2021 ANNUAL DRINKING WATER SYSTEM SUMMARY REPORT
Oxford South Water System

1. GENERAL INFORMATION

Oxford County (the County) prepares a report summarizing system operation and water quality for every municipal drinking water system annually. The reports detail the latest water quality testing results, water quantity statistics and any adverse conditions that may have occurred for the previous year. They are available for review by the end of February on the County website at www.oxfordcounty.ca/drinkingwater or by contacting the Public Works Department.

All efforts have been made to ensure the information presented in this report is accurate. If you have any questions or comments concerning the report please contact the County at the address and phone number listed below or by email at publicworks@oxfordcounty.ca

Drinking Water System:	Oxford South Water System
Drinking Water System Number:	220000601
Drinking Water System Owner & Contact Information:	Oxford County Public Works Department Water Services P.O. Box 1614 21 Reeve Street Woodstock, ON N4S 7Y3 Telephone: 519-539-9800 Toll Free: 866-537-7778 Email: publicworks@oxfordcounty.ca
Reporting Period:	January 1, 2021- December 31, 2021

1.1. System Description

The Oxford South Water System is a Large Municipal Water system as defined by Ontario Regulation (O.Reg.) 170/03 and serves a population of approximately 5,340. Transmission watermains interconnect the communities of Otterville, Springford, and Norwich.

The system consists of seven secure groundwater wells and four treatment facilities as follows:

Treatment Facility	*Location*	*Wells*	*Treatment*
Pitcher Street	Norwich	N2 N5	Filtration for iron removal and disinfection with sodium hypochlorite
Main Street	Norwich	N4	Iron sequestering with sodium silicate and disinfection with sodium hypochlorite
Otterville	Otterville	O3 O4	Disinfection with sodium hypochlorite
Springford	Springford	S4 S5	Disinfection with sodium hypochlorite

The treatment facilities each house high lift pumps, and monitoring and treatment equipment for the supply wells. A 1,818 m^3 water tower at Norwich and a 1,440 m^3 water tower in Otterville provide storage and maintain pressure in the system.

In 2021, approximately 15,785 L of sodium hypochlorite and 1,740 L of sodium silicate was used in the water treatment process. These chemicals are certified to meet standards set by the Standards Council of Canada or American National Standards Institute.

Standby generators are available at Norwich and Otterville to run the facilities in the event of a power failure. The system is maintained by licensed water system operators, who operate treatment and monitoring equipment and collect samples as specified by the Regulation. Alarms automatically notify operators in the event of failure of critical operational requirements.

1.2. Major Expenses

The Oxford South Water System is one of 14 water systems that have revenues and expenses pooled for the economy of scale purposes. The systems are combined into the Township Water financial system and in 2021 had operating and maintenance expenditures of approximately $3,000,000.

Operations and maintenance expenditures included:

- $175,000 for the replacement of general operating equipment and well rehabilitations

In addition to regular operational and maintenance expenditures, Capital Improvement Projects for the Townships systems totaled $1,500,000 for improvements to water treatment systems and replacement of distribution mains in the Township System.

Township Capital Improvement Projects included:

- $65,000 groundwater modeling
- $350,000 for facilities improvements

Capital Improvement projects for all systems included:

- $720,000 to develop Countywide SCADA Master Plan for all water systems
- $14,000 for updated water systems modeling

2. MICROBIOLOGICAL TESTING

2.1. E. coli and Total Coliform

Bacteriological tests for *E. coli* and total coliforms are required weekly from the raw and treated water at the facility and from the distribution system. Extra samples are taken after major repairs or maintenance work. Any *E. coli* or total coliform results above 0 in treated water must be reported to the Ministry of Environment, Conservation and Parks (MECP) and Medical Officer of Health (MOH). Resamples and any other required actions are taken as quickly as possible. The results from the 2021 sampling program are shown on the table below. There were no adverse test results from 484 treated water samples in this reporting period.

	Number of Samples	*Range of E. coli Results Min - Max MAC = 0*	*Range of Total Coliform Results Min - Max MAC = 0*
Raw	364	0-2	0-13
Treated	261	0	0
Distribution	223	0	0

2.2. Heterotrophic Plate Count (HPC)

HPC analyses are required from the treated and distribution water. The tests are required weekly for treated water and for 25% of the required distribution system bacteriological samples. HPC should be less than 500 colonies per 1 mL. Results over 500 colonies per 1 mL may indicate a change in water quality but it is not considered an indicator of unsafe water. The 2021 results are shown in the table below.

