



**LUCKNOW DRINKING WATER SYSTEM APPENDIX**

The following Section represents DWQMS information specific to the individual systems.

Element 6 - System Description

Element 8 – Risk Assessment Outcomes

Appendix B 2 – Risk Assessment Table

Appendix I 1 – Sampling, Testing, and Monitoring Table

Please see the appropriate section for details on the individual systems for the Township of Huron-Kinloss

File: C:\DWQMS\Huron-Kinloss- LUCKNOW WELL SUPPLY SYSTEM APPENDIX

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Note: To be reviewed annually or when a QMS change occurs.



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## 6. Drinking Water System

### Lucknow Drinking Water System:

#### System Description

##### 6.1 General

- 6.1.1 The Lucknow water system is characterized as a "secure ground water" system and is classified as a large municipally owned water system. The plant and its equipment have a daily maximum capacity to deliver 2115 cubic metres of potable water to the Lucknow community the sub system supplying the Lucknow South subsystem in Ashfield Colborne Wawanosh. The distribution system serves the community of Lucknow with a population of approximately 1230 residents, with approximately 485 customer services plus 10 Lucknow South properties in the Municipality of Ashfield-Colborne-Wawanosh in Huron County.
- 6.1.2 The Lucknow Water Distribution and Supply Subsystem is a Class 2, large municipal residential system owned by the Township of Huron-Kinloss and operated by Veolia Water Canada. The Lucknow Well Supply provides potable water to the residents and businesses of the Village of Lucknow and to as small number of properties that are outside the Township of Huron Kinloss boundary.
- 6.1.3 Lucknow Well # 4 is a 200 mm diameter, 54.8 m deep drilled groundwater production well, located at 600 Havelock Street. Well No.4 is equipped with a vertical turbine pump, with a discharge line connected to the well pump header, with a turbine flow meter in the header. Well No.4 is used to supply water to the system when the output from primary production Well No.5 proves insufficient to meet the demand of the system. The well house and well # 4 was constructed in 1957.
- 6.1.4 Lucknow Well # 5 is a 203 mm diameter, 58.8 m deep drilled groundwater production well located inside pumphouse # 5 at 381 Delhi Street, and is the main production well for the system. Well No.5 is equipped with a submersible pump with a discharge line connected to the well pump header, which contains a turbine flow meter. The well house and well # 5 were constructed in 1967.

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6.1.5 The Lucknow drinking water system is equipped with a supervisory control and data acquisition system (SCADA) allowing for remote control, monitoring and record keeping of the system. This provides the operator with the current operating status of the supply and treatment equipment throughout the system at any given time.

6.1.6 Wells # 4 and # 5 are equipped with receptacle and manual transfer switch for a portable generator.

**6.2 Description of Water Source**

6.2.1 Well # 4 and Well # 5 are not under the influence of surface water. The wells penetrate limestone aquifers. Because of the depth and structure of the aquifers, the water temperature is relatively constant, turbidity is low, and the water is relatively hard. The raw water is also relatively high in fluoride, but the lead content of the raw water is well below the half-MAC (Maximum Allowable Concentration). Those who are supplied water from the Lucknow Well Supply are made aware of the various concentrations in their drinking water by numerous means of communication with the Township of Huron-Kinloss.

6.2.2 The full characterization of the raw water supply source is listed in the First Engineer's Report.

**6.3 Disinfection System**

6.3.1 Both Pumphouse # 4 and # 5 in the Lucknow Water System ensure that raw water is disinfected. Sodium hypochlorite (12%), the chemical used in the disinfection process, disinfects the raw water, and serves primarily as a measure to prevent microbiological growth within the raw water pipeline, and distribution system. Each pumphouse has a chlorine contact watermain to provide chlorine contact time between sodium hypochlorite and the raw water ensuring the deactivation of pathogens should they be present in the drinking water supply.

6.3.2 Disinfection equipment for each production well consists of two chemical feed pumps (one duty, one standby), with automatic switch over and alarms, and two chemical solution tanks complete with secondary containment. Chlorine residuals are continuously monitored by on-line instrumentation to verify the pumphouses are supplying safe drinking water to the system.

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6.3.3 The chlorine dosage range varies with the chlorine demand of the raw water. The free chlorine residual is monitored at the point of entry to the distribution system, by an on-line chlorine analyzer, with a target residual of > 1.0 and < 1.3 mg/l.

6.4 System Flows

6.4.1 The Lucknow water system has 1 permit to take water # 78-P-1052, which allows 865 cubic metres per day from well # 4 and 2275 cubic metres per day from well #5.

6.4.2 The 2 well houses each have a maximum flow as specified in C of A # 9904-6FKPKH. These are based on the CT calculations for each site and the minimum free chlorine residuals used in those calculations. The maximum flow allowed by the C of A at Well # 4 is 9.5 litres per second and at Well # 5 37.92 litres per second.

6.4.3 The limiting factor regarding flow is chlorine contact time in the chlorine contact mains. In order to meet the regulatory CT requirements (CT value > 3.0) the maximum allowed flow must correspond with a free chlorine residual of a minimum 0.20 mg/l.

6.5 Distribution System

6.5.1 The Lucknow Distribution System has approximately 485 water connections. Through a watermain extension, southward along Lucknow Line (Huron County Road No.1), the Lucknow distribution system also supplies drinking water to approximately 10 properties in the Municipality of Ashfield-Colborne-Wawanosh in Huron County. This section of the distribution system is known as South Lucknow. In total, the Lucknow Water Supply serves a population of approximately 1230.

6.5.2 Distribution mains consist of cast iron, ductile iron or PVC, depending on the location and date of installation.

6.5.3 There are 49 Hydrants connected to the distribution system. A third pumphouse, located at 482 Ross Streets contains a diesel booster pump, designed to increase water pressure in the event of a fire.

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6.5.4 The Lucknow water system has elevated storage in the form of a standpipe located at 656 Wheeler Street. The total volume of the standpipe is 1128 m<sup>3</sup>. The high-lift pumps of Well # 4 and Well # 5 are automatically controlled by the water level in the standpipe.

6.5.5 Distribution piping is predominately 150 mm cast iron and ductile but ranges from 50 mm to 250 mm through out the village, a small amount of which is PVC.

