Ministry of Environment and Climate Change

Safe Drinking Water Branch

Sarnia/Windsor District
1094 London Rd
Sarnia ON N7S 1P1

Ministère de l'Environnement et de l'Action en matière de changement climatique

Direction du contrôle de la qualité de l'eau potable

District de Sarnia et de Windsor
1094, chemin London
Sarnia ON N7S 1P1

Ontario

File: SI-ES-KI-540
Union WSS

March 30, 2016

Union Water Supply System
1615 Union Ave.
Ruthven, ON N0P 2G0

Attention: Mr. Rodney Bouchard
Manager
rbouchard@unionwater.ca

Dear Mr. Bouchard:

Re: January 14, 2016 Inspection – Union Area Water Supply System

Enclosed is a copy of the inspection report prepared for the Union Area Water Supply System, under the Ministry's focused inspection protocol to assess compliance with *Safe Drinking Water Act* legislation. The report is based on conditions encountered at the time of inspection, and subsequent follow-up.

The Union Water System Joint Board of Management must directly address the items under the heading **"Non-Compliance with Regulatory Requirements and Actions Required"** since they relate to compliance with regulatory requirements under Safe Drinking Water legislation. Written responses must be submitted by the dates identified in the required actions.

For the items under the heading **"Summary of Best Practice Issues and Recommendations"**, you are also encouraged to provide a written response stating how these items have been or will be addressed.

Section 19 of the Safe Drinking Water Act (Standard of Care) creates a number of obligations for individuals who exercise decision-making authority over municipal drinking water systems. Please be aware that the Ministry has encouraged such individuals, particularly municipal councillors, to take steps to be better informed about the drinking water systems over which they have decision-making authority. These steps could include asking for a copy of this inspection report and a review of its findings. Further information about Section 19 can be found in *"Taking Care of Your Drinking Water: A guide for members of municipal council"* found under "Resources" on the Drinking Water Ontario website at http://www.ontario.ca/document/taking-care-your-drinking-water-guide-members-municipal-councils.

In order to measure individual inspection results, the Ministry has established an inspection compliance risk framework based on the principles of the Inspection, Investigation & Enforcement

(II&E) Secretariat and advice of internal/external risk experts. The Inspection Summary Rating Record (IRR), included as Appendix D of the inspection report, provides the Ministry, the system owner and the local Public Health Unit with a summarized quantitative measure of the drinking water system's annual inspection and regulated water quality testing performance. IRR ratings are published (for the previous inspection year) in the Ministry's Chief Drinking Water Inspectors' Annual Report.

Should you note any errors or omissions or have any concerns, please contact me at (519) 383-3785, or Gary Johnson at (519) 383-3769.

Yours truly,

_____

Al Petersen
Provincial Officer
Safe Drinking Water Branch, Sarnia District Office
al.petersen@ontario.ca

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File: SI-ES-KI 540 Union Water Supply System (2015/16)

Ontario

Ministry of the Environment and Climate Change

UNION AREA WATER SUPPLY SYSTEM

Inspection Report

Site Number:	210000853
Inspection Number:	1-BZARB
Date of Inspection:	Jan 14, 2016
Inspected By:	Al Petersen

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OWNER INFORMATION:

Company Name:	UNION WATER SYSTEM JOINT BOARD OF MANAGEMENT (LEAMINGTON, KINGSVILLE, ESSEX, LAKESHORE)		
Street Number:	1615	**Unit Identifier:**	
Street Name:	UNION Ave		
City:	RUTHVEN		
Province:	ON	**Postal Code:**	N0P 2G0

CONTACT INFORMATION

Type:	Operating Authority	**Name:**	Dale Dillen
Phone:	(519) 326-4447	**Fax:**	(519) 326-0450
Email:	ddillen@ocwa.com		
Title:	Operations Manager, OCWA		

Type:	Operating Authority	**Name:**	Dan Beaulieu
Phone:		**Fax:**	
Email:			
Title:	Process and Compliance Technician, OCWA (formerly)		

Type:	Operator	**Name:**	Sam Wen
Phone:	(519) 326-4447	**Fax:**	(519) 326-0450
Email:	swen@owca.com		
Title:	Senior Operator/Mechanic (ORO), OCWA		

Type:	Operator	**Name:**	Terry Truant
Phone:	(519) 326-4447	**Fax:**	(519) 326-0450
Email:			
Title:	O & M Team Lead, OCWA		

Type:	Owner	**Name:**	Rodney Bouchard
Phone:	(519) 326-1668	**Fax:**	(519) 326-3490
Email:	rbouchard@unionwater.ca		
Title:	Manager, UWSS Joint Board Management		

INSPECTION DETAILS:

Site Name:	UNION AREA WATER SUPPLY SYSTEM
Site Address:	1615 UNION AVE RUTHVEN ON N0P 2G0
County/District:	Kingsville
MOECC District/Area Office:	Windsor Area Office
Health Unit:	WINDSOR-ESSEX COUNTY HEALTH UNIT
Conservation Authority	Essex Region Conservation Authority
MNR Office:	Chatham Regional Office

Category:	Large Municipal Residential
Site Number:	210000853
Inspection Type:	Announced
Inspection Number:	1-BZARB
Date of Inspection:	Jan 14, 2016
Date of Previous Inspection:	Dec 17, 2014

COMPONENTS DESCRIPTION

Site (Name): Union AWSS
Type: Other **Sub Type:** Other
Comments:
The Union Area Water Supply System (Union WSS) is located in Ruthven, Ontario. The drinking water system is owned by, and supplies water to, the municipalities of Kingsville, Leamington, Essex and Lakeshore via the Union Water System Joint Board of Management. Each of these respective municipalities forms part of board, but each also owns and operates a separate standalone distribution system receiving water from the Union WSS. According to the drinking water system registration profile, this results in a total serviced population of approximately 55,000 persons. The Union WSS system is considered a "large municipal residential system" under O. Regulation 170/03.

The communities of Kingsville, Leamington, Essex are equipped with elevated tanks. Other than the reservoirs on-site at the Union treatment plant, there is also a reservoir/booster station in the village of Cottam which serves the Town of Essex.

Site (Name): Union AWSS Low Lift Building
Type: Source **Sub Type:** Surface Water
Comments:
The treatment facility in Ruthven, receives water from Lake Erie via a low lift pumping station. Seven low lifts pumps can draw water through two intake pipes and another emergency intake channel if needed. The low lift station is equipped with a zebra mussel control system consisting of a pre-chlorination line retrofitted through the #2 intake line, extending to a diffuser within its intake crib. The original pre-chlorination line extending to the #1 and #2 intakes plugged and was disconnected. A replacement line to #1 intake was not installed but is planned. The low lift pumping station consists of a two cell interconnected pump-well, equipped with manually removed bar screens and automatic travelling screens. Low lift pump well #1 houses five low lift pumps and low lift pump well #2 houses the remaining two pumps. The low-lift also houses two surge tanks for pump pressure surges.

Raw water flows through 24 inch and 36 inch raw transmission mains to the treatment plant approximately one kilometre inland.

Site (Name): Union AWSS WTP
Type: Treated Water POE **Sub Type:** Treatment Facility
Comments:
The Union WSS treatment plant is currently rated at 124,588 m3/d approved capacity. It is a conventional water treatment plant consisting of contact clarification via four solids upflow clarifiers after coagulant, coagulant aid (polymer) and activated carbon addition. Clarified water flows into eight dual media-type filters (sand and anthracite). Filter aid can be dosed on a contingency basis. The filters are equipped with backwash facilities via two backwash pumps. Sedimentation sludge and backwash from the filters is directed to a residue management pump station and is transferred to two settling/storage ponds. Supernatant overflow from the ponds is discharged into a storm sewer which discharges to Lake Erie.

Primary disinfection is provided via chlorine gas solution injection into the clarified water (pre) or filtered water (post) locations. Injection into the filtered water is currently used. Chlorine contact is achieved in two on-site reservoirs, operated in series. Interconnecting piping and valves allow taking individual reservoirs out of service. Free and total chlorine is monitored after the reservoirs to properly meter and inject aqueous ammonia into the treated water stream for secondary disinfection before the high-lift pump station. The high-lift pump station consists of two wells. High-lift pump well #1 houses seven high lift pumps and high-lift pump well #2 houses two pumps. There is also an emergency diesel-drive for one of the high-lift pumps. The high-lift also houses two surge tanks for pump pressure surges.

INSPECTION SUMMARY

INTRODUCTION

* **The primary focus of this inspection is to confirm compliance with Ministry of the Environment and Climate Change (MOECC) legislation as well as evaluating conformance with ministry drinking water policies and guidelines during the inspection period. The ministry utilizes a comprehensive, multi-barrier approach in the inspection of water systems that focuses on the source, treatment, and distribution components as well as management practices.**

This drinking water system is subject to the legislative requirements of the Safe Drinking Water Act, 2002 (SDWA) and regulations made therein, including Ontario Regulation 170/03, "Drinking Water Systems" (O.Reg. 170/03). This inspection has been conducted pursuant to Section 81 of the SDWA.

This inspection report does not suggest that all applicable legislation and regulations were evaluated. It remains the responsibility of the owner to ensure compliance with all applicable legislative and regulatory requirements.

Specifically, this review includes an assessment of compliance / conformance in relation to the following:

• Drinking Water Systems Regulation (O. Reg. 170/03);

• Drinking Water Operator and Water Quality Analyst Certification Regulation (O. Reg. 128/04) with respect to facility certification, operator licensing and operating standards;

• Drinking Water System Licence 041-101, Issue Number 4, issued July 21, 2014, related to Performance, Monitoring and Recording, Operations and Maintenance requirements;

• Drinking Water Works Permit 041-201, Issue Number 3, issued July 21, 2014;

• Permit to Take Water 00-P-1342, related to compliance with permitted taking limits and special conditions;

• Ontario Drinking Water Quality Standards based on water quality data generated since the previous inspection, and

• required actions and recommendations in the previous Ministry inspection report dated December 17, 2014.

The inspection was conducted on an announced basis on January 14 and 15, 2016, consisting of:

1. a physical inspection of the low and high lift pumping facilities, water treatment equipment, above-ground reservoir facilities, spill containment measures and hazardous materials storage methods, treatment by-pass connections, and residual waste management facilities;

2. a review of critical alarms,

3. testing free residual disinfectant from the point of primary chlorine contact and combined chlorine residuals;

4. testing turbidity from selected filter effluents, and

5. collection of relevant operational documents and owner's sampling results.

Additional components of the inspection were completed on January 21, 2016 at the water treatment plant, Cottam Booster Station, Essex tower and Albuna tower, consisting of:

1. a physical inspection at the remote facilities and disinfection facilities at the water treatment plant;

INTRODUCTION

2. testing combined chlorine residuals from the Cottam Booster Station, Essex tower, Albuna tower and from the treated water at the water treatment plant, and

3. staff interviews.

Follow-up components of the inspection consisted of review of collected documentation and operating and contingency procedures for assessment of compliance with regulated requirements. The inspection covers the period from January 2015 to December 2015.

SOURCE

* **The drinking water system management was aware of the potential sources of pollution or activities that could impair source water quality as contained in the approved Assessment Report.**

An assessment of Union WSS intake threats was included in the Assessment Report for the Essex Region Source Protection Area, conducted under the Ontario Clean Water Act 2006. According to the Assessment Report, moderate threats were identified in Intake Protection Zone 1 (IPZ-1 typically comprising a radius of 1 kilometre around the intake) of the emergency intake. Identified threats reported are:

• the operation of a sewage system.

• the operation and use of a waste disposal site.

• the storage of agricultural and non-agricultural source material and the application of these material to land.

• the use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard.

The Union WSS Joint Management Board has representation on the Source Protection Committee.