	Number of Samples	*Range of HPC Min - Max*
Treated	156	0-15
Distribution	52	0-50

3. CHEMICAL TESTING

The Safe Drinking Water Act requires periodic testing of the water for approximately 60 different chemical parameters. The latest results for all parameters are provided in Appendix A. The sampling frequency varies for different types and sizes of water systems and chemical parameters. If the concentration of a parameter is above half of the Maximum Allowable Concentration (MAC) under the Ontario Drinking Water Quality Standards, an increased testing frequency of once every three months is required by the Regulation. Where concerns regarding a parameter exist, the MECP can also require additional sampling be undertaken.

Information on the health effects and allowable limits of components in drinking water may be found on the MECP web page through the link provided in Appendix A. Additional information on common chemical parameters specific to the Oxford South system is provided below.

3.1. Sodium

Sodium levels in drinking water are tested once every five years. The aesthetic objective is 200 mg/L meaning at levels less than this, sodium will not impair the taste of water.

When sodium levels are above 20 mg/L the MECP and Medical Officer of Health (MOH) are notified. Southwest Public Health maintains an information page on sodium in drinking water at https://www.swpublichealth.ca/en/partners-and-professionals/resources/Health-Care-Providers/Alerts-Advisories-Updates/Advisories/ADV_HIA-Sodium-20201203.pdf in order to help people on sodium-restricted diets control their sodium intake. The sodium levels in the Oxford South system range from 23.2 to 48.4 mg/L, depending on which wells are in use.

3.2. Fluoride

Fluoride levels are sampled once every five years and levels above 1.5 mg/L must be reported to the MECP and MOH. Levels under 2.4 mg/L are considered safe for consumption, however at levels between 1.5 and 2.4 mg/L of fluoride may cause staining or pitting of teeth in children less than 6 years old. Further information on fluoride can be found on the Southwest Public Health web page at https://www.swpublichealth.ca/en/partners-and-professionals/resources/Health-Care-Providers/Alerts-Advisories-Updates/Advisories/ADV_HIA-Fluoride-20201203.pdf

The County does not add fluoride to the water at any of its drinking water systems, however, the Springford wells have naturally occurring fluoride levels. The fluoride levels in the Springford wells are 1.68 mg/L. All the other wells in the system have fluoride levels below the reportable levels.

3.3. Hardness, Iron, and Manganese

These are aesthetic parameters that may affect the appearance of the water but is not related to health. Well water commonly has high levels of hardness and other minerals from being in contact with underground rock formations. Many households have water softeners to help reduce white calcium deposits and improve the efficiency of soaps. This information is included here to help set the water softener at the level recommended by the manufacturer.

The hardness in the Oxford South system depends on the wells being used. The Norwich wells supply a larger proportion of the water to the entire system and a weighted average was used to give an accurate representation for the average hardness of the Otterville-Springford system. Samples for hardness are collected at a minimum every 3 years from raw or treated water.

- The average hardness in Norwich is 275 mg/L (16 grains/gallon) based on samples collected from 2006-2019.
- The average hardness in Otterville-Springford is 309 mg/L (18 grains/gallon) based on samples collected 2006 to 2019.

Iron levels less than 0.30 mg/L (ppm) are not considered to cause aesthetic problems such as discoloured water.

- The Otterville and Springford wells have less than 0.30 mg/L iron.
- Iron is removed by filtration at the Norwich Pitcher St. facility, wells N2 and N5.

- The iron level at the Norwich Main St. facility well N4 is 0.51 mg/L (ppm) and sodium silicate is added to keep the iron in suspension.

Manganese is commonly found in conjunction with iron and also causes discoloured water. Currently, levels of manganese under 0.05 mg/L are not considered to cause aesthetic issues. However, a new aesthetic objective of 0.02 mg/L has been proposed though not yet take effect.

- The Norwich Main St. facility (W4) average manganese level in 2021 was 0.03 mg/L.
- The Springford water treatment facility average manganese level in 2021 was 0.03 mg/L.

3.2. Additional Testing Required by MECP

None.

