



**Armow Drinking Water System**

**2018 Annual Water Summary Report**

## 1. INTRODUCTION AND BACKGROUND

The municipality owns and operates drinking water systems to provide residents with safe, potable water. These municipal drinking water systems are regulated under various legislation and legal documents including the Safe Drinking Water Act and Ontario Regulation 170/03 Drinking Water Systems. O. Reg. 170 requires that the municipality complete an annual water report (Section 11) and an annual summary report (Schedule 22). The information required for each of these reports has been combined into this one report.

The reports are available free of charge on the municipal website at [www.kincardine.ca](http://www.kincardine.ca) or by contacting the Water Services Department at [waterservice@kincardine.ca](mailto:waterservice@kincardine.ca). Requests will also be received in person or by telephone at the Municipal Administration Centre (1475 Concession 5, 519-396-3468) or the Water Services Office (155 Durham Street, Kincardine, 519-396-4660).

### 1.1. System Description

<b>Drinking-Water System Number:</b>	220008792
<b>Drinking-Water System Name:</b>	Armow Drinking Water System
<b>Drinking-Water System Owner:</b>	Municipality of Kincardine
<b>Drinking-Water System Category:</b>	Small Municipal Residential
<b>Period being reported:</b>	Year 2018

The Armow Drinking Water System (DWS) consists of one non-GUDI well (which means that it is a secure well and not under the influence of surface water).

Primary treatment is achieved through UV disinfection. The UV system consists of two (2) Trojan UV units, each capable of treating 0.63 L/s (10 gpm). Each UV unit is equipped with flow restrictors to ensure that the flow limit is not exceeded. If one UV unit is off-line, a sufficient volume of water can be treated by the second UV unit to meet the demands of the distribution system. If both UV units are unable to run, the well will be locked out. Upstream of each UV unit is a 50/5 micron cartridge filter.

Sodium hypochlorite (NSF certified) is used for secondary treatment but can also provide primary disinfection if the UV disinfection is unavailable.

In 2018, an arsenic-removal system was installed on-site to remove the naturally occurring arsenic.

An emergency back-up generator is capable of providing sufficient power to the entire Armow treatment system.

### 1.2. Major Expenses

The system incurred expenses necessary to install, repair or replace required equipment as follows:

Arsenic Treatment System (\$111,270.54)

Treatment and Monitoring Equipment (\$3,638.84)

## 2. WATER QUALITY MONITORING

Each municipal drinking water system is required to do testing to ensure that the water supplied to consumers is safe for consumption. Some of these tests such as chlorine residuals are done on-site while others, like microbiological testing, must be performed by a licenced laboratory.

### 2.1. Microbiological Testing

O. Reg. 170 Schedule 11, requires the Armow DWS to take a minimum of one sample per month of raw water from the well, and one sample every two weeks of distribution water and have them tested for Escherichia coli (E. coli) and total coliforms. The distribution samples must also be tested for heterotrophic plate count (HPC). Our internal sampling schedule exceeds the minimum requirements by having operations staff collect one treated and one distribution sample every week and have them tested for E. coli, total coliform and HPC.

Any E. coli or total coliform results above 0 in treated or distribution water must be reported to the Ministry of Environment, Conservation and Parks (MECP) Spills Action Centre (SAC) and the Medical Officer of Health (MOH).

Heterotrophic plate count is a colony count of general bacteria population. There is no adverse limit for HPC samples. 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 results from the 2018 sampling program are shown in the table below.

Water Source	Number TC/EC of Samples	Range of Total Coliform Results (#-#)	Range of E.coli Results (#-#)	Number of HPC Samples	Range of HPC Results (#-#)
Raw	12	0 – 0	0 – 0	12	0 – 20
Treated	52	0 – 0	0 – 0	52	0 – 18
Distribution	52	0 – 0	0 – 0	52	0 – 23

### 2.2. Chemical Testing

The Safe Drinking Water Act Reg 170 Schedule 13 requires periodic testing of the water for chemical parameters. The Armow DWS is required to test for nitrite/nitrate and Haloacetic Acid on a quarterly basis. Until recently, trihalomethanes were tested for quarterly but due to the low levels, they are now only required to be tested on a quarterly basis every third year. The tables below outline other inorganic and organic parameters that are required to be tested every five years and include the date and result of the most recent test. Any result displayed as less than (<) are below the method detection limit of the lab.

