Engineers Evaluation Report

Calabogie Peaks Resort

30 Barrett Chute Road, Calabogie, ON

Prepared for:
Calabogie Peaks Inc.

Prepared by:
Azimuth Environmental
Consulting, Inc.

June 2020

AEC 17-328

AZIMUTH ENVIRONMENTAL CONSULTING, INC.
Environmental Assessments & Approvals

June 22, 2020 AEC 17-328

Calabogie Peaks Resort
30 Barrett Chute Road
Calabogie, ON
K0J 1H0
Attention: Paul Murphy, President

Re: First Engineers Evaluation Report
Calabogie Peaks Resort Water Treatment Plant

Dear Sir:

Azimuth Environmental Consulting, Inc (Azimuth) is pleased to present our report on the operations and status of the potable water supply for a residential development and resort facility at the Calabogie Peaks Resort (CPR). The system provides a potable supply that meets provincial standards for water quality. The treatment system design and operation complies with the requirements outlined in O.Reg. 170/03.

Although the communal water treatment system is in its operational infancy, it is believed that both the equipment and operational standards that are presently in place will yield high quality water for the years to come, given that the operational standards are maintained

Yours truly,
AZIMUTH ENVIRONMENTAL CONSULTING, INC.

Jackie Coughlin, P.Eng.
Partner / Senior Environmental Engineer

642 Welham Road, Barrie, Ontario L4N 9A1
telephone: (705) 721-8451 • fax: (705) 721-8926 • info@azimuthenvironmental.com • www.azimuthenvironmental.com

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1.0 INTRODUCTION

The Safe Drinking Water Act (Drinking Water Systems - O.Reg. 170/03) requires drinking water protection / treatment for regulated potable water systems. Calabogie Peaks Resort (CPR) water treatment system is classified as a year-round non-municipal residential water works facility (Section 1 - O.Reg. 170/03).

According to the provisions of the Drinking Water Systems regulation (O.Reg. 170/03), a qualified professional must author a report termed the "Engineering Evaluation Report" on the water treatment system [Schedule 21-2(1)] within 30 days of the date of plant commissioning. The report contents must address the compliance of the system to the required treatment equipment and operational requirements stipulated in the regulation (Schedule 21-5). This document provides the First Engineering Evaluation Report to address the requirements of this regulation.

Under Schedule 2 of the regulation, a series of minimum treatment / operational requirements are mandated for the water works, which must be adhered to at all times that potable water is being provided.

The purpose of the Engineering Evaluation is to assess the potential for microbiological contamination of the water works and to identify operational and physical improvements necessary to mitigate this potential utilizing multiple barrier concepts. The second purpose is to identify a sufficient monitoring regime for the entire water works to ensure compliance with the Ontario Drinking Water Standards, Objectives and Guidelines (O.Reg. 169/03 [as amended]) along with all other applicable regulations.

For the purpose of this report, the water works at CPR means a system for the collection, production, treatment, storage, and supply of water (STSW), but not a water distribution system solely for the purposes of water demand management.

The site has been inspected by Azimuth Environmental Consulting, Inc. (Azimuth) staff, on December 16, 2020 by Jacqueline Coughlin, P.Eng. for the purposes of fully documenting the elements of the system for this report [Schedule 21-5(b)].

2.0 BACKGROUND

CPR is situated at the municipal address of 30 Barrett Chute Road and is located approximately 6 km west of the community of Calabogie, ON (Figure 1). The Site has existing frontage on to both Calabogie Road (Provincial Highway 508) and Barrett Chute Road and is accessed via three (3) existing entranceways; one (1) off of Calabogie Road and two (2) from Barrett Chute Road.

The total Site area is approximately 222.6 ha (550 acres), however, the area of the main development is approximately 4.1 ha (10 acres). CPR includes a main hotel, a ski lodge, two residential buildings (Cedars and Pines) and two housing accommodation units, otherwise known as Base Mountain (Figure 2). The new residential development, otherwise known as Juniper Ridge, includes 3 existing townhouse complexes (the Oaks) as well as 260 proposed new residential units to be developed in phases in blocks of 12-20 townhomes.

A summary of the Base Mountain facilities is provided below:

1. the Calabogie Peaks Hotel;
2. the ski lodge;
3. the Cedars eight (8) unit accommodation building;
4. the Pines ten (10) unit accommodation building;
5. the O'Brien's Bunkhouse accommodation unit;
6. the First Tracks accommodation unit;

A summary of the Juniper Ridge facilities is provided below:

1. the Oaks 2 Townhouse complexes (4 units/ complex); and
2. 260 "new" residential units.

