

# Lucknow Annual and Summary Report

*For the 2021 Operating Year*

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## 1.0 EXECUTIVE SUMMARY

The purpose of this report is to provide information to system Owners and Stakeholders to satisfy the regulatory requirements of the following:

- *Safe Drinking Water Act (SDWA)*
- Drinking Water Quality Management Standard (DWQMS)
- Section 81 of the Clean Water Act (CWA)
- Reporting required under Ontario Regulation (O. Reg.) 170/03, Section 11
- Reporting required under O. Reg. 170/03, Schedule 22

The Operating Authority (Veolia), on behalf of the Owner (Township of Huron-Kinloss), has prepared this report as a compilation of information that demonstrates the ongoing provision of a safe, consistent supply of high quality drinking water to customers supplied by the Lucknow Drinking Water System.

### **SAFE DRINKING WATER ACT**

Following the Walkerton Tragedy in 2000, the Ontario Government developed a new, comprehensive legislative paradigm based on a source-to-tap, multi-barrier approach to the protection of drinking water. The *Safe Drinking Water Act (SDWA)*, 2002, and its Regulations, contain requirements for Municipalities that provide potable water to their residents.

Under Section 19 (Standard of Care of the *SDWA*), Owners of a Drinking Water System are required to:

- a) exercise the level of care, diligence and skill in respect of a Municipal Drinking Water System that a reasonably prudent person would be expected to exercise in a similar situation; and
- b) act honestly, competently and with integrity, with a view to ensuring the protection and safety of the users of the Municipal Drinking Water System.

2002, c. 32, s. 19(1).

The following chart outlines key aspects of the *SDWA* that relate to the Lucknow Drinking Water System:

Legislative Framework for the Lucknow Drinking Water System

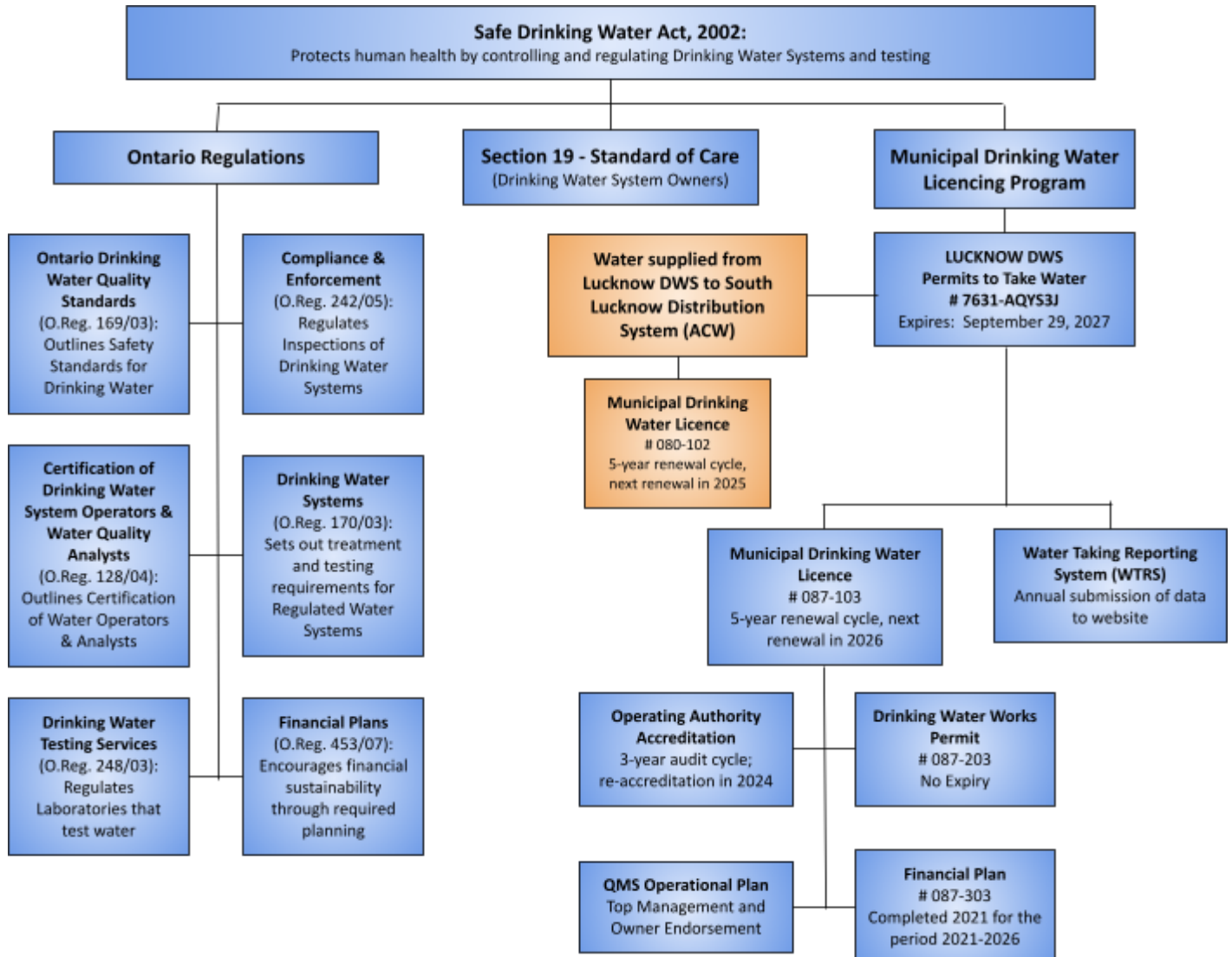


Figure 1

## 2.0 REPORTING REQUIREMENTS:

This report intends to provide relevant information to help the Township of Huron-Kinloss, its Council, as Owners of the Lucknow Drinking Water System, meet the Standard of Care. Its contents are organized as follows, according to specific reporting requirements under the *SDWA*:

### O. REG. 170/03, SECTION 11 - ANNUAL REPORT

- The Owner shall ensure an annual report is prepared as per O. Reg. 170/03, s. 11(1)
- The Owner of a Drinking Water System (DWS) that supplies water to another DWS shall provide a copy of the annual report to the system that receives the water
- The annual report must cover the period of January 1 to December 31 in a year and must be prepared not later than February 28 of the following year
- The annual report must:
  - Contain a brief description of the DWS, including a list of water treatment chemicals used
  - Summarize any reports made to the Ministry under s.s. 18(1) of the *Act*, or Sch. 16 (16-4)
  - Summarize the results of tests made under O. Reg. 170/03 and the Municipal Drinking Water Licence (MDWL)
  - Describe any corrective actions taken under Sch. 17
  - Describe any major expenses to install, repair or replace required equipment
  - Include a statement of where a report prepared as per Sch. 22 will be available for inspection under s.s. 12(4)
  - Specify the number of points sampled as per s.s. 15.1-4(2) or s.s. 15.1-5(5), the number of samples taken, and the number of points where a sample exceeded the prescribed standard for lead
- The Owner shall ensure that a copy of an annual report for a system is given, without charge, to every person who requests a copy
- If a DWS is connected to and receives all of its drinking water from another DWS, the Owner of the system that receives the water shall ensure that a copy of an annual report for the DWS that supplies water is given, without charge, to every person who requests a copy
- Every time that an annual report is prepared for a DWS, the Owner of the system shall ensure that effective steps are taken to advise users of water from the system that copies of the report are available, without charge, and of how a copy may be obtained

### O. REG. 170/03, SCHEDULE 22 - SUMMARY REPORT FOR MUNICIPALITIES

- The Owner of a DWS shall ensure that, not later than March 31 of each year, a report is prepared as per s.s. (2) and (3) for the preceding year and is given to:
  - in the case of a DWS owned by a Municipality, the members of the Municipal Council;
  - in the case of a DWS owned by a Municipal Service Board established under s. 195 of the *Municipal Act, 2001*, the members of the Municipal Service Board; or
  - in the case of a DWS owned by a Corporation, the Board of Directors of the Corporation

- The summary report must,
  - list the requirements of the *Act*, the Regulations, the system's approval, Drinking Water Works Permit (DWWP), MDWL, and any Orders applicable to the system that were not met at any time during the period covered by the report; and
  - for each requirement referred to above that was not met, specify the duration of the failure and the measures that were taken to correct the failure.
- The summary report must also include the following information for the purpose of enabling the Owner of the DWS to assess the capability of the system to meet existing and planned uses of the system:
  - A summary of the quantities and flow rates of the water supplied during the period covered by the report, including monthly average and maximum daily flows;
  - A comparison of the summary referred to above to the rated capacity and flow rates approved in the system's approval, DWWP or MDWL, or if the system is receiving all of its water from another system under an agreement pursuant to subsection 5(4), to the flow rates specified in the written agreement.
- If a report is prepared under s.s. (1) for a system that supplies water to a Municipality under the terms of the contract, the Owner of the DWS shall give a copy of the report to the Municipality by March 31.

#### **MINISTRY OF THE ENVIRONMENT, CONSERVATION AND PARKS (MECP) INSPECTION REPORT**

- In 2006, the MECP introduced a comprehensive inspection program for Municipal Residential Drinking Water Systems. The objectives of this program are to determine compliance with the *SDWA* and associated regulations; to encourage the continuous improvement of the Drinking Water System; and to establish a process to measure these improvements.

#### **MUNICIPAL DRINKING WATER MANAGEMENT REVIEW**

- The *SDWA*, through the Municipal Drinking Water System Licensing Program, requires that the Township maintain an accredited Quality Management System (QMS) for its drinking water system. This review communicates to Council the key information related to the QMS and the Municipal Drinking Water Licencing Program.

#### **QMS OPERATIONAL PLAN**

- The *SDWA*, through the Municipal Drinking Water Licensing Program, requires that a Municipal Drinking Water System Owner (Council) endorse the most current version of the QMS Operational Plan. This document, once endorsed, is posted on the Township of Huron-Kinloss website and is available at the Operations Centre.