Sodium and fluoride levels exceed the Ontario Drinking Water Quality Standards, but they are naturally occurring in the groundwater and do not need to be tested more frequently than every five years.

If the concentration of a parameter is above half of the Maximum Acceptable Concentration (MAC) under the Ontario Drinking Water Quality Standards, an increased testing frequency of once every three months is required by O. Regulation 170. Arsenic is naturally occurring in the ground water in the Armow DWS and was required to be tested for on a quarterly basis until the arsenic-removal system was installed.

Inorganic Parameters	Sample Date	Result Value	Unit of Measure	Exceedance
<b>Antimony</b>	Oct 19/15	< 0.02	ug/L	No
<b>Arsenic</b>	Jan 8/18	16.2	ug/L	No
	Jan 12/18	18.0		
	April 9/18	15.4		
	April 17/18	16.2		
	July 16/18	15.7		
	Oct 15/18	13.1		
	Nov 19/18	11.8		
	Nov 22/18	< 0.2		
	Dec 17/18	< 0.2		
<b>Barium</b>	Oct 19/15	22.0	ug/L	No
<b>Boron</b>	Oct 19/15	286	ug/L	No
<b>Cadmium</b>	Oct 19/15	0.008	ug/L	No
<b>Chromium</b>	Oct 19/15	< 0.03	ug/L	No
<b>Mercury</b>	Oct 19/15	< 0.01	mg/L	No
<b>Selenium</b>	Oct 19/15	< 0.04	ug/L	No
<b>Sodium</b>	Oct 19/15	46.8	mg/L	Yes
	Oct 26/15	51.1		
<b>Uranium</b>	Oct 19/15	1.17	ug/L	No
<b>Fluoride</b>	Oct 19/15	2.16	mg/L	Yes
	Oct 26/15	2.11		
	Oct 26/15	2.05		
<b>Nitrite</b>	Jan 8/18	< 0.003	mg/L	No
	Apr 9/18	< 0.003		
	July 16/18	< 0.003		
	Oct 15/18	< 0.003		
<b>Nitrate</b>	Jan 8/18	0.014	mg/L	No
	Apr 9/18	< 0.006		
	July 16/18	< 0.006		
	Oct 15/18	0.007		

In 2016, the Ministry of the Environment removed some organic parameters and added others to the lists of those required to be tested for. The new parameters are to be tested for along with the regular testing of organics in 2020. The old parameters have still been included in the table below until the next sampling cycle in 2020.

