



# 2020 ANNUAL REPORT KENORA AREA DRINKING WATER SYSTEM



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## 1.0 Background

This report has been written to meet to requirements of both Section 11 and Schedule 22 of Ontario Regulation 170/3: Drinking Water Systems (O. Reg. 170/03), under the Safe Drinking Water Act 2002 (SDWA). The purpose is to inform the public and Municipal Council on pertinent information.

Section 11 requires the following information be provided to the public:

- A brief description of the drinking water system, including a list of water treatment chemicals used by the system.
- A summary of all adverse water quality incidents reported to the Ministry of the Environment, Conservation and Parks (MECP) and the corrective actions taken.
- A summary of results from tests required under O. Reg. 170/03.
- A summary of major expenses incurred to install, repair or replace required equipment.

Schedule 22 requires the following information be provided to Municipal Council:

- A summary of incidents of regulatory non-compliance and the corrective actions taken.
- A summary of the quantities and flow rates of water supplied, with a comparison to the rated capacity and approved flow rates of the system.

This report is available free of charge to anyone who requests a copy. An electronic copy is available on the City of Kenora website, and anyone wanting to be provided a paper copy can make arrangements to pick one up from the Water Treatment Plant. Staff at the Water Treatment Plant can be contacted to assist in the interpretation of this report if required.

## 2.0 System Information

### 2.1 System Description

The Kenora Area Drinking Water System (DWS # 220001423) services the Kenora area, as well as providing water to two subsystems. Subsystems are located on Rocky Heights Road, and on Wauzhushk Onigum Nation.

The Kenora Area DWS distribution system is designated as Class 2, and is comprised of five booster stations, three standpipes and approximately 136 kilometers of watermains.

The Kenora Water Treatment Plant (WTP) is located adjacent to Lake of the Woods, and has a rated capacity of 25,270 cubic meters per day. It is a conventional filtration plant with an upflow clarifier dual media sand/anthracite filters. Raw water flows by gravity into the lowlift chamber, where it is pumped up to the clarifier by lowlift pumps. Coagulation and flocculation is achieved using aluminum sulfate as a coagulant and the BASF polyelectrolyte LT-22S as a coagulant aid. After filtration, chlorine is added in the mixing chamber prior to the clearwell for primary disinfection. Fluoridation also occurs at this point. After CT has been met in the clearwell, highlift pumps direct the water to the distribution system. Prior to entering the system, trim chlorine is added to prepare the water for chloramination, sodium

hydroxide is added for pH adjustment, and ammonium sulfate is added to produce chloramines as a secondary disinfectant.

## 2.2 Chemicals Used in Treatment

No changes in the chemicals used for treatment occurred in 2020.

Chemical	Purpose
Chlorine Gas	Disinfection
Aluminum Sulfate	Coagulation
BASF LT-22S Polymer	Coagulant Aid
Sodium Hydroxide	pH, Alkalinity Adjustment
Sodium Silicofluoride	Fluoridation
Ammonium Sulfate	Chloramination

## 2.3 Summary of Significant Expenses Incurred

Project	Expense Type	Location	Value
Park St. Watermain	Replacement	Distribution	\$1,106,240
5 <sup>th</sup> Ave S Watermain	Replacement	Distribution	\$29,708
2 <sup>nd</sup> St S Laneway Watermain	Replacement	Distribution	\$54,706
Brinkman Booster Pump and Motor	Replacement	Distribution	\$19,159
Flash Mixer	Replacement	WTP	\$18,688

## 3.0 Operational Parameters and Regulatory Sampling

### 3.1 Turbidity and Free Chlorine Monitoring for Primary Disinfection

Turbidity values and chlorine residuals used for the purpose of determining primary disinfection are continuously monitored with online analyzers. This data must be recorded at minimum intervals to satisfy the requirements of O. Reg. 170/03. Chlorine residual measurements must be recorded at least every five minutes, and turbidity values every fifteen minutes.

Filtrate turbidity values must not exceed 1 Nephelometric Turbidity Unit (NTU), and must remain below 0.3 NTU 95% of the time or greater. The free chlorine residual measured as it exits the clearwell must never drop to a point where CT is no longer being met.

There were no occurrences in 2020 where primary disinfection was inadequate. Filter turbidities did not exceed 1 NTU at any time, and periods over 0.3 NTU were negligible. The clearwell chlorine residual never dropped below our low alarm setpoint of 0.60 mg/L, where CT effectiveness would need to be confirmed.