The Township of Huron-Kinloss is approved by the MECP to operate a Class 2 Distribution and Supply Subsystem through its MDWL # 087-103, and to alter the system through it DWWP # 087-203.

The MECP "Municipal Drinking Water Systems" web portal provides the most current version of the *Act* and its regulations and can be found:

<https://www.ontario.ca/page/municipal-drinking-water-systems-licencing-registration-and-permits>



### 3.0 DESCRIPTION OF WATER SYSTEM (O. Reg. 170/03, s. 11 (6) (a))

A summary of the Lucknow Drinking Water System description is outlined below:

Drinking Water System Number:	220002663
Drinking Water System Name:	Lucknow Water Distribution and Supply
Drinking Water System Owner:	Corporation of the Township of Huron-Kinloss
Drinking Water System Category:	Large Municipal Residential
Drinking Water System Classification:	Water Distribution and Supply Subsystem Class 2
Drinking Water System Certificate No.:	1381
Daily Maximum Water Supply Capacity:	1,500 m <sup>3</sup>
Disinfection Chemicals:	Sodium Hypochlorite, 12%
Population (Stats Can):	1,172
Total Number of Service Connections:	670
Estimated Seasonal Population:	1,742 (based on Census data of 2.6 persons per household)
Average Day Demand:	498.15 m <sup>3</sup>
Peak Day Demand:	977.98 m <sup>3</sup> (June 13, 2021)
Average Capacity:	33.3%
Peak Capacity:	65.2% (June 13, 2021)
Distribution Network:	19.8 km
Fire Hydrants:	65
Blow-offs:	4

The Lucknow Drinking Water Distribution and Supply Subsystem is characterized as a “secure groundwater system”. It consists of two (2) well supplies and its equipment deliver potable water to the Village of Lucknow and ten (10) Lucknow South properties in the Township of Ashfield-Colborne-Wawanosh in Huron County. The Township of Huron-Kinloss has an agreement with The Township of Ashfield-Colborne-Wawanosh, where the Lucknow South distribution system is treated as part of the Lucknow Drinking Water System.

Each well supply is located within its own pumphouse in the Village of Lucknow. Both sites are controlled, monitored, and alarmed through a Supervisory Control and Data Acquisition (SCADA) system which is connected to the main controller, autodialer, and server at the Ripley Municipal Office. The desktop computer used by the system’s operators is located at the Ripley Township Shed and is connected remotely to the SCADA server. As a redundancy, each site is also equipped with an auto-dialer that is independent of the SCADA system, and is used to call out alarms in the event of communications/SCADA failure. This SCADA system provides the operator with the ability to monitor current operating status of the supply and treatment equipment throughout the water system at any given time via remote access by computer or Smartphone, and to have control over operations.

The two (2) well supplies are detailed as follows:

**Site: Lucknow Well # 4 - 600 Havelock Street**

- Water Source: Groundwater, Non-GUDI
- Number of Production Wells: 1 (drilled 1957)
- Depth of Wells: 54.8 m
- Well Pumps: 15 hp each (vertical turbine)\*
- Disinfection: Sodium hypochlorite (12%)
- CT Requirement: 2-log, 5°C, contact watermain (1.0 BF)
- Permit To Take Water: 7631-AQYS3J, expires September 29, 2027

\*Replaced in November 2021 with a 15 hp submersible pump and VFD.

**Site: Lucknow Well # 5 - 381 South Delhi Street**

- Water Source: Groundwater, Non-GUDI
- Number of Production Wells: 1 (drilled 1967)
- Depth of Well: 58.8 m
- Well Pump: 50 hp (submersible)
- Disinfection: Sodium hypochlorite (12%)
- CT Requirement: 2-log, 5°C, contact watermain (1.0 BF)
- Permit To Take Water: 7631-AQYS3J, expires September 29, 2027

Both Lucknow wells are secure, deep bedrock wells that penetrate limestone aquifers. Due to the depth and structure of the aquifers, the water temperature is relatively constant (< 10°C), turbidity is low, and the water is relatively hard. The raw water is also relatively **high in naturally-occurring fluoride**, but the lead content of the raw water is well below the half-MAC (Maximum Allowable Concentration). Those who are supplied from the Lucknow DWS are made aware of the various concentrations in their drinking water by numerous means of communication from the Township of Huron-Kinloss.

Each pumphouse is equipped with a receptacle and manual transfer switch for a portable diesel generator in the event of an extended power outage. A stand-by propane generator is located at the Ripley Municipal Office for back-up power requirements for the office and SCADA server equipment.

The Lucknow DWS currently (December 2021) has a distribution network with a combination of PVC, copper, ductile, and cast iron water mains, in sizes varying between 1-inch and 12-inch diameter. A Standpipe, located at 656 Wheeler Street, is 6.7 m in diameter, 27.5 m high and has a total volume of 996 m<sup>3</sup>. The well pumps at Well # 4 and Well # 5 are automatically controlled by the water level in the Standpipe via communications located at 482 Ross Street (former pumphouse).

The Standpipe was built in 1930, making it approximately 90 years old. It consists of a riveted steel design (bolted steel top section), which includes a protective layer of 'shop coat' (lead and linseed oil), two (2) coats of 'anti aqua paint' (unknown), and a food grade grease paint on the interior that is intended to provide corrosion protection. The riveted steel design of Standpipes was phased out in the 1930s and is no longer used. The Standpipe is in a state of disrepair, but is currently in operable condition. As it is risky to perform aggressive cleaning without compromising its structural integrity and introducing a potential for contamination, the replacement of the Standpipe with a new Elevated Tank (ET) is currently in the preliminary phase. Work is scheduled to get the site and infrastructure ready to accommodate the new ET.

#### **4.0 SUMMARY OF REPORTS MADE TO THE MINISTRY (O. Reg. 170/03, s. 11 (6) (b))**

- There were two (2) Adverse Water Quality Incidents in the Lucknow DWS in 2021.
  - AWQI # 153753: 1 Total Coliform was reported from Lucknow Well # 5 Treated Water, but the resample was zero (0).
  - AWQI # 154037: Arsenic exceedance was reported from Lucknow Well # 4 Treated Water (98.3 µg/L), but the resample was 3.9 µg/L which is typical.
- There was one (1) non-compliance: a well level measurement at Lucknow # 5 was missed in October 2021. This was reported to the MECP Inspector.

## 5.0 SUMMARY OF WATER QUALITY MONITORING (O. Reg. 170/03, s. 11 (6) (c))

The purpose of sampling and testing is to confirm that water is safe for human consumption and to provide a comprehensive track record.

**Table 1 - Monitoring Requirements:**

Parameter	Description	Required # of Samples	Requirement Source
<b>Chlorine Residual (grab)</b>	For monitoring amount of residual in the Distribution system, and confirming of water quality following maintenance	365/year (1 daily)	O. Reg. 170/03, Sch. 7
<b>Chlorine Residual (continuous monitoring)</b>	Continuous monitoring equipment used to sample and test Treated water at the location where intended contact time has been completed	5 minute intervals, minimum, each POE	O. Reg. 170/03, Sch. 7
<b>E. Coli (EC) Total Coliform (TC) Heterotrophic Plate Count (HPC)</b>	For testing presence of microbiological activity	108/year (Dist) 104/year (Raw) 104/year (Treated)	O. Reg. 170/03, Sch. 10
<b>Inorganics and Organics</b>	For testing presence of metals, pesticides and herbicides	36 month interval	O. Reg. 170, Sch 13, s. 13-2 (Sch 23), and s. 13-4 (Sch 24)
<b>Arsenic</b>	For testing presence of arsenic in the treated water at Point-of-Entry	4/year (quarterly)	O. Reg. 170, Sch 13-5 (increased frequency)
<b>Trihalomethanes (THMs)</b>	For testing presence of disinfection by-products (DBPs) in the Distribution system	4/year (quarterly)	O. Reg. 170/03, Sch. 13, s. 13-6
<b>Lead (Pb)</b>	For testing presence of lead in the Distribution system only - not private side	36 month interval (pH and alkalinity annually)	O. Reg. 170/03, Sch. 15; MDWL #087-102, Sch. D
<b>Haloacetic Acids (HAAs)</b>	For monitoring the formation of disinfection by-products (DBPs) in the Distribution system	4/year (quarterly, near each well supply)	O. Reg. 170/03, Sch. 13, s. 13-6.1
<b>Nitrate and Nitrite</b>	For testing presence of nitrates and nitrites in the Treated water at Point-of-Entry	4/year (quarterly)	O. Reg. 170/03, Sch. 13, s. 13-7
<b>Sodium</b>	For testing presence of sodium in the Treated water at Point-of-Entry	60 month interval	O. Reg. 170/03, Sch. 13, s. 13-8
<b>Fluoride</b>	For testing presence of fluoride in the treated water at Point-of-Entry	60 month interval	O. Reg. 170/03, Sch. 13, s. 13-9

### COMMUNICATIONS WHEN ADVERSE WATER SAMPLES ARE IDENTIFIED

#### Requirement - Laboratory

A water sample that does not meet Provincial water quality standards is considered “adverse”. When adverse water quality is detected, the accredited laboratory conducting the testing will immediately notify the Operating Authority, the Spills Action Centre (SAC), and the office of Grey Bruce Health Services, and occasionally the office of Huron-Perth Public Health (as necessary, if applicable). This notification is made by telephone through live communication to a person in authority. In addition to the phone calls, a fax of the sample results is sent to these agencies to verify the live communication made earlier.

Requirement - Drinking Water System Owner/Operating Authority

The SDWA also requires the Drinking Water System Owner/Operating Authority to immediately notify the MECP and the Grey Bruce Health Services office and the Huron-Perth Public Health office (if applicable), that the laboratory notice has been received and that “corrective actions” are being initiated. The method of contact is by telephone to a person of authority. The Operating Authority also faxes Form 2A - Notices of Adverse Test Results and Issue Resolution (Schedule 16) within 24 hours to both agencies first to verify previous live communication. Once the issue has been resolved and to confirm that corrective actions have been completed, the Operating Authority also faxes Form 2B - Notices of Adverse Test Results and Issue Resolution (Schedule 16) within 7 days to the agencies. This reporting system provides assurance that the DWS Owner is complying with the applicable regulations and that appropriate corrective actions are being taken and are being reported.