<b>Organic Parameters</b>	<b>Sample Date</b>	<b>Result Value</b>	<b>Unit of Measure</b>	<b>Exceedance</b>
<b>Alachlor</b>	Oct 19/15	< 0.02	ug/L	No
<b>Aldicarb</b>	Oct 19/15	< 0.01	ug/L	No
<b>Aldrin + Dieldrin</b>	Oct 19/15	< 0.01	ug/L	No
<b>Atrazine + N-dealkylated metabolites</b>	Oct 19/15	< 0.01	ug/L	No
<b>Azinphos-methyl</b>	Oct 19/15	< 0.05	ug/L	No
<b>Bendiocarb</b>	Oct 19/15	< 0.01	ug/L	No
<b>Benzene</b>	Oct 19/15	< 0.32	ug/L	No
<b>Benzo(a)pyrene</b>	Oct 19/15	< 0.004	ug/L	No
<b>Bromoxynil</b>	Oct 19/15	< 0.33	ug/L	No
<b>Carbaryl</b>	Oct 19/15	< 0.05	ug/L	No
<b>Carbofuran</b>	Oct 19/15	< 0.01	ug/L	No
<b>Carbon Tetrachloride</b>	Oct 19/15	< 0.16	ug/L	No
<b>Chlordane (Total)</b>	Oct 19/15	< 0.01	ug/L	No
<b>Chlorpyrifos</b>	Oct 19/15	< 0.02	ug/L	No
<b>Cyanazine</b>	Oct 19/15	< 0.03	ug/L	No
<b>Diazinon</b>	Oct 19/15	< 0.02	ug/L	No
<b>Dicamba</b>	Oct 19/15	< 0.20	ug/L	No
<b>1,2-Dichlorobenzene</b>	Oct 19/15	< 0.41	ug/L	No
<b>1,4-Dichlorobenzene</b>	Oct 19/15	< 0.36	ug/L	No
<b>Dichlorodiphenyltrichloroethane (DDT) + metabolites</b>	Oct 19/15	< 0.01	ug/L	No
<b>1,2-Dichloroethane</b>	Oct 19/15	< 0.35	ug/L	No
<b>1,1-Dichloroethylene (vinylidene chloride)</b>	Oct 19/15	< 0.33	ug/L	No
<b>Dichloromethane</b>	Oct 19/15	< 0.35	ug/L	No
<b>2-4 Dichlorophenol</b>	Oct 19/15	< 0.15	ug/L	No
<b>2,4-Dichlorophenoxy acetic acid (2,4-D)</b>	Oct 19/15	< 0.19	ug/L	No
<b>Diclofop-methyl</b>	Oct 19/15	< 0.40	ug/L	No
<b>Dimethoate</b>	Oct 19/15	< 0.03	ug/L	No
<b>Dinoseb</b>	Oct 19/15	< 0.36	ug/L	No
<b>Diquat</b>	Oct 19/15	< 1	ug/L	No
<b>Diuron</b>	Oct 19/15	< 0.03	ug/L	No
<b>Glyphosate</b>	Oct 19/15	< 1	ug/L	No
<b>Heptachlor + Heptachlor Epoxide</b>	Oct 19/15	< 0.01	ug/L	No
<b>Lindane (Total)</b>	Oct 19/15	< 0.01	ug/L	No
<b>Malathion</b>	Oct 19/15	< 0.02	ug/L	No
<b>Methoxychlor</b>	Oct 19/15	< 0.01	ug/L	No
<b>2 methyl-4-chlorophenoxyacetic acid (MCPA)</b>			mg/L	
<b>Metolachlor</b>	Oct 19/15	< 0.01	ug/L	No
<b>Metribuzin</b>	Oct 19/15	< 0.02	ug/L	No
<b>Monochlorobenzene</b>	Oct 19/15	< 0.3	ug/L	No
<b>Paraquat</b>	Oct 19/15	< 1	ug/L	No
<b>Parathion</b>	Oct 19/15	< 0.02	ug/L	No
<b>Pentachlorophenol</b>	Oct 19/15	< 0.15	ug/L	No
<b>Phorate</b>	Oct 19/15	< 0.01	ug/L	No
<b>Picloram</b>	Oct 19/15	< 1	ug/L	No

<b>Organic Parameters</b>	<b>Sample Date</b>	<b>Result Value</b>	<b>Unit of Measure</b>	<b>Exceedance</b>
<b>Polychlorinated Biphenyls (PCB)</b>	Oct 19/15	< 0.04	ug/L	No
<b>Prometryne</b>	Oct 19/15	< 0.03	ug/L	No
<b>Simazine</b>	Oct 19/15	< 0.01	ug/L	No
<b>Temephos</b>	Oct 19/15	< 0.01	ug/L	No
<b>Terbufos</b>	Oct 19/15	< 0.01	ug/L	No
<b>Tetrachloroethylene</b>	Oct 19/15	< 0.35	ug/L	No
<b>2,3,4,6-Tetrachlorophenol</b>	Oct 19/15	< 0.20	ug/L	No
<b>Triallate</b>	Oct 19/15	< 0.01	ug/L	No
<b>Trichloroethylene</b>	Oct 19/15	< 0.44	ug/L	No
<b>2,4,6-Trichlorophenol</b>	Oct 19/15	< 0.25	ug/L	No
<b>2,4,5-Trichlorophenoxy acetic acid (2,4,5-T)</b>	Oct 19/15	< 0.22	ug/L	No
<b>Trifluralin</b>	Oct 19/15	< 0.02	ug/L	No
<b>Vinyl Chloride</b>	Oct 19/15	< 0.17	ug/L	No