The general location of the property is shown on Figure 1 and the site layout is shown on Figure 2. The water treatment plant draws water from one of two drilled water wells (described later in the report), located to the west of the main hotel and southwest of the Cedars building.

3.0 REGULATORY COMPLIANCE

A Permit To Take Water (No.: 00-P-3018) exists for the former water treatment system servicing CPR. The PTTW was issued in August of 2011 and expires on August 1, 2021 for two drilled wells located on the property. The water takings authorized by the permit are to a maximum of 360 m^3/day (250 Lpm).

The former CWTS operated under the existing C of A No. 5336-5KRJR8 however non-municipal systems no longer require an Ontario Water Resources Act (OWRA) Certificate of Approval (i.e., Section 52 CoA).

Finally, the facility is operated by Whitteker Environmental Services Inc., a licensed water works company (O.Reg. 128/04), under contract and in accordance with Schedule 2-2(9)(i) (O.Reg. 170/03).

4.0 WATER WORKS DESIGNATION

The MECP has recently granted CPR (residential development) a Drinking Water System Number (No.: TBD) and has classified it as a “Non Municipal Year Round Residential System”. <<Drinking Water System number to be issued by MECP>>

5.0 WATER DEMAND

Water demand estimates have been calculated as part of the system design for the first phase and at full development. The system was designed to supply up to a maximum day flow of 110,000L/day for Base Mountain and 962,400L/ day for Juniper Ridge. Average daily demand is expected to approximately 36,773°L/day for Base Mountain and 320,800 L/day for Juniper Ridge.

6.0 WELL CONTRUCTION

Water is supplied from two bedrock wells, each rated at 250 Lpm (360,000Lpd). Well No. 1 is located ~50m west of the main hotel and Well No. 2 is located just southwest of the Cedars building.

Water well information for Well No. 1 was taken from an existing hydrogeological letter prepared by Oliver, Mangione, McCalla & Associates Ltd. (1986), which indicates that the water wells No.: 1 and 2 are 150 mm (6.0”) nominal diameter drilled well that intersected water bearing fractures below a depth of 42.7 m in depth. Well No. 1 was completed in December 1985 and the reported static water level is 2.1 m below ground surface (bgs). The stratigraphy is described in the drillers log as consisting of an appreciably thick sequence of brown sand and gravel to ~15m, followed by grey limestone, in which the well is finished.

7.0 WATER QUALITY

<<Need to Include First Test sampling >>

8.0 GROUND WATER UNDER DIRECT INFLUENCE (GUDI)

An evaluation was completed to ascertain the status of the site water works with respect to potential connection to surface water sources. As such, this assessment addresses the GUDI (“Ground water Under the Direct Influence” of surface water) status of the well supply. GUDI wells are of concern because insufficient infiltration of the surface water percolating through the ground could allow bacteria impacts to occur within the system. According to Section 2 (2) - O.Reg. 170/03, the production well (W-1) could be classified as GUDI, as the raw water supply:

"*... is capable of supplying water at a rate greater than 0.58 litres per second and that obtains water from a bedrock well, any part of which is within 500 m of surface water*". (Section 2 (2) - O.Reg. 170/03).

Notwithstanding, a GUDI assessment was undertaken to confirm this assertion. The assessment is based on the physical setting of the resort, well siting and construction, and the water chemistry.

8.1 Physical Setting

One of the key factors in considering surface water influence is the physical setting of the well within the regional surface water setting. The resort is located within an area dominated by *Precambrian* bedrock terrain on the Canadian Shield. Published geologic mapping notes that a small glaciofluvial deposit of coarse grained material occur beneath the main development area which extends to the eastern shore of Calabogie Lake. This is consistent with the borehole record for CPR primary production well (W-1) which encountered coarse sand to a depth of ~15 m (50 ft). Test pit data provided by Simmering & Associates Ltd (2002), describe the soil as consisting of calcareous coarse sands and gravel (SP Type) which are part of the White Lake soil group.