**5.1 Water Treatment Equipment Operation and Monitoring**

**5.1.1 Treated Water (Point of Entry) Free Chlorine Residuals (Grab Samples)**

In 2021, a total of 615 treated water grab samples were collected and analyzed for free chlorine residual at the point of entry (POE) using a Hach pocket chlorine colorimeter. **Table 2** shows the grab samples monthly average of free chlorine residual values. **Table 3** shows the on-line continuous samples monthly average (as collected by SCADA) of the free chlorine residual values.

**5.1.2 Distribution Free Chlorine Residuals (Grab Samples)**

In 2021, a total of 476 distribution residuals were collected: 365 daily grab residuals and an additional 111 weekly grab residuals were taken in conjunction with the required weekly microbiological sampling. A summary of all the residuals collected is presented in **Table 2**. South Lucknow in ACW is included in the distribution residuals.

**Table 2 - Average Treated and Distribution Free Chlorine Residuals (Grab Samples)**

Month	Lucknow # 4 Treated Water	Lucknow # 5 Treated Water	Lucknow Distribution
Jan	1.65	1.72	1.49
Feb	1.70	1.84	1.57
Mar	1.64	1.83	1.61
Apr	1.61	1.65	1.40
May	1.57	1.73	1.49
Jun	1.51	1.68	1.50
Jul	1.58	1.69	1.43
Aug	1.58	1.65	1.35
Sep	1.51	1.68	1.48
Oct	OFF-LINE	1.80	1.61
Nov	OFF-LINE	1.83	1.62
Dec	1.85	1.86	1.66
<b>CT Requirement</b>	<b>0.26</b>	<b>0.27</b>	<b>0.20</b>
<b>Annual Min</b>	1.39	1.34	0.71
<b>Annual Max</b>	1.97	2.13	1.98
<b>Annual Avg</b>	1.62	1.75	1.52
<b># Samples</b>	257	365	476

Table 3 - Average Treated Free Chlorine Residuals (On-Line Continuous from SCADA)

Month	Lucknow # 4 Treated Water	Lucknow # 5 Treated Water
Jan	1.70	1.72
Feb	1.74	1.84
Mar	1.68	1.83
Apr	1.65	1.61
May	1.61	1.72
Jun	1.55	1.68
Jul	1.60	1.67
Aug	1.60	1.64
Sep	1.49	1.69
Oct	1.50	1.82
Nov	1.55	1.85
Dec	1.74	1.87
<b>CT Requirement</b>	<b>0.26</b>	<b>0.27</b>
Annual Min	1.26	1.38
Annual Max	2.00	2.11
Annual Avg	1.62	1.74

### 5.1.3 Raw and Treated Water Turbidity

Raw water and treated water grab samples were collected and analyzed for turbidity using a portable turbidity analyzer. **Table 4** provides a summary of raw and treated water turbidity results.

Table 4 - Raw and Treated Water Turbidity Results (monthly average)

Month	Lucknow # 4		Lucknow # 5	
	Raw	Treated	Raw	Treated
Jan	0.12	0.20	0.22	0.26
Feb	0.19	0.18	0.18	0.23
Mar	0.17	0.26	0.17	0.23
Apr	0.14	0.19	0.29	0.19
May	0.15	0.20	0.20	0.25
Jun	0.18	0.24	0.17	0.23
Jul	0.17	0.31	0.15	0.33
Aug	0.16	0.24	0.22	0.29
Sep	0.19	OFF-LINE	0.18	0.23
Oct	0.74	OFF-LINE	0.18	0.27
Nov	OFF-LINE	OFF-LINE	0.16	0.19
Dec	0.46	0.27	0.19	0.19
Annual Min	0.08	0.15	0.11	0.15
Annual Max	0.85	0.33	0.43	0.33
Annual Avg	0.24	0.23	0.19	0.24
# Samples	38	31	48	36

## 5.2 Microbiological Sampling per Schedule 10, O. Reg. 170/03

### 5.2.1 Raw Water Samples

Raw water samples are collected every week. In 2021, a total of 96 samples were collected and analyzed for E. Coli and Total Coliform. **Tables 5 and 6** provide a summary of microbiological results performed on the raw water.

**Table 5 - Microbiological Results for Raw Water - LUCKNOW # 4**

Month	Total Coliform			E. Coli		
	# Samples	# Samples "0"	# Samples $\geq 1$	# Samples	# Samples "0"	# Samples $\geq 1$
Jan	4	4	0	4	4	0
Feb	4	4	0	4	4	0
Mar	5	5	0	5	5	0
Apr	4	4	0	4	4	0
May	4	4	0	4	4	0
Jun	5	5	0	5	5	0
Jul	4	4	0	4	4	0
Aug	5	5	0	5	5	0
Sep	1	1	0	1	1	0
Oct	2	2	0	2	2	0
Nov	1	1	0	1	1	0
Dec	4	4	0	4	4	0
<b>TOTAL</b>	<b>43</b>	<b>43</b>	<b>0</b>	<b>43</b>	<b>43</b>	<b>0</b>

**Table 6 - Microbiological Results for Raw Water - LUCKNOW # 5**

Month	Total Coliform			E. Coli		
	# Samples	# Samples "0"	# Samples $\geq 1$	# Samples	# Samples "0"	# Samples $\geq 1$
Jan	4	4	0	4	4	0
Feb	4	4	0	4	4	0
Mar	6	6	0	6	6	0
Apr	4	3	1	4	4	0
May	4	4	0	4	4	0
Jun	5	4	1	5	5	0
Jul	4	4	0	4	4	0
Aug	5	5	0	5	5	0
Sep	4	4	0	4	4	0
Oct	4	4	0	4	4	0
Nov	5	4	1	5	5	0
Dec	4	4	0	4	4	0
<b>TOTAL</b>	<b>53</b>	<b>50</b>	<b>3</b>	<b>53</b>	<b>53</b>	<b>0</b>

5.2.2 Treated Water (Point of Entry) Samples

One (1) treated water sample from each point of entry is taken every week and analyzed for E. Coli, Total Coliform, and Heterotrophic Plate Count (HPC). In 2021, a total of 94 treated water samples were collected and analyzed for the above parameters. One sample collected from the Lucknow # 5 Treated water had 1 Total Coliform result. All other samples had EC and TC results that were 0 cfu/100 mL. The range of HPC results were 0 - 10 cfu/100 mL. **Tables 7 and 8** provide a summary of all microbiological results performed on treated water.

**Table 7 - Microbiological Results for Treated Water (Point of Entry) - LUCKNOW # 4**

Month	Total Coliform			E. Coli			HPC		
	# Samples	# Samples "0"	# Samples $\geq 1$	# Samples	# Samples "0"	# Samples $\geq 1$	# Samples	# Samples "0"	# Samples $\geq 1$
Jan	4	4	0	4	4	0	4	3	1
Feb	4	4	0	4	4	0	4	2	2
Mar	5	5	0	5	5	0	5	3	2
Apr	4	4	0	4	4	0	4	4	0
May	4	4	0	4	4	0	4	4	0
Jun	5	5	0	5	5	0	5	5	0
Jul	4	4	0	4	4	0	4	3	1
Aug	4	4	0	4	4	0	4	1	3
Sep	5	5	0	5	5	0	5	4	1
Oct	4	4	0	4	4	0	4	3	1
Nov	4	4	0	4	4	0	4	3	1
Dec	5	5	0	5	5	0	5	0	5
<b>TOTAL</b>	<b>52</b>	<b>52</b>	<b>0</b>	<b>52</b>	<b>52</b>	<b>0</b>	<b>52</b>	<b>35</b>	<b>17</b>

**Table 8 - Microbiological Results for Treated Water (Point of Entry) - LUCKNOW # 5**

Month	Total Coliform			E. Coli			HPC		
	# Samples	# Samples "0"	# Samples $\geq 1$	# Samples	# Samples "0"	# Samples $\geq 1$	# Samples	# Samples "0"	# Samples $\geq 1$
Jan	4	4	0	4	4	0	4	3	1
Feb	4	4	0	4	4	0	4	2	2
Mar	5	5	0	5	5	0	5	2	3
Apr	4	4	0	4	4	0	4	2	2
May	4	4	0	4	4	0	4	3	1
Jun	5	5	0	5	5	0	5	5	0
Jul	4	4	0	4	4	0	4	4	0
Aug	4	4	0	4	4	0	4	3	1
Sep	5	5	0	5	5	0	5	4	1
Oct	4	4	0	4	4	0	4	3	1
Nov	4	4	0	4	4	0	4	4	0
Dec	5	5	0	5	5	0	5	0	5
<b>TOTAL</b>	<b>52</b>	<b>52</b>	<b>0</b>	<b>52</b>	<b>52</b>	<b>0</b>	<b>52</b>	<b>35</b>	<b>17</b>

### 5.2.3 Distribution Samples

Distribution samples are collected every week and tested for E. Coli, Total Coliform, and 25% of the samples are also analyzed for Heterotrophic Plate Count (HPC). Ontario Regulation 170/03 requires 8 distribution samples plus one additional sample for every 1,000 people served by the system. In 2021, a total of 157 distribution samples were collected and analyzed for TC and EC, which is above the required number of samples (n=108, based on 1,742 potential residents). A total of 104 distribution samples were analyzed for HPC (n=27, 25% of 108). Each E. Coli result from the treated water was 0 cfu/100 mL. The range of HPC results were 0 - 30 cfu/100 mL. **Table 9** provides a summary of all microbiological samples taken in the distribution system.