The Union WSS Joint Management Board receives briefings in its regular meetings on the status of seasonal Blue-Green algae threats at the raw water intake and the results of the monitoring program undertaken in raw and treated water samples for microcystin analyses.

There were also two notable events in 2015 operating logs which revealed activities with a potential to impact on the source water quality:

1. On August 13, 2015 the operator was informed that spoils from Kingsville harbour dredging would be disposed of at a designated site in Lake Erie 1 km out and 2 km east of the harbour (west of the water plant).

2. On September 18, 2015 a spill was reported from a tomato processing facility discharging to a drainage ditch which enters Lake Erie 3 km west of the intake. The spilled material was septic effluent from the facility's wastewater system.

The plant is also routinely notified of combined sewer overflows east of the plant from the Town of Leamington, although the prevailing lake current is west to east so no impacts are anticipated on the intake.

PERMIT TO TAKE WATER

* **The owner had a valid PTTW for all of the production sources.**

  Permit to take water 0816-9T9SVT, for taking water from Lake Erie, was issued March 6, 2015. The Permit expires on January 31, 2025.

  It prescribes maximum daily and instantaneous water takings of 163,656 m3/d and 113,650 L/min respectively.

* **The maximum water takings were in accordance with those allowed under the PTTW.**

  The owner's raw water trending data confirms the following maximum takings for 2015:

  Maximum day flow: 75,179 m3 (46% of PTTW limit)

  Maximum peak flow: 66,264 L/min (58% of PTTW limit)

* **The PTTW imposed additional monitoring or recording requirements and the owner had complied with the conditions of the PTTW.**

  Permit to Take Water 0816-9T9SVT contains the following special condition:

  4.1 The Permit Holder shall maintain a record of all water takings. This record shall include the dates of water takings, and the total measured amounts of water pumped per day for each day that water is taken under the authorization of this Permit. A separate record shall be maintained for each source. The Permit Holder shall keep all required records up to date and available at or

  near the site of the taking and shall produce the records immediately for inspection by a Provincial Officer upon his or her request. The total amounts of water pumped shall be measured using existing infrastructure flow meters.

  In order to assess compliance with these condition, the owner must sum the daily rates of taking from four raw flow meters. Within the period of review, the Union WSS's flow rates for both instantaneous and daily volumes were generated and logged. Daily taking volumes were recorded in bench logs and totalized on SCADA.

CAPACITY ASSESSMENT

* **There was sufficient monitoring of flow as required by the Permit and Licence or Approval issued under Part V of the SDWA**

  Condition 2.0 of Schedule C of the Drinking Water Licence requires the owner to undertake continuous flow measurement and recording for:

  2.1.1 The flow rate and daily volume of treated water that flows from the treatment subsystem to the distribution system.

  2.1.2 The flow rate and daily volume of water that flows into the treatment subsystem.

  One magnetic type and three differential pressure type meters are installed on the raw inlet supply to each upflow clarifier, four in total. The metered flow piping to clarifiers 1 and 2 are inter-connected with each other. Magnetic type meters are installed on each filter effluent line.

  Magnetic type meters are also installed on the high-lift discharge headers to the distribution system. Additionally flow meters are installed to measure filter backwash and jet wash flows.

  A flow meter is also provided at the Cottam booster pumping station on the station effluent/bypass header.

CAPACITY ASSESSMENT

* **Flow measuring devices were calibrated or verified in accordance with the requirements of a Permit and Licence or Approval issued under Part V of the SDWA.**

  Municipal Drinking Water System Licence condition 3.1 and 3.2 state that flow measuring devices must be checked and calibrated in accordance with the manufacturer's instructions, or if the instructions do not indicate how often to check and calibrate the flow measuring devices, they must be checked and calibrated at least once every 12 months during which the drinking-water system is in operation.

  The last flow meter calibrations of the main plant effluent magnetic type meters were completed on May 21, 2015. The certificates of calibration shows that the meters were within acceptable accuracy.

  Calibrations of three of the plant's four raw flow meters (all differential pressure type) were completed on December 12, 2015. The certificates of calibration shows that the meters were within acceptable accuracy. Records indicate that the meter head on the other raw (magnetic type) meter was replaced with a new unit and its output verified in October 2015.

* **The owner was in compliance with the conditions associated with maximum flow rate or the rated capacity conditions in the Permit and Licence or Approval issued under Part V of the SDWA.**

  Condition 1.0 of Schedule C of the Drinking Water System Licence states that the maximum daily volume of treated water that flows from the treatment subsystem to the distribution system shall not exceed 124,588 m3/day.

  During the period of review, the maximum day flow of treated water was 69,532 m3, or approximately 56% of the approved rated capacity.

* **Records of flows and any capacity exceedances were made in accordance with the Permit and Licence or Approval issued under Part V of the SDWA.**

  Records of flow signals flow meters are recorded on the SCADA Historian system, consistent with Schedule C Condition 2.0 of the Drinking Water Licence. Daily flow totals are recorded in the Operational Data Log, consistent with Condition 4.1 of the Permit to Take Water. There were not any instances of capacity exceedences determined from a review of flow trends.

TREATMENT PROCESSES

* **The owner had ensured that all equipment was installed in accordance with Schedule A and Schedule C of the Drinking Water Works Permit.**

  A physical inspection was done to review the plant works for consistency with those identified in the Drinking Water System Description outlined in Schedule A of the Drinking Water Works Permit issued in July 2014. The works inspected were generally consistent with those identified in the Drinking Water System Description.

  The following observations were made:

  1. Filters 2 and 4 were retrofitted with filter media air scour to replace water jet wash and new underdrains, as proposed in the last application for permit renewal.

  2. A retrofit of the no. 1 intake with a new sodium hypochlorite solution supply line extending to the intake crib, proposed in the last application for permit renewal, has not been installed to date but is pending.

  3. The operator was in the process of re-locating the powdered activated carbon (PAC) dosing equipment from the maintenance room to the raw piping/valve gallery. This project necessitates replacing existing metering pumps with new peristaltic slurry mix/dosing pumps and removing existing slurry day tanks, mixers and transfer pump. Authorization for these changes was received from the Director on November 23, 2015, contingent on the owner preparing a Form 2 and submitting Director's Notification under Drinking Water Works Permit condition 2.4 requirements.

TREATMENT PROCESSES

4. The following were omitted in error and/or not corrected in the description of the works in the last permit renewal issuance:

A. The sodium hypochlorite dosing system at the low-lift building.

B. The collection/retention 'sulphur' pond receiving raw screen rejects, roof and floor drainage, located at the low-lift building.

C. The ratings of the gas chlorine disinfection system chlorinators.

Requirements for compliance with the provisions of Condition 4.0 of the Drinking Water Works Permit for other minor modifications are discussed below.

* **The owner had evidence that all required Director Notifications under Condition 2.4 of Schedule B of the Permit were made during the inspection period.**

A Director's Notification for changes to the PAC system, described above, was submitted on January 19, 2016. A planned test of one of the new dosing pumps was scheduled to occur during the same week.

* **The owner/operating authority was in compliance with the requirement to prepare Form 2 documents as required by their Drinking Water Works Permit during the inspection period.**

Form 2 documents must be prepared for any works falling within the scope of sections 4.1, 4.2 and 4.3 of the Drinking Water Works Permit. Required Form 2 documents were prepared for the following projects undertaken in 2015:

- Replacement of the compound meter with a magmeter on one of the Union WSS transmission mains on Division Road (County Road 29) at Kingsville Road #6. - April 27, 2015. Form 2 prepared on April 23, 2015.

- Replacement of ABB turbidimeters with Rosemount Emerson Model 56 modules (with Rosemount Clarity II turbidimeter bodies) on filters #1 and #4 on May 12, 2015. Form 2 prepared April 30, 2015.

- Replacement of a Prominent analyser with an SWAN Analytical AMI Trides analyser for measuring free chlorine in the treated water (CRA-9) on September 4, 2015. Form 2 prepared September 10, 2015.

- Replacement of the differential pressure (DP) meter with a new magnetic flowmeter on the discharge line serving filter backwash pump Mainwash #1 on the week of May 4, 2015. Form 2 prepared April 16, 2016.

- Replacement of High Lift pump #1 (electric drive) on November 24, 2015. Form 2 prepared November 25, 2015.

- Re-locating of the powdered activated carbon (PAC) dosing equipment, discussed above, necessitating replacing existing metering pumps with new peristaltic slurry mix/dosing pumps and removing existing slurry day tanks, mixers and transfer pump. - ongoing at time of inspection. Form 2 prepared September 10, 2015.

* **Records indicated that the treatment equipment was operated in a manner that achieved the design capabilities required under Ontario Regulation 170/03 or a Permit, Licence or Approval issued under Part V of the SDWA at all times that water was being supplied to consumers.**

Operating logs and continuous trends from January to December 2015 were reviewed.

In order to claim applicable Cryptosporidium oocyst and Giardia cyst removal credits, the Procedure for Disinfection of Drinking Water Supplies in Ontario states that performance must meet filtered water turbidity of less than or equal to 0.3 NTU in 95% of the turbidity measurements each month. Summaries assessed for the review period show that, except for August and September 2015, turbidity values were less than 0.3 NTU virtually 100% of the time. The standard was met at each filter in each month.

TREATMENT PROCESSES

There were two notable events resulting in elevated filter turbidity and declines in filter performance; one of brief duration and one of extended duration:

1. On July 6, 2015 increases in filter #1 to #4 effluent turbidity, short filter runs and rapid loss of head were recorded, and the operator reported that filters were showing "breakthrough" conditions. Filters #5 to #8 showed less instability. Logs indicate that raw water conditions (pH and temperature) changed, but raw turbidity remained stable so no chemical dosing adjustments were made until later that evening. A change in clarifier #2 coagulant (from alum to Delpac) had also taken place the evening before. Clarifiers #1 and #2 were feeding the filters most impacted. Signs of filter #1 to #4 turbidity breakthrough were evident, but values remained at or below 0.2 NTU while the filters were still online and there was no indication that coagulant feed was interrupted.

2. There was a noticeable deterioration in quality of effluent turbidity from filters #1 to #4 during August and September 2015. Monthly filter turbidity assessments for August and September show that filters #1 though #4 turbidity exceeded 0.3 NTU the following percentage of operational time:

Month	Filter #1	Filter #2	Filter #3	Filter #4
August	3.0 %	3.3 %	1.3%	1.6%
September	0.05 %	0.02 %	0 %	0%

Logs suggest that chlorine demand also increased during this period. These filters were being fed from clarifier #2; one of three clarifiers in service although its effluent turbidity results did not appear to be significantly different than the others. The logs show that minimal coagulant adjustments (including dosing reversals from one shift to the next) were performed, and no regular jar testing was done to determine the optimal mix of coagulant and polymer dosage. Despite making some operational changes, including temporarily feeding filters #1 to #4 from the other clarifiers, yielding better results, filtering did not return to its normal performance until clarifier #2 was taken out of service for the season. It appears that the August / September deterioration coincided with an on-set of a seasonal algae bloom:

- microcystin analysis, as an indicator of presence the of algae, started showing positive detections in raw water samples in both the owner's and Ministry's Drinking Water Surveillance Program (DWSP) results;

- taste and odour compounds geosmin and 2 methylisoborneol showed similar trends in DWSP results;

- a taste and odour complaint was registered near the plant shortly after the on-set, and

- NOAA satellite imagery of Lake Erie indicates a bloom trending near the intake in early August.

The Disinfection Procedure requires that in order to be considered conventional filtration and meet or exceed the 2.5 log Giardia cyst removal, the 2.0 log Cryptosporidium oocyst removal and 2.0 log virus removal credits, the filtration process must use a chemical coagulant at all times when the treatment plant is in operation.