6.5.6 The system pressure ranges from 48.5 to 54 psi.

**6.6 Sample Analysis**

6.6.1 Provincial regulations dictate the sampling and monitoring requirements for the system. Water quality is tested throughout the treatment process and distribution system. Where required by regulation, samples are submitted to an accredited laboratory for analyses.

**6.7 Process Flow Schematic and Diagram:**

(see below)

File: C:\DWQMS\Huron-Kinloss\H-K- Lucknow - 6- Drinking Water System

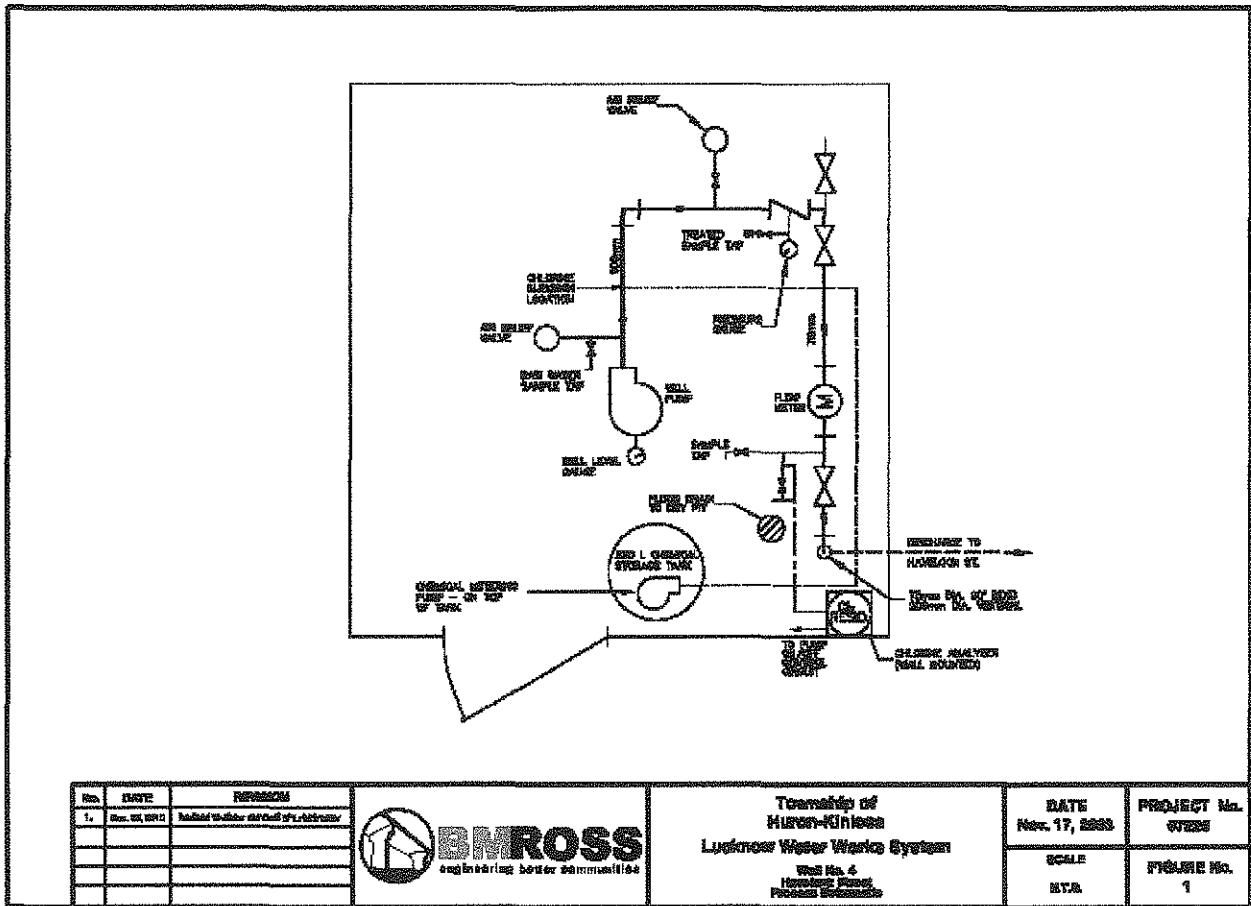
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6.7.1 Havelock Street Process Schematic