**Table 9 - Microbiological Results for Distribution System**

Month	Total Coliform			E. Coli			HPC		
	# Samples	# Samples "0"	# Samples $\geq 1$	# Samples	# Samples "0"	# Samples $\geq 1$	# Samples	# Samples "0"	# Samples 1 - 30
Jan	12	12	0	12	12	0	8	0	8
Feb	12	12	0	12	12	0	8	0	8
Mar	16	16	0	16	16	0	10	0	10
Apr	12	12	0	12	12	0	8	0	8
May	12	12	0	12	12	0	8	0	8
Jun	15	15	0	15	15	0	10	0	10
Jul	12	12	0	12	12	0	8	0	8
Aug	15	15	0	15	15	0	10	0	10
Sep	12	12	0	12	12	0	8	0	8
Oct	12	12	0	12	12	0	8	0	8
Nov	15	15	0	15	15	0	10	0	10
Dec	12	12	0	12	12	0	8	0	8
<b>TOTAL</b>	<b>157</b>	<b>157</b>	<b>0</b>	<b>157</b>	<b>157</b>	<b>0</b>	<b>104</b>	<b>0</b>	<b>104</b>

### 5.3 Chemical Sampling and Testing as per Schedule 13, O. Reg. 170/03

#### 5.3.1 Inorganics (Schedule 13, s. 13-2; Schedule 23)

Treated water samples are collected every 36 months and analyzed for inorganics. The most recent samples for the Lucknow Drinking Water System were collected on June 22, 2021 and submitted to the laboratory for analysis of inorganics as listed in Schedule 23 (see **Table 10**). All parameters were found to be within compliance, however, the Arsenic level at both Lucknow #4 and Lucknow #5 exceeded the Half-Maximum Allowable Concentration (half-MAC). Any half-MAC exceedance must be sampled on a quarterly basis to comply with O. Reg. 170/03, Schedule 13-5(1) - Increased frequency under s.s 13-2 and 13-4.

**Table 26** (Section 7.1 - Regulatory Changes, Arsenic Results) provides a summary of the increased Arsenic sampling. **Table 30** (Section 12.0 - Observations and Historical Trends) provides some historical arsenic test results.

Inorganics will be sampled and analyzed again in June 2024.



Table 10 - Inorganics (Schedule 13, s. 13-2; Schedule 23) Results

Parameter	Lucknow # 4 Treated Water (µg/L)	Lucknow # 5 Treated Water (µg/L)	Maximum Allowable Concentration (µg/L)	Exceedance
Antimony	0.9 <MDL	0.9 <MDL	6	No
Arsenic	5.2	5.8	10	No
Barium	304	321	1000	No
Boron	38	39	5000	No
Cadmium	0.003 <MDL	0.003 <MDL	5	No
Chromium	0.28	0.27	50	No
Mercury	0.01 <MDL	0.01 <MDL	1	No
Selenium	0.04 <MDL	0.04 <MDL	50	No
Uranium	1.03	0.874	20	No

\*MDL = Laboratory Minimum Detection Limit

### 5.3.2 Organics (Schedule 13, s. 13-4; Schedule 24)

Treated water samples are collected every 36 months and tested for Schedule 24 organic parameters. The most recent samples were collected on June 22, 2021. All parameters were found to be within compliance. Organics will be sampled and analyzed again in June 2024. Samples results can be found in **Table 11**.

Table 11 - Organics (Schedule 13, s. 13-4; Schedule 24) Results

Parameter	Lucknow # 4 Treated Water (µg/L)	Lucknow # 5 Treated Water (µg/L)	Maximum Allowable Concentration (µg/L)	Aesthetic Objective / Operational Guideline (µg/L)	Exceedance
Benzene	0.32 <MDL	0.32 <MDL	1	--	No
Carbon Tetrachloride	0.17 <MDL	0.17 <MDL	2	--	No
1,2-Dichlorobenzene	0.41 <MDL	0.41 <MDL	200	3	No
1,4-Dichlorobenzene	0.36 <MDL	0.36 <MDL	5	1	No
1,1-Dichloroethylene	0.33 <MDL	0.33 <MDL	14	--	No
1,2-Dichloroethane	0.35 <MDL	0.35 <MDL	5	--	No
Dichloromethane	0.35 <MDL	0.35 <MDL	50	--	No
Monochlorobenzene	0.3 <MDL	0.3 <MDL	80	30	No
Tetrachloroethylene	0.35 <MDL	0.35 <MDL	10	--	No
Trichloroethylene	0.44 <MDL	0.44 <MDL	5	--	No
Vinyl Chloride	0.17 <MDL	0.17 <MDL	1	--	No
Diquat	1 <MDL	1 <MDL	70	--	No
Paraquat	1 <MDL	1 <MDL	10	--	No
Glyphosate	1 <MDL	1 <MDL	280	--	No
Polychlorinated Biphenyls	0.04 <MDL	0.04 <MDL	3	--	No

\*MDL = Laboratory Minimum Detection Limit

Table 11 - Organics (Schedule 13, s. 13-4; Schedule 24) Results - Continued

Parameter	Lucknow # 4 Treated Water (µg/L)	Lucknow # 5 Treated Water (µg/L)	Maximum Allowable Concentration (µg/L)	Aesthetic Objective / Operational Guideline (µg/L)	Exceedance
Benzo(a)pyrene	0.004 <MDL	0.004 <MDL	0.01	--	No
Alachlor	0.02 <MDL	0.02 <MDL	5	--	No
Atrazine+N-dealkylated metabolites	0.01 <MDL	0.01 <MDL	5	--	No
Atrazine	0.01 <MDL	0.01 <MDL	--	--	No
Desethyl Atrazine	0.01 <MDL	0.01 <MDL	--	--	No
Azinphos-methyl	0.05 <MDL	0.05 <MDL	20	--	No
Carbaryl	0.05 <MDL	0.05 <MDL	90	--	No
Carbofuran	0.01 <MDL	0.01 <MDL	90	--	No
Chlorpyrifos	0.02 <MDL	0.02 <MDL	90	--	No
Diazinon	0.02 <MDL	0.02 <MDL	20	--	No
Dimethoate	0.06 <MDL	0.06 <MDL	20	--	No
Diuron	0.03 <MDL	0.03 <MDL	150	--	No
Malathion	0.02 <MDL	0.02 <MDL	190	--	No
Metolachlor	0.01 <MDL	0.01 <MDL	50	--	No
Metribuzin	0.02 <MDL	0.02 <MDL	80	--	No
Phorate	0.01 <MDL	0.01 <MDL	2	--	No
Prometryne	0.03 <MDL	0.03 <MDL	1	--	No
Simazine	0.01 <MDL	0.01 <MDL	10	--	No
Terbufos	0.01 <MDL	0.01 <MDL	1	--	No
Triallate	0.01 <MDL	0.01 <MDL	230	--	No
Trifluralin	0.02 <MDL	0.02 <MDL	45	--	No
2,4-Dichlorophenoxyacetic acid	0.19 <MDL	0.19 <MDL	100	--	No
Bromoxynil	0.33 <MDL	0.33 <MDL	5	--	No
Dicamba	0.20 <MDL	0.20 <MDL	120	--	No
Diclofop-methyl	0.40 <MDL	0.40 <MDL	9	--	No
MCPA	0.00012 <MDL	0.00012 <MDL	0.1	--	No
Picloram	1 <MDL	1 <MDL	190	--	No
2,4-Dichlorophenol	0.15 <MDL	0.15 <MDL	900	0.3	No
2,4,6-Trichlorophenol	0.25 <MDL	0.25 <MDL	5	2	No
2,3,4,6-Tetrachlorophenol	0.20 <MDL	0.20 <MDL	100	1	No
Pentachlorophenol	0.15 <MDL	0.15 <MDL	60	30	No

\*MDL = Laboratory Minimum Detection Limit

### 5.3.3 Trihalomethanes (Schedule 13, s. 13-6)

Distribution samples are taken every three months from representative points in the distribution system and tested for Trihalomethanes (THMs). The Ontario Drinking Water Quality Standards (ODWQS) have set a Maximum Allowable Concentration (MAC) of 100 µg/L for this parameter and it is expressed as a running annual average (RAA). In 2021, the RAA for THM was found to be 9.8 µg/L, which is within compliance. Refer to **Table 12, 13, and 14**.

**Table 12 - LUCKNOW # 4 - Trihalomethane (Schedule 13, s. 13-6) Results**

Month	THMs (µg/L)	Bromodichloro methane (µg/L)	Bromoform (µg/L)	Chloroform (µg/L)	Dibromochloro methane (µg/L)
Feb	4.0	0.55	<0.34	3.4	<0.37
May	4.9	0.78	<0.34	4.1	<0.37
Aug	11.0	2.0	<0.34	8.6	0.38
Nov	11.0	2.0	<0.34	8.4	0.49
RAA	7.7	1.33	<0.34	6.4	0.40
Maximum	11.0	2.0	<0.34	8.6	0.49
MAC (µg/L)	100	---	---	---	---
Exceedance	No	---	---	---	---

**Table 13 - LUCKNOW # 5 - Trihalomethane (Schedule 13, s. 13-6) Results**

Month	THMs (µg/L)	Bromodichloro methane (µg/L)	Bromoform (µg/L)	Chloroform (µg/L)	Dibromochloro methane (µg/L)
Feb	6.1	1.0	<0.34	5.0	<0.37
May	12.0	1.9	<0.34	9.6	0.51
Aug	14.0	3.0	<0.34	9.8	0.77
Nov	10.0	2.3	<0.34	7.4	0.57
RAA	10.5	2.1	<0.34	8.0	0.56
Maximum	14.0	3.0	<0.34	9.8	0.77
MAC (µg/L)	100	---	---	---	---
Exceedance	No	---	---	---	---

**Table 14 - SOUTH LUCKNOW (ACW) - Trihalomethane (Schedule 13, s. 13-6) Results**

Month	THMs (µg/L)	Bromodichloro methane (µg/L)	Bromoform (µg/L)	Chloroform (µg/L)	Dibromochloro methane (µg/L)
Feb	6.1	0.98	<0.34	5.1	<0.37
May	12.0	2.1	<0.34	9.1	0.52
Aug	14.0	2.2	<0.34	11.0	0.52
Nov	13.0	2.2	<0.34	9.9	0.47
RAA	10.9	1.9	<0.34	8.8	0.47
Maximum	10.5	2.2	<0.34	11.0	0.52
MAC (µg/L)	100	---	---	---	---
Exceedance	No	---	---	---	---

5.3.4 Haloacetic Acids (Schedule 13, s. 13-6.1)

Ontario Regulation 170/03 has been amended to include quarterly testing for Haloacetic Acids (HAAs). Distribution samples are taken every three months from representative points in the distribution system and tested for Haloacetic Acids (HAAs). In 2021, samples were collected during the months of February, May, August, and November and results are expressed as a running annual average (RAA). Results are summarized in **Table 15 and 16**.