There were no instances identified in logs and trends where the operator noted that there had been coagulant dosing interruptions while equipment was in service. However, one concern was identified with the secondary coagulant system:

1. Subsequent to May 27, 2015 clarifier #2 was brought on-line to prepare it for seasonal service. In order to build a coagulant blanket before placing it on-line, the secondary coagulant (alum) system was used. From May 27 to June 2, 2015, numerous coagulant flow failures were found, yet interruptions were only detected during operator rounds. Failures persisted despite switching service to a number of the available metering pumps. Clarifier #2 was subsequently placed in service on June 17, 2015. The operator provided instructions that the secondary coagulant pump operated acceptably in local mode but required a manual restart in the event of a power outage.

TREATMENT PROCESSES

Restarts were required on two occasions (June 23 and June 25) until the coagulant feed to clarifier #2 was switched to the primary coagulant system on July 5, 2015. Primary coagulant pumps are equipped with flow failure alarms.

Available logs and trends suggest that the adequate chlorine contact CT was consistently provided.

* **Records confirmed that the water treatment equipment which provides chlorination or chloramination for secondary disinfection purposes was operated so that at all times and all locations in the distribution system the chlorine residual was never less than 0.05 mg/l free or 0.25 mg/l combined.**

Distribution monitoring programs for combined chlorine residuals in each of the respective municipalities fed by the Union WSS are included within the scope of inspections for each of the stand-alone distribution systems for those drinking water systems. A couple of exceptions are noted since the Union WSS is responsible for operation of the remote sites including Cottam Booster Station and the elevated tank and tower sites, and must maintain adequate combined chlorine residuals at those locations to ensure acceptable residuals are maintained throughout the entire system.

The Union WSS monitors combined chlorine residuals at the inlet and outlet of the Cottam Booster Station. The Cottam Booster station feeds the Town of Essex. According to the operating authority, based on available reservoir storage and the town's demand, the reservoir is normally under-utilized. Water age, and deteriorating combined chlorine residuals especially in the summer, plays a factor in the need to operate the reservoir at lower levels to achieve a quicker turnover rate to keep the water fresh and residuals up. Levels in the Essex tower need to be similarly managed in order to maintain adequate residuals for the town.

A review of available trends reveals that no inadequate residual measurements were determined.

* **The owner had evidence indicating that all chemicals and materials that come in contact with water within the drinking water system met the AWWA and ANSI standards in accordance with the Permit and Licence issued under Part V of the SDWA.**

For each chemical that comes contact with water within the system, condition 14.2 under Schedule B of the Drinking Water System Licence requires the owner to have documentation available of the most current chemical and material product registration documentation from a Standards Council of Canada or ANSI accredited testing institution. The manifests showing NSF certification for water treatment chemicals delivered to the plant are retained. The owner has the ability to access the testing institution certifications via web access.

* **Up-to-date plans for the drinking-water system were available in accordance with the Permit and Licence issued under Part V of the SDWA.**

As-built drawings for the water plant are available for reference by its operators within drawing racks located in the hall near the control room.

For the re-location of the powdered activated carbon (PAC) dosing equipment from the maintenance room to the raw piping/valve gallery, the owner will be required to update any drawings maintained for the drinking water system to reflect these modification, consistent with the requirements of conditions 4.8 of the Drinking Water Works Permit and 15.2 of the Drinking Water System Licence.

* **The facility and equipment appeared to be maintained and in a fit state of repair.**

Clause (i) of paragraph 2 under sub-section 11 (1) of the Safe Drinking Water Act requires that the owner and operating authority are required to ensure the drinking water system is maintained in a fit state of repair.

The last inspection report documented a concern with a crack in the sidewall of the clearwell which leaked onto the high-lift floor if water levels in the reservoirs got too high. The report

TREATMENT PROCESSES

recommended that this breach be properly repaired and sealed. An external check of the clearwell during the inspection confirmed that the owner completed the repair.

The owner also reported that the UWSS and OCWA collaborated on the preparation of a Facility and Equipment Condition Assessment and Evaluation (FECAE) in 2014, using its results and recommendations to prepare annual maintenance and capital improvements to UWSS facilities.

In February 2015 an inspection of the large #2 reservoir was conducted to investigate suspected leakage at joints in the reservoir floor. The inspecting contractor reported the following:

- All five hatchways into the reservoir were in fair condition, but the majority of the hatchway hardware (locks, hinges, props) was missing or broken at all locations and steel debris likely from the hatchways was noted on the floor of the reservoir below the hatchways.

- The two expansion joints present in the reservoir floor were in poor condition with deteriorated caulking material and leakage noted along sections of both expansion joints. Caulking was removed from the leaking sections and the joint sealed with backer-rod to temporarily stop the leakage.

- The expansion joints present in the reservoir ceiling appear to be in good condition with no evidence of past leakage.

- The concrete walls of the reservoir cells were found to be in fair to good condition but the surface of the concrete was found to be very soft and could be scraped away with hand action.

Their report recommended that a permanent repair of the leaking expansion joints should be completed, for replacing the backer-rod with permanent joint seals.

The Leamington elevated tank underwent upgrades and maintenance including exterior painting and interior inspection and re-coating in the summer of 2015.

The operating authority has a comprehensive maintenance program. At the time of inspection, a number of preventative maintenance and equipment replacement activities were ongoing, including rehabilitation of one of the Cottam booster pumps, and replacement of the filter inlet valve on filter #2. A draft capital budget for 2016 was presented to the Joint Board in December 2015. Approximately 20 water-treatment upgrade projects were proposed.

During the inspection:

1. At least two cracks were noted in the floor of the maintenance shop located above the below-grade powdered activated carbon slurry tanks. It is not known if the cracks penetrate through to the slurry tank ceiling, but it appears possible that water ponded on the maintenance shop floor may introduce contaminants from maintenance shop activities into the tanks. Slurry from these tanks are dosed into the raw water headers discharging to the clarifier units.

2. Reservoir vent lines had missing or broken screens on one of the vent lines in the water plant reservoir #1 and Cottam reservoir. These were identified to the operator.

3. Some of the water plant reservoir #2 hatch securing mechanisms were also found to be missing, confirming findings reported in the February 2015 reservoir inspection report.

4. The Cottam reservoir was inspected in March 2014 to investigate potential leakage at the base of the reservoir's 'contact chamber'. A leak was located at an expansion joint around one of the roof support columns. Due to the gap opening's size, it was determined that filling it with a sealing compound was impractical. Rubber foam was used to cover the hole, with a stainless steel backing and concrete blocks to hold it in place. However, during this inspection, it was determined that some leakage from the Cottam reservoir into the perimeter sump via its underdrains likely still continues.

TREATMENT PROCESSES

* **The Operator-in-Charge had not ensured that that the equipment and processes were monitored, inspected, and evaluated.**

To ensure that all critical equipment and processes are performing appropriately, Section 26 of O. Reg. 128/04 requires operators-in-charge to ensure that the process and all process equipment are monitored, inspected and evaluated and records are prepared noting the status of the process and equipment. The Operating Authority has a set of rounds sheets and checks that are used for identifying parameters to be inspected and for logging observations from these checks. This includes the water treatment plant and remote site facilities. The logs reviewed indicate that required checks and assessments are occurring.

However, paragraph (a) of sub-section 26(2) O. Regulation 128/04 states that an operator-in-charge shall take all steps reasonably necessary to operate the processes within his or her responsibility in a safe and efficient manner in accordance with the relevant operations manuals. The following important exceptions to this requirement were noted during the period of inspection review:

A. Standard Operating Procedure OCWA-C6-09 Sludge Clarifier Analysis Procedure requires testing of the percentage of solids in each of the four zones of each in-service clarifier in order to determine the optimum function of the clarifiers. The SOP states that testing should be performed once every operator shift (unless there is an adjustment due to the results, which then requires retesting). Logs show these tests had not been routinely done as prescribed. Log entries for November 16, 2015 showed this resulted in a loss of coagulant blanket and zero solids in all zones of clarifier #3. Elevated clarifier effluent turbidity was noted but trending fortunately did not reveal adverse effects on filtration. Regardless, an adequate sludge blanket is required for adequate contact for effective floc formation and settling of incoming raw water.

B. In regards to deterioration of filter performance on July 6, 2015, and from August to September 2015, logs show that no regular jar testing was done to determine the optimal mix of coagulant and polymer dosage. Logs also suggest that coagulant adjustments are made primarily in response to changing raw water turbidity exclusively. Jar testing and optimization of dosages is required in response to influx of natural organic matter (NOM). Section 4.1 (Chemical Addition) of the Operations Manual states:

"The effectiveness and efficiency of the chemical coagulation processes depends on several factors. Water quality in surface water supplies can vary with time and it is therefore necessary to adjust chemical dosages. The optimum chemical dosage is usually determined in the laboratory using the jar test or according to the dosage sheet." Standard Operating Procedure OCWA-C6-07A Jar Testing (Coagulation Control) provides directions for this purpose.

Operational raw water monitoring is routinely conducted for turbidity, pH, temperature and alkalinity. However, due to seasonal and periodic conditions which could upset the treatment process, the operator should also adopt an effective means to monitor and detect or incorporate changes in NOM in raw water so that a prompt proactive response can be undertaken before treatment conditions deteriorate. UV-254 absorbance and transmittance, measured by spectrophotometry, is typically used for this purpose. Similar analysis of treated water can be used to assess the effectiveness of treatment changes. The water plant currently uses a YSI 6600 environmental monitor (microcystin luminescence) in the raw supply which can detect algal blooms.

* **Where a potential bypass of primary or secondary treatment equipment existed, measures were taken to ensure that raw or partially treated water was not directed to the distribution system.**

The following process unit and treatment system bypasses and cross-connections are shown in as-built process flow drawings:

1. Raw water by-passes of clarifiers #1 or #2 to filter influent channel No. 1 via motor-controlled valves CB-C1 and CB-C2 located in the raw water pipe gallery were found to be padlocked and/or electrically disconnected.

TREATMENT PROCESSES

2. Clarifiers #1 or #2 effluent by-passes of the filters direct to the reservoirs via pneumatically actuated valves FB-1 and FB-2, located in the filter pipe gallery were found to be chained and padlocked.

3. Filters #1 to #4 effluent by-pass of the reservoirs directly to high lift pump well via valves FE-1 and RB-1, located in outdoor valve chambers #2 and #3 respectively. A visual inspection into valve chamber #3 revealed valve RB-1 but it's status could not be confirmed due to awkward access and positioning. Valve chamber #2 was not inspected.

4. A raw water by-pass of the entire treatment system directly to the high lift pump well in valve chamber #3 was previously disconnected and blank-flanged.

Due to the current redundancy built into treatment systems in the plant none of these by-passes, designed into the original plant construction, appear to be necessary. Because of their age and disuse, the integrity of sealing of these valves' seats is unknown. Newer components of the plant were designed without similar by-pass piping.

* **Based on information provided by the owner/operator, it was not likely that contaminants entering the floor drains would have come in contact with the source water or treated water.**

Grating and hatches that are flush with the floor over the #2 raw well open up directly into the raw water. There is a potential for spilled or fugitive contaminants to enter the #2 raw well although no chemicals or other potential contaminants were found within the same room.

A vehicle access door also permits vehicle access into the room adjacent to this area for delivery and removal of motors and heavy equipment installed or stored within the pump station. The asphalt drive leading up to the vehicle access door is graded away from it such that runoff would not enter the building.

Although not confirmed, it appears that floor drains in the #1 raw well area are piped separately and do not enter well. One of the drains was found to be stopped with a plumber's plug. Drawings were not checked to verify floor drain piping, but it is suspected it combines with screen rejects, roof drainage and perimeter drainage to route to the wastewater 'sulphur' pond on-site.

A truckway for delivery of coagulant and other treatment chemicals at the water plant sits overtop high-lift pump well #1. A manway sealed with a solid cast-iron lid covering a membrane seal, located in the centre of the truckway, forms the only access into the high-lift pump well. This access is flush with the floor and appears to be subject to any water ponding carried into or generated within the truckway. No floor drains were found within the truckway during the inspection.