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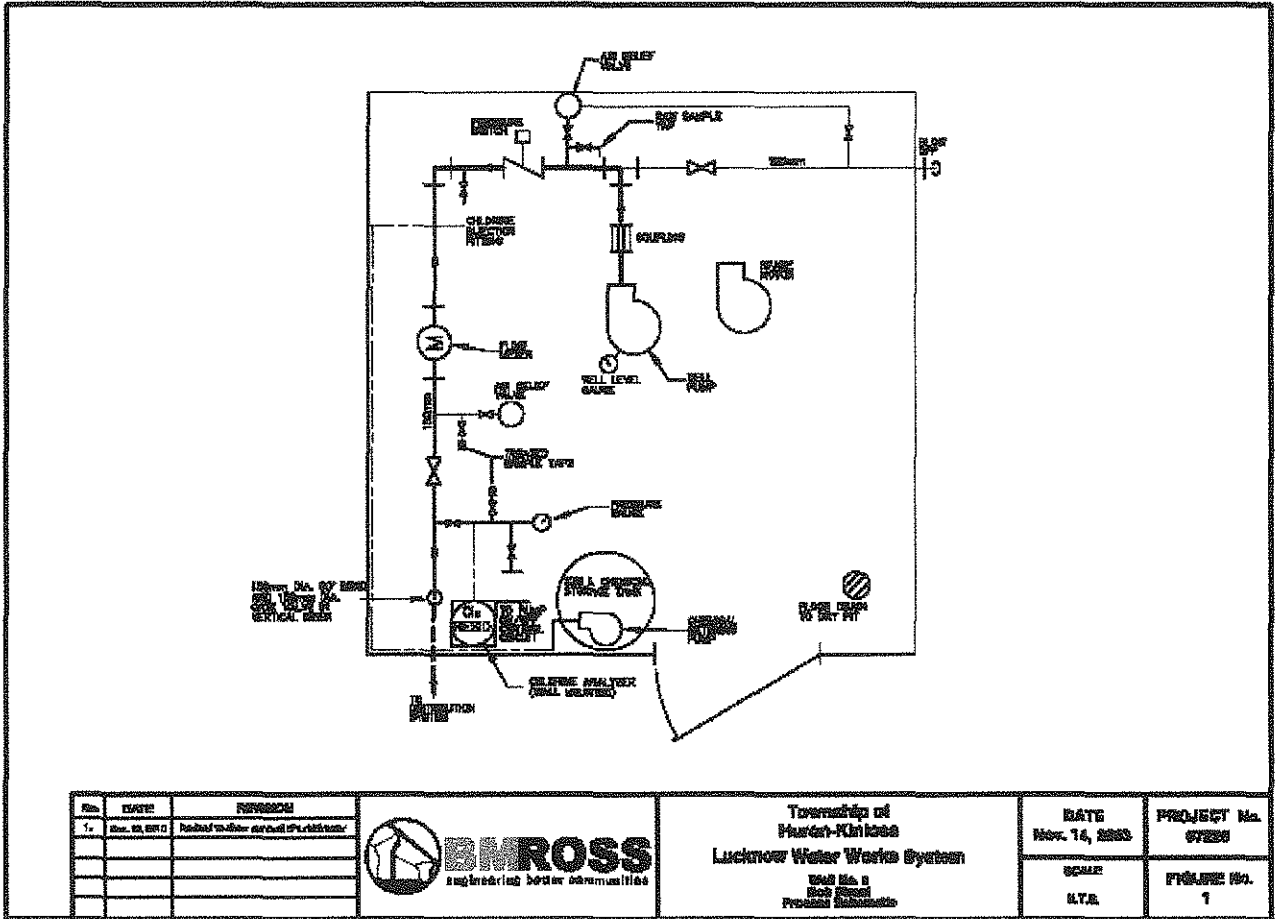
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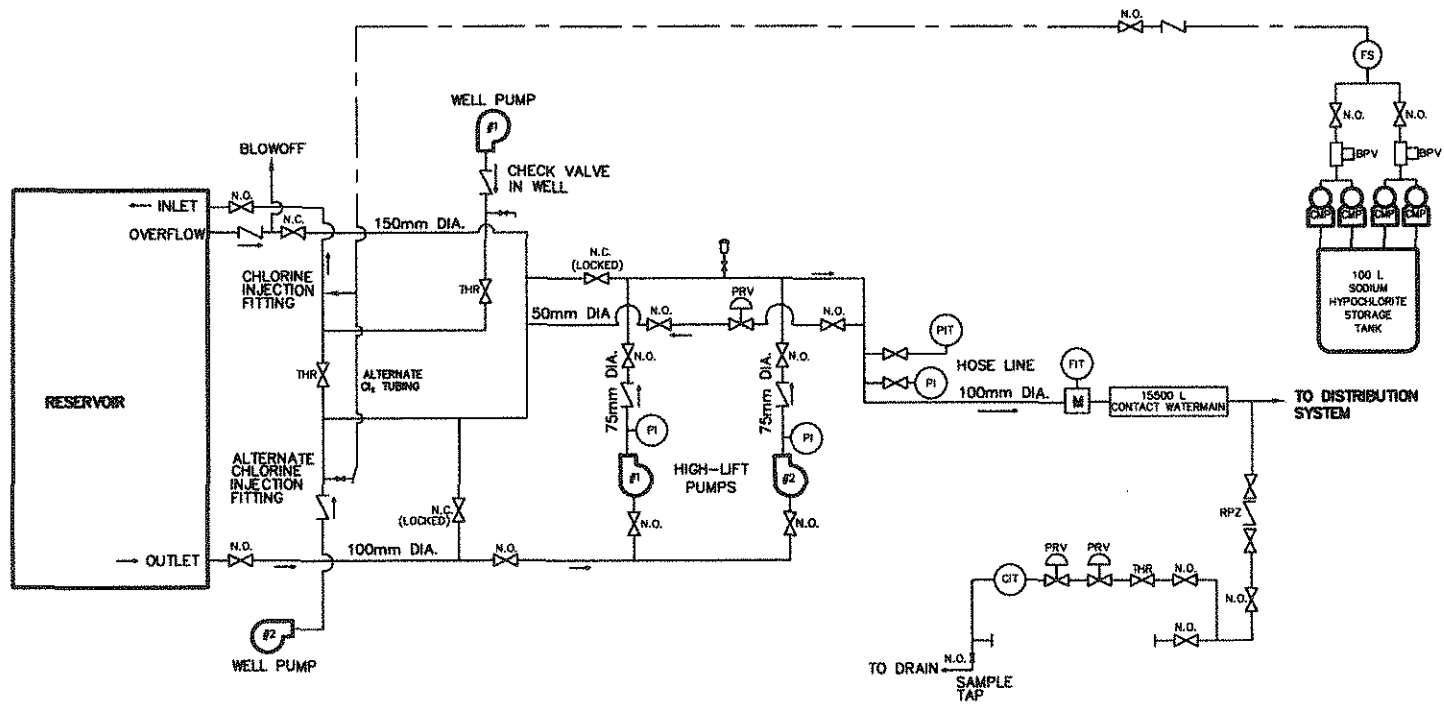
6.7.2 Bob Street Process Schematic



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**LEGEND**

- CHLORINE RESIDUAL ANALYZER
- PRESSURE GAUGE
- FLOAT/LEVEL SWITCH
- PRESSURE TRANSMITTER
- FLOWMETER
- PRESSURE RELIEF VALVE
- AIR RELEASE VALVE
- PUMP
- CHEMICAL METERING PUMP
- MANUALLY ACTUATED VALVE
- CHECK VALVE
- MANUAL SAMPLE POINT
- FLOW DIRECTION
- CHLORINE PIPING
- BPV BACKPRESSURE VALVE
- RPZ BACKFLOW PREVENTER
- THR THROTTLED VALVE
- N.O. NORMALLY OPEN
- N.C. NORMALLY CLOSED