Monitoring Location	Units	Minimum Value	Maximum Value
Clearwell Effluent	mg/L	0.89	1.80

Monitoring Location	Units	Minimum Value	Maximum Value
Filter #1 Filtrate	NTU	0.025	0.331
Filter #2 Filtrate	NTU	0.023	0.261
Filter #3 Filtrate	NTU	0.025	0.272
Filter #4 Filtrate	NTU	0.034	0.387

### 3.2 Combined Chlorine Monitoring for Secondary Disinfection

Chlorine residuals are tested in the distribution system twice per week to ensure adequate secondary disinfection. Six samples are taken at the beginning of the week in conjunction with bacteriological samples, and three more samples are taken later in the week at least 48 hours after the first set, and at least 48 hours prior to the beginning of sampling the next week.

Chlorine residuals are also tested in the distribution system for non-routine occurrences such as watermain repairs, boil water advisories, and temporary/seasonal service lines.

A minimum of 0.25 mg/L of combined chlorine must be maintained at all points in the distribution system. Residuals must also remain under the 3.00 mg/L maximum limit for chloramines. In 2020 there were no adverse events related to distribution chlorine levels.

Sample Type	Samples Taken	Minimum Residual (mg/L)	Maximum Residual (mg/L)	Standard Limits (mg/L)	
Distribution	456	0.54	2.07	0.25	3.00
Dist. (non-routine)	102	0.74	2.10	0.25	3.00

### 3.3 Raw Water Monitoring

A raw water sample is collected at the beginning of each week and tested for turbidity, pH and color. Changes in raw water quality can indicate to operators when adjustments to plant processes may be required.

Parameter	Samples Taken	Units	Minimum Value	Maximum Value
Turbidity	53	NTU	0.649	1.88
pH	53	N/A	7.10	8.92
Color	53	Units PtCo	9	31

### 3.4 Microbiological Sampling

Microbiological samples are taken weekly and are tested for E-coli and Total Coliform, as well as Heterotrophic Plate Count (HPC) in treated water and at least 25% of distribution samples. One sample is taken weekly from both the raw water entering the plant and the treated water leaving the plant, as well as six samples from the distribution system. Samples taken from the distribution system are spread out geographically so that they give an accurate representation of the entire system.

E-coli and Total Coliform should always be absent, and if they are present in any number this is reported to the MECP as an adverse event. In 2020, there were five instances where total coliform was detected in a distribution sample, as detailed in Section 4.0 Adverse Water Quality Incidents and Corrective Actions Taken.

Sample Type	Samples Taken	Results Range E-coli (CFU/100 ml)		Results Range Total Coliform (CFU/100 ml)		HPC Samples Tested	Results Range HPC (CFU/1 ml)	
		0	64	0	>200		0	70
Raw	53	0	64	0	>200	N/A	N/A	
Treated	53	Absent		Absent		53	0	70
Distribution	318	Absent		0	2	106	0	40
Dist. (non-routine)	58	Absent		0	OG	0	N/A	

### 3.5 Lead Sampling

Under Schedule 15.1 of O. Reg. 170/03 the City of Kenora meets the requirements for reduced sampling. Previous rounds of residential plumbing sampling indicated lead levels did not meet the threshold required for continued annual testing, so lead samples are currently taken from distribution locations every three years. Sampling requirements under 15.1 in 2020 were limited to alkalinity and pH, so no lead sampling data is available for this reporting period.

### 3.6 Organic Parameters

Sampling occurs annually for the organic parameters listed in Schedule 24 or O. Reg.170/03. Samples are collected from the treated water leaving the Water Treatment Plant. No organic parameters exceeded the prescribed standard in 2020.