The bedrock geology in the area is quite variable and consists of a mixture of igneous/plutonic rock types and carbonate based metasedimentary rocks. Areas of topographic high are generally associated with bedrock ridges and/or knobs that consist of a mixture of igneous / plutonic rock types (*i.e.,* granodiorite, tonalites, *etc.*). In these areas, the overburden is typically very thin (< 1.2 m) and outcroppings are common. In lower lying areas (such as the main development area) the metasedimentary bedrock is overlain with thicker coarse textured sequences of overburden (as described above). This metasedimentary formation is known to be associated with mapped fault features in the area. Faults, geological contacts and other structural features are often targeted for potable water purposes as they tend to accumulate large amounts of ground water within fractures associated with these features.

From a hydrogeological perspective, precipitation either infiltrates to the ground water regime or runs off as overland flow to first-order tributaries. Infiltration is expected to be moderately rapid due to the permeable nature of the sandy overburden, and is slower through the organic wetland soils. It is also limited by the steepness of the bedrock ridges and outcrops. Ground water flow in the overburden follows the general topography to the east, with discharge into the lowlands, associated creeks/wetlands and Calabogie Lake. Shallow ground water flow will also be influenced by the central stream.

The overburden is highly permeable compared to the underlying bedrock, with an estimated hydraulic conductivity between 10^{-3} and 10^{-5} m/sec (Simmering & Associates Ltd., 2002). The overburden aquifer is currently used by the resort (in permanent ponds shown on Figure 2) for snow making / irrigation purposes. The metasedimentary bedrock formation occurs beneath the Site and is often the target for many water supplies in the area (including the main production well at CPR). This aquifer consists of large fracture networks throughout the formation which are encountered at ~43 m (118 masl) beneath the Site as per the well record for the main supply well. Lastly, a third low-yielding aquifer unit is more sparsely noted at the Precambrian bedrock contact. However, the water quality is noted to be more mineralized with elevated concentrations of iron (WESA, 1986).

The topography across the entire Site area is rather steep which is to be expected based on the Site's existing use as a Ski Resort. Relief trends northward from the pinnacle of the ski slope (~370 masl) towards the main Ski Lodge (~160 masl). In contrast, the main development area is generally flat with a slight eastward trend downwards towards Calabogie Lake which is situated approximately 250 m from the eastern Site boundary. Runoff in the main development area occurs in a similar direction either overland or through a series of onsite ditches / swales that convey flows to an onsite watercourse that ultimately discharges to Calabogie Lake. A small watercourse flows through the center of the main development area in a west to east orientation. The watercourse intersects two (2) dugout ponds that are utilized by resort staff for snow making and irrigation purposes. The watercourse is fed from a series of small "pocket" wetlands that originate immediately northwest of the Site. These wetlands capture runoff and convey flows through this natural drainage network.

8.2 Analytical Results

The GUDI protocol also relies on historical water chemistry results to demonstrate the lack of seasonal variation in water chemistry (which would indicate recent influx of surface water). A complete historical database is not yet available, but will be monitored as data becomes available. However, water chemistry samples have been collected periodically from the production well (W-1) (1986 & 2017) and Calabogie Lake (2017). Water chemistry results are presented below and the laboratory analytical report is provided in Appendix C.

Table 1 - Summary of Water Quality Data

Parameter	Units	ODWQS	Production Well (W-1)		Calabogie Lake
			10-Apr-86	19-Jul-17	19-Jul-17
Hardness	mg/L	80-100	-	227	42
pH @ 25C	pH Units	6.5-8.5	-	7.92	7.67
TDS	mg/L	-	305	231	45
Color	TCU	5	2.5	4	24
Chloride	mg/L	250	9	14	4.7
Fluoride	mg/L	1.5	0.04	< 0.1	< 0.01
Nitrite	mg/L	1	< 0.03	< 0.1	< 0.01
Nitrate	mg/L	10	0.4	0.4	< 0.01
Total Ammonia	mg/L	-	-	-	-
Total Phosphorus	mg/L	-	-	-	-
Sulphate	mg/L	500	17	11	-
Arsenic	mg/L	0.025-0.010	< 0.01	< 0.0001	< 0.0001
Boron	mg/L	5	0.02	0.01	< 0.005
Cadmium	mg/L	-	<0.005	-	< 0.000014
Calcium	mg/L	-	-	72.8	13.2
Iron	mg/L	0.3	< 0.05	0.127	0.083
Magnesium	mg/L	-	-	-	-
Manganese	mg/L	0.05	< 0.05	< 0.001	0.015
Sodium	mg/L	200, 20	-	13.1	3.3
Uranium	mg/L	0.02	< 0.02	-	-
Total Coliform	cfu/100mL	0	0	0	18
E coli	cfu/100mL	0	0	0	4
Turbidity	NTU	5	< 1	19.3	-
Sulphide	mg/L	-	-	< 0.01	< 0.01