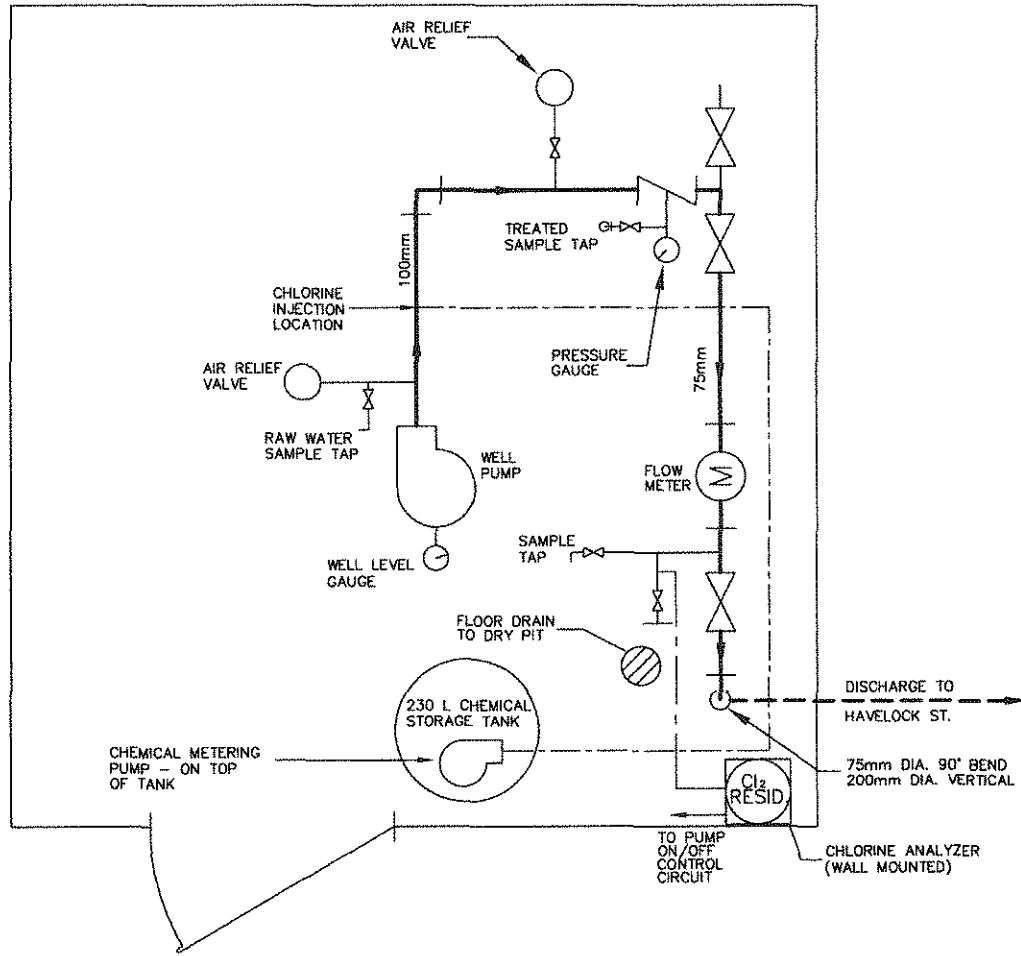
No.	DATE	REVISION
1.	Mar. 30, 2010	Revised to show removal of turbidimeter



**Township of  
Huron-Kinloss**  
  
**Ripley Water System**  
 Process Schematic

DATE Jan. 25, 2008	PROJECT No. 07226
SCALE N.T.S.	FIGURE No. 1





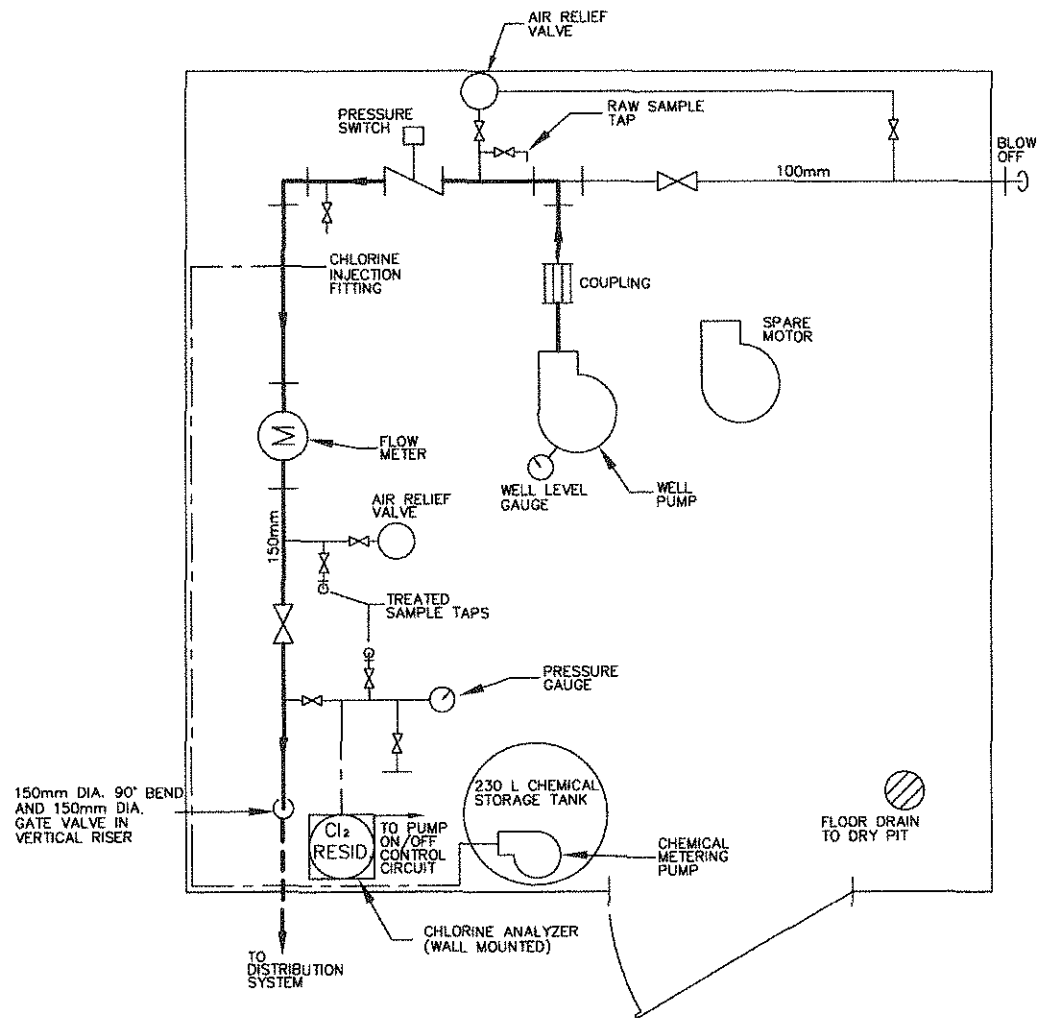
No.	DATE	REVISION
1.	Mar. 30, 2010	Revised to show removal of turbidimeter



**Township of  
Huron-Kinloss**  
**Lucknow Water Works System**  
 Well No. 4  
 Havelock Street  
 Process Schematic

DATE	Nov. 17, 2003
SCALE	N.T.S.