Although drawings were not reviewed, according to the plant's operations manuals, perimeter drains serving the reservoirs at the water treatment plant site flow into float-activated sump pumps. Reservoir overflows also terminate in these sump chambers. These sumps are equipped with high level alarms. Sumps are discharged to the wastewater ponds. The Cottam reservoir is similarly designed. Only screened reservoir vents and raised hatch structures project out of the ground atop these reservoirs.

* **Measures were taken to ensure that pesticides were not applied, stored, or mixed in the immediate vicinity of source(s), treatment, and storage facilities.**

It is the operating authority's policy to restrict the use of pesticides at water treatment sites.

TREATMENT PROCESS MONITORING

* **Primary disinfection chlorine monitoring was being conducted at a location approved by Permit, Licence or Approval issued under Part V of the SDWA, or at/near a location where the intended CT had just been achieved.**

  A ProMinent D1C continuous chlorine monitor / controller (designated as CRA-7) with CLE probe measures free chlorine on the second reservoir outlet line for measuring primary disinfection CT, consistent with the Ministry's "Procedure for Disinfection of Drinking Water in Ontario". This location is prior to addition of aqueous ammonia for the creation of chloramine for secondary disinfection.

* **Operators were aware of the operational criteria necessary to achieve primary disinfection within the drinking water system.**

  The operations manual and control room wipe board establish alarm settings and targets for minimum chlorine needed. However, besides the free chlorine concentration, minimum CT required at any one point depends on reservoir level, flow and water pH, temperature. Utilizing these monitored parameters, there is an algorithm built into the SCADA system that monitors the CT factor and will alarm.

* **Continuous monitoring of each filter effluent line was being performed for turbidity.**

  Filter effluent turbidity values are measured by:

  - ABB 4600 continuous turbidity analysers with ABB 7997 turbidity sensors on filters #3 and 5 to 8.

  - A Hach 1720E unit on filter #2.

  - Rosemount Clarity II units with Emerson 56 control modules on filters #1 and #4, replacing the ABB units since the last inspection.

  Replacement of the older ABB units will continue on the filters not yet retrofitted with newer equipment.

  Measured results recorded by SCADA. Alarm and filter-to-waste set-points are established in SCADA to respond to measured tests from these analysers. The Rosemount Emerson 56 units also have retrievable storage memory providing data backup capability.

* **The secondary disinfectant residual was measured as required for the distribution system.**

  As discussed above, distribution monitoring programs for combined chlorine residuals in each of the respective municipalities fed by the Union WSS are included within the scope of those inspections.

  Additionally, continuous analysers are provided for monitoring chlorine residuals at the:

  1. Cottam booster station. Inlet and outlet total chlorine (essentially combined chlorine) readings measured by these analysers are recorded by the SCADA system.

  2. Albuna tower in Kingsville. Tower inlet and outlet total chlorine and tower outlet free chlorine readings measured by these analysers are recorded by the SCADA system.

  3. Essex tower. Tower bowl outlet total chlorine readings measured by this analyser haven't yet been captured for recording by SCADA and review at the Union WSS. Testing of a signal over a new communication protocol being implemented for the Essex tower is anticipated in 2016.

* **Records confirmed that the maximum free chlorine residual in the distribution system was less than 4.0 mg/L or that the combined chlorine residual was less than 3.0 mg/L.**

  A review of trending for continuous distribution system analysers described above revealed that all results were within the combined residual limit of 3.0 mg/L which the Procedure for Disinfection of Drinking Water in Ontario (section 4) states is equivalent to the maximum acceptable concentration of 3.0 mg/L for chloramines allowed by the Ontario Drinking-Water Quality Standards.

TREATMENT PROCESS MONITORING

* **Operators were examining continuous monitoring test results and they were examining the results within 72 hours of the test.**

  In accordance with the operating authority's policy, and as reflected in the project logs, reviews of continuous monitoring results via daily summary reports are completed once per day and recorded on the summary reports.

* **Samples for chlorine residual analysis were tested using an acceptable portable device.**

  The operator can test free and total chlorine grab samples using Hach Pocket Colorimeter II, DR-2000 Spectrophotometer and DR-890 Colorimeter units.

* **All continuous monitoring equipment utilized for sampling and testing required by O. Reg. 170/03, or approval or order, were equipped with alarms or shut-off mechanisms that satisfied the standards described in Schedule 6.**

  As discussed above:

  1. Free chlorine is measured on the reservoir's outlet (CRA-7) for monitoring primary disinfection CT.

  2. Each filter effluent line is equipped for continuous measurement of turbidity.

  Low and high chlorine alarm settings reviewed for CRA-7 through SCADA during the Ministry's inspection were 1.40 mg/L and 2.0 mg/L respectively. These settings were seasonally adjusted from 1.30 mg/L low and 2.50 mg/L high settings documented in the operating manual in order to adjust for required increased secondary disinfection combined residuals in Essex and Lakeshore. Alarms for secondary disinfection free and total chlorine levels leaving the plant are similarly set.

  High filter turbidity alarms reviewed through SCADA during the inspection were 0.24 NTU (high) and 0.29 NTU (auto filter-to-waste). Operational alarms for clarifier effluent turbidity prior to filtration are set at 3 NTU (high) and 5 NTU (high-high).

  Alarms are enunciated via SCADA to an audible bell in the plant and visual display at the SCADA terminal. The plant is staffed 24 hours per day. The audible can be heard through and outside the plant.

  An assessment of worst case conditions for CT (treated water pH of 7.5 and minimum temperature of 0.5 deg. Celsius) under current reservoir operating levels indicated that the current low-low alarm more than satisfies the requirement under O. Regulation 170/03 Schedule 6-5(1.1) to maintain a minimum alarm standard 0.1 milligrams per litre less than the concentration of free chlorine residual that is required to achieve primary disinfection.

* **Continuous monitoring equipment that was being utilized to fulfill O. Reg. 170/03 requirements was performing tests for the parameters with at least the minimum frequency specified in the Table in Schedule 6 of O. Reg. 170/03 and recording data with the prescribed format.**

  Specifications for the Prominent post-reservoir analyser probe show that it has a reaction time of 60 seconds as the chlorine concentration rises or falls.

  Specifications for the ABB filter effluent turbidity sensors show that the instrument response time varies with flow rate, typically less than 45 seconds for a 90% step change in reading at a sample flow rate of 1 L/min. Specifications for the Hach 1720E filter effluent turbidity sensor shows that the instrument has a response time of 1 minute, 15 seconds for a full scale step change. Literature for the Rosemount Clarity II filter effluent turbidity sensors show that the instrument has a response time that is dependant on sample flow but indicates that utilizing signal averaging of 20 seconds yields a reading that reaches 63% of its final value following a step change greater than the filter threshold.

TREATMENT PROCESS MONITORING

O. Regulation 170 sub-section 6-5(1), paragraph 1 requires the continuous monitoring equipment to record the date, time, sampling location and result of every test for the parameter with at least the minimum frequency prescribed as follows:

1. Free chlorine residual required to achieve primary disinfection - 5 minutes;
2. Filter effluent turbidity - 15 minutes.

Recording with a frequency of one minute was revealed in provided data for turbidity on all filter units and CT free chlorine residual (CRA-07).

* **All continuous analysers were calibrated, maintained, and operated, in accordance with the manufacturer's instructions or the regulation.**

Manufacturer's instructions for the Prominent free chlorine analyser located at CRA-7 indicates calibration should be repeated at regular intervals and, in potable water applications, they are normally every 3 to 4 weeks. Operating logs show that the continuous chlorine analyser was verified / calibrated on a regular basis. Since the SCADA control system uses CRA-7 free chlorine analyser signal in a compound loop with the final plant flow signal to accurately dose aqua-ammonia to achieve a full conversion to monochloramine, CRA-7 accuracy must be frequently checked. Logs show that when the analyser was serviced the aqua-ammonia dosing pumps were temporarily shutdown.

Manufacturer's instructions for the ABB turbidity sensor recommend maintenance limited mainly to manual monthly cleaning of the flow chamber under normal conditions, unless there is a high turbidity breakthrough, upon which the chamber should be cleaned immediately to ensure accurate readings. Instructions also state that routine calibration is normally unnecessary but routine calibration checks of the system accuracy may be needed, particularly after cleaning. If readings are still out of specification, instructions are given to calibrate the sensor using a manufacturer's dry calibration standard or wet calibration formazine standard.

Manufacturer's instructions for the Rosemount turbidity sensor recommend calibration after maintenance of the turbidity sensor. Instructions are also given for the flow chamber and calibration instructions and verification against known standards such as grab sample or formazine standard.

Routine calibration checks of on-line instrument versus hand-held and lab bench units are done for this purpose. Maintenance, checks and calibrations are documented in the operating authority's equipment maintenance recording system.

The operating authority maintains three instrument calibration SOPs for operator reference:

- OCWA-C1-01 ABB Turbidimeter Calibration

- OCWA-C1-03 Portable pH Probe Calibration

- OCWA-C1-04 Prominent Chlorine Analyzer Calibration

These procedures contain excerpts from manufacturers' manuals.

PROCESS WASTEWATER

* **The process wastewater and residual solids/sludges were being treated, handled and disposed of in accordance with the design requirements approved under the Permit and Licence or Approval issued under Part V of the SDWA.**

The process wastewater pumping station and settling lagoons were briefly inspected. Lagoons were found to have sufficient freeboard. Sluice gates were set up for the south cell to receive clarifier blowdown and filter backwash waste flows.

PROCESS WASTEWATER

* **The process wastewater discharge quality and discharge monitoring program complied requirements established in the Permit and Licence or Approval issued under Part V of the SDWA.**

  Under condition 1.5 of Schedule C under the Drinking Water System Licence the annual average concentration of total suspended solids shall not exceed 25 mg/L.

  A review of monitoring results revealed that the results of 12 months of sampling yielded average total suspended solids concentration of 5.2 mg/L and 3.0 mg/L for the north and south cell discharges respectively. The operator indicated that monthly composite samples consisted of weekly grab samples added to composite sampling buckets, one for each cell, and submitted monthly for suspended solids analysis.

DISTRIBUTION SYSTEM

* **The owner had a program or maintained a schedule for routine cleanout, inspection and maintenance of reservoirs and elevated storage tanks within the distribution system.**

  As discussed above:

  1. The Cottam reservoir was removed from service for maintenance and upgrades in 2013 and then inspected in March 2014 to investigate and address potential leakage.

  2. The Leamington elevated tank underwent recoating and maintenance in 2015.

  3. An underwater inspection by Watech of Reservoir #2 was completed in February 2015. Leakage was found and temporary repairs were completed. More permanent repairs were budgeted for 2016.

  4. The pre-2004 Operations Manual states that no maintenance is done on high-lift clearwell #1 and it has never been cleaned. The operating authority confirmed that no such inspection, maintenance or cleaning has been done since but does not expect any sedimentation necessitating cleanout due to the high rate of flow through this chamber.

  Recommendations for the Cottam reservoir are made in the "SUMMARY OF BEST PRACTICE ISSUES AND RECOMMENDATIONS" section of this report.

* **Existing parts of the distribution system that were taken out of service for inspection, repair or other activities that may lead to contamination, and all new parts of the distribution system that came in contact with drinking water, were disinfected in accordance with Schedule B, Condition 2.3 of the Drinking Water Works Permit.**

  Prior to returning the Leamington elevated tank to service, super-chlorination, refilling and testing of the tower was first completed in accordance with AWWA procedures. Disinfection procedures were also applied to in plant equipment that was removed from service for repair or maintenance, including filters, pumping and flow metering equipment. Personnel and equipment disinfection steps were also followed for an inspection and repair of the #2 on-site reservoir while it remained in service.