**Table 15 - LUCKNOW # 4 - Haloacetic Acid (Schedule 13, s. 13-6.1) Results**

Month	Total HAAs (µg/L)	Bromo acetic acid (µg/L)	Chloro acetic acid (µg/L)	Dichloro acetic acid (µg/L)	Dibromo acetic acid (µg/L)	Trichloro acetic acid (µg/L)
Feb	<5.3	<2.9	<4.7	<2.6	<2.0	<5.3
May	6.6	<2.9	<4.7	6.6	<2.0	<5.3
Aug	<5.3	<2.9	<4.7	2.7	<2.0	<5.3
Nov	<5.3	<2.9	<4.7	2.7	<2.0	<5.3
Avg	5.6	<2.9	<4.7	3.7	<2.0	<5.3
Max	6.6	<2.9	<4.7	6.6	<2.0	<5.3
MAC (µg/L)	80	---	---	---	---	---
Exceedance	No	---	---	---	---	---

**Table 16 - LUCKNOW # 5 - Haloacetic Acid (Schedule 13, s. 13-6.1) Results**

Month	Total HAAs (µg/L)	Bromo acetic acid (µg/L)	Chloro acetic acid (µg/L)	Dichloro acetic acid (µg/L)	Dibromo acetic acid (µg/L)	Trichloro acetic acid (µg/L)
Feb	6.3	<2.9	<4.7	6.3	<2.0	<5.3
May	<5.3	<2.9	<4.7	<2.6	<2.0	<5.3
Aug	<5.3	<2.9	<4.7	<2.6	<2.0	<5.3
Nov	5.6	<2.9	<4.7	<2.6	<2.0	<5.3
Avg	5.6	<2.9	<4.7	3.7	<2.0	<5.3
Max	6.3	<2.9	<4.7	6.3	<2.0	<5.3
MAC (µg/L)	80	---	---	---	---	---
Exceedance	No	---	---	---	---	---

5.3.5 Nitrate and Nitrite (Schedule 12, s. 13-7)

Treated water samples are taken every three months and tested for nitrate and nitrite. In 2021, samples were collected during the months of February, May, August, and November. The Ontario Drinking Water Quality Standards (ODWQS) have set a Maximum Allowable Concentration (MAC) of 10 mg/L for nitrates and 1 mg/L for nitrites. The results were found to be within compliance and are summarized in **Table 17**.

Table 17 - Nitrate and Nitrite (Schedule 13, s. 13-7) Results

Month	LUCKNOW # 4		LUCKNOW # 5	
	Nitrite (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	Nitrate (mg/L)
Feb	<0.003	0.006	<0.003	<0.006
May	0.003	0.006	0.003	<0.006
Aug	<0.003	0.006	<0.003	<0.006
Nov	<0.003	0.007	<0.003	<0.006
Average	0.003	0.006	0.003	<0.006
Maximum	0.003	0.007	0.003	<0.006
MAC (mg/L)	1	10	1	10
Exceedance	No	No	No	No

### 5.3.6 Sodium (Schedule 13, s. 13-8)

One (1) water sample is collected from each Point of Entry (treated water) every 60 months and analyzed for Sodium. The Ministry's *Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines, PIBS 4449e01, June 2006*, states: "The aesthetic objective for sodium in drinking water is 200 mg/L. The local Medical Officer of Health should be notified when the sodium concentration exceeds 20 mg/L so that this information may be communicated to local physicians for their use with patients on sodium restricted diets." These samples were collected on July 27, 2021. Results can be found in **Table 18**. The next sampling date for Sodium will be in 2026.

### 5.3.7 Fluoride (Schedule 13, s. 13-9)

One (1) water sample is collected from each Point of Entry (treated water) every 60 months and analyzed for Fluoride. The Ontario Drinking Water Quality Standards (ODWQS) have set a Maximum Allowable Concentration (MAC) of 1.5 mg/L. On August 15, 2017, samples were collected for this analysis. All four samples exceeded the MAC due to naturally occurring fluoride in the aquifers. These exceedances were reported to the Grey Bruce Health Unit and the Ministry's Spills Action Centre (AWQI # 135641). The results are summarized in **Table 18**. The next sampling date for Fluoride will be in 2022.

Table 18 - Sodium (Schedule 13, s. 13-8) and Fluoride (Schedule 13, s. 13-9) Results

Location	Sodium	Fluoride
	Result (mg/L)	Result (mg/L)
Lucknow # 4 Treated Water	11.1	1.75
Lucknow # 5 Treated Water	12.8	1.78
MAC (mg/L)	20	1.50
Exceedance	No	Yes

### 5.3.8 Lead (Schedule 15.1) - (O. Reg. 170/03, s. 11 (6) (g))

Schedule 15.1 of Ontario Regulation 170/03 requires that samples be taken during two seasons: once between December 15 and April 15, and once between June 15 and October 15. Three (3) pH and alkalinity samples were collected on January 11, 2021, and two (2) of these were also tested for lead. Three (3) pH and alkalinity samples were collected on July 12, 2021, and two (2) of these were also tested for lead. These parameters are required to be sampled and analyzed again between the months of December and April, and again between June and October. Lead samples are required next in the 2023-2024 sampling season. Results can be found in **Table 19**.

**Table 19 - Lead Sampling Program (Schedule 15.1) Results**

Season	Alkalinity (mg/L)	pH	Lead (µg/L)
Dec-Apr	213 (ACW)	7.56 (ACW)	—
	221	7.51	0.34
	264	7.52	0.17
Jun-Oct	225 (ACW)	7.87 (ACW)	—
	222	7.74	0.46
	211	7.75	0.04
<b>MAC (µg/L)</b>	---	---	<b>10</b>
<b>Exceedance</b>	---	---	<b>No</b>

### 5.3.9 Non-Regulatory Testing - Aesthetic Objectives and Operational Guidelines (AO/OG)

Samples were collected from each Point of Entry (treated water) on November 21, 2016 and tested for parameters listed in the Ministry's *Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines, June 2006, PIBS 4449e01*. These results are included in **Table 20** for information purposes.

**Table 20 - Aesthetic Objectives and Operational Guideline Results**

Parameter	AO/OG	Lucknow # 4 Treated Water	Lucknow # 5 Treated Water
pH	6.5 - 8.5	7.88	8.03
Alkalinity (mg/L as CaCO <sub>3</sub> )	30 - 500	217	224
Colour (TCU)	5	3	3 <MDL
Total Dissolved Solids (mg/L)	500	280	274
Organic Nitrogen (mg/L)	0.15	0.05 <MDL	0.05 <MDL
Total Kjeldahl Nitrogen (mg/L)	---	0.05 <MDL	0.05 <MDL
Ammonia + Ammonium (mg/L)	---	0.06	0.06
Hydrogen Sulphide (mg/L)	0.05	0.006 <MDL	0.006 <MDL
Sulphide (mg/L)	0.05	0.006 <MDL	0.006 <MDL
Chloride (mg/L)	250	3.7	3.9
Sulphate (mg/L)	500	31	31
Hardness	80 - 100	206	209

\*MDL = Laboratory Minimum Detection Limit

**Table 20 - Aesthetic Objectives and Operational Guideline Results - Continued**

Parameter	AO/OG	Lucknow # 4 Treated Water	Lucknow # 5 Treated Water
Aluminum (µg/L)	100	0.5	2.5
Copper (µg/L)	1000	4.25	1.99
Iron (µg/L)	300	132	264
Manganese (µg/L)	50	8.38	13.8
Zinc (µg/L)	5000	3	4
Dissolved Organic Carbon (mg/L)	5	1 <MDL	1 <MDL
Methane (L/m <sup>3</sup> )	3	0.02 <MDL	0.02 <MDL
Ethylbenzene (µg/L)	2.4	0.33 <MDL	0.33 <MDL
Toluene (µg/L)	24	0.36 <MDL	0.36 <MDL
Xylene (µg/L)	300	0.43 <MDL	0.43 <MDL
m/p-xylene (µg/L)	---	0.43 <MDL	0.43 <MDL
o-xylene (µg/L)	---	0.17 <MDL	0.17 <MDL

\*MDL = Laboratory Minimum Detection Limit

## 6.0 WATER AND CHEMICAL USE (O. Reg. 170/03, s. 11 (6) (a); Schedule 22-2 (3))

### 6.1 Chemical Usage (O. Reg. 170/03, s. 11 (6) (a))

In 2021, the total amount of 12% sodium hypochlorite (NaOCl) used to treat the water supplied by the Lucknow wells is tabulated in **Table 21** with the average chlorine dosage.