PROJECT No.	07226
FIGURE No.	1



No.	DATE	REVISION
1.	Mar. 30, 2010	Revised to show removal of turbidimeter



Township of  
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Lucknow Water Works System

Well No. 5  
Bob Street  
Process Schematic

DATE  
Nov. 14, 2003

PROJECT No.  
07226

SCALE  
N.T.S.

FIGURE No.  
1



## 8. Risk Assessment Outcomes

### Risk Assessment Outcomes - Summary and Analysis

#### Huron-Kinloss – Lucknow Water Treatment System

Basis: Risk Assessment Table and Team Meeting June 11, 2008

#### 1- First Engineer's Report

No outstanding items

#### 2- Rank Hazardous Events and Identify CCP's

From the Risk Assessment Table ranking of the potential result of the hazard, the Risk Priority Numbers (RPN) ranged from 4 to 11 (out of a total max of 15).

An RPN Threshold Value of 6 was chosen from review of the Risk Table because the Critical Control Point minimum number is 6, with exceptions as shown of 4 and 5 considered in some cases. It should be noted that although all hazards were assigned RPNs, only Critical Control Points and hazards with control measures available have Standard Operating Procedures or Contingency Plan response procedures.

Potential hazards and events always considered critically hazardous to water quality are high turbidity, inadequate primary and secondary disinfection, and loss of or low system pressure. These have been taken into account in this assessment.

RPN numbers less than 6 will be further assessed on an on-going basis as annual Risk Assessment reviews take place, and additional Monitoring or Control Measures may be considered at that time. Also not all high ranking hazards have Critical Control Limits or Control Measures, and will be considered in Contingency Plans or future reviews as required.

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**Risk Assessment Table Summary**

NOTE: A total 24 hazards were identified in the Risk Assessment Table – Appendix B2

CCP's (see additional details in Table below)

	<u>RPN</u>	<u>CONTROL</u>
Chemical feed system failure	6	SOP
Contamination of the CCC with improperly disinfected water	6	SOP/CP
Inadequate chlorine residual in distribution system	10	SOP/CP
Loss of system pressure	5	SOP
Loss of use or damage to Standpipe	4	CP

Not Considered CCP's (< 6 RPN)

	<u>RPN</u>	<u>CONTROL</u>
Well casing failure / Well head damage	5	SOP
Well pump failure	4	SOP
Low well levels	5	SOP
High flows -insufficient chlorine contact time	5	SOP
Chlorine Contact Chamber-out of service for mtce / repair	4	SOP
Commission of new mains	5	SOP
Non-funct. press. sustaining valves and press. red. valves	4	SOP

Not all high ranking hazards have Critical Control Limits or Control Measures. A summary of results from the risk assessment is shown below.

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Additional Potential Hazards or Hazardous Events Identified in the Risk Assessment ( >= 6 RPN)

(Although assessed with RPNs equal to or greater than the threshold value these are not considered CCP's, or assessed as required to have formal Operator response plans because no control measures are available.)

Not Considered CCP's ( >= 6 RPN)

	<u>RPN</u>	<u>CONTROL</u>
Chemical spill	8	CP
Agricultural run-off	8	CP
Changes in aquifer water quality	7	SOP
Degradation of liquid chlorine	7	SOP
Watermain break	9	SOP
Non-functioning isolation valves and hydrants	8	SOP
Failure to receive critical supply of parts or chemical	10	CP
Power failure	6	SOP
Remote Transmitting Unit / Remote Processing Unit Failure	9	SOP
Communications / Telemetry lines failure	9	SOP
Primary power failure	6	SOP
Vandalism, introduction of contaminant	11	CP

The Operating Authority intends to document and implement Standard Operating Procedures (SOP's) for many of these potential hazards regardless of the RPN number. These are noted in the Risk Assessment Table.

A summary of Process Steps established from the Risk Assessment Table, as Critical Control Points (CCPs) with Critical Control Limits (CCLs) is shown in the Table below:

**3- Establishing Procedures for Deviations from Critical Control Limits**

Each CCP must have one or more documented response procedure to respond if a critical control limit is exceeded. These procedures are documented in the Operating Authority's Operations Manual or Contingency Plan (Emergency Response Plan – ERP).

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**SUMMARY OF CCP'S FROM RISK ASSESSMENT TABLE:**

Process Step	Description of Hazard	Result of Hazard	Monit. & Cont Meas.	Control Proc.	L	S	D	#	CCP ?	CCL	Contin.Plan
Primary Disinfection	Chemical feed system failure	-loss of disinfection -possible loss of water	-on-line monitoring and controls with auto pump lock-out -Operator response -automatic back-up feed system -standpipe	-Operator response -maintain spare parts on site -refer to SOP -routine preventative maintenance	2	3	1	6	N  YES	None  -less than 0.2 mg/L free chlorine	-Prepare procedure -Boil Water Procedure -0.5 mg/L free chlorine -chlorine alarm sounds and well pump locks out -operator response
Chlorine Contact Chamber	Contamination of the chamber with improperly disinfected water	-improperly disinfected water entering the distribution system	-online chlorine analyzers -alarms -operator observation	-Operator response -refer to procedure	3	2	1	6	YES	-less than 0.2 mg/L free chlorine	SOP CP / Emergency Response Procedure
Secondary Disinfection	inadequate chlorine residual in distribution system	-potential biological contamination	-on-line monitoring and controls of primary disinfection -chlorine residual at point of entry to distribution system -daily residual from distribution system	-Operator response -increase chemical dosage -routine flushing of dead-ends -refer to Operations Manual SOP	5	2	3	10	YES	-less than 0.2 mg/L free chlorine in distribution	SOP CP / Emergency Response Procedure
Distribution	Loss of system pressure	-potential chemical or biological contamination -backflow from private plumbing	-monitoring of system pressure -standpipe	-consumer complaint -precautionary boil water Notice -standpipe -refer to SOP	2	2	1	5	YES	Table provided by Nancy for pressure limits	SOP