Parameter	Sample Date	Units	Result	Standard Limit
Alachlor	Jan 07, 2020	µg/L	<0.10	5
Atrazine + N-dealkylated metabolites	Jan 07, 2020	µg/L	<0.20	5
Azinphos-methyl	Jan 07, 2020	µg/L	<0.10	20
Carbaryl	Jan 07, 2020	µg/L	<0.20	90
Carbofuran	Jan 07, 2020	µg/L	<0.20	90
Chlorpyrifos	Jan 07, 2020	µg/L	<0.10	90
Diazinon	Jan 07, 2020	µg/L	<0.10	20
2,4-Dichlorophenol	Jan 07, 2020	µg/L	<0.30	900
Diclofop-methyl	Jan 07, 2020	µg/L	<0.20	9
Dimethoate	Jan 07, 2020	µg/L	<0.10	20
Diquat	Jan 07, 2020	µg/L	<1.0	70
Diuron	Jan 07, 2020	µg/L	<1.0	150
Malathion	Jan 07, 2020	µg/L	<0.10	190
Metolachlor	Jan 07, 2020	µg/L	<0.10	50
Metribuzin	Jan 07, 2020	µg/L	<0.10	80
Paraquat	Jan 07, 2020	µg/L	<1.0	10
Pentachlorophenol	Jan 07, 2020	µg/L	<0.50	60
Phorate	Jan 07, 2020	µg/L	<0.10	2
Prometryne	Jan 07, 2020	µg/L	<0.10	1
Simazine	Jan 07, 2020	µg/L	<0.10	10
Terbufos	Jan 07, 2020	µg/L	<0.20	1
2,3,4,6-Tetrachlorophenol	Jan 07, 2020	µg/L	<0.50	100
Triallate	Jan 07, 2020	µg/L	<0.10	230
2,4,6-Trichlorophenol	Jan 07, 2020	µg/L	<0.50	5
Trifluralin	Jan 07, 2020	µg/L	<0.10	45

Parameter	Sample Date	Units	Result	Standard Limit
Bromoxynil	Jan 07, 2020	µg/L	<0.20	5
Dicamba	Jan 07, 2020	µg/L	<0.20	120
2,4-Dichlorophenoxyacetic acid (2,4-D)	Jan 07, 2020	µg/L	<0.20	100
Glyphosate	Jan 07, 2020	µg/L	<5.0	280
2-Methyl-4-chlorophenoxyacetic acid (MCPA)	Jan 07, 2020	µg/L	<0.20	100
Picloram	Jan 07, 2020	µg/L	<0.20	190

Parameter	Sample Date	Units	Result	Standard Limit
Benzene	Jan 07, 2020	µg/L	<0.50	1
Carbon Tetrachloride	Jan 07, 2020	µg/L	<0.20	2
1,2-Dichlorobenzene	Jan 07, 2020	µg/L	<0.50	200
1,4-Dichlorobenzene	Jan 07, 2020	µg/L	<0.50	5
1,2-Dichloroethane	Jan 07, 2020	µg/L	<0.50	5
1,1-Dichloroethylene (vinylidene chloride)	Jan 07, 2020	µg/L	<0.50	14
Dichloromethane	Jan 07, 2020	µg/L	<5.0	50
Monochlorobenzene	Jan 07, 2020	µg/L	<0.50	80
Tetrachloroethylene (perchloroethylene)	Jan 07, 2020	µg/L	<0.50	10
Trichloroethylene	Jan 07, 2020	µg/L	<0.50	5
Vinyl Chloride	Jan 07, 2020	µg/L	<0.20	1

Parameter	Parameter Type	Sample Date	Units	Result	Standard Limit
Benzo(a)pyrene	Polycyclic aromatic hydrocarbon	Jan 07, 2020	µg/L	<0.0050	0.01
Total PCBs	Polychlorinated biphenyl	Jan 07, 2020	µg/L	<0.035	3

### 3.7 Inorganic Parameters

Sampling occurs annually for the inorganic parameters listed in Schedule 23 or O. Reg.170/03. Samples are collected from the treated water leaving the Water Treatment Plant. No inorganic parameters exceeded the prescribed standard in 2020.

Parameter	Sample Date	Units	Result	Standard Limit
Antimony	Jan 07, 2020	µg/L	<0.60	6
Arsenic	Jan 07, 2020	µg/L	<1.0	10
Barium	Jan 07, 2020	µg/L	<10	1000
Boron	Jan 07, 2020	µg/L	<50	5000
Cadmium	Jan 07, 2020	µg/L	<0.10	5
Chromium	Jan 07, 2020	µg/L	<1.0	50
Mercury	Jan 07, 2020	µg/L	<0.10	1
Selenium	Jan 07, 2020	µg/L	<1.0	50
Sodium	Jan 07, 2020	µg/L	14.5	20
Uranium	Jan 07, 2020	µg/L	<2.0	20



### 3.8 Nitrate and Nitrite

Sampling occurs quarterly for nitrate and nitrite, and samples are collected from the treated water leaving the Water Treatment Plant. Nitrate and nitrite did not exceed the prescribed standards in 2020.