  Other concerns relating to conformance with AWWA standard C652-11 for the Leamington tower maintenance project and on-site reservoir #2 inspection and repair project were noted:

  1. Following internal coating and curing of the Leamington elevated tank, no samples for VOC analysis were obtained.

  Section 5.1.1.5 of AWWA standard C652-11 states:

  "5.1.1.5 Optional sampling and testing …If the tank was painted or if epoxy was applied, measuring levels of volatile organic compounds or other components of the coating material (such as zinc) may be necessary…"

DISTRIBUTION SYSTEM

2. During the underwater inspection of reservoir #2, no microbiological samples were obtained daily during the inspection process which involved disturbance of the bottom sediment to inspect for leaks.

Sections 4.4.4 and 4.4.5.1.6 of AWWA standard C652-11 state:

"4.4.4 …If the water storage facility remains in service during the cleaning operation, samples shall be collected daily from the tank and tested for coliform bacteria, chlorine residual (if applicable), and turbidity."

"4.4.5.1.6 Disturbing tank bottom sediment may impair water quality. Sediment may contain bacteria, which if resuspended can cause contamination…"

* **A program was in place for inspecting and exercising valves.**

Mainline valves on Union WSS transmissions are maintained by the operating authority. Exercising and maintenance of these valves is conducted on a yearly basis. The operator employs a valve turning machine borrowed from the Town of Kingsville since the valves require a great deal of torque and many turns to fully operate.

* **The owner has undertaken efforts to identify, quantify and reduce sources of apparent water loss.**

The January 2016 meeting minutes of the joint Union WSS board indicates that a Leak Detection Study is part of the 6 year Capital Plan and will be considered in 2017.

The UWSS cannot conduct a traditional water loss program as it has no metered customers other than each of the respective municipalities and the Highbury Canco food processing plant. Water leakage in reservoirs and subsequent short-term and long-term repairs to those structures have been identified via inspection.

Major leaks in the distribution system transmission mains can be detected by abnormal operation of the water plant high lift pumps or Cottam booster station pumps or decreasing pressures monitored back at these facilities. Otherwise, transmission leaks are responded to via public calls or respective Works Department staff identifying abnormal conditions.

* **The distribution system pressure was monitored to alert the operator of conditions which may have lead to loss of pressure below the value under which the system is designed to operate.**

All elevated tank, tower levels and control valve station pressures were continuously measured and logged through SCADA. Similarly, system pressure was continuously measured and logged at the water treatment plant and the Cottam booster station. Pressure monitors plus tower and elevated tank levels are all alarmed. Standard operating procedures exist for placing the Essex and Kingsville towers in hydraulic mode of operation, and operate high-lift pumps at the water plant to maintain Leamington pressures, in the event of loss of communications or failure of automatic electronic tower controls.

Tower levels / distribution system pressure trends were reviewed within the scope of each of the connected distribution system inspections and are not included within the scope of this review.

* **The donor had provided an Annual Report to the receiver stand alone distribution system(s) connected to this system.**

The 2015 annual report, prepared under section 11 of O. Regulation 170/03, was received by member municipal representatives on February 17, 2016 at the Joint Management Board meeting.

OPERATIONS MANUALS

* **Operators and maintenance personnel had ready access to operations and maintenance manuals.**

  The relevant operating manuals for the Union treatment plant are kept in the plant control room.

  A standard operating procedure binder, operations manual and facility emergency plan for the Cottam Booster Station is located in the HMI control room at the booster station.

  A set of binders, folders and reference manuals containing manufacturers' equipment manuals and information is also available at the water plant 'library' for reference.

* **The operations and maintenance manuals contained plans, drawings and process descriptions sufficient for the safe and efficient operation of the system.**

  The Union Area WSS Operations Manual contains descriptions of each of the process steps. The Union Area WSS Operations Manual was last revised in June 2011, with hand written revisions and notes entered into the manual since then. A review of the Operations Manual is currently being undertaken with a view to revising and updating its content and incorporating revisions.

  Standard Operating Procedure manuals for the plant and the Cottam Booster Station contain standard procedures and policies.

  Operators also have access to a map showing transmission mains in the Union distribution system along with as-built drawings. These are available as hard copies at the water plant.

* **The operations and maintenance manuals did meet the requirements of the Permit and Licence or Approval issued under Part V of the SDWA.**

  Condition 16.2 under Schedule B of the Drinking Water System licence includes the following conditions regarding procedures to be maintained in the operations manual:

  16.2.1 The requirements of this licence and associated procedures;

  16.2.2 The requirements of the drinking water works permit for the drinking water system;

  16.2.3 Procedures for monitoring and recording the in-process parameters necessary for the control of any treatment subsystem and for assessing the performance of the drinking water system;

  16.2.4 Procedures for the operation and maintenance of monitoring equipment;

  16.2.5 Contingency plans and procedures for the provision of adequate equipment and material to deal with emergencies, upset conditions and equipment breakdown;

  16.2.6 Procedures for dealing with complaints related to the drinking water system, including the recording of the nature of the complaint and any investigation and corrective action taken in respect of the complaint;

  The available operating manual and standard operating procedures satisfy these conditions.

  The last inspection report required the owner to:

  (i) Revise SOP OCWA-C3-07 "Filter Maintenance (Annual)" to ensure that measures are taken to replenish media when anthracite depths are found to be inadequate or the operator notices that significant media has washed out of the bed during backwash activities.

  (ii) Revise sections 6.4.1 and 6.4.2 of the Operations Manual to ensure they include reference to controlling backwash flows to prevent media washout during backwashing operations.

  (iii) Update the Facility Emergency Plan’s essential suppliers list to ensure it includes a contact for supply and ordering of anthracite to readily replenish any lost filter media.

  The owner's actions and revisions in response to the report satisfied these requirements.

  Standard operating procedures should be developed for calibration of the following analysers or refer to manufacturers' manuals or documents for providing directions to operators:

OPERATIONS MANUALS

- the Hach 1720E turbidimeter - filter unit #2

- the Rosemount Clarity II Emerson 56 turbidimeter - filter units #1 and #4

- the SWAN AMI Trides free chlorine analyser - CRA-09

During the period of review, one of the operators needed to shutdown a filter due to lack of training on calibration of one of the new Rosemount turbidimeters.

LOGBOOKS

* **Logs for the drinking water subsystem(s) contained the required information.**

* **Logbook entries were made in chronological order.**

* **The record system allowed the reader to unambiguously identify the person who made the logbook entry.**

* **Entries in the logbook were made only by appropriate and authorized personnel.**

* **Records or other record keeping mechanisms confirmed that operational testing not performed by continuous monitoring equipment was being done by a certified operator, water quality analyst, or person who suffices the requirements of O. Reg. 170/03 7-5.**

* **For every required operational test and every required sample, a record was made of the date, time, location, name of the person conducting the test and result of the test.**

* **The operator-in-charge ensured that records were maintained of all adjustments made to the processes within his or her responsibility.**

* **Logs or other record keeping mechanisms were available for at least five (5) years.**

The last five years of operational logs and records are maintained in cabinets next to the control room. Additional archived records, going back decades and possibly to the start-up of the water plant, are maintained in an international shipping container adjacent to the water treatment plant.

CONTINGENCY/EMERGENCY PLANNING

* **Spill containment was provided for process chemicals and/or standby power generator fuel.**

Chemical storage areas within the water plant and Cottam booster station are equipped with secondary containment curbs and structures, including for:

- Sodium hypochlorite storage and metering.

- Primary coagulant, polymer and filter-aid storage, mixing and metering. Containment is formed by the chemical room itself, although there is an open floor drain that routes to the process wastewater system.

CONTINGENCY/EMERGENCY PLANNING

- Ammonia storage, delivery and leak abatement systems.

The area for secondary coagulant storage and delivery is located overtop of floor grating within the raw header pipe gallery/valve room. The area underneath the grating is equipped with a sump pump which is normally designed to pump accumulated water to the floor drain system routed to the process wastewater system.

Generators and fuel storage within the low-lift, water plant and Cottam booster station are equipped with secondary containment curbs. The fuel tanks serving the low-lift generator, the Cottam booster station generator, the high-lift diesel driven pump, and the water plant's bulk fuel and day storage tanks serving the plant's two generators, are equipped with built-in outer secondary containment systems.

* **Clean-up equipment and materials were in place for the clean up of spills.**

A stocked spill station is located at the water plant's "pole barn". Smaller spill kits are located at the low-lift building and the Cottam booster station.

* **Standby power generators were tested under normal load conditions.**

According to log entries, standby generator testing under load was conducted on a monthly basis. Standard operating procedure OCWA-C6-04 must be used. It states:

"This procedure is required for monthly maintenance and should be performed by the operational staff, as it will disrupt plant operations. Once diesels are running, frequent checks should be made and readings recorded into a maintenance logbook."

SECURITY

* **All storage facilities were not completely covered and secure.**

Reservoirs at the water plant are both covered below ground structures. As discussed above, it was found during the February 2015 inspection of reservoir #2 that hatchway hardware (locks, hinges, props) on all five hatchways was missing or broken and that steel debris was noted on the reservoir floor below the hatchways. Similar conditions were also found during this inspection.

The reservoir at the Cottam booster station is a covered partially below-grade structure. The single outside access hatch was found to be secured.

* **Air vents and overflows associated with reservoirs and elevated storage structures were equipped with screens.**

During the inspection two screens were found to be missing from reservoir vents: a broken mesh screen was found on one of the reservoir #1 gooseneck vents, and a fine mesh screen was found to be missing from one of the gooseneck vents on the Cottam reservoir. Both vent screens were subsequently replaced.

* **The owner had provided security measures to protect components of the drinking-water system.**

The Union WSS water treatment plant and reservoirs are located in a fenced compound with locked / camera monitored security entrances which must be remotely opened by the operator. With the exception of the front door of the plant, which is monitored from the control room, all doors of the plant are steel security doors which are normally kept locked.

The low lift building is in a separate windowless brick structure. It is not in a fully fenced compound, although strategic security fencing has been installed for preventing access to the roof and the electrical transformer compound. The building is equipped with lockable steel security doors, intruder door contact alarms, keycode entry and remote camera monitoring.

SECURITY

The Cottam Booster station is a brick structure, equipped with secure doors, intruder door contact alarms, and is located within a fenced compound with lockable gate. Remote camera monitoring of the inside of the building's pump room was added in 2015.

All finished water elevated water structures, are located within fenced compounds. The elevated tanks in Leamington and Kingsville were not visually inspected within the scope of this inspection but are required to be fitted with locks on their external ladders, electrical control panel boxes and valve chamber hatches. The elevated tank in Essex was found to be secure upon arrival. It's control building is equipped with an intruder door contact intrusion alarm and a keycode pad door access alarm. The Albuna tower is equipped with locked steel security doors on its concrete base, an intruder door contact intrusion alarm and a keycode pad door access alarm.

There are no windows on any of the remote site structures. Most are equipped with outdoor security lights.

CONSUMER RELATIONS

* **Water conservation was being practiced by the owner or operating authority.**

Lawn watering restrictions from May 1 to September 30 have been adopted in a uniform by-law in each of the municipalities served by the Union WSS. An information brochure is available on the Union WSS web site indicating the restrictions. Restrictions entail even/odd house number watering days and time of day application.

Based on approximate total population served, and available flow rates (from the owner's flow trends), the per capita daily use in the Union WSS was determined at approximately 718 L/person/day. This is reflective of higher industrial use. Traditionally Heinz/Highbury Canco plant has been the third largest wholesale consumer behind the municipalities of Leamington and Kingsville. The peak ratio, which is the ratio of maximum day demand to average day demand, was 1.78. Higher demand is also reflected during the September tomato processing season. The 2015 maximum demand day was July 28, 2015.