4. OPERATIONAL MONITORING

4.1. Chlorine Residual

Free chlorine levels of the treated water are monitored continuously at the discharge point of the Water Treatment Facility. In the distribution system, free chlorine is checked twice weekly at various locations. As a target, free chlorine residual within the distribution system should be above 0.20 mg/L. A free chlorine level lower than 0.05 mg/L must be reported and corrective action taken. There were no reportable incidents in 2021. A summary of the chlorine residual readings is provided in the table below.

4.2. Turbidity

Turbidity of treated water is continuously monitored at the treatment facility, as a change in turbidity can indicate an operational problem. The turbidity of untreated water from each well is checked weekly. Turbidity is measured in nephelometric turbidity units (NTU). Under O.Reg. 170/03 turbidity in groundwater is not reportable however turbidity should be < 1 NTU at the treatment plant and < 5 NTU in the distribution system. A summary of the monitoring results for 2021 is provided in the table below.

	Number of Tests or Monitoring Frequency	*Range of Results (Min – Max) and Average*
Chlorine residual in distribution (mg/L)	Continuous	(0.36 – 1.55) 1.17
Norwich Main St. E. WTF		
Chlorine Residual (mg/L)	Continuous	(0.39 – 3.51) 1.19
Turbidity (NTU)	Continuous	(0.04 – 2.64) 0.07
Norwich Pitcher St. WTF		
Chlorine Residual (mg/L)	Continuous	(0.56 – 1.64) 1.34
Turbidity (NTU)	Continuous	(0.02 – 2.51) 0.26
Otterville WTF		
Chlorine (mg/L)	Continuous	(0.63 – 2.44) 1.35
Turbidity (NTU)	Continuous	(0.01 – 4.00) 0.12
Springford WTF		
Chlorine (mg/L)	Continuous	(0.71 – 4.03) 1.13
Turbidity (NTU)	Continuous	(0.04 – 4.03) 0.23

5. WATER QUANTITY

Continuous monitoring of flow rates from supply wells into the treatment system and from the facility into the distribution system is required by O.Reg. 170/03. The Municipal Drinking Water License and Permit to Take Water issued by the MECP regulate the amount of water that can be utilized over a given time period. A summary of the 2021 flows are provided in the Table below and presented graphically in Appendix B.

Flow Summary	*Quantity*
Permit to Take Water Limit	6,054 m^3/d
Municipal Drinking Water License Limit	6,054 m^3/d
2021 Average Daily Flow	1,205 m^3/d
2021 Maximum Daily Flow	2,277 m^3/d
2021 Average Monthly Flow	36,629 m^3
2021 Total Amount of Water Supplied	439,663 m^3

A review of the available supply capacity and the anticipated growth forecasted for the community indicates that the system has sufficient capacity over the 20 year planning horizon.

Firm Capacity of this system is rated at 2,454 m^3/day. Firm Capacity is defined as the removal of the highest producing well in an emergency or operational / maintenance situation with the ability to transport a maximum of 100 m^3/day if necessary to maintain system integrity. This system comprises of seven supply wells with only three active in the Village of Norwich. Wells located in Otterville and Springford are currently operational at this time however are not used in the firm capacity rating as their supply remains unreliable due to elevated nitrate levels (Otterville wells) and water quantity issues (Springford wells).

6. NON-COMPLIANCE FINDINGS AND ADVERSE RESULTS

This section documents any known incidents of non-compliance or adverse results and the associated correction actions taken to resolve the issue. Non-compliance issues are typically identified by either the Operating Authority or the MECP Drinking Water Inspectors. The issues and associated required actions are documented by the Inspectors in the system's Annual Inspection Report. All non-compliance issues are investigated, corrective actions taken and documented using the County's Drinking Water Quality Management System (DWQMS) procedures.

6.1. Non-Compliance Findings

The annual MECP inspection took place in October 2021. There were no non-compliance findings and the 2021 Inspection Report Rating was 100%.

6.2. Adverse Results

Any adverse results from bacteriological, chemical samples or observations of operational conditions that indicate adverse water quality is reported as required and corrective actions taken. There were no adverse or reportable occurrences in 2021.

APPENDIX A: SUMMARY OF CHEMICAL RESULTS

UNDERSTANDING CHEMICAL TEST RESULTS

The following tables summarize the laboratory results of the chemical testing the County is required to complete. Different types of parameters are required to be tested for at different frequencies as noted below. Explanations on the health impacts of these parameters can be found in the MECP document at https://cvc.ca/wp-content/uploads/2011/03/std01_079707.pdf PSIB 4449e01 titled "Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines".