Trihalomethane (THM) distribution sampling is required quarterly and must also be expressed as a running annual average. The limit as set in the Ontario Drinking Water Quality Standards is 100 ug/L. THMs are a by-product of the disinfection process.

<b>Date Sampled</b>	<b>THM Result Value (ug/L)</b>	<b>Running Annual Average (ug/L)</b>	<b>Exceedance</b>
January 8/18	4.5	7.2	No
April 9/18	8.0	8.7	No
July 16/18	14	9.9	No
October 15/18	14	10.1	No

Sampling and testing for Haloacetic Acid (HAA) in the distribution system is a new requirement in 2017. The limit as set in the Ontario Drinking Water Quality Standards is 80 ug/L and starting in 2020 must also be expressed as a running annual average. HAAs are a by-product of the disinfection process.

<b>Date Sampled</b>	<b>HAA Result Value (ug/L)</b>	<b>Running Annual Average (ug/L)</b>	<b>Exceedance</b>
January 8/18	< 5.3	6.0	No
April 9/18	< 5.3	6.0	No
July 16/18	< 5.3	6.0	No
October 15/18	< 5.3	5.3	No

The Armow DWS does not have significant levels of lead and so is currently under a reduced-sampling program. Under this sampling program, O. Reg 170 Schedule 15.1 requires sampling for lead every three years and lead-related parameters every year. Lead was required to be sampled in 2018.

<b>Parameter</b>	<b>Location Type</b>	<b>Number of Samples</b>	<b>Range of Results</b>
<b>Lead (ug/L)</b>	Distribution	2	1.69 - 4.53
<b>pH</b>	Distribution	2	7.98 – 8.37
<b>Alkalinity (mg/L)</b>	Distribution	2	120 – 123

### 2.3. Operational Monitoring

Ultraviolet (UV) light is used for primary disinfection of the raw water. A minimum UV dosage of 40 mJ/cm<sup>2</sup> must be maintained for adequate disinfection. The UV dosage is continuously monitored.

	UV dosage (mJ/cm <sup>2</sup> ) Range of Results (#-#)
UV Unit #1	41.8 – 361.3
UV Unit #2	40.0 – 283.9

Sodium hypochlorite is used for secondary disinfection. The free chlorine residual is monitored continuously on the treated water and a sample of distribution water is tested at least twice a week for free chlorine residual.

As a target, free chlorine residual within the distribution system should be above 0.20 mg/L. A distribution free chlorine level lower than 0.05 mg/L must be reported and corrective action taken.

<b>Distribution Water</b>	<b>Number of Grab Samples</b>	<b>Range of Results (#-#)</b>
<b>Free Chlorine Residual</b>	169	0.08 – 1.82

O. Reg 170 Schedule 7 requires that turbidity in the raw water is tested at least once every month. Consistent turbidity results greater than 5 NTU could indicate surface water influence on the well.

<b>Raw Water Turbidity</b>	<b>Number of Grab Samples</b>	<b>Range of Results (#-#)</b>
<b>Armow Well</b>	39	0.16 – 0.78

### 3. WATER QUANTITY

The following tables list the quantities and flow rates of the water supplied to the distribution system during the reporting period covered by this report, including monthly average and maximum daily flows and a comparison to the rated capacity specified in the system Municipal Drinking Water Licence. The rated capacity of the treatment system is 82 m<sup>3</sup>/day. There is no maximum flow rate specified for water supplied to the distribution system.