* **Required documents were available free-of-charge during normal business hours at a location accessible to the public.**

Documents related to operational monitoring and sampling are kept at the Union WSS. Requests are made through the individual member municipalities, who are provided with copies of sample results. Operational summaries and any specific operational data requests can be directed through the operating authority.

* **The owner did take effective steps to advise users of the water system of the availability of Annual Reports, including posting a copy on a web site, if applicable.**

The owner posts reports on its web site. They are also available at the water plant and each of the municipal offices.

CERTIFICATION AND TRAINING

* **The overall responsible operator had been designated for each subsystem.**

The operating authority has a memo (currently in electronic form) indicating the overall responsible operator for the treatment system and distribution system. He holds class IV certification for both; matching the classification of the Union water treatment plant and the Union trunk water distribution system. This designation was confirmed in September 2013. Two backup overall responsible operators holds class III certifications for both treatment and distribution sub-systems.

CERTIFICATION AND TRAINING

* **Operators in charge had been designated for all subsystems which comprised the drinking-water system.**

  Operators in charge for each shift are required to be identified in a designated field in the project log book. When an operator in training was on shift during the review period, log book entries were consistently made identifying her shift's OIC.

* **All activities that were undertaken by uncertified persons in the DW subsystems were overseen by persons having the prescribed qualifications.**

  There were many instances identified in the log books reviewed where on-site work was performed by uncertified contractors and staff. According to log entries, it appears that required activities were overseen by certified operators.

* **All operators possessed the required certification.**

  According to operating logs reviewed for the period assessed.

* **Only certified operators made adjustments to the treatment equipment.**

  According to operating logs reviewed for the period assessed.

* **Operator certificates or water quality analyst certificates were displayed in a conspicuous location at the workplace or at the premises from which the subsystem was managed.**

  Certificates are posted in the control room at the water plant.

* **The classification certificates of the subsystems were conspicuously displayed at the workplace or at premises from which the subsystem was managed.**

  Certificates are posted in second floor hallway at the water plant.

* **An adequately licenced operator was designated to act in place of the overall responsible operator when the overall responsible operator was unable to act.**

  Sub-section 23 (4) of O. Regulation 128/04 states that an operator who has certification not more than one class lower than the class of the subsystem may act in the place of the overall responsible operator. However, sub-section 23 (4) states that this shall not be relied on by the owner or operating authority of a municipal residential subsystem for more than 150 days in any 12-month period.

* **The owner/operating authority was aware of the operator training and record keeping requirements, and they were taking reasonable steps to ensure that all operators receive the required training.**

  For Class IV Water Treatment and Class IV Distribution sub-systems, operators must take 14 hours or more of continuing education training annually out of a minimum 50 hours total training including on-the-job training annually. The training can be averaged over a 3 year period.

  The operating authority maintains summary training reports showing hours of on-the-job and continuing education training for each operator. Based on available records covering 2015, operators were being provided with continuing education and on-the-job training opportunities.

WATER QUALITY MONITORING

* **All microbiological water quality monitoring requirements for raw water samples were being met.**

  O. Regulation 170/03 Schedule 10-4 requires the owner and operating authority to sample raw water once per week and analyse it for E. coli and total coliforms.

  For the period reviewed, treated water microbiological samples were taken each week.

* **All microbiological water quality monitoring requirements for treated samples were being met.**

  O. Regulation 170/03 Schedule 10-3 requires the owner and operating authority to sample treated water once per week and analyse it for E. coli, total coliforms and heterotrophic plate count (HPC).

  For the period reviewed, treated water microbiological samples were taken each week.

* **All inorganic water quality monitoring requirements prescribed by legislation were conducted within the required frequency.**

  Provided that previous sample results haven't exceeded one-half maximum acceptable concentration (MAC) for any parameter under Schedule 23, O. Regulation 170/03 Schedule 13-2 requires that samples must be taken and analysed for Schedule 23 parameters every 12 months for a surface water supply.

  The required samples were taken January 12, 2015. Previous samples for analysis of these parameters were taken January 13, 2014.

  Schedule 6-1.1 (5) states that for samples required to be taken every 12 months and tested for a parameter, the owner and the operating authority shall ensure that at least one sample that is taken during a 12-month period for the purpose of being tested for that parameter is taken not more than 30 days before or after the first anniversary of the day a sample was taken for that purpose in the previous 12-month period. The owner complied with this provision.

* **All organic water quality monitoring requirements prescribed by legislation were conducted within the required frequency.**

  Provided that previous sample results haven't exceeded one-half maximum acceptable concentration (MAC) for any parameter under Schedule 24, O. Regulation 170/03 Schedule 13-4 requires that samples must be taken and analysed for Schedule 24 parameters every 12 months for a surface water supply.

  The required samples were taken January 12, 2015. Previous samples for analysis of these parameters were taken January 13, 2014.

  Schedule 6-1.1 (5) states that for samples required to be taken every 12 months and tested for a parameter, the owner and the operating authority shall ensure that at least one sample that is taken during a 12-month period for the purpose of being tested for that parameter is taken not more than 30 days before or after the first anniversary of the day a sample was taken for that purpose in the previous 12-month period. The owner complied with this provision.

* **All trihalomethanes water quality monitoring requirements prescribed by legislation were conducted within the required frequency.**

  The drinking water system does not include any distribution systems except transmission mains. An assessment of distribution sampling compliance for Trihalomethanes is referred to within the scope of those separate stand-alone distribution system inspections. However, samples for Trihalomethane analysis were also taken at the water treatment plant quarterly and can be compared to results of samples taken in in each of the distribution systems.

WATER QUALITY MONITORING

* **All nitrate/nitrite water quality monitoring requirements prescribed by legislation were conducted within the required frequency for the DWS.**

  As required under O. Regulation 170/03 Schedule 13-7, samples must be taken and analysed for nitrate and nitrite every 3 months. Samples taken at the plant in conjunction with distribution total ammonia, nitrate/nitrite samples in order to track nitrification trends within the distribution system, were taken essentially each week. Raw samples were also taken.

* **All sodium water quality monitoring requirements prescribed by legislation were conducted within the required frequency.**

  O. Regulation 170/03 Schedule 13-8 requires sampling and analysis of sodium every 60 months. A sample for analysis of sodium was last taken on January 12, 2015. A previous sample for analysis of this parameter was taken January 13, 2014.

* **All fluoride water quality monitoring requirements prescribed by legislation were conducted within the required frequency.**

  O. Regulation 170/03 Schedule 13-9 requires sampling and analysis of fluoride every 60 months. A sample for analysis of fluoride was last taken on January 12, 2015. A previous sample for analysis of this parameter was taken January 13, 2014.

* **The owner ensured that water samples were taken at the prescribed location.**

  Samples were taken from the point at which water enters the distribution system or at the locations as otherwise specified under O. Regulation 170/03.

* **The owner was conducting sampling beyond the minimum legislative requirements.**

  As discussed above:

  - Weekly sampling is being done for nitrite/nitrate monitoring from raw and treated samples in conjunction with system chloramination. Ammonia concentrations are also analysed.

  - Monthly sampling of Trihalomethanes is being done from treated water.

  Samples were also taken for:

  - Clostridium Perfringens from raw water and the filter header (normally from filters 1 through 4).

  - Microcystin from raw and treated water samples on a weekly basis, from July to December 2015.

  - Lab tested aluminum residual samples were taken in November and December 2015 in response to a complaint.

* **Records confirmed that chlorine residual tests were being conducted at the same time and at the same location that microbiological samples were obtained.**

* **The drinking water system owner had submitted written notices to the Director that identified the laboratories that were conducting tests for parameters required by legislation, Order Certificate of Approval (OWRA) or a Permit, Licence or Approval issued under Part V of the SDWA.**

  The latest Laboratory Services Notification form, updating the analyte parameter listing to include new parameters added to sampling schedules under O. Regulation 170/03, was submitted on December 30, 2015.

WATER QUALITY MONITORING

* **Based on information provided by the owner/operator, samples were being taken and handled in accordance with instructions provided by the drinking-water system's laboratories.**

  The operating authority has written sampling instructions provided by its primary laboratory:

  Caduceon Environmental Laboratories - Guidance Document for the Collection and Handling of Drinking Water Samples

  Sample submission to the labs met acceptable holding time guidelines. Certificates of Analysis showed that sample temperature on receipt at the lab, above the recommended criteria of 10 degrees C or lower, reflected seasonal temperature of the source water. Microbiological grab samples are delivered directly to the owner's lab within four to six hours of the time of sampling at the UWSS.

* **The owner indicated that the required records are kept and will be kept for the required time period.**

WATER QUALITY ASSESSMENT

* **The audit samples collected by the inspector met the applicable Ontario Drinking Water Quality Standards and/or the aesthetic objectives or operation guidelines. The results of the audit sampling are summarized as follows:**

  Treated water samples were taken as part of the inspection and tested for disinfectant residual levels. Filter effluent turbidity readings from operating filters were also recorded. Combined chlorine residuals were also measured and/or recorded from continuous analysers at the Cottam Booster Station.

  Audit sample results, including operational sample readings, are found in Appendix B.

* **Records show that water sample results taken during the review period met the Ontario Drinking Water Quality Standards (O. Reg. 169/03), with the following exception:**

  Microbiological quality consistently met Ontario Drinking Water Quality Standards, although one of the 52 routine treated samples yielded an adverse E- coli and total coliform count. The operator explained, and lab observations support, that the adverse result was from a treated sample mistakenly taken from the raw sample tap. Results were similar for both the raw and treated samples. Consecutive treated samples subsequently taken were clear.

  The following water quality is also noted from the owner's results for treated water samples collected from January to December 2015:

  (i) Trihalomethane samples from treated water from the plant yielded an average concentration of 0.0155 mg/L for the last four quarters of sampling, below the drinking water standard of 0.100 mg/L (moving annual average). As discussed above, an assessment of distribution sampling compliance for Trihalomethanes is referred to within the scope of the separate member-owned stand-alone distribution system inspections. The Technical Support Document for Ontario Drinking Water Quality Standards, Objectives and Guidelines indicates that Trihalomethanes in drinking water are primarily produced by the reaction of chlorine and the naturally occurring organics (precursors) in the water.

  (ii) Sampling for nitrification products associated with chloramination yielded results that were within Ontario Drinking Water Quality Standards for nitrites (as N) and nitrates (as N). The sampling program during the review period consisted of 51 sets of samples from the treated water sampling point. The maximum nitrite and nitrate concentrations found were 0.1 mg/L and 0.6 mg/L respectively. Ontario Drinking Water Standards for these parameters are 1 mg/L and 10 mg/L respectively.

WATER QUALITY ASSESSMENT

(iii) Samples submitted weekly for monitoring of algal toxins seasonally under the owner's monitoring program and also the Ministry's DWSP monitoring program showed detections of Microcystins in the raw water but no detections in treated water.

(iv) Recent research has shown that the disinfection by-product N-nitrosodimethylamine (NDMA) can form in chloraminated water systems in conjunction with diallyldimethylammonium chloride (DADMAC cationic polymer) use in coagulation. A review of the Ministry's most recent DWSP monitoring program results revealed no detections for NDMA in treated and distributed samples. The Ontario Drinking Water Quality Standard for NDMA is 9 ng/L.

REPORTING & CORRECTIVE ACTIONS

* **Corrective actions (as per Schedule 17) had been taken to address adverse conditions, including any other steps that were directed by the Medical Officer of Health.**

  Corrective actions taken for the November 9, 2015 adverse E-coli / total coliform sample, consisting of immediate re-sampling, were completed. Sampling on consecutive days was prescribed by the Windsor Essex County Health Unit (WECHU). A review of sample results taken from 30 locations with the four connected distribution systems, on the same day the adverse treated sample was taken, yielded clear results.