Results are shown as concentrations with units of either milligrams per litre (mg/L) or micrograms per litre (ug/L). 1 mg/L is equal to 1000 ug/L. The Maximum Acceptable Concentration (MAC) is the highest amount of a parameter that is acceptable in Municipal drinking water and can be found in the MECP Drinking Water Standards. The Method Detection Limit (MDL) is the lowest amount to which the laboratory can confidently measure. A result of "ND" stands for "Not Detected" and means that the concentration of the chemical is lower than the laboratory's equipment is capable of measuring. In the event that some samples results are ND, and other results are above the MDL, the value of the MDL will be used in place of the ND where an average result must be calculated. Where all collected samples are ND the average sample result will be assumed to be ND.

Nitrate and nitrite samples are required every 3 months in normal operation.

Parameter & Location	*Result Range* Min – Max *(mg/L)*	*Average Result (mg/L)*	*MAC (mg/L)*	*MDL (mg/L)*
Nitrite			1.0	0.003
Norwich Main St. WTF	ND	ND		
Norwich Pitcher St. WTF	ND	ND		
Otterville WTF	ND	ND		
Springford WTF	ND	ND		
Nitrate			10.0	0.006
Norwich Main St. WTF	ND-0.035	0.013		
Norwich Pitcher St. WTF	ND-0.031	0.013		
Otterville WTF	6.28-7.92	7.25		
Springford WTF	0.006-0.043	0.014		

Trihalomethane (THM) and total Haloacetic Acids (HAA) are by-products of the disinfection process. The samples are required every 3 months from the distribution system.

Parameter	*Annual Average*	*Result Value (ug/L)*	*MAC (ug/L)*	*MDL (ug/L)*
Trihalomethane (THM)	2021	9.3	100	0.37
Haloacetic Acids (HAA)	2021	ND	80	5.3

The following Table summarizes the most recent test results for Sodium and Fluoride. Testing and reporting any adverse results is required every 5 years.

Parameter & Location	*Sample Date*	*Result Value (mg/L)*	*MAC (mg/L)*	*MDL (mg/L)*
Sodium			20.0*	0.01
Norwich Main St. WTF	May 27/2019	17.9		
Norwich Pitcher St. WTF	Feb 19/2019	23.2		
Otterville WTF	May 27/2019	34.0		
Springford WTF	April 17/2017	51.4		
Fluoride			1.5**	0.06
Norwich Main St. WTF	Aug. 16/2021	0.93		
Norwich Pitcher St. WTF	Aug 16/2021	0.89		
Otterville WTF	April 24/2021	0.08		
Springford WTF	April 17/2017	1.67		

*Sodium levels between 20 – 200 mg/L must be reported every 5 years.
**Natural levels of fluoride between 1.5 – 2.4 mg/L must be reported every 5 years.

The following Table summarizes the most recent results for the Lead Testing Program. Lead samples are taken every 3 years. Levels of alkalinity and pH are monitored twice per year in the distribution system to ensure water quality is consistent and does not facilitate leaching of lead into the water.

Parameter	*Result Range (Min - Max)*	*Number of Samples*	*Acceptable Level*
Distribution Alkalinity	211-244	6	30 – 500mg/L
Distribution pH	7.48-7.55	6	6.5 – 8.5
Distribution Lead 2021	0.03-1.31	6	10 ug/L MAC

The following Table summarizes the most recent test results for Schedules 23.Testing is required every 3 years for secure groundwater wells.

Parameter	*Result Value (ug/L) Norwich Pitcher St. December 7, 2020*	*Result Value (ug/L) Norwich Main St. December 7, 2020*	*MAC (ug/L)*	*MDL (ug/L)*
Antimony	ND	ND	6	0.02
Arsenic	1.1*	1.5	10	0.2
Barium	174	226	1000	0.01
Boron	79	51	5000	2
Cadmium	ND	ND	5	0.003
Chromium	0.62	0.80	50	0.03
Mercury	ND	ND	1	0.01
Selenium	ND	ND	5	1
Uranium	0.088	0.386	20	0.001

Parameter	*Result Value (ug/L) Otterville WTF May 27, 2019*	*Result Value (ug/L) Springford WTF July 7, 2020*	*MAC (ug/L)*	*MDL (ug/L)*
Antimony	ND	ND	6	0.02
Arsenic	0.2	5.7*	10	0.2
Barium	35.0	116	1000	0.01
Boron	17	204	5000	2
Cadmium	0.012	0.003	5	0.003
Chromium	0.29	0.09	50	0.08
Mercury	ND	ND	1	0.01
Selenium	0.36	ND	5	0.04
Uranium	0.552	0.067	20	0.002

**average of all annual samples (collected in 2021)*

The following Tables summarize the most recent test results for Schedule 24. Testing is required every 3 years for secure groundwater wells.

