENDIX A

Existing Loads

QuickSize
Generator Set Sizing

Project Lefaivre/Alfred WTP (Existing)
Customer Township of Alfred and Plantagenet

Generator Set

Model No. 125REOZJB **Gensets** 1
Engine 6068TF250 (Diesel)
Alternator 4S13

Performance Summary

LN / LL Voltage	346/600	volts	**Altitude**	500	feet
Frequency	60	hertz	**Ambient Temp.**	70	F
Phase(s)	3	phase			

Genset Rating @ 130C Rise	130.00 kW	
Genset Derated Rating	130.00 kW	
Total Running Power	103.20 kW	
Percent of Available kW Used	79.38 %	
Alternator Starting kVA	254.86 kVA @ 20% dip	
Peak Starting kVA	166.98 kVA	
Percent of Available kVA Used	65.52 %	
Maximum Voltage Dip	7.86 %	
Maximum Frequency Dip	2.40 %	(no restriction)
Voltage THD	0.00 %	(no restriction)

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QuickSize
Generator Load Profile

Project Lefaivre/Alfred WTP (Existing)
Customer Township of Alfred and Plantagenet

Generator Set

Model No. 125REOZJB **Gensets** 1
Engine 6068TF250 (Diesel)
Alternator 4S13

Load Profile

	Qty	Run kW	Run kVA	Run pF	Start kW	Start kVA	Volt Dip	Freq Dip	Volt (L-N) THD
Step #1 30HP Hi Lift Pump P-5									
30HP P-5 (30.00 HP, 3 phase, code D, loaded motor, w/ 80% Autotransformer starting)									
Rated motor torque from full voltage starting = 54.7%									
	1	26.00	29.50	0.88	35.88	85.43			
Step Totals		26.00	29.50	0.88	35.88	85.43	7.58	2.18	0.0%/0.0%/0.0%
Cum. Totals		26.00	29.50	0.88					
Step #2 7.5HP Low Lift Pump P-8									
20HP P-8 (7.50 HP, 3 phase, code F, loaded motor, w/ A.T.L. starting)									
Rated motor torque from full voltage starting = 93.0%									
	1	6.50	8.40	0.77	21.86	39.75			
Step Totals		6.50	8.40	0.77	21.86	39.75	3.58	1.04	0.0%/0.0%/0.0%
Cum. Totals		32.50	37.90	0.86					
Step #3 30HP Fire Pump P-10									
Pump P-10 (30.00 HP, 3 phase, code D, loaded, fire pump motor, w/ 80% Autotransformer starting)									
Rated motor torque from full voltage starting = 54.5%									
	1	26.00	29.50	0.88	35.88	85.43			
Step Totals		26.00	29.50	0.88	35.88	85.43	7.69	2.18	0.0%/0.0%/0.0%
Cum. Totals		58.50	67.40	0.87					
Step #4 3HP Low Lift Pump P-1									
Pump P-1 (3.00 HP, 3 phase, code F, loaded motor, w/ A.T.L. starting)									
Rated motor torque from full voltage starting = 88.2%									
	1	2.80	3.70	0.76	9.54	15.90			
Pump P-2 (3.00 HP, 3 phase, code F, loaded motor, w/ A.T.L. starting)									
Rated motor torque from full voltage starting = 88.2%									
	1	2.80	3.70	0.76	9.54	15.90			
Pump P-3 (3.00 HP, 3 phase, code F, loaded motor, w/ A.T.L. starting)									
Rated motor torque from full voltage starting = 88.2%									
	1	2.80	3.70	0.76	9.54	15.90			
Pump P-4 (3.00 HP, 3 phase, code F, loaded motor, w/ A.T.L. starting)									
Rated motor torque from full voltage starting = 88.2%									
	1	2.80	3.70	0.76	9.54	15.90			
Step Totals		11.20	14.80	0.76	38.16	63.60	6.10	2.40	0.0%/0.0%/0.0%
Cum. Totals		69.70	82.20	0.85					

Step #5 Plant Process Loads

Misc. process load (7.50 kW misc. load)

	1	7.50	7.89	0.95	7.50	7.89		
Step Totals		7.50	7.89	0.95	7.50	7.89	0.73	0.21	0.0%/0.0%/0.0%
Cum. Totals		77.20	90.09	0.86					