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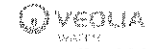
Process Step	Description of Hazard	Result of Hazard	Monit. & Cont Meas.	Control Proc.	L	S	D	#	CCP ?	CCL	Contin.Plan
Distribution	Loss of use or damage to Standpipe	-loss of water pressure -no access to fire protection -potential contamination -restrictions on water use	-alarms -visual examinations	-operator response -refer to SOP -high-lift control options -pressure control valves	1	2	1	4	Yes	Table provided by Nancy for pressure limits	CP / Emergency Response Procedure

Note: Primary Disinfection and Distribution have been added as minimum Critical Control Points, although not originally assessed as such.

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**APPENDIX B 2: RISK ASSESSMENT TABLE (from Team Meeting June 11, 2008)**

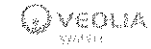
Process Step	Description of Hazard	Potential Result of Hazard	Available Monitoring and Control Measures	Control Procedure	Likelihood	Severity	Detectability	Risk Priority Number - RPN	CCP ?	Critical Control Limits	Contingency Plan
Raw Water / Well	Well casing failure / Well head damage	-Loss of raw water -potential biological / chemical contamination	-finished water on-line turbidity testing -weekly samples for microbiological testing -monthly monit. and raw water turbidity testing -redundancy back-up well house	-shut down the affected well -refer to SOP -plans for a new well	2	2	1	5	N	None	Need procedure - SOP

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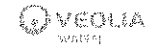
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Process Step	Description of Hazard	Result of Hazard	Monit. & Cont Meas.	Control Proc.	L	S	D	#	CCP ?	CCL	Contin.Plan
Raw Water / Well	Well pump failure	-loss of raw water	-alarm system -redundancy back-up well -standpipe	-Operator response -shut down the affected well -refer to SOP	2	1	1	4	N	None	Need Plan-develop SOP
Raw Water / Well	Chemical spill	-potential chemical contamination of aquifer	-monitor weekly microbiological, -monthly turbidity -36 month chemical testing -Operator observation -Customer complaint -well head protection plan -standpipe	-refer to contingency plan -Operator response	1	5	2	8	N	None	Part of Emergency Response Plan

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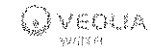
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Process Step	Description of Hazard	Result of Hazard	Monit. & Cont Meas.	Control Proc.	L	S	D	#	CCP ?	CCL	Contin.Plan
Raw Water / Well	Agricultural run-off	-potential biological / chemical contamination of aquifer	-monitoring - weekly microbiological, -monthly turbidity -quarterly chemical testing -36 month chemical testing -Operator observation -Customer complaint -well head protection plan -standpipe	-Operator response -refer to SOP	1	3	4	8	N	None	-Water Quality Monitoring -Prepare procedure Part of Emergency Response Procedure

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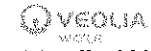
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Process Step	Description of Hazard	Result of Hazard	Monit. & Cont Meas.	Control Proc.	L	S	D	#	CCP ?	CCL	Contin.Plan
Raw Water / Well	Low well levels	-loss of water	-monitoring well levels weekly -trending	-Operator response -refer to SOP	1	2	2	5	N	None	Prepare procedure SOP
Additional Treated Water Quality Exceedences	Changes in aquifer water quality	-potential chemical contamination -restrictions on water use	-monitoring -advise health unit as required	Refer to SOP	1	2	4	7	N	None	SOP for adverse
Primary Disinfection	Chemical feed system failure	-loss of disinfection -possible loss of water	-on-line monitoring and controls with auto pump lock-out -Operator response -automatic back-up feed system -standpipe	-Operator response -maintain spare parts on site -refer to SOP -routine preventative maintenance	2	3	1	6	YES	-0.5 mg/L free chlorine -chlorine alarm sounds and well pump locks out	-Prepare procedure -Boil Water Procedure -0.5 mg/L free chlorine -chlorine alarm sounds and well pump locks out -operator response

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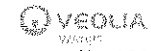
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Process Step	Description of Hazard	Result of Hazard	Monit. & Cont Meas.	Control Proc.	L	S	D	#	CCP ?	CCL	Contin.Plan
Primary Disinfection	High flows	-insufficient chlorine contact time -possible loss of water	-on-line monitoring and controls -Operator inspection, response, and repair -calculation of CT	-Operator response -control access to hydrants -refer to SOP	2	2	1	5	N	None	-procedure required -SOP -0.2 mg/L free chlorine resid. -chlorine alarm sounds and well pump locks out -operator response
Primary Disinfection	Degradation of liquid chlorine	-improper disinfection	-on-line monitoring and controls with auto pump lock-out -Operator response -standpipe	-Operator response -refer to test method -spare chlorine kept on site -increase chemical dosage -refer to SOP	2	4	1	7	N	None	-refer to test method SOP procedure -less than 8% -SOP req'd
Chlorine Contact Chamber	Out of service for maintenance / repair	-inadequate contact time for primary disinfection	-increase dosage rate -redundancy- alternate well house	-limit flows -increase chlorine residual at point of entry	1	2	1	4	N	None	PROCEDURE TO BE DEVELOPED

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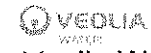
DWQMS Operational Plan  
LUCKNOW

Process Step	Description of Hazard	Result of Hazard	Monit. & Cont Meas.	Control Proc.	L	S	D	#	CCP ?	CCL	Contin.Plan
Chlorine Contact Chamber	Contamination of the chamber with improperly disinfected water	-improperly disinfected water entering the distribution system	-online chlorine analyzers -alarms -operator observation	-Operator response -refer to procedure	3	2	1	6	YES	-less than 0.2 mg/L free chlorine	Need procedure Part of Emergency Response Procedure
Secondary Disinfection	inadequate chlorine residual in distribution system	-potential biological contamination	-on-line monitoring and controls of primary disinfection -chlorine residual at point of entry to distribution system -daily residual frm distribution system	-Operator response -increase chemical dosage -routine flushing of dead-ends -refer to Operations Manual SOP	5	2	3	10	YES	-less than 0.2 mg/L free chlorine in distribution	Review / Amend Procedure Part of Emergency Response Procedure -As provided by Nancy