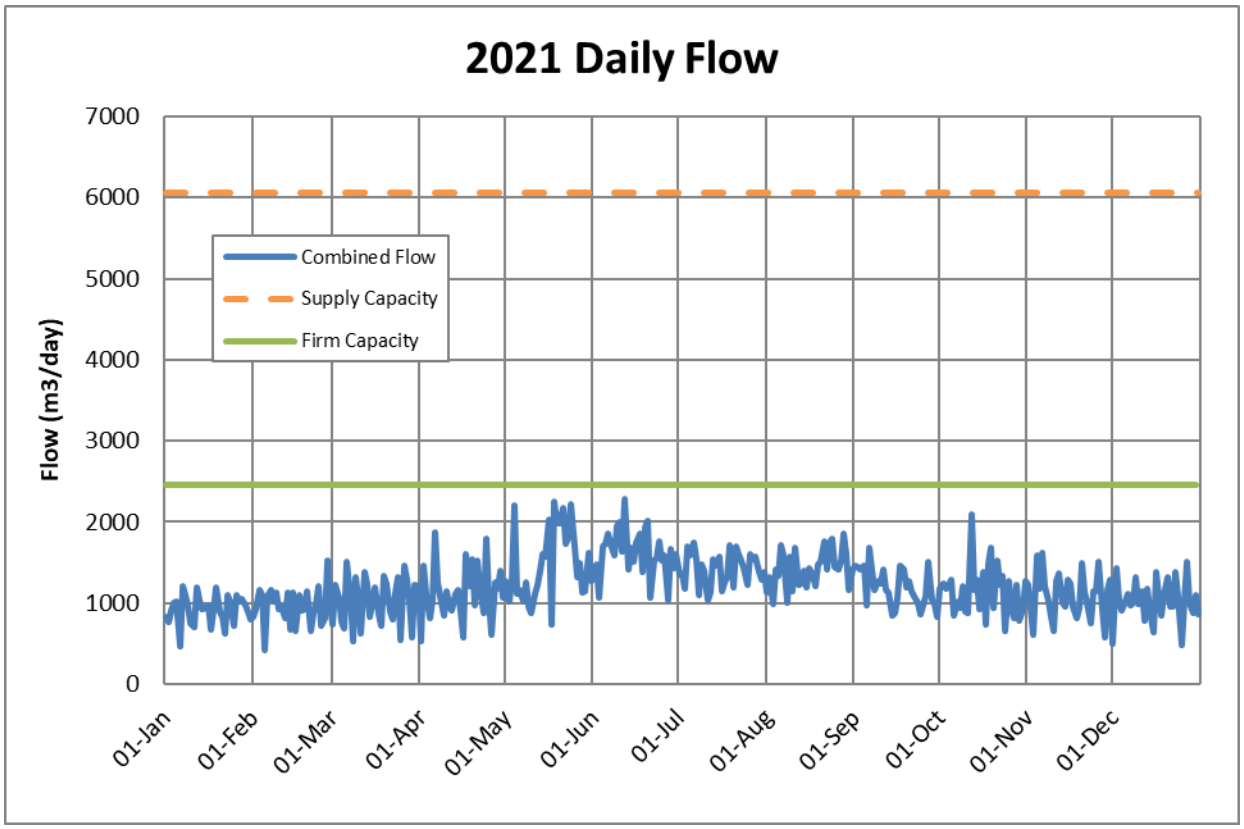
Parameter	*Result Value (ug/L) Norwich Pitcher St December 7, 2020*	*Result Value (ug/L) Norwich Main St. December 7, 2020*	*MAC (ug/L)*	*MDL (ug/L)*
Alachlor	ND	ND	5	0.02
Atrazine + N-dealkylated metobolites	ND	ND	5	0.01
Benzene	ND	ND	1	0.32
Benzo(a)pyrene	ND	ND	0.01	0.004
Bromoxynil	ND	ND	5	0.33
Carbaryl	ND	ND	90	0.01
Carbofuran	ND	ND	90	0.01
Carbon Tetrachloride	ND	ND	2	0.16
Chlorpyrifos	ND	ND	90	0.02
Cyanazine	ND	ND	10	0.03
Diazinon	ND	ND	20	0.02