Based on the limited dataset presented above, there are some clear quality differences between the two (2) sampling locations. Ground water within the production well (W-1) is more mineralized (*i.e.,* "hard") than that of the Calabogie Lake. Hardness, total dissolved solids (TDS), chloride, calcium and sodium are all elevated by an order of magnitude or more when compared to the lake data. Iron, is also slightly elevated in the production well in 2017 (0.127 mg/L), however, not significantly when compared lake samples (0.083 mg/L). Iron was not historically detected in the production well in 1986, however, this sample was collected after 146.4 minutes into a long-term pumping test. As such, it is suspected that iron concentration was remedied through well development.

Conversely, some parameters, such as colour and manganese are noted to be elevated in the lake rather than the production well. Colour is commonly elevated in surface waters, and is typically from decaying organic matter (*i.e.,* dissolved organic carbon [DOC], tannins and lignins, *etc.*) or elevated inorganic parameters (*i.e.,* iron, manganese, *etc.*). As such, elevated colour in ground waters may signify surface water influence. Colour was detected in the 1986 and 2017 production well samples (2.5 TCU and 4 TCU, respectively); however, both are found at much lower concentrations compared to the lake sample (24 TCU) and are below the ODWQS limit of 5 TCU. In this instance, the colour detections in the ground water is likely a result of dissolved iron concentrations, while the elevated concentrations of colour in the lake is from a combination of dissolved iron/manganese, and other organic constituents; though the organics were not assessed in the lab report. Notwithstanding, based on these concentrations it is unlikely that the ground water is mixed directly with surface water.

Total coliform and *E.coli* detections are noted in the lake sample, however, there is no detection in the production well samples. This also asserts that there is no direct hydraulic connection between surface water sources and exploited bedrock aquifer. Notwithstanding, it is possible that is a minor connection ("leaky") exists between the surface to the bedrock aquifer. However, there appears to be an ample amount of retention time through the overburden to the bedrock aquifer occurring, based on the greater mineralization seen in the water chemistry and nonappearance of microbiological indicator parameters.

Based on the evaluation of the additional data, we conclude that the wells are not GUDI wells. However, the treatment system does provide appropriate treatment to meet or exceed GUDI requirements.

9.0 WATER TREATMENT

The current treatment system complies with the treatment requirements of Schedule 2 of O.Reg 170/03 for a year round, non-municipal, residential system. There is currently a logbook in place, which includes all associated documentation regarding the system. Also included are operating instructions and forms for keeping track of maintenance, flows and sampling.

The system has four (4) components: (1) the supply well, (2) the treatment system, (3) the storage reservoirs, and (4) the re-pressurization pumps and the distribution system. Figure 3 indicates the process flow of the STSW.

The existing water treatment system is located in a dedicated building in the water treatment room. The room is electrically serviced and heated. The well pump control panels are present within this room along with the treatment system, supplies and replacement parts as stipulated in Schedule 2-2.

The treatment system consists of disinfection, sand filtration and a blended softener system to reduce iron, manganese and hardness and subsequent primary and secondary disinfection using sodium hypochlorite. The sand filtration and softener system is rated to treat 500Lpm, which is the combined full flow of each well, however the softener systems will have a modulating bypass valve that will allow for a blending of the soften system to control the reduction percentage of iron, manganese and hardness.

The water comes into the building from the wells via a 50mm diameter feed line, and is dosed with sodium hypochlorite before moving through three (3) NexaSand filter tanks installed in parallel for manganese, iron and hardness removal. The water is then directed into two (2) underground storage tanks, each with a capacity of 40,000 L.

The primary disinfection system consists of two prominent diaphragm metering pumps (Grundfos DDA) drawing from a 200 L polyethylene tote complete with containment dike, injection quill and an online chlorine residual analyzer (Signet 4630 model). The sodium hypochlorite will dose prior to the sand filters to prevent biofilm and maintain a free chorine residual prior to entry into the clearwells.

Particulate matter and suspended solids will be removed by direct filtration utilizing a NextSand filter furnished in 3 fiberglass pressure tanks, installed in parallel. These tanks include automatic backwash devices that use raw water for the purpose of backwashing any precipitate to the drain line and pump station.