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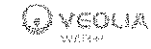
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Process Step	Description of Hazard	Result of Hazard	Monit. & Cont Meas.	Control Proc.	L	S	D	#	CCP ?	CCL	Contin.Plan
Distribution	Watermain break	-loss of system pressure - potential biological contamination of distributed water -property damage	-alarm -Operator response / observation -consumer complaint	-Operator response -refer to SOP (Operations Manual)	4	2	3	9	N	None	Review / Amend procedure -need SOP
Distribution	Commission of new mains	-potential contamination	-daily sampling and monitoring -Operator response -system maintenance and repair	-Disinfection procedure -refer to SOP	3	1	1	5	N	None	Procedures in place -amend / review SOP
Distribution	Loss of system pressure	-potential chemical or biological contamination -backflow from private plumbing	-monitoring of system pressure -standpipe	-consumer complaint -precautionary boil water Notice -standpipe -refer to SOP	2	2	1	5	YES	None Nancy to advise	Review / Amend Procedure

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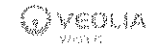
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Process Step	Description of Hazard	Result of Hazard	Monit. & Cont Meas.	Control Proc.	L	S	D	#	CCP ?	CCL	Contin.Plan
Distribution	Non-functioning isolation valves and hydrants	-unable to isolate -no access to fire protection -loss of water	-annual exercise -annual inspection -regular maintenance	-Operator response -refer to SOP	4	1	3	8	N	None	Amend procedure
Distribution	Non-functioning pressure sustaining valves and pressure reducing valves	-loss of water pressure -high pressure breaks -no access to fire protection	-alarms -consumer complaints	-operator response -interconnection valve with Kincardine	1	2	1	4	N	None	Refer to Kinc. Procedure SOP Req'd
Distribution	Loss of use or damage to Standpipe	-loss of water pressure -no access to fire protection -potential contamination -restrictions on water use	-alarms -visual examinations	-operator response -refer to SOP -high-lift control options -pressure control valves	1	2	1	4	YES	Table provided by Nancy for pressure limits	Part of Emergency Response Procedure -as provided by Nancy

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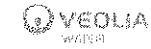
Process Step	Description of Hazard	Result of Hazard	Monit. & Cont Meas.	Control Proc.	L	S	D	#	CCP ?	CCL	Contin.Plan
Suppliers	Failure to receive critical supply of parts or chemical	-unable to treat water adequately -failure of equipment	-written communication and agreements with suppliers -NSF and CofA requirement on site -redundancy of equipment	-Operator response -alternate source -critical spare parts available	4	3	3	10	N	None	<b>PROCEDURE REQ'D FOR LISTING SPARE PARTS AND CRITICAL QUANTITIES OF CHEMICALS</b>
Control Systems	Power failure	-loss of SCADA -loss of pumps, water pressure, and supply	-UPS -back-up disks, memory stick -propane back-up generator w/ auto transfer switch at Municipal office	-Operator response -stand-by genset for SCADA PC	3	2	1	6	N	None	Develop procedure (gen set from Ripley)
Control Systems	Remote Transmitting Unit / Remote Processing Unit Failure	-loss of control of equipment -loss of communication and record keeping	-alarms -regular checks	-Operator response -spare components -refer to procedure	3	2	4	9	N	None	Need Procedure

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Process Step	Description of Hazard	Result of Hazard	Monit. & Cont Meas.	Control Proc.	L	S	D	#	CCP ?	CCL	Contin.Plan
Control Systems	Communications / Telemetry lines failure	-loss of operator monitoring and control	-alarms -regular checks	-operator response	5	2	2	9	N	None	Need SOP - purchase remote dialers -install phone lines
Entire System	Primary power failure	-loss of treated water supply	-back-up diesel generator with manual transfer (from Ripley) -UPS on SCADA PC -annual inspections -standpipe	-Operator response -refer to procedure -refer to SOP -standpipe	3	2	1	6	N	None	Review Procedure-SOP
Facility Security	-Vandalism, -introduction of contaminant	-damage to equipment -inability to produce treated water -potential contamination	-locks -daily checks -high visibility	-operator response -refer to procedure	1	5	5	11	N	None	Need Procedure Part of ERP

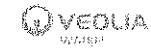
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Township of Huron-Kinloss



Veolia Water Canada

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Process Step	Description of Hazard	Result of Hazard	Monit. & Cont Meas.	Control Proc.	L	S	D	#	CCP ?	CCL	Contin.Plan
Emergency Preparedness											PROCEDURE REQ'D FOR EMERGENCY PROCEDURE FOR WATER SYSTEM- CONTACT #S NAMES ETC.

Team Members: H-K – Tracey Howe, Hugh Nichol, Nicole Elliott  
Veolia – Laurie Cox, Nancy Mayhew, Wendy Gallant, Don Scott

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**APPENDIX I 1: SAMPLING, TESTING, AND MONITORING SUMMARY TABLE: (Ground Water System)**

PARAMETER						
Process step	Sampling or Monitoring Parameter and Frequency	Location	Quality Targets	Response	Challenging Conditions	Records
<u>Raw Water</u> -WELL LEVEL STATIC	WEEKLY level checks -static	Well #4 and #5	Flows & level: Operator responds to / reports significant changes in flows, levels or pressure	-Operator to note and respond to significant changes in readings or observations and note in Log Book	None known	Recorded in Log Book and log sheet
<u>Raw Water</u> -TURBIDITY	MONTHLY grab sample testing from each well -turbidity	-collected at raw water tap	Turbidity: Observe trends, report significant change (of +/- .25 NTU)	-Operator to note and respond to significant changes in readings or observations and note in Log Book	-status of aquifer such as limestone flaking -well casing deterioration	Recorded in Log Book and log sheet
<u>Raw Water</u> MICRO-BIOLOGICAL	WEEKLY microbiological grab sample from each well  -E-coli -total coliform	-collected at raw water tap	-not detectable -not detectable	samples sent to outside lab for analysis and report	As above	-Operator records on Custody Sheets -results reported by outside lab to WTP