  A concern was raised by the WECHU regarding staff availability and communication of timely information and re-sample results for the first re-sample. Due to the nature of the adverse result, the WECHU was looking for prompt assurance to justify not issuing a system-wide boil water advisory. The operating authority's documents show that, while the on-duty operator provided a prompt response to the health unit regarding the likely explanation for the adverse result on November 11, the first re-sample result was available from the lab on November 12 but not conveyed to the health unit until the morning of November 13 due to a mixup of emails. These issues were discussed with the operating authority.

* **All required notifications of adverse water quality incidents were immediately provided as per O. Reg. 170/03 16-6.**

  For the adverse November 9, 2015 sample result, the owner completed timely verbal reporting to the Windsor Essex Health Unit and the Ministry's Spills Action Centre, as required.

* **All required written notices of adverse water quality incidents were not provided as per O. Reg. 170/03 16-7.**

  Written notice provided for the adverse November 9, 2015 sample result was not given within 24 hours after making the immediate report. The verbal notification was made on November 11, 2015 after receiving notice of the result from the owner's lab, yet the written notice was not given until November 13, 2015.

  Under sub-section 16-7 (1) of O. Regulation 170/03, a written notice required must be given within 24 hours after the immediate report is given under subsection 18 (1) of the Act.

* **In instances where written notice of issue resolution was required by regulation, the notice was provided as per O. Reg. 170/03 16-9.**

* **Where required continuous monitoring equipment used for the monitoring of chlorine residual and/or turbidity triggered an alarm or an automatic shut-off, a qualified person responded in a timely manner and took appropriate actions.**

  Because the water plant is staffed 24 hours per day, 365 days per year, an operator is always on site and the operating authority has an expectation of an immediate response to alarms.

  Water plant operating logs reviewed do not indicate that response to analyser alarm conditions was inadequate in the instances where the operator was alerted to the problem.

REPORTING & CORRECTIVE ACTIONS

* **The Annual Report containing the required information was prepared by February 28th of the following year.**

  The 2015 annual report, required under section 11 of O. Regulation 170/03, was prepared in February 2016 and presented to the Joint Management Board during the February 17, 2016 regular meeting.

* **Summary Reports for municipal council were completed on time, included the required content, and were distributed in accordance with the regulatory requirements.**

  The 2015 summary report was presented to the Joint Management Board during the February 17, 2016 regular meeting.

  With regard to summary report content, it is noted that the non-compliance identified in the report relates to adverse water quality events revealed from routine sampling. It should be noted that having a failure to meet a water quality standard under O. Regulation 169/03 does not necessarily constitute non-compliance. Section 2 of O. Regulation 169/03 states that the owner and operating authority are not deemed to have contravened the obligation to meet the drinking water quality requirements if, in circumstances where the water does not meet the standard:

  (1) the person immediately contacts the medical officer of health and takes such other steps as are directed by the medical officer of health.

  (2) they ensure that the appropriate corrective actions are taken under O Regulation 170/03.

  While not limited to items identified in the inspection report, non-compliance which should be reported in the summary report for the previous calendar year may be derived from the previous inspection report's required actions. In this case, items of non-compliance found in the Ministry's 2015 inspection review are listed below.

OTHER INSPECTION FINDINGS

* **The following instance of non-compliance was also noted during the inspection:**

  Recently adopted provisions under Section 4.3.3 of the Drinking Water Works Permit require the owner to undertake a review and notify the Director in the event there are changes in coagulants and pH adjustment chemicals, where replacement chemicals perform the same function. The review is required prior to making the alteration to determine the impacts that it will have on corrosion control or other treatment processes. A change in dosing coagulant to clarifier #4, using Hyper-ion 1090 aluminum chlorohydrate was implemented in clarifier #4 starting November 10, 2015. The required review was not performed prior to making the alteration. At the time of the inspection, the inventory of the coagulant was depleted and it's use was discontinued.

* **The following issues were also noted during the inspection:**

  A. The operator was in the process of re-locating the powdered activated carbon (PAC) dosing equipment from the maintenance room to the raw piping/valve gallery. This project necessitates replacing existing metering pumps with new peristaltic slurry mix/dosing pumps and removing existing slurry day tanks, mixers and transfer pump. Authorization for these changes was received from the Director on November 23, 2015, contingent on the owner preparing a Form 2 and submitting Director's Notification under Drinking Water Works Permit condition 2.4 requirements.

  B. Due to the current redundancy built into treatment systems in the plant, none of the unit treatment by-passes designed into the original plant construction, appear to be necessary. Because of their age and disuse, the integrity of sealing of these valves' seats is unknown. Newer components of the plant were designed without similar by-pass piping.

OTHER INSPECTION FINDINGS

C. During the inspection:

1. At least two cracks were noted in the floor of the maintenance shop located above the below-grade powdered activated carbon slurry tanks. It is not known if the cracks penetrate through to the slurry tank ceiling, but it appears possible that water ponded on the maintenance shop floor may introduce contaminants from maintenance shop activities in into the tanks. Slurry from these tanks are dosed into the raw water headers discharging to the clarifier units.

2. The Cottam reservoir was inspected in March 2014 to investigate potential leakage at the base of the reservoir's 'contact chamber'. A leak was located at an expansion joint around one of the roof support columns. Due to the gap opening's size, it was determined that filling it with a sealing compound was impractical. Rubber foam was used to cover the hole, with a stainless steel backing and concrete blocks to hold it in place. However, during this inspection, it was determined that some leakage from the Cottam reservoir into the perimeter sump via its underdrains likely still continues.

D. Following internal coating and curing of the Leamington elevated tank, no samples for VOC analysis were obtained. During the underwater inspection of reservoir #2, no microbiological samples were obtained daily during the inspection process which involved disturbance of the bottom sediment to inspect for leaks. Recommendations and requirements in AWWA standard C652-11 indicates that these important monitoring provisions should have been followed.

E. Containment for the primary coagulant, polymer and filter-aid systems is formed by the chemical room itself, although there is an open floor drain that routes to the process wastewater system. The area for secondary coagulant storage and delivery is located overtop of floor grating within the raw header pipe gallery/valve room. The area underneath the grating is equipped with a sump pump which is normally designed to pump accumulated water to the floor drain system routed to the process wastewater system.

F. Subsequent to May 27, 2015 clarifier #2 was brought on-line to prepare it for seasonal service. In order to build a coagulant blanket before placing it on-line, the secondary coagulant (alum) system was used. From May 27 to June 2, 2015, numerous coagulant flow failures were found, yet interruptions were only detected during operator rounds. Failures persisted despite switching service to a number of the available metering pumps. Clarifier #2 was subsequently placed in service on June 17, 2015. The operator provided instructions that the secondary coagulant pump operated acceptably in local mode but required a manual restart in the event of a power outage. Restarts were required on two occasions (June 23 and June 25) until the coagulant feed to clarifier #2 was switched to the primary coagulant system on July 5, 2015.

G. Standard operating procedures have not yet been developed for calibration of the following analysers recently installed:

- the Hach 1720E turbidimeter - filter unit #2

- the Rosemount Clarity II Emerson 56 turbidimeter - filter units #1 and #4

- the SWAN AMI Trides free chlorine analyser - CRA-09

During the period of review, one of the operators needed to shutdown a filter due to lack of training on calibration of one of the new Rosemount turbidimeters.

NON-COMPLIANCE WITH REGULATORY REQUIREMENTS AND ACTIONS REQUIRED

This section provides a summary of all non-compliance with regulatory requirements identified during the inspection period, as well as actions required to address these issues. Further details pertaining to these items can be found in the body of the inspection report.

1. **The Operator-in-Charge had not ensured that that the equipment and processes were monitored, inspected, and evaluated.**

   Paragraph (a) of sub-section 26(2) O. Regulation 128/04 states that an operator-in-charge shall take all steps reasonably necessary to operate the processes within his or her responsibility in a safe and efficient manner in accordance with the relevant operations manuals. The following important exceptions to this requirement are noted:

   A. Standard Operating Procedure OCWA-C6-09 Sludge Clarifier Analysis Procedure requires testing of the percentage of solids in each of the four zones of each in service clarifier in order to determine the optimum function of the clarifiers. The SOP states that testing should be performed once every operator shift (unless there is an adjustment due to the results, which then requires retesting). Logs show these tests had not been routinely done as prescribed. Log entries for November 16, 2015 showed this resulted in a loss of coagulant blanket and zero solids in all zones of clarifier #3. An adequate sludge blanket is required for adequate contact for effective floc formation and settling of incoming raw water.

   B. In regards to deterioration of filter performance on July 6, 2015, and from August to September 2015, logs show that no regular jar testing was done to determine the optimal mix of coagulant and polymer dosage. Logs also suggest that coagulant adjustments are made primarily in response to changing raw water turbidity exclusively. Jar testing and optimization of dosages is required in response to influx of natural organic matter (NOM). Section 3.1a of the Operations Manual states:

   "The effectiveness and efficiency of the chemical coagulation processes depends on several factors. Water quality in surface water supplies can vary with time and it is therefore necessary to adjust chemical dosages. The optimum chemical dosage is usually determined in the laboratory using the jar test or according to the dosage sheet." Standard Operating Procedure OCWA-C6-07A Jar Testing (Coagulation Control) provides directions for this purpose.

   Operational raw water monitoring is routinely conducted for turbidity, pH, temperature and alkalinity. However, due to seasonal and periodic conditions which could upset the treatment process, the operator should also adopt an effective means to monitor and detect or incorporate changes in NOM in raw water so that a prompt proactive response can be undertaken before treatment conditions deteriorate. UV-254 absorbance and transmittance, measured by spectrophotometry, is typically used for this purpose. Similar analysis of treated water can be used to assess the effectiveness of treatment changes.

   Action(s) Required:

   By April 30, 2016:

   I. Review the process monitoring requirements of SOP OCWA-C6-09 Sludge Clarifier Analysis Procedure and Section 3.0 (Chemical Addition) of the Operations Manual to ensure that they reflect safe and efficient operation of the process, and that they adequately address the concerns identified above.

   II. Review the requirements of these procedures with all operators responsible for operating the treatment system.

III. Make any changes to the raw water monitoring program deemed necessary to ensure that operators are promptly alerted to changes in raw water NOM and are provided with any further directions, apart from existing SOPs and Operations Manual procedures to respond to such changes.

IV. Report to the issuing officer on the status of items I to III above and submit copies of any revised or new procedures or directions.

2. All required written notices of adverse water quality incidents were not provided as per O. Reg. 170/03 16-7.

Although a written notice was provided for the adverse November 9, 2015 E-Coli / total coliform sample result, that written notice was not given within 24 hours after making the immediate report. The verbal notification was made on November 11, 2015 after receiving notice of the result from the owner's lab, yet the written notice was not given until November 13, 2015.

Action(s) Required:

The operating authority reviewed Standard Operating Procedure OCWA-C8-06 "Reporting Adverse Water Quality Incident" shortly after the incident. The SOP properly indicates the prescribed time frame for submitting written notice. No further action is required at this time.

3. The following instance of non-compliance was also noted during the inspection:

Recently adopted provisions under Section 4.3.3 of the Drinking Water Works Permit require the owner to undertake a review and notify the Director in the event there are changes in coagulants and pH adjustment chemicals, where replacement chemicals perform the same function. The review is required prior to making the alteration to determine the impacts that it will have on corrosion control or other treatment processes. A change in dosing coagulant to clarifier #4, using Hyper-ion 1090 aluminum chlorohydrate was implemented in clarifier #4 starting November 10, 2015. The required review was not performed prior to making the alteration. At the time of the inspection, the inventory of the coagulant was depleted and it's use was discontinued.

Action(s) Required:

Shortly after the requirements of Section 4.3.3 of the Drinking Water Works Permit were discussed with the operating authority, the owner approved funding to hire a consultant to investigate recently used coagulants, including Hyper-ion and Delpac aluminum chloride hydroxide sulphate and any potential impacts in the distribution system. No further changes will be made until the required review is completed. No further action is required at this time.