Iron and manganese are present in the well water at a level where an ion exchange softener can effectively remove these contaminants and additionally remove hardness from the water. Iron and manganese specific resin will be furnished in 2 fiberglass tanks installed in parallel. These tanks include automatic backwash devices that use raw water for the purpose of backwashing and regeneration.

A second chlorine analyser has been intergraded into the high lift distribution pumps effluent line to monitor free chlorine levels (minimum free chlorine residuals in the distribution system of 0.5 mg/L targeted). A provision has been made in the tank discharge to facilitate post chlorination if required.

Water is pumped out into the distribution system via two separate pump systems and two separate forcemains to service Base Mountain and Juniper Ridge respectively. The Juniper Ridge consists of two high lift pumps (Grundfos 15hp CR15-8) rated at 7.9Lps @90m head and two cushion tanks (WX-350). One of the pumps operates as a jockey pump to provide pressure to the system, with each of the subsequent pumps actuating as required, to provide for peak flows. A third pump will be added when required to satisfy demand based for future expansion.

The Base Mountain distribution system consists of two high lift pumps (Grundfos 15hp CR15-8) rated at 7.9Lps @90m head and two cushion tanks (WX-350). One of the pumps operates as a jockey pump to provide pressure to the system, with each of the subsequent pumps actuating as required, to provide for peak flows. A third pump will be added when required to satisfy demand based on future expansion. The discharge manifold will consist of a free chorine analyzer, contacting head flow meter, pH meter and provide for post chlorination.

The potable drinking water treatment system is fully instrumented to allow full-automated control of the system, with alarm call-out features and remote monitoring features. The entire system can be monitored through the internet so that all control functions can be monitored and executed remotely. The computer system controlling the system will restart the operation automatically if the electrical system is tripped.

For the treatment system, three sampling ports have been installed. A sampling port has been installed on the inlet feed line from the well (i.e., raw water) and just prior to storage to allow measurement of infeed chlorine concentrations. Chlorination is to be temperature-compensated and locally calibrated. Calibration of instruments must allow for span and offset adjustment.

A third sampling port is available following storage to allow measurement of chlorine concentration from the tanks and to allow measurement of infeed chlorine concentrations to the distribution system. One sampling port has been installed on the return line to the WTP (as needed).

10.0 DISINFECTION ASSESSMENT

A Grundfos DDA metering pump is utilized for injecting chlorine into the potable waste system. The specifications for the model used have been inserted in the on-site equipment specifications binder. According to the specifications of the pump, it is capable of adequately treating the peak design flow at CPR.

The system is monitored continuously for the water volume used and this provides a calibration check on the meter. Free chlorine residual is set at the injection point and monitored at the discharge point into the distribution system. Free chlorine residual is recorded at five minute intervals in the control system and then these data are used to determine the daily statistics. The five minute readings are kept in a rolling 20 day buffer. Daily logs are kept by the controller for approximately 60 days and are transferred to the computer system monthly. Data can also be downloaded remotely. As stated previously, the residual chlorine levels are also manually monitored by the operator.

Storage is accomplished using 2- 40,000 L tanks for a total volume of 80,000 L and in intended to be sufficient for chlorine residual, peak daily flow and buffer for peak hour demand.

Chlorine contact time is sufficient to meet the required standards for Phase I. At peak flow for phase 1 (Base Mountain and Oaks Townhomes), the residence time is a minimum of 158 minutes, assuming a plug flow factor of 0.5 for the two storage tanks (PHD / 80,000 * 0.5). However, peak flow is not maintained for long durations so that the average chlorine contact time is 421 minutes (ADF/ 80000L *0.5). Both cases exceed the treatment requirements.

11.0 MICROBIOLOGICAL CONTAMINATION ASSESSMENT

11.1 STSW

Visual inspection of the water treatment facility was conducted during construction of the treatment system. The wellheads are situated approximately 50m and 100m west of the hotel, with adequate stickup (approximately 1.5 m above ground surface) in order to prevent any possible surface contaminants from getting to the water source through the well casing.

As discussed in the water quality section of this report, water quality with respect to microbiology in the production wells is considered satisfactory thus far. No detection of *E. coli* has been reported in the period of record. Continued development of the sampling data base is required in order to derive any meaningful statistical assessment.