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Initial Release	Apr. 20, 2009	Release	DC Scott –QMS Rep.	Laurie Cox - Veolia PM / ORO
Rev. 1	Mar. 4, 2011	No Dist Cl2 analyser, remove turbidity analyser	DC Scott –QMS Rep.	Laurie Cox - Veolia PM / ORO

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Process step	Sampling or Monitoring Parameter and Frequency	Location	Quality Targets	Response	Challenging Conditions	Records
<b>Treated Water</b> <b>CHLORINE RESIDUAL</b>  - Disinfection / Chlorination	<u>ON-LINE / SCADA</u> Cl2 analyzer residual monitoring analysis  <u>DAILY</u> grab sample Cl2 residual testing (free chlorine residuals)	point of entry treated tap	-Operational Goal is 0.90-1.10 mg/l	Operator to respond to significant changes in readings or observations and note in Log Book	-raw water quality changes	On-line SCADA record  Recorded in Log Book and log sheet
<b>Treated Water</b> <b>TURBIDITY</b>	Daily Operator checks	-point of entry to distribution system (treated tap)	-observe trends	Operator to respond to significant changes in readings or observations and note in Log Book	-raw water quality changes	On-line SCADA record  Recorded on log sheets only
<b>Treated Water</b> <b>MICRO-BIOLOGICAL</b>	<u>WEEKLY</u> sample collection from each well  microbiological sample for -E-coli -total coliform -Heterotrophic Plate Count (HPC)  -bacteria plate count (25% HPC- distr.)	-point of entry -collected at treated tap	Operational Goals:  -E-coli- not detectable  -Coliform-not detectable  -HPC steady baseline, no sudden change  ( (< 10 – plate count (colonies per ml) < 10- HPC plate count (colonies per ml) )	samples sent to outside lab for analysis and report	Raw water quality	-Operator records on Custody Sheets -results reported by outside lab to WTP

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Process step	Sampling or Monitoring Parameter and Frequency	Location	Quality Targets	Response	Challenging Conditions	Records
<u>Treated Water</u> NITRATE & NITRITE	<u>QUARTERLY</u> (every 3 mo)  -nitrate & nitrite testing	-point of entry (collected at treated water tap)	Per O.Reg 169/03  -MAC 10 mg/l (Operational Goal 5 mg/l) -MAC 1.0 mg/l (as nitrogen) (Operational goal 0.5 mg/l)	-samples sent to outside lab for analysis and report	Raw water quality	-Operator records on Custody Sheets -results reported by outside lab to WTP
<u>Treated Water</u> INORGANICS	<u>TRI-ANNUALLY</u> (every 36 mo)  Per schedule 23 of O.Reg. 170/03	-point of entry (collected at treated water tap)	As outlined in O.Reg 169/03 for parameters in sch. 23 of O.Reg. 170/03 (< 50% MAC Operational Goal)	-samples sent to outside lab for analysis and report	Raw water quality	-Operator records on Custody Sheets -results reported by outside lab
<u>Treated Water</u> ORGANICS	<u>TRI-ANNUALLY</u> (every 36 mo)  Per schedule 24 of O.Reg. 170/03	-point of entry (collected at treated water tap)	As outlined in O.Reg 169/03 for parameters in sch. 24 of O.Reg. 170/03  (< 50% MAC Operational Goal)	-samples sent to outside lab for analysis and report	Raw water quality	-Operator records on Custody Sheets -results reported by outside lab to WTP
<u>Treated Water</u> SODIUM	<u>5 YEAR</u> intervals (every 60 mo)  (Per schedule 23 of O.Reg. 107/03)	-point of entry (collected at treated water tap)	<20 mg/l (if above- advise MOH)  See also Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines	-samples sent to outside lab for analysis and report	Raw water quality	-Operator records on Custody Sheets -results report by outside lab

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<u>Treated Water</u> FLUORIDE CONTENT	5 YEAR intervals (every 60 mo)	- point of entry (treated water sample tap)	Operational goal is < 1.5 mg/l (if above – call MOH)	-samples tested by Operator, records results, and advises MOH if above 1.5 mg/l	Raw water quality	Recorded in Log Book
<u>Treated Water</u> HARDNESS	ON REQUEST grab sample collected	-collected at treated tap	N/A See Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines	Operator to report result to ORO / CO to respond to Request	N/A	Recorded in Log Book
<u>Distribution System</u> CHLORINE RESIDUAL	-DAILY grab sample Cl2 residual testing (free chlorine residuals)	-household or business tap	-Operational Goal is > 0.2 mg/l  (and <2.0 mg/l)	Operator to respond as required and note in Log Book	-raw water quality changes	On-line SCADA record  Recorded in Log Book

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Process step	Sampling or Monitoring Parameter and Frequency	Location	Quality Targets	Response	Challenging Conditions	Records
<b>Distribution System</b> <b>MICRO-BIOLOGICAL</b>	- <u>WEEKLY</u> sample collection 9 per month 3-samples week 1 2- samples week 2,3,4 from distribution system  microbiological sample for -E-coli -total coliform -Heterotrophic Plate Count (HPC) bacteria plate count (25% HPC- distr.)	Distribution system per Weekly Bacti Sample Routes and Locations  (per SOP Sampling Schedule)	Operational Goals:  -E-coli- not detectable -Coliform-not detectable  -HPC steady baseline, no sudden change  Operational Goal ( (< 10 – plate count (colonies per ml) < 10- HPC plate count (colonies per ml) )	samples sent to outside lab for analysis and report	Raw water quality	-Operator records on Custody Sheets -results reported by outside lab to WTP
<b>Distribution System</b> <b>TRIALOMETHANES</b>	<u>QUARTERLY</u> (every 3 mo)  trihalomethane testing	-distribution system (collected at rotating distant points in the system)	MAC - 0.10 mg/l  (Ref. O.Reg 169/03)	-samples sent to outside lab for analysis and report	Raw water quality	-Operator records on Custody Sheets -results reported by outside lab
<b>Distribution System</b> <b>LEAD</b>  (see SOP also for lead Sampling Schedule )	<u>SEMI-ANNUALLY</u> (every 6 mo)  -lead testing	-distribution system- private plumbing, non-private plumbing, and distribution system samples (collected per Operations Manual Schedule)	0.10 mg/l  Per O.Reg 169/03	-samples sent to outside lab for analysis and report		-Operator records on Custody Sheets -results reported by outside lab

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