**Table 21 - Sodium Hypochlorite Usage**

Month	LUCKNOW # 4		LUCKNOW # 5	
	Usage (kg)	Average Dosage (mg/L)	Usage (kg)	Average Dosage (mg/L)
Jan	37.14	3.82	15.98	3.86
Feb	33.64	3.97	17.24	4.03
Mar	35.74	3.85	20.18	4.11
Apr	40.79	3.70	8.41	4.11
May	30.55	3.70	32.80	3.85
Jun	29.43	3.69	53.96	4.27
Jul	49.34	4.25	22.85	4.20
Aug	54.80	4.09	17.10	4.39
Sep	11.35	3.97	49.90	4.35
Oct	0	OFF-LINE	64.19	4.38
Nov	0	OFF-LINE	64.47	4.38
Dec	0	OFF-LINE	57.75	4.32
<b>TOTAL</b>	322.79	--	424.82	--
<b>Average</b>	35.87	3.89	35.40	4.19

Sodium Hypochlorite Grand Total Usage: **747.61 kg**  
Sodium Hypochlorite Average Dosage: **4.04 mg/L**

**6.2 Summary of Flow Rates, Annual Volumes and Capacities (O. Reg. 170/03, Schedule 22-2 (3))**

A summary of the water supplied to the distribution system in 2021 from each well supply is provided in **Tables 22 and 23**. The combined annual volumes and capacities are provided in **Table 24**. The volumes reported for each well supply are taken from the SCADA continuous monitoring system. The flow meters were exchanged with calibrated flow meters on the following dates:

Lucknow # 4:	Raw water flow meter	June 22, 2021
Lucknow # 5:	Raw water flow meter	June 22, 2021

**Table 22 - LUCKNOW # 4 - Flow Rates, Annual Volumes, and Capacities**

Month	Raw Flow Daily Max (L/s)	Raw Flow Monthly Avg (L/s)	Raw Volume Monthly Total (m <sup>3</sup> )	Raw Volume Daily Max (m <sup>3</sup> )	Raw Volume Monthly Avg (m <sup>3</sup> )	Capacity Monthly Max (%)
Jan	9.97	8.86	9,633.07	465.92	310.74	49.8%
Feb	9.96	8.81	8,360.79	384.07	298.60	41.1%
Mar	10.24	8.90	9,166.42	367.14	295.69	39.3%
Apr	10.14	9.00	10,795.60	713.94	359.85	76.4%
May	10.07	8.92	8,297.83	465.56	267.67	49.8%
Jun	11.97	8.85	7,898.21	472.33	263.27	50.5%
Jul	9.44	8.41	11,590.32	625.53	373.88	66.9%
Aug	9.45	8.39	13,213.46	581.11	426.24	62.2%
Sep	9.37	8.37	2,603.69	370.28	86.79	39.6%
Oct	0	0	0	0	0	0%
Nov	0	9.63	53.20	50.42	1.77	5.4%
Dec	12.44	10.95	26.55	20.26	0.86	2.2%
<b>PTTW Max</b>	<b>14.42</b>	<b>14.42</b>	<b>28,439.58</b>	<b>935.00</b>	---	---
<b>Annual Max</b>	12.44	---	13,213.46	713.94	---	76.4%
<b>Annual Avg</b>	---	9.01	6,803.26	---	223.67	23.9%
<b>Annual Total</b>	---	---	<b>81,639.14</b>	---	---	---



Table 23 - LUCKNOW # 5 - Flow Rates, Annual Volumes, and Capacities

Month	Raw Flow Daily Max (L/s)	Raw Flow Monthly Avg (L/s)	Raw Volume Monthly Total (m <sup>3</sup> )	Raw Volume Daily Max (m <sup>3</sup> )	Raw Volume Monthly Avg (m <sup>3</sup> )	Capacity Monthly Max (%)
Jan	33.26	31.93	4,219.17	186.58	136.10	12.4%
Feb	33.30	31.75	4,269.48	385.80	152.48	25.7%
Mar	33.26	32.06	4,833.73	419.04	155.93	27.9%
Apr	33.20	31.66	2,051.13	152.01	68.37	10.1%
May	33.18	31.81	8,487.02	651.92	273.77	43.5%
Jun	33.11	31.24	12,587.82	807.52	419.59	53.8%
Jul	32.06	30.83	5,540.52	519.04	178.73	34.6%
Aug	32.41	30.88	3,947.49	220.90	127.34	14.7%
Sep	32.97	31.07	11,631.63	717.41	387.72	47.8%
Oct	32.23	31.00	15,037.10	560.89	485.07	37.4%
Nov	32.72	30.93	14,585.43	754.30	486.18	50.3%
Dec	32.28	30.99	13,493.00	483.77	435.26	32.3%
<b>PTTW Max</b>	<b>37.90</b>	<b>37.90</b>	<b>45,625.00</b>	<b>1,500</b>	---	---
Annual Max	33.30	---	15,037.10	807.52	---	53.8%
Annual Avg	---	31.35	8,390.29	---	275.85	
Annual Total	---	---	<b>100,683.52</b>	---	---	---

Table 24 - Flow Rates, Annual Volumes and Capacities - LUCKNOW # 4 AND # 5 COMBINED

Month	Raw Volume Monthly Total (m <sup>3</sup> )	Raw Volume Daily Max (m <sup>3</sup> )	Raw Volume Monthly Avg (m <sup>3</sup> )	Capacity Monthly Max (%)
Jan	13,852.24	508.49	446.85	33.9%
Feb	12,630.27	509.79	435.53	34.0%
Mar	14,000.15	522.88	451.62	34.9%
Apr	12,846.73	713.94	428.22	47.6%
May	16,784.85	879.32	541.45	58.6%
Jun	20,486.03	977.98	682.87	65.2%
Jul	17,130.84	788.66	552.61	52.6%
Aug	17,160.95	652.14	553.58	43.5%
Sep	14,235.32	717.41	474.51	47.8%
Oct	15,037.10	560.89	485.07	37.4%
Nov	14,638.63	754.30	487.95	50.3%
Dec	13,519.55	490.43	436.11	32.7%
<b>PTTW Max</b>	<b>45,625.00</b>	<b>1,500.00</b>	---	---
Annual Max	20,486.03	977.98	---	65.2%
Annual Avg	15,193.56	---	498.15	33.3%
Annual Total	<b>182,322.66</b>	---	---	---

6.3 System Capacity (O. Reg. 170/03, Schedule 22-2 (3) Continued)

The following is a comparison of the annual volumes to the rated capacity and flow rates approved in the systems' PTTW, DWWP and MDWL. The total system capacity represents the percentage capacity of the sum of all the water produced in relation to the total system volume permitted. A summary of the totals for all the well supplies is presented in **Table 25**. The visual representations of each well and the Lucknow total capacity are presented in Figures 2 through 4.

Table 25 - Total Volumes of All Well Supplies

Location (Well Supply)	Total Volume for 2021 (m <sup>3</sup> )
Lucknow Well # 4	81,639.14
Lucknow Well # 5	100,683.52
<b>Total Rated Capacity, PTTW (m<sup>3</sup>)</b>	<b>547,500.00</b>
Grand Total (all well supplies), Actual (m <sup>3</sup> )	<b>182,322.66</b>
Overall Operating Capacity, Actual %	<b>33.3%</b>

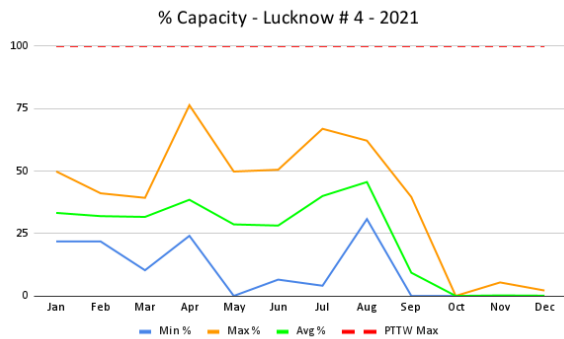


Figure 2

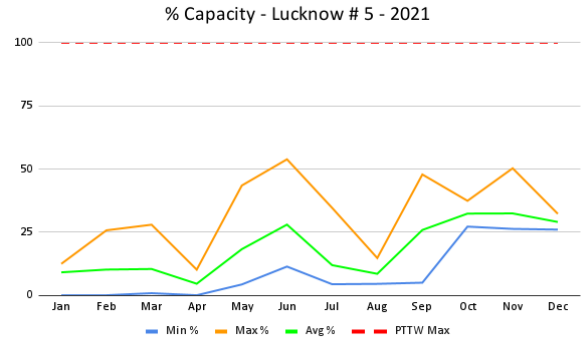


Figure 3

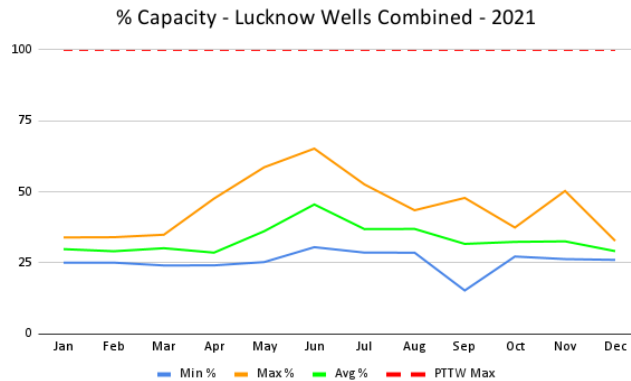


Figure 4

## 7.0 IMPROVEMENTS TO SYSTEM AND ROUTINE AND PREVENTATIVE MAINTENANCE (s. 11 (6) (e))

The following summarizes water system improvements and routine and preventative maintenance for the Lucknow Drinking Water System Supply:

### Both Sites:

Routine and preventative maintenance performed as per Jobs Plus schedule.  
Flow meter calibrations completed.  
Georgian Bay Fire and Safety inspections completed.  
Ministry Drinking Water Inspection conducted.  
Semi-annual flushing and annual valve turning completed.  
Backflow preventer testing completed.