Step #6 30HP Hi Lift Pump P-6

30HP P-6 (30.00 HP, 3 phase, code D, loaded motor, w/ 80% Autotransformer starting)

Rated motor torque from full voltage starting = 54.3%

	1	26.00	29.50	0.88	35.88	85.43		
Step Totals		26.00	29.50	0.88	35.88	85.43	7.86	2.18	0.0%/0.0%/0.0%
Cum. Totals		103.20	119.59	0.86					
Grand Totals		103.20	119.59	0.86					0.0%/0.0%/0.0%

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APPENDIX B

Proposed Loads

Stantec

QuickSize
Generator Set Sizing

Project Lefaivre/Alfred WTP (Proposed Loads)
Customer Township of Alfred and Plantagenet

Generator Set

Model No. 150REOZJB **Gensets** 1
Engine 6068HF150 (Diesel)
Alternator 4S13

Performance Summary

LN / LL Voltage	346/600	volts	**Altitude**	500	feet
Frequency	60	hertz	**Ambient Temp.**	70	F
Phase(s)	3	phase			

Genset Rating @ 130C Rise	160.00 kW	
Genset Derated Rating	160.00 kW	
Total Running Power	112.10 kW	
Percent of Available kW Used	70.06 %	
Alternator Starting kVA	254.86 kVA @ 20% dip	
Peak Starting kVA	237.23 kVA	
Percent of Available kVA Used	93.08 %	
Maximum Voltage Dip	16.60 %	
Maximum Frequency Dip	5.59 %	(no restriction)
Voltage THD	0.00 %	(no restriction)

Informational

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QuickSize
Generator Load Profile

Project Lefaivre/Alfred WTP (Proposed Loads)
Customer Township of Alfred and Plantagenet

Generator Set

Model No. 150REOZJB **Gensets** 1
Engine 6068HF150 (Diesel)
Alternator 4S13

Load Profile

	Qty	Run kW	Run kVA	Run pF	Start kW	Start kVA	Volt Dip	Freq Dip	Volt (L-N) THD
Step #1	**7.5HP Hi Lift Pump P-8**								
7.5HP P-8 (7.50 HP, 3 phase, code F, loaded motor, w/ A.T.L. starting)									
Rated motor torque from full voltage starting = 92.7%									
	1	6.50	8.40	0.77	21.86	39.75			
Step Totals		6.50	8.40	0.77	21.86	39.75	3.70	1.44	0.0%/0.0%/0.0%
Cum. Totals		6.50	8.40	0.77					
Step #2	**30HP Fire Pump**								
Pump P-10 (30.00 HP, 3 phase, code D, loaded, fire pump motor, w/ 80% Autotransformer starting)									
Rated motor torque from full voltage starting = 54.4%									
	1	26.00	29.50	0.88	35.88	85.43			
Step Totals		26.00	29.50	0.88	35.88	85.43	7.83	2.75	0.0%/0.0%/0.0%
Cum. Totals		32.50	37.90	0.86					
Step #3	**20HP Low Lift Pump P-1**								
Pump P-1 (20.00 HP, 3 phase, code F, loaded motor, w/ A.T.L. starting)									
Rated motor torque from full voltage starting = 80.7%									
	1	16.60	19.90	0.83	49.82	106.00			
Step Totals		16.60	19.90	0.83	49.82	106.00	10.15	4.21	0.0%/0.0%/0.0%
Cum. Totals		49.10	57.80	0.85					
Step #4	**Plant Process Loads**								
Misc. process load (15.00 kW misc. load)									
	1	15.00	15.79	0.95	15.00	15.79			
Step Totals		15.00	15.79	0.95	15.00	15.79	1.63	0.88	0.0%/0.0%/0.0%
Cum. Totals		64.10	73.59	0.87					
Step #5	**60HP Hi Lift Pump P-5**								
60HP P-5 (60.00 HP, 3 phase, code D, loaded motor, w/ 300% solid start starting)									
Rated motor torque from full voltage starting = 17.4%									
	1	48.00	59.00	0.81	61.95	177.00			
Step Totals		48.00	59.00	0.81	61.95	177.00	16.60	5.59	0.0%/0.0%/0.0%
Cum. Totals		112.10	132.59	0.85					
Grand Totals		112.10	132.59	0.85					0.0%/0.0%/0.0%

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