SUMMARY OF RECOMMENDATIONS AND BEST PRACTICE ISSUES

This section provides a summary of all recommendations and best practice issues identified during the inspection period. Details pertaining to these items can be found in the body of the inspection report. In the interest of continuous improvement in the interim, it is recommended that owners and operators develop an awareness of the following issues and consider measures to address them.

1. **All storage facilities were not completely covered and secure.**

   It was found during the February 2015 inspection of reservoir #2 that hatchway hardware (locks, hinges, props) on all five hatchways was missing or broken and that steel debris was noted on the reservoir floor below the hatchways. Similar conditions were also found during this inspection.

   Recommendation:

   The owner and operating authority should undertake measures to repair broken reservoir #2 hatchway hardware.

2. **The following issues were also noted during the inspection:**

   Seven additional issues were identified, and are described in detail under the "OTHER INSPECTION FINDINGS" section.

   Recommendation:

   With respect to the additional observations noted:

   A. For the re-location of the powdered activated carbon (PAC) dosing equipment from the maintenance room to the raw piping/valve gallery, the owner is reminded to update any drawings maintained for the drinking water system to reflect these modifications, consistent with the requirements of conditions 4.8 of the Drinking Water Works Permit and 15.2 of the Drinking Water System Licence.

   B. The owner should consider eliminating existing unit treatment by-passes incorporated into the original design of the water plant, including bypasses of clarifiers #1 and 2, filters #1 to 4 and the reservoir by-pass direct to the high-lift clearwell.

   C. The owner and operating authority should undertake measures to address integrity concerns identified with the physical facilities listed above.

   D. Henceforth, for any internal maintenance, repair and cleaning work in reservoirs, elevated tanks and storage facilities, the operating authority should review the recommendations and requirements in AWWA standard C652-11 to ensure preventative and monitoring provisions are closely followed.

   E. The owner and operating authority should consider the risks involved with spills at the primary and secondary coagulant areas with a view to implementing any necessary improvements to spill containment measures.

F. The coagulant dosing failures while building a sludge blanket while bringing clarifier #2 on-line in May and June 2015 highlighted problems with a lack of dosing failure alarming on the secondary coagulant system. The owner and operating authority should consider equipping the secondary coagulant dosing system with metering flow failure alarms.

G. Standard operating procedures should be developed for calibration of the following analysers or refer to manufacturers' manuals or documents for providing directions to operators:

- the Hach 1720E turbidimeter - filter unit #2
- the Rosemount Clarity II Emerson 56 turbidimeter - filter units #1 and #4
- the SWAN AMI Trides free chlorine analyser - CRA-09

SIGNATURES

Inspected By:	Signature: (Provincial Officer):
Al Petersen	

Reviewed & Approved By:	Signature: (Supervisor):
Gary Johnson	2016.03.30 11:28:44 -04'00'
Review & Approval Date:	

Note: This inspection does not in any way suggest that there is or has been compliance with applicable legislation and regulations as they apply or may apply to this facility. It is, and remains, the responsibility of the owner and/or operating authority to ensure compliance with all applicable legislative and regulatory requirements.

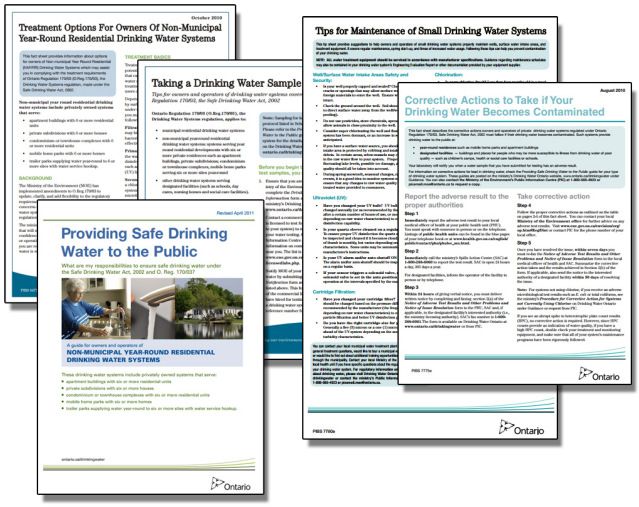
Stakeholder Appendix

Key Reference and Guidance Material for Non-Municipal Year-Round Residential Drinking Water Systems

Many useful materials are available to help you operate your drinking water system. Below is a list of key materials owners and operators of non-municipal year-round residential drinking water systems frequently use.

To access these materials online click on their titles in the table below or use your web browser to search for their titles. Contact the Public Information Centre if you need assistance or have questions at 1-800-565-4923/416-325-4000 or **picemail.moe@ontario.ca**.

For more information on Ontario's drinking water visit **www.ontario.ca/drinkingwater** and email **drinking.water@ontario.ca** to subscribe to drinking water news.



PUBLICATION TITLE	PUBLICATION NUMBER
FORMS: Drinking Water System Profile Information, Laboratory Services Notification, Adverse Test Result Notification	7419e, 5387e, 4444e
Providing Safe Drinking Water to the Public: A Guide for Owners and Operators of Non-Municipal Year-Round Residential Drinking Water Systems	5362e
Taking a Drinking Water Sample for Testing – Tips for Owners and Operators of Drinking Water Systems Covered by Ontario Regulation 170/03	5744e
Treatment Options for Owners of Non-Municipal Year-Round Residential Drinking Water Systems	5477e
Tips for Maintenance of Small Drinking Water Systems	7780e
Corrective Actions to Take if Your Drinking Water Becomes Contaminated	7775e
Drinking Water System Contact List	7128e
Procedure for Disinfection of Drinking Water in Ontario	4448e01
Procedure for Corrective Action for Systems Not Currently Using Chlorine	4414e01
Protecting Groundwater to Protect Health	6969e
Required Qualifications to Operate, Test or Sample Drinking Water Systems Under the Safe Drinking Water Act, 2002	6555e
Technical Support Document for Ontario Drinking Water Quality Standards, Objectives and Guidelines	4449e01
Steps to Become a Limited System Operator	5749e
Guide to Drinking Water Operator Training Requirements	9802e

PIBS 8988b01

MOECC Audit Sample Results

Ministry Audit Samples - Operational Results

Sample Type	Location Union AWSS Water Supply	Date/Time 2016	Bacti Sample	MOECC Audit Field Reading		Owner's Sample / Analyser Reading	
				F / T Cl_2	turb.	F/ T Cl_2	turb.
Treated CT	**Union WSS WTP reservoir effl. (CT)**	Jan 15 2:40 PM	N	1.80 free 2.04 total	-	1.94 free [1] 2.37 total [2]	-
Treated POE	**Union WSS WTP high lift discharge**	Jan 15 2:59 PM	N	-	-	0.06 free [3] 2.02 total [4]	0.11 *
Treated POE	**Union WSS WTP high lift discharge**	Jan 21 2:25 PM	N	0.08 free 1.83 total	-	0.09 free [3] 2.00 total [4]	-
Filter #1	**Union WSS WTP filter Filter1 effl.**	Jan 15 2:21 PM	N	-	-	-	**
Filter #2	**Union WSS WTP filter Filter2 effl.**	Jan 15 2:14 PM	N	-	-	-	**
Filter #3	**Union WSS WTP filter Filter3 effl.**	Jan 15 2:15 PM	N	-	0.09	-	0.034 *
Filter #4	**Union WSS WTP filter Filter4 effl.**	Jan 15 2:11 PM	N	-	-	-	**
Filter #5	**Union WSS WTP filter Filter5 effl.**	Jan 15 2:04 PM	N	-	0.12	-	0.11 *
Filter #6	**Union WSS WTP filter Filter6 effl.**	Jan 15 2:02 PM	N	-	-	-	**
Filter #7	**Union WSS WTP filter Filter7 effl.**	Jan 15 2:00 PM	N	-	-	-	**
Filter #8	**Union WSS WTP filter Filter8 effl.**	Jan 15 2:01 PM	N	-	-	-	0.04 *
Raw	**Union WSS raw water**	Jan 14 10:57 AM	N	-	-	-	33.7 *
Distribution	**Cottam Booster PS inlet CRA-1**	Jan 21 11:45 AM	N	1.49 total	-	1.64 total * 1.61 total **	-
Distribution	**Cottam Booster PS discharge CRA-2**	Jan 21 11:55 AM	N	1.54 total	-	1.67 total *	-
Distribution	**Albuna (Leam'n) tower – total in**	Jan 21 2:35 PM	N	1.78 total	-	1.58 total *	-
Distribution	**Albuna (Leam'n) tower – free/total out**	Jan 21 2:45 PM	N	0.06 free 1.66 total	-	0.09 free * 1.51 total *	-
Distribution	**Essex tower**	Jan 21 10:10 AM	N	1.87 total	-	1.62 total *	-

NOTES:
[1] Continuous analyser reading – CRA-7
[2] Continuous analyser reading – CRA-8
[3] Continuous analyser reading – CRA-9
[4] Continuous analyser reading – CRA-10

* Continuous analyser reading(s)
** Grab sample reading(s)
*** Treatment unit out of service

Provincial Officer Report(s) and Order(s)

Not applicable

Inspection Rating Record

Ministry of the Environment - Inspection Summary Rating Record (Reporting Year - 2015-2016)

DWS Name:	UNION AREA WATER SUPPLY SYSTEM
DWS Number:	210000853
DWS Owner:	Union Water System Joint Board Of Management (Leamington, Kingsville, Essex, Lakeshore)
Municipal Location:	Kingsville
Regulation:	O.REG 170/03
Category:	Large Municipal Residential System
Type Of Inspection:	Detailed
Inspection Date:	January 14, 2016
Ministry Office:	Windsor Area Office

Maximum Question Rating: 721

Inspection Module	Non-Compliance Rating
Permit To Take Water	0 / 30
Capacity Assessment	0 / 42
Treatment Processes	21 / 111
Process Wastewater	0 / 20
Distribution System	0 / 25
Operations Manuals	0 / 42
Logbooks	0 / 42
Consumer Relations	0 / 8
Certification and Training	0 / 65
Water Quality Monitoring	0 / 111
Reporting & Corrective Actions	6 / 84
Other Inspection Findings	0 / 0
Treatment Process Monitoring	0 / 141
TOTAL	**27 / 721**

Inspection Risk Rating	**3.74%**

FINAL INSPECTION RATING:	**96.26%**

Inspection Rating Record Generated On 30-MAR-16 (Inspection ID: 1-BZARB).

Ministry of the Environment - Detailed Inspection Rating Record (Reporting Year - 2015-2016)

DWS Name:	UNION AREA WATER SUPPLY SYSTEM
DWS Number:	210000853
DWS Owner:	Union Water System Joint Board Of Management (Leamington, Kingsville, Essex, Lakeshore)
Municipal Location:	Kingsville
Regulation:	O.REG 170/03
Category:	Large Municipal Residential System
Type Of Inspection:	Detailed
Inspection Date:	January 14, 2016
Ministry Office:	Windsor Area Office

Non-compliant Question(s)	Question Rating
Other Inspection Findings	
In the event that an issue of non-compliance outside the scope of this inspection protocol is identified, a "No" response may be used if further actions are deemed necessary (and approved by the DW Supervisor) to facilitate compliance.	0
Reporting & Corrective Actions	
Were all required written notices of adverse water quality incidents provided as per O. Reg. 170/03 16-7?	6
Treatment Processes	
Does the Operator-in-Charge ensure that all equipment used in the processes is monitored, inspected, and evaluated?	21
TOTAL QUESTION RATING	27

Maximum Question Rating: 721

Inspection Risk Rating	**3.74%**

FINAL INSPECTION RATING:	**96.26%**

Inspection Rating Record Generated On 30-MAR-16 (Inspection ID: 1-BZARB).