### Lucknow # 4:

February: Replaced tubing on chlorine analyzer; replaced backup chlorine pump  
March: Iconix onsite for flow meter maintenance  
June: Flow meter exchange  
July: Power failure; Westario restored power  
September: Site shut down for well inspection (Hopper Well Drillers onsite)  
November: New submersible pump installed; waiting for VFD controller

### Lucknow # 5:

February: Installed rebuilt chlorine analyzer  
March: Iconix onsite for flow meter maintenance  
April: Site shut down for well inspection (Hopper Well Drillers onsite)  
June: Well pump failure; Sepoy Electric onsite for repair  
Repair to Benshaw drive  
Flow meter exchange  
November: Power outage due to high winds

## 8.0 MINISTRY OF THE ENVIRONMENT, CONSERVATION AND PARKS INSPECTIONS AND REGULATORY ISSUES (Schedule 22-2 (2))

- MECP Drinking Water Inspection was conducted on July 12, 2021 and awarded a rating of 95.86% (previous rating was 98.14%).
- MECP Drinking Water Inspection of South Lucknow (ACW) was conducted on July 12, 2021 and awarded a rating of 100.00% (previous rating was 100.00%).
- A list of Capital Items for 2021 was submitted to the Township of Huron-Kinloss on October 29, 2021.
- DWQMS Management Review for 2020 was conducted on June 24, 2021.
- DWQMS Internal Audit was conducted between November 25 - December 3, 2021.
- DWQMS Complete Risk Assessment was conducted on December 30, 2021.
- DWQMS External Audit (off-site) was conducted on July 12 - 13, 2021.
- An Emergency Response Exercise was conducted by the Township in September 2021, but Veolia was not asked to participate. Veolia utilized a break-in and theft event to conduct a tabletop After Action Report in November 2021.

## 9.0 REGULATORY CHANGES

- Proposed amendments to drinking water operator and water quality analyst certification regulations have been issued to address the impacts of emergencies. These include:
  - allowing the Ministry to act quickly to ensure the Province’s drinking water is protected during an emergency
  - extending Operator certificates and allowing certain qualified but non-certified staff to temporarily maintain system operations, and would only be enacted during an emergency
  - allowing temporary relief from training and certification requirements

This proposal has been registered with the Environmental Registry of Ontario and the consultation process was closed on July 2, 2021. The outcome of this proposal is expected to be published in 2022.

- Proposed updates to the Director’s Directions - Minimum Requirements for Operational Plans - May 2021. The Director’s Directions have updated the following:
  - Content Requirements - all referenced documents will be considered part of the Operational Plan.
  - Procedures for version control - version number and revision date is to be embedded in every electronic copy, and recorded on every page of any physical copy
  - Completed copy of Subject System Description Form in Schedule “C” of the Director’s Directions
  - Operational Plans are to be submitted to the Director electronically
  - Retention of Operational Plans - Operational Plans that were the subject of an audit by an auditor for the accreditation body shall be retained for a minimum of 10 years
  - Public Disclosure of Operational Plans - shall be made available for viewing by the public either electronically (website) or at the principal place of business, but not in a manner that would threaten the safety, health or quality of the drinking water, or create significant prejudice with the contractual obligations of the Operating Authority or other organization.
  - Operational Plans shall be updated to meet the requirements of the Director’s Directions no later than April 1, 2022.

### 9.1 Arsenic Sampling

In January 2018, O. Reg. 169/03 - Ontario Drinking Water Quality Standard for Arsenic was changed to 0.010 mg/L from 0.025 mg/L, making the new Half-MAC (Maximum Allowable Concentration) 0.005 mg/L. Both Lucknow wells have had an Arsenic level in exceedance of the Half-MAC and therefore must be sampled on a quarterly basis to satisfy O. Reg. 170/03, Schedule 13-5(1) - Increased frequency under s.s 13-2 and 13-4. See **Table 26** for 2021 Lucknow Arsenic results.

**Table 26 - Arsenic Results**

Sample Date	Lucknow # 4 Arsenic Concentration (µg/L)	Lucknow # 5 Arsenic Concentration (µg/L)
Feb 22, 2021	3.7	4.6
May 3, 2021	98.3, 3.9	4.6
Aug 9, 2021	4.0	4.4
Nov 8, 2021	2.5	5.2
<b>MAC (µg/L)</b>	<b>10</b>	<b>10</b>
<b>Exceedance</b>	<b>No</b>	<b>No</b>

**NOTE:**

**O. Reg. 170/03, Schedule 13: Increased frequency under s.s 13-2 and 13-4**

13-5. (1) If a test result obtained under section 13-2 or 13-4 for a parameter **exceeds half of the standard prescribed** for the parameter in Schedule 2 to the Ontario Water Quality Standards, the frequency of sampling and testing for that parameter under that section shall be **increased** so that at least one sample is taken and tested **every three months**.

**10.0 WELL LEVELS (PTTW)**

The Lucknow DWS has a Permit To Take Water (PTTW), which dictates the capacity that each well is permitted to supply, as well as specific monitoring parameters. In addition to flow, static well levels are taken on a weekly basis to monitor the performance of the aquifer. **Table 27** provides a summary of the static well levels recorded in 2021.

**Table 27 - Static Well Levels (PTTW) - Monthly Averages**

Month	Lucknow Well # 4					Lucknow Well # 5				
Jan	5.79	6.10	6.10	6.10		6.40	6.40	6.10	6.10	
Feb	6.09	6.09	6.09	6.09		5.79	6.09	6.09	5.79	
Mar	6.09	6.40	6.70	6.40	6.09	6.09	6.09	6.09	6.09	6.09
Apr	6.09	5.79	6.70	6.70		OFF-LINE	5.90	5.95	6.09	
May	7.31	7.01	7.01	7.31		6.09	6.09	6.09	5.79	
Jun	7.31	6.70	6.70	7.01	7.62	5.79	5.79	5.79	6.09	6.09
Jul	7.62	7.62	7.31	7.31		6.09	6.09	5.79	5.79	
Aug	7.31	7.31	7.31	7.31		6.47	6.50	6.62	6.65	
Sep	7.31	7.62	OFF-LINE	OFF-LINE	OFF-LINE	6.66	6.62	6.87	7.47	7.65
Oct	OFF-LINE	OFF-LINE	OFF-LINE	OFF-LINE		*	6.58	7.39	6.99	
Nov	OFF-LINE	OFF-LINE	6.31	6.08	6.14	6.40	6.50	6.60	6.50	
Dec	6.23	6.08	6.28	6.18		6.40	6.18	6.58	6.52	6.23
Min	<b>5.79</b>					<b>5.79</b>				
Max	<b>7.62</b>					<b>7.65</b>				
Avg	<b>6.64</b>					<b>6.29</b>				

## 11.0 SOURCE WATER PROTECTION (*Clean Water Act, 2006*)

A Drinking Water Source Protection Assessment (DWSPA) Report was generated for the Ausable Bayfield Maitland Valley Source Protection Region by the Conservation Authority Source Protection Office. This report identifies vulnerable areas, recharge areas, and potential threats to help protect existing and future sources of drinking water from contamination and overuse. This report can be found on-line at:

<https://www.sourcewaterinfo.on.ca/the-plans/>

The Well Head Protection Areas (WHPAs) within the Lucknow Drinking Water System have 4 designations:

- WHPA-A: 100 m radius around the well head
- WHPA-B: 2-year time-of-travel capture zone
- WHPA-C: 5-year time-of-travel capture zone
- WHPA-D: 25-year time-of-travel capture zone

The Lucknow wells are NOT classified as groundwater under direct influence of surface water (GUDI).

The DWSPA report states: “The WHPA extends south-eastward from the wells to include about 7.7 km along the south Huron-Kinloss border and into Ashfield-Colborne-Wawanosh. WHPA-A, the 100 m radius around the wells, falls entirely within Huron-Kinloss. However, a small portion of WHPA-B, located in ACW, has a vulnerability score of 10. The remainder of WHPA-B has a vulnerability score of 8 or 6. The section of WHPA-C that falls into ACW has a vulnerability score of 8, 6 or 4. Finally, WHPA-D has a vulnerability score of 6 or less.”

**Table 28**, taken from the report, shows a summary of significant drinking water threats within the Lucknow Drinking Water System.

**Table 28 - Lucknow WHPA: Summary of Significant Drinking Water Threats**

Threat (numbered according to <i>Clean Water Act, 2006</i> )		Significant Instances		
		Chemical	Pathogens	DNAPL
1	Waste Disposal Site	1		
2	Sewage System		3	
3	Agricultural Source Material Application		1	
4	Agricultural Source Material Storage		1	
6	Non-Agricultural Source Material Application			
7	Non-Agricultural Source Material Handling/Storage			
8	Commercial Fertilizer Application	2		
9	Commercial Fertilizer Handling/Storage			
10	Pesticide Application	1		
11	Pesticide Handling/Storage			
15	Fuel Handling/Storage	11		
16	Dense Non-Aqueous Phase Liquid Handling/Storage			2
21	Grazing/Pasturing Livestock	2	2	
<b>TOTAL</b>		<b>17</b>	<b>7</b>	<b>2</b>

In conclusion, as stated in the DWSPA Report: “No issues with wells or conditions resulting from past activities were identified within the WHPA.”

## 12.0 OBSERVATIONS AND HISTORICAL TRENDS

### Raw Water Quality

- Microbiological: There were three (3) positive microbiological test results in 2021, each result was 1 Total Coliform.

**Table 29 - 10-Year Historical Microbiological Results:**

Year	Well Source	Positive microbiological Result
2017 - September 5	Lucknow # 4	1 Total Coliform
2017 - October 17	Lucknow # 4	1 Total Coliform
2021 - April 27	Lucknow # 5	1 Total Coliform
2021 - June 15	Lucknow # 5	1 Total Coliform
2021 - November 30	Lucknow # 5	1 Total Coliform

Due to the infrequent historical results, there are no concerns at this time.

- Chemical Parameters: There were no exceedances for any of the chemical parameters tested in 2021. Sodium was analyzed in 2021 and Fluoride is not required until 2022. Sodium will be sampled again in 2026, Arsenic is being tested quarterly since it is so close to the half-MAC.