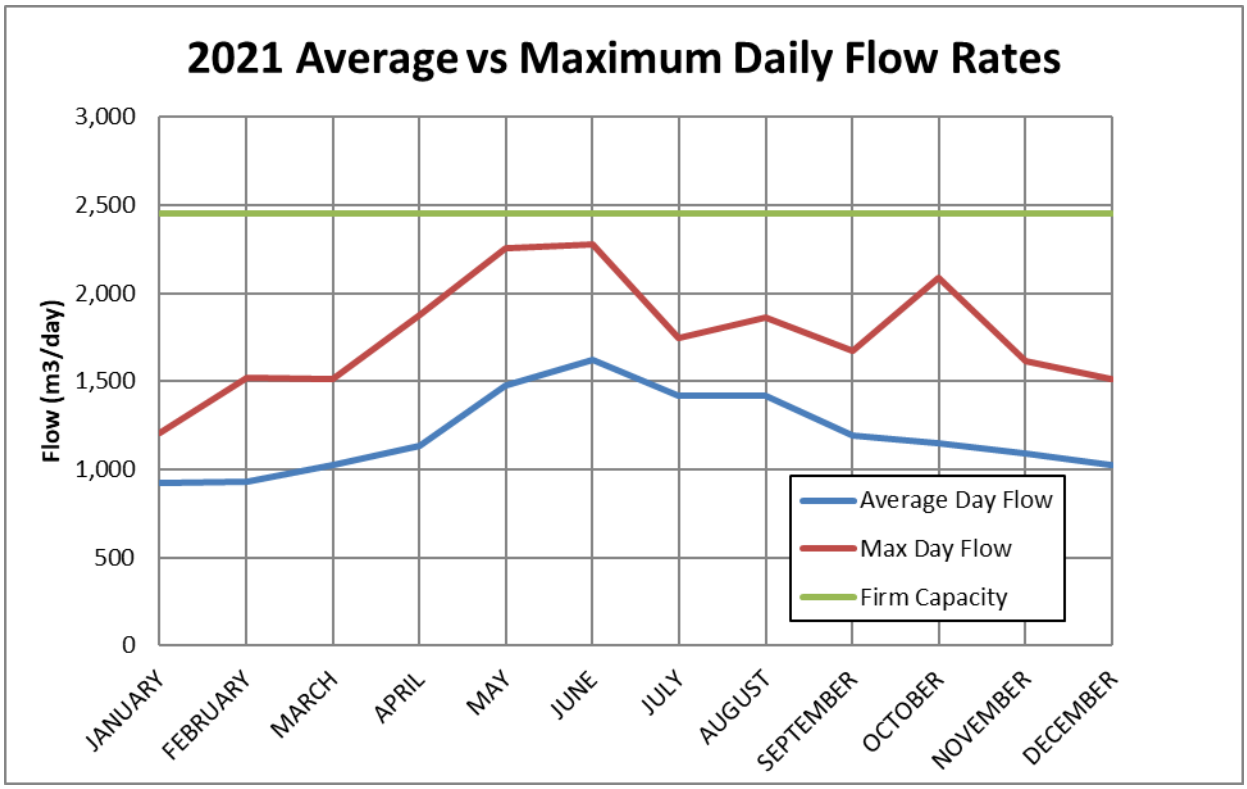
Parameter	*Result Value (ug/L) Norwich Pitcher St December 7, 2020*	*Result Value (ug/L) Norwich Main St. December 7, 2020*	*MAC (ug/L)*	*MDL (ug/L)*
Dicamba	ND	ND	120	0.20
1,2-Dichlorobenzene	ND	ND	200	0.36
1,4-Dichlorobenzene	ND	ND	5	0.36
1,2-Dichloroethane	ND	ND	5	0.35
1,1-Dichloroethylene (vinylidene chloride)	ND	ND	14	0.33
Dichloromethane	ND	ND	50	0.35
2-4 Dichlorophenol	ND	ND	900	0.15
2,4-Dichlorophenoxy acetic acid (2,4-D)	ND		100	0.19
Diclofop-methyl	ND	ND	9	0.40
Dimethoate	ND	ND	20	0.03
Dinoseb				
Diquat	ND	ND	70	1
Diuron	ND	ND	150	0.003
Glyphosate	ND	ND	280	6
Malathion	ND	ND	190	0.02
2-methyl-4chlorophenoxyacetic acid (MCPA)	ND	ND	100	0.12
Methoxychlor	ND	ND	900	0.01
Metolachlor	ND	ND	50	0.01
Metribuzin	ND	ND	80	0.02
Monochlorobenzene	ND	ND	80	0.30
Paraquat	ND	ND	10	1
Pentachlorophenol	ND	ND	60	0.15
Phorate	ND	ND	2	0.01
Picloram	ND	ND	190	0.25
Polychlorinated Biphenyls(PCB)	ND	ND	3	0.04
Prometryne	ND	ND	1	0.03
Simazine	ND	ND	10	0.01
Terbufos	ND	ND	1	0.01
Tetrachloroethylene	ND	ND	10	0.44
2,3,4,6-Tetrachlorophenol	ND	ND	100	0.14
Triallate	ND	ND	230	0.01
Trichloroethylene	ND	ND	5	0.44
2,4,6-Trichlorophenol	ND	ND	5	0.25
Trifluralin	ND	ND	45	0.02
Vinyl Chloride	ND	ND	1	0.17