11.2 Distribution System

CPR's water works delivers treated water through the distribution system. The distribution system routes the treated water to Base Mountain and Juniper Ridge present on the site. To date, only limited microbiological sampling has been done on the condominium distribution system at CPR because it was commissioned in December 2019. Occupancy during the spring was limited to less than five residences but by June 2020 is expected to increase to more than five dwellings. Chlorine residual is manually monitored on a daily basis by the operator at the system extremities.

As prescribed in Schedule 11 (O.Reg. 170/03), sampling for microbial parameters must be conducted biweekly until a 24-month period is established.

11.3 Adjacent Land Uses

Adjacent land use consists of residential to the north and southeast and a golf course (also owned by CPR) immediately east. Lands to the west and south are vegetated and in a relatively natural state.

These land uses do not pose unusual risk to the safety of the water supply and are remote to this centrally located facility. Since the well draws water from a confined aquifer, there is little opportunity for hydraulic connection to the surface soils, which may receive septic leachate or chemicals associated with the ski hill operations. Previous testing done on the well indicates that the aquifer is isolated from these source(s).

12.0 PROPOSED WATER QUALITY MONITORING PROGRAM

A monitoring program has recently been established at CPR. The proposed water sampling program is in accordance with the current regulations (i.e., O.Reg. 170/03). Compliance monitoring should include at least the following:

- sampling for microbiological parameters (*E. coli*, total coliform and heterotrophic plate count) on a bi-weekly basis from the plumbing that serves the development [Schedule 11-2(1)(a)].
- sampling for microbiological parameters (*E. coli* and total coliform) at least once every month of the raw water before any treatment [Schedule 11-3(1)].
- sampling should be undertaken every 3 months from an appropriate point in the distribution system for trihalomethanes [Schedule 13-6(1)] and haloacetic acids [Schedule 13-6.1(1)]. The distribution sampling point should be varied so sampling at the same location does not occur until all other possible points within the distribution system have been sampled.
- sampling should be undertaken every 3 months from an appropriate point in the distribution system for nitrite and nitrate [Schedule 13-7].
- sampling should be undertaken twice per year (winter and summer) from an appropriate point in the distribution system for lead [Schedule 15.1]. The distribution sampling point should be varied so sampling at the same location does not occur until all other possible points within the distribution system have been sampled. The frequency of sampling and number of samples required can be reduced with results consistently below the lead standard.
- sampling should be undertaken every 60 months for the parameters listed in Schedule 23 and 24 of O.Reg. 170/03 (e.g. inorganic and organic parameters) from the an appropriate point in the distribution system [Schedule 13-2(3) and 13-4(3)].
- sampling should be undertaken every 60 months from an appropriate point in the distribution system for sodium [Schedule 13-8].
- sampling should be undertaken every 60 months from an appropriate point in the distribution system for fluoride [Schedule 13-9].
- all monitoring must be undertaken by a certified person (i.e., a licensed operator as per O.Reg. 435/93).

As the monitoring programs continue, the program should include protocols to maintain an accurate database. This database can be used to rapidly assess data as it is becomes available to address adverse results, and to ensure that rapid notification and remedial action occur if an adverse result is obtained in accordance with O.Reg. 170/03 [Schedule 16].

13.0 FACILITY OPERATIONS

The facility operations have been formalized to specifically address the operational requirements present in O.Reg. 170/03 [Schedules 6, 8, 11, and 13]. The operational records for this facility are compiled and stored in a central location (i.e., water treatment building office). This is a requirement of the Safe Drinking Water Act and calls for the retention of specific documents for at least five years (Section 13 O.Reg. 170/03). Prudence suggests that a duplicate copy should reside elsewhere (i.e., Office). There are several minor operational requirements that need to be added to the existing procedures.

A review of the log books and equipment manuals for the facility shows the operational requirements presented in O.Reg. 170/03 are being satisfied. The complete set of operations manuals consists of a large binder with as built drawings and in some cases Manufacturer/ Suppliers Maintenance Manuals and Catalogues. These manuals were scrutinized in a general sense but not thoroughly reviewed. They are sizable documents and therefore have not been reproduced for this report.

Schedule 2-2(6) requires that written operating instructions for the water treatment equipment are kept near the equipment. These instructions need to conform with the manufacturer's recommended instructions for operation and maintenance of each component in the water treatment system. It would be appropriate to append such instruction in the operations manual for reference purposes.