**Table 30 - 10-Year Historical Chemical Results:**

Year	Lucknow # 4			Lucknow # 5		
	Sodium	Fluoride	Arsenic	Sodium	Fluoride	Arsenic
2006	9.63	1.81	5.2	9.49	1.82	5.8
2009	---	---	5.1	---	---	5.1
2011	8.72	1.82	---	9.92	1.74	---
2012	---	---	4.6	---	---	5.8
2015	---	---	5.0	---	---	6.2
2016	10.8	---	---	12.8	---	---
2017	---	1.75	---	---	1.74	---
2018	---	---	4.8	---	---	5.7
2019 - Jun	---	---	4.7	---	---	5.4
2019 - Sep	---	---	3.5	---	---	4.9
2019 - Nov	---	---	3.1	---	---	3.5
2020 - Feb	---	---	3.7	---	---	5.3
2020 - May	---	---	4.1	---	---	5.5
2020 - Aug	---	---	3.2	---	---	4.9
2020 - Nov	---	---	3.6	---	---	4.6
2021 - Feb	—	—	3.7	—	—	4.6
2021 - May	—	—	98.3, 3.9	—	—	4.6
2021 - Jul	11.1	—	—	12.8	—	—
2021 - Aug	—	—	4.0	—	—	4.4
2021 - Nov	—	—	2.5	—	—	5.2

## 12.0 OBSERVATIONS AND HISTORICAL TRENDS - Continued

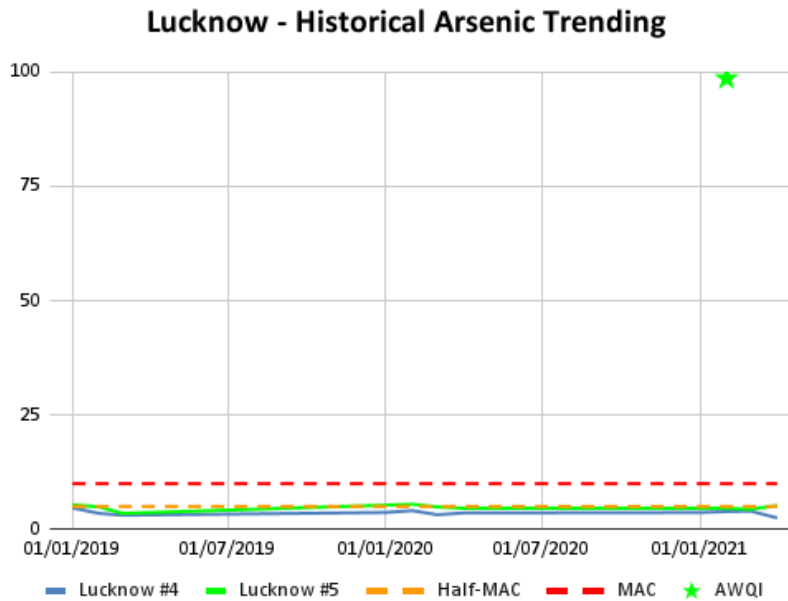


Figure 5

- Raw Turbidity:

**Table 31 - 10-Year Historical Turbidity Results**

Well Source	10-Year Historical Average (2011 to 2020)	2021 Average	Comments
Lucknow Well # 4	0.16 NTU	0.22 NTU	The raw turbidity has remained consistent based on the 10-year historical average. There is no concern at this time.
Lucknow Well # 5	0.15 NTU	0.19 NTU	The raw turbidity has remained consistent based on the 10-year historical average. There is no concern at this time.



## 12.0 OBSERVATIONS AND HISTORICAL TRENDS - Continued

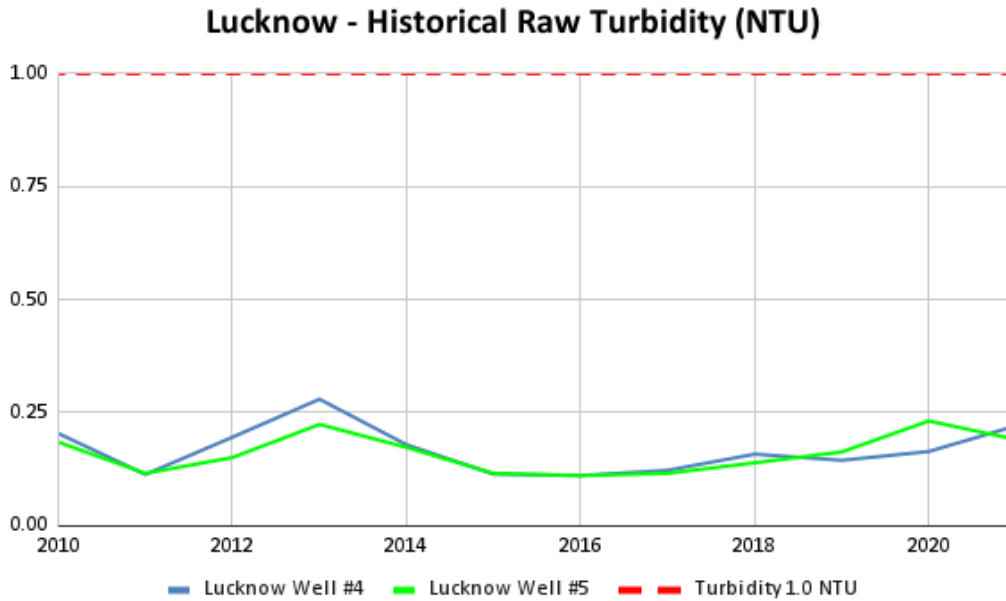


Figure 6

- Well Levels:

Table 32 - 10-Year Historical Well Levels

Well Source	10-Year Historical Average (2011 to 2020)	2021 Average	Comments
Lucknow Well # 4	7.22 m below grade	6.64 m below grade	The well level has remained consistent based on the 10-year historical average. There is no concern at this time.
Lucknow Well # 5	6.53 m below grade	6.29 m below grade	The well level has remained consistent based on the 10-year historical average. There is no concern at this time.

## 12.0 OBSERVATIONS AND HISTORICAL TRENDS - Continued

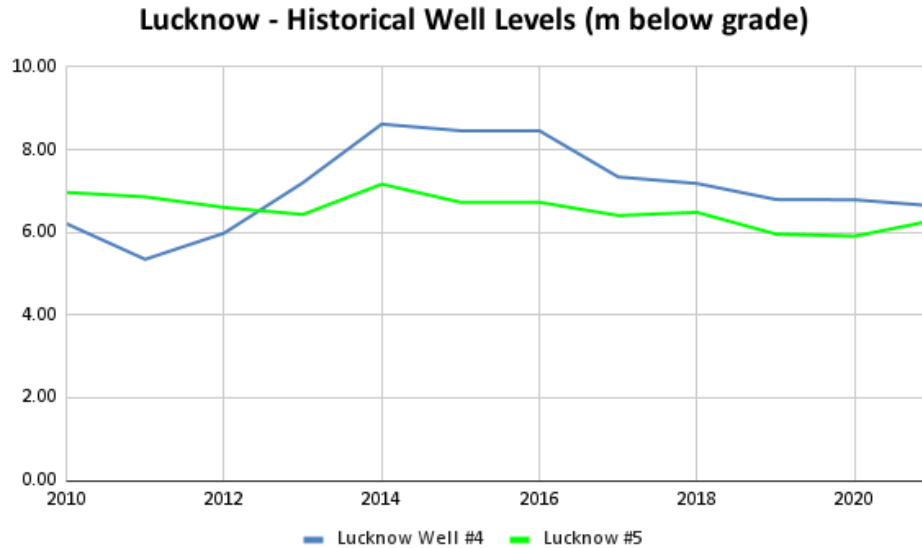


Figure 7

- Well Flows and Pump Performance:

**Table 33 - 5-Year Historical Well Flows and Capacities**

Well Source	5-Year Historical Average (2016 to 2020)	2021 Average	Comments
Lucknow Well # 4	Avg flow: 8.84 L/s Capacity: 20.85%	Avg flow: 9.01 L/s Capacity: 23.92%	Flows are consistent based on the 5-year historical average. The operation of the well cycling has been changed and the capacities are reflective of this change. There are no concerns at this time.
Lucknow Well # 5	Avg flow: 28.53 L/s Capacity: 25.78%	Avg flow: 31.35 L/s Capacity: 18.39%	Flows are consistent based on the 5-year historical average. The operation of the well cycling has been changed and the capacities are reflective of this change. There are no concerns at this time.

## 12.0 OBSERVATIONS AND HISTORICAL TRENDS - Continued

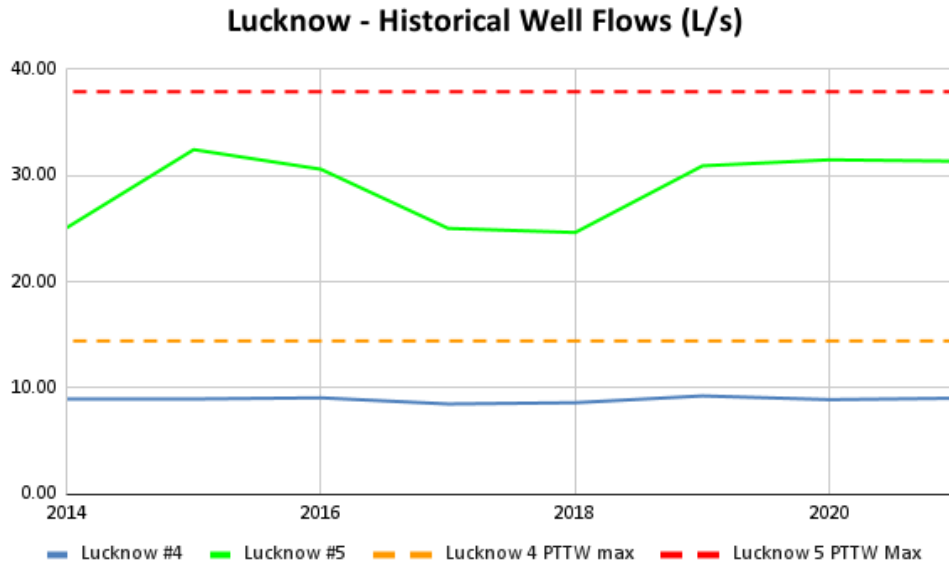


Figure 8