Parameter	*Result Value (ug/L) Otterville WTF June 7, 2021*	MDL (ug/L)	*Result Value (ug/L) Springford WTF July 6, 2020*	MDL (ug/L)	*MAC (ug/L)*
Alachlor	ND	0.02	ND	0.02	5
Atrazine + N-dealkylated metobolites	ND	0.01	ND	0.01	5
Azinphos-methyl	ND	0.02	ND	0.02	20
Benzene	ND	0.32	ND	0.32	1
Benzo(a)pyrene	ND	0.004	ND	0.004	0.01
Bromoxynil	ND	0.33	ND	0.33	5
Carbaryl	ND	0.05	ND	0.01	90
Carbofuran	ND	0.01	ND	0.01	90
Carbon Tetrachloride	ND	0.17	ND	0.16	2
Chlorpyrifos	ND	0.02	ND	0.02	90

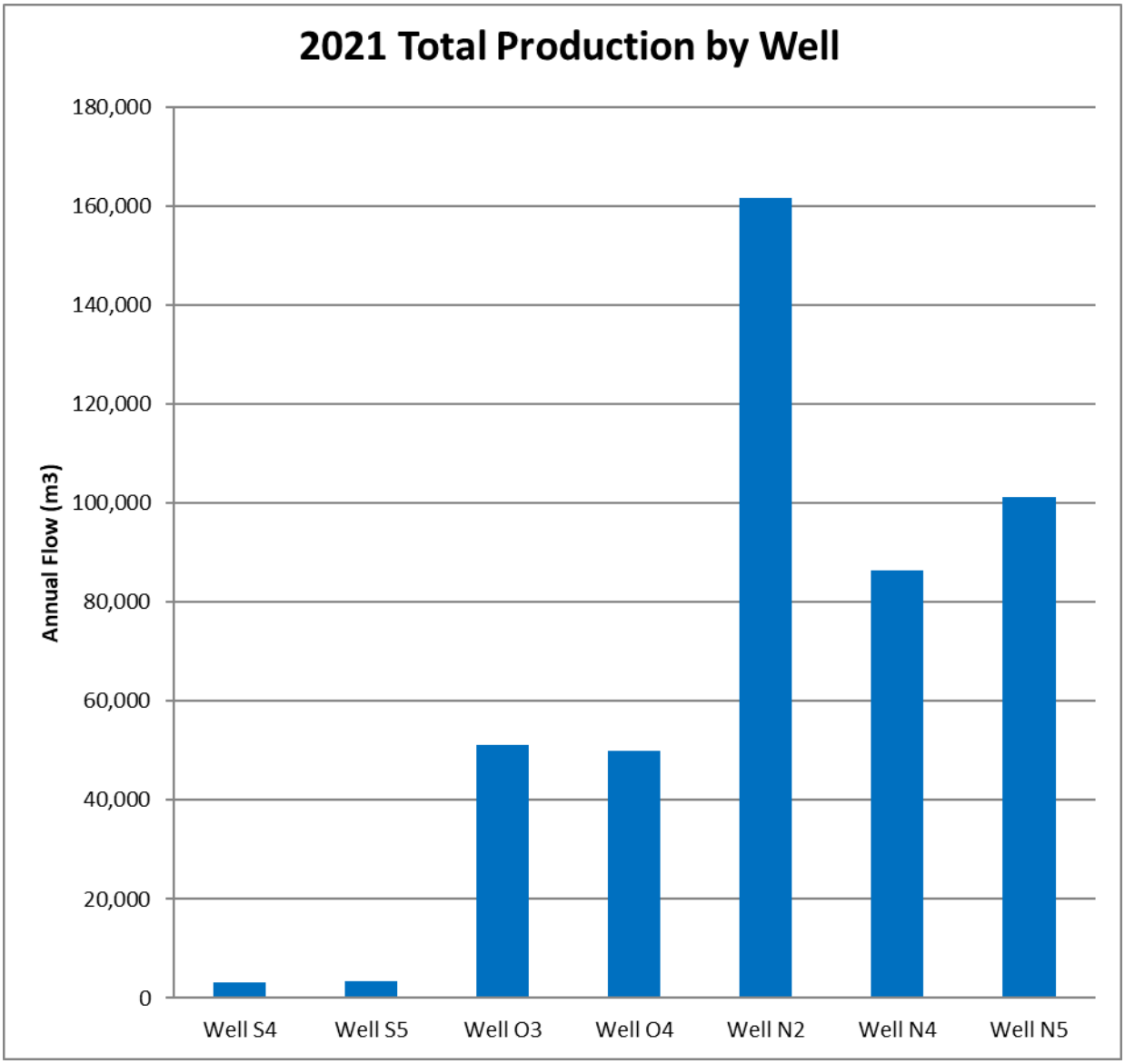
Parameter	*Result Value (ug/L) Otterville WTF June 7, 2021*	MDL (ug/L)	*Result Value (ug/L) Springford WTF July 6, 2020*	MDL (ug/L)	*MAC (ug/L)*
Diazinon	ND	0.02	ND	0.02	20
Dicamba	ND	0.20	ND	0.20	120
1,2-Dichlorobenzene	ND	0.41	ND	0.36	200
1,4-Dichlorobenzene	ND	0.36	ND	0.36	5
1,2-Dichloroethane	ND	0.35	ND	0.35	5
1,1-Dichloroethylene (vinylidene chloride)	ND	0.33	ND	0.33	14
Dichloromethane	ND	0.35	ND	0.35	50
2-4 Dichlorophenol	ND	0.15	ND	0.15	900
2,4-Dichlorophenoxy acetic acid (2,4-D)	ND	0.19	ND	0.19	100