<b>Month</b>	<b>Average Daily Flow (m<sup>3</sup>/day)</b>	<b>% Average Day/Rated Capacity (m<sup>3</sup>/day)</b>	<b>Maximum Daily Flow (m<sup>3</sup>/day)</b>	<b>% Maximum Day/Rated Capacity (m<sup>3</sup>/day)</b>
<b>January</b>	4	4 %	6	7 %
<b>February</b>	3	4 %	4	5 %
<b>March</b>	3	4 %	5	6 %
<b>April</b>	4	5 %	11	13 %
<b>May</b>	4	4 %	7	8 %
<b>June</b>	5	6 %	21	25 %
<b>July</b>	5	6 %	13	16 %
<b>August</b>	3	4 %	6	7 %
<b>September</b>	4	5 %	9	11 %
<b>October</b>	4	4 %	6	7 %
<b>November</b>	4	5 %	13	15 %
<b>December</b>	4	5 %	7	8 %
<b>Annual</b>	<b>3.9</b>	<b>5 %</b>	<b>21</b>	<b>25 %</b>

<b>Month</b>	<b>Average Daily Flow Rate (L/s)</b>	<b>Maximum Daily Flow Rate (L/s)</b>
<b>January</b>	0.04	0.93
<b>February</b>	0.04	0.90
<b>March</b>	0.04	0.90
<b>April</b>	0.05	2.06
<b>May</b>	0.04	2.06
<b>June</b>	0.06	2.05
<b>July</b>	0.05	2.02
<b>August</b>	0.04	0.98
<b>September</b>	0.05	2.05
<b>October</b>	0.04	0.79
<b>November</b>	0.05	1.00
<b>December</b>	0.05	0.97
<b>Annual</b>	0.04	2.06



#### 4. ADVERSE WATER QUALITY INCIDENTS AND NON-COMPLIANCE FINDINGS

Any adverse results from microbiological samples, chemical samples or observations of operational conditions that indicate adverse water quality are reported to the Spills Action Centre (SAC) of the MECP and the Medical Officer of Health (MOH). All adverse conditions are responded to immediately and corrective actions taken. The reportable incidents in 2018 were all for the elevated levels of arsenic before regulatory relief was given by the MECP. The arsenic removal system was installed and commissioned in November 2018. The arsenic in the water distributed to users is now below the method detection level of the licenced laboratory (<0.2 ug/L).

Incident Date	Parameter	Result	Unit of Measure	Corrective Action	Corrective Action Date
January 11, 2018 AWQI # 138538	Arsenic	16.2	ug/L	Resampled	January 12, 2018
January 17, 2018 AWQI # 138589	Arsenic	18.0	ug/L	Relief application in progress with the MECP; resampling not required as per MECP	
April 13, 2018 AWQI # 139086	Arsenic	15.4	ug/L	Resampled	April 17, 2018
April 17, 2018 AWQI # 139153	Arsenic	16.2	ug/L	Relief application in progress with the MECP; resampling not required as per MECP	

The annual MECP Inspection took place on May 30, 2018. The inspection report addressed one concern regarding continuous monitoring data and the system received a final inspection rating of 99.16%.

O. Reg 170 Schedule 22 requires the municipality to identify any requirements of the Act, Regulations, Drinking Water Works Permit, Municipal Drinking Water Licence and any Order that the system failed to meet during the reporting period. These are detailed in the following table including the duration and the measures taken to correct each failure.

<b>Drinking Water Legislation</b>	<b>Requirements the System Failed to Meet</b>	<b>Duration</b>	<b>Corrective Actions</b>
O. Reg. 170, Schedule 6, Section 6-1.1 (3)	Raw water samples taken monthly and tested for turbidity exceeded the 40 day limit between samples	June 4 to July 16	A portable analyzer used for turbidity testing has been left on-site.
O. Reg. 170, Section 13 (1)	Continuous monitoring data was not kept for at least two years	Feb 7,14-16, April 30, May 4	The Endress-Hauser data collection unit on-site was used in addition to the UV Comm Centre for recording continuously monitored data