Similarly, a sufficient supply of sodium hypochlorite needs to be kept on site. The location of this supply needs to be clearly marked and separate from all other supplies [Schedule 2-2(7) and (8)].

Section 11 requires that an annual report be prepared as per O.Reg 170/03. Section 12 requires that that all documentation associated with water quality test results, annual reports, Engineer's Report, and a copy of O. Reg. 170/03 must be made available to the public in accordance with subsection (4) of Section 12. The facility has established adequate record-keeping of consumer related documentation (i.e., O.Reg. 170 regulation, annual reports, and water quality reports) which are available to the public during normal business hours at the office.

14.0 FACILILTY MAINTENANCE

As required in Schedule 21-5(d) a maintenance schedule is to set out minimum requirements relating to the frequency with which equipment must be inspected, tested, and replaced. In general, a visual inspection of the water works should be conducted each time the site is attended (and properly documented in the operation's logbook) to ensure all components are in sound working order. This maintenance inspection schedule should be properly documented in on-site records / log books. All maintenance records should be stored at the onsite office.

On-site access to all of the water treatment equipment component "service and operations" manuals is required. Equipment manuals should be listed within a binder containing all of this material. Lost manuals need to be replaced as soon as it is noticed that it is missing. It is recommended that each operator read and understand each component and initial each manual as having been read and understood. Within each manual, reference flags (i.e., "post it" markers) should be affixed to identify critical operational information sections or highlight minimum maintenance requirements. The overview provided in this document is not intended to replace the complete information contained in these reference manuals nor replace the need to become fully familiar with the workings of each equipment component.

It is our opinion that the manufacturer's recommended maintenance schedule be followed for all equipment used at this facility including, but not limited to, the monitoring equipment used or brought to the site (e.g., residual chlorine meters). The CPR system uses sodium hypochlorite and sand filtration and a blended softener system.

Operators are cautioned to maintain a diligent inspection schedule (i.e., weekly or monthly as deemed necessary) to ensure "shifts" in water quality owing to seasonal or event-related occurrences (i.e., heavy / intense precipitation events) do not overwhelm the operations system. Furthermore, any indication of such a response should be recorded and re-evaluation of the system designation considered in light of the new data.

It is also noted that the several manufacturers may require "certified" personnel for the repair of certain components associated with the equipment (e.g., high lift pumps, metering systems). These requirements need to be followed, where applicable. At a minimum, the required maintenance schedules outlined in the various equipment manuals should be complied with as suggested in Schedule 8-2(2). This would include; but not be limited to, all treatment equipment, monitoring equipment, and testing equipment (both automatic and manual).

Chemical feed pumps and associated components (o rings, check valves, diaphragm) should be inspected bi-weekly for leaks. The overhaul should include cleaning the feeder head, cleaning and checking all valves and O rings for wear. Cleaning and checking the condition of check valves and pump control valves should occur quarterly. If valves are fouled or blocked open with particulates, the valve should be dissembled, cleaned and then returned to service. Any worn out parts should be replaced. The chemical feed line and solution tanks should be inspected bi-weekly or as required to ensure that the chemical feed system functions properly and that the lines are not clogged or kinked and that the solution tanks are clean. The chemical feed pump should be calibrated quarterly to ensure the appropriate amounts of chemicals are being delivered to the system.

The operator should be cognizant of the maintenance requirements (i.e., leaks) of all larger equipment items including; but not limited to, pressure, water storage and media/ softener tanks. Maintenance schedules for the pressure and vessel tanks were not provided however prudence would suggest semi-annual inspections of these tanks would be required. Salt usage should be monitored weekly or as required to confirm expected function of the softener. The bedding material for the sand filters may need to be replaced once every 5-8 years. If applicable, grease motor bearings on high lift pumps. Confirm pressures to the distribution system on bi-weekly basis or as needed.

All water storage tanks should be inspected annually or as needed to ensure that they are protected from contamination. Vents and screens should be checked for blockages and/ or entry of small insects, animals or debris. Tanks should be checked for overflows and for any deterioration in the tank walls and/ or foundation. Water level measuring devises should also be checked to ensure accuracy. Tank hatches should be checked to ensure the lids are property sealed and locked.