Diclofop-methyl	ND	0.40	ND	0.40	9
Dimethoate	ND	0.03	ND	0.03	20
Diquat	ND	1	ND	1	70
Diuron	ND	0.03	ND	0.003	150
Glyphosate	ND	1	ND	6	280
Malathion	ND	0.02	ND	0.02	190
2-methyl-4chlorophenoxyacetic acid (MCPA)	NA	0.12	ND	0.12	100
Metolachlor	ND	0.01	ND	0.01	50
Metribuzin	ND	0.02	ND	0.02	80
Monochlorobenzene	ND	0.30	ND	0.30	80
Paraquat	ND	1	ND	1	10
Pentachlorophenol	ND	0.15	ND	0.15	60
Phorate	ND	0.01	ND	0.01	2
Picloram	ND	0.25	ND	0.25	190
Polychlorinated Biphenyls(PCB)	ND	0.04	ND	0.04	3
Prometryne	ND	0.03	ND	0.03	1
Simazine	ND	0.01	ND	0.01	10
Terbufos	ND	0.01	ND	0.01	1
Tetrachloroethylene	ND	0.35	ND	0.35	10
2,3,4,6-Tetrachlorophenol	ND	0.20	ND	0.14	100
Triallate	ND	0.01	ND	0.01	230
Trichloroethylene	ND	0.44	ND	0.44	5
2,4,6-Trichlorophenol	ND	0.25	ND	0.25	5
Trifluralin	ND	0.02	ND	0.02	45
Vinyl Chloride	ND	0.17	ND	0.17	1

APPENDIX B: WATER QUANTITY SUMMARY





Oxford South Water System Firm Capacity 2,454 m^3/day
Oxford South Water System Capacity 6,054 m3 /day



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