General maintenance for other equipment such as high lift and wells pumps and associated pump components should also be conducted as needed to ensure proper working order. Pumps and associated components should be cleaned and overhauled on a yearly basis or as needed. The overhaul should include cleaning the feeder head, cleaning and checking all valves and O rings for wear, and cleaning and checking the condition of check valves and pump control valves. Any worn out parts should be replaced. If applicable, grease motor bearings on high lift pumps. Confirm pressures to the distribution system on a daily basis or as needed.

The frequency of valve inspection depends on the type of valve, but the operator should inspect the valves at least once a year or as deemed necessary. The inspection should include completely closing, reopening, and reclosing the valve until it seats properly. If valves are damaged or are showing signs of leaking, valves should be scheduled for repair by the operator.

The control panels in the treatment plant room should be inspected at least once a year for corrosion and other problems that could cause shorts or failures. All wiring should be visually inspected annually for signs of visible wear and other damage

15.0 DEVIATIONS FROM 10 STATE STANDARDS

As stated in the Terms of Reference for Engineers Reports of Water Works, any deviations of the existing STSW from the "10 State Standards" must be discussed with the focus being on disinfection of water supply. The policy statement in The Recommended Standards for Water Works (2003) states that certain guidelines should be met. A summary of these guidelines and the existing STSW's compliance is as follows.

15.1 Disinfection:

There were no deviations for the 10 Standard State noted for the operation of the chlorination disinfection system.

Chlorinator capacity shall be such that a free chlorine residual of at least 2 mg/L can be maintained in the water once all demands are met after contact time of at least 30 minutes when maximum flow rate coincides with anticipated maximum chlorine demand. This assumes that free chlorine is being used as a primary disinfection source. The required residual chlorine level (i.e., 0.2 mg/L) stipulated in O.Reg. 170/03 is maintained by the system.

The minimum residual chlorine level (i.e., 0.5mg/L) is to be maintained by the system at all times and is higher the minimum residual chlorine stipulated in O.Reg. 170/03. Current records show stable chlorine residuals above the required chlorine level.

16.0 CONCLUSIONS

The following conclusions are reached regarding the quality of the water source for CPR:

- the existing well provides a raw water quality in compliance with the Ontario Drinking Water Quality Standards.
- the well source is not a GUDI supply. The wells are located more than 350m away from a surface water body. The physically setting suggests that there is no direct hydraulic connection to a surface water feature and that there is a substantial thickness of overburden (~ 10 to 15 m) in the immediate Site area that provides an ample amount of retention from infiltrating surface water to the deeper bedrock aquifer.

- the existing treatment (chlorine disinfection) provides adequate disinfection to meet the minimum standards for inactivation of bacteria, viruses, and parasites.
- the water treatment system has been registered with the OETC in accordance with O.Reg. 435/93 as a Class 1 system.
- a remedial action plan needs to be developed in the event of a system failure and the appropriate staff trained to execute this procedure.
- a copy of O.Reg.170/03 should be posted in the operational manual.
- an itemized operational procedure / protocol needs to be added to the operational manual.

17.0 DECLARATION

I, the undersigned, hereby declare that to the best of my knowledge, the information contained herein and the information in support of this submission is complete and accurate in accordance with my obligations under the Professional Engineers Act (RSO 1990) and its regulations.

I further declare that this submission has been prepared in reasonable accordance with the published terms of reference for this submission, despite any qualifications in the agreement retaining me, and I acknowledge that the Director and the Owner will be relying on the accuracy of this Report.

18.0 REFERENCES

Simmering & Associates, 2002
Sewage System Application, Calabogie Peaks Inc.

Water and Earth Science Associates Ltd., 1986
Hydrogeological and Environmental Assessment Calabogie Peaks Proposed Resort Development

Ministry of the Environment. 2001. Terms of Reference for Hydrogeological Study to Examine Groundwater Sources Potentially Under Direct Influence of Surface Water, October, PIBS 4167e, p.6

Ministry of the Environment. 2003. Terms of Reference for Engineers Reports for Water Works, Revised December 2003, PIBS 4057e, p.9

Ministry of the Environment. 2003. Procedure for the Disinfection of Drinking Water in Ontario (As adopted by reference by Ontario Regulation 170/03 under the Safe Drinking Water Act), Revised June 2003, PIBS 4448e, p.31

APPENDICES

APPENDIX A

Figures

APPENDIX B

Process Instrumentation Drawing

APPENDIX C

Laboratory Reports

APPENDIX D

Operator Certificate

APPENDIX E

O.Reg. 170/0

APPENDIX E

Engineer's Declaration