Parameter	Sample Date	Units	Result	Standard Limit
Nitrate	Jan 07, 2020	mg/L	0.076	10
	Apr 14, 2020	mg/L	0.07	10
	Jul 06, 2020	mg/L	<0.05	10
	Oct 13, 2020	mg/L	<0.05	10
Nitrite	Jan 07, 2020	mg/L	<0.010	1
	Apr 14, 2020	mg/L	<0.05	1
	Jul 06, 2020	mg/L	<0.05	1
	Oct 13, 2020	mg/L	<0.05	1

### 3.9 Trihalomethanes

Sampling occurs quarterly for THMs, and samples are collected from the furthest point in the distribution system. THMs did not exceed the prescribed standards in 2020.

Sample Date	Units	Results	Quarterly Average	Running Annual Average	Standard Limit
Jan 07, 2020	µg/L	39.6	39.6	36.5	100
Apr 14, 2020	µg/L	13.3	13.3		
Jul 06, 2020	µg/L	52.3	51.4		
Jul 06, 2020	µg/L	58			
Jul 06, 2020	µg/L	43.8			
Oct 13, 2020	µg/L	41.7	41.7		

### 3.10 Haloacetic Acids

Sampling occurs quarterly for HAAs, and samples are collected from a mid-point in the distribution system. HAAs did not exceed the prescribed standards in 2020.

Sample Date	Units	Results	Quarterly Average	Running Annual Average	Standard Limit
Jan 07, 2020	µg/L	25.8	25.8	30.1	80
Apr 14, 2020	µg/L	20	20		
Jul 06, 2020	µg/L	35.2	44.7		
Jul 06, 2020	µg/L	50.9			
Jul 06, 2020	µg/L	48			
Oct 13, 2020	µg/L	33	33		

## 4.0 Adverse Water Quality Incidents and Corrective Actions Taken

Schedule 16 of O. Reg. 170/03 requires that any adverse sample results or observations are reported to the MECP and the local Medical Officer of Health. The City of Kenora had five Adverse Water Quality Incidents (AWQIs) in 2020, all of which were related to Total Coliform being detected in a distribution system sample.

### 4.1 AWQI #1

On July 8<sup>th</sup>, staff received notification from the lab that a sample taken during routine distribution sampling was positive for total coliform. Lab results indicated 2 Colony Forming Units (CFU)/100 mL. Resampling at the affected location, as well as an upstream and downstream sample did not show the presence of total coliform. A Notice of Resolution was submitted to the MECP on July 10<sup>th</sup>.

### 4.2 AWQI #2

On July 22<sup>nd</sup>, staff received notification from the lab that a sample taken for the purposes of lifting a Boil Water Advisory (BWA) after a watermain repair was positive for total coliform. Lab results indicated 12 CFU/100 mL. Resampling at the affected location, as well as an upstream and downstream sample did not show the presence of total coliform. A Notice of Resolution was submitted to the MECP on July 30<sup>th</sup>.

### 4.3 AWQI #3

On August 5<sup>th</sup>, staff received notification from the lab that a sample taken from a fire hydrant to lift a BWA after a watermain repair was positive for total coliform. Lab results indicated the sample was overgrown (NDOG) and a CFU count could not be given. After extensive flushing and multiple incidents of total coliform from the same location, consecutive resamples did not show the presence of total coliform. A Notice of Resolution was submitted to the MECP on August 20<sup>th</sup>. It should be noted that an issue was suspected with the hydrant being used for the sample, so houses on either side were sampled to rule out a more widespread issue. Houses in the vicinity of the hydrant in question did not show the presence of total coliform during the time period in which the hydrant did.

### 4.4 AWQI #4

On August 26<sup>th</sup>, staff received notification from the lab that a sample taken during routine distribution sampling was positive for total coliform. Lab results indicated 1 CFU/100 mL. Resampling at the affected location, as well as an upstream and downstream sample did not show the presence of total coliform. A Notice of Resolution was submitted to the MECP on September 1<sup>st</sup>.

### 4.5 AWQI #5

On September 2<sup>nd</sup>, staff received notification from the lab that a sample taken during routine distribution sampling was positive for total coliform. Lab results indicated 1 CFU/100 mL. Resampling at the affected location, as well as an upstream and downstream sample did not show the presence of total coliform. A Notice of Resolution was submitted to the MECP on September 9<sup>th</sup>.

## 5.0 Regulatory Compliance

An MECP Inspection of the DWS took place on August 20<sup>th</sup> and 21<sup>st</sup>, with some follow up on September 3<sup>rd</sup>. The final inspection rating was 89.02%. Four non-compliances were identified in the Inspection Report. Three of the four non-compliances are related to SCADA computer issues which were immediately reported to the local MECP inspector and resolved prior to the Inspection.

### 5.1 Non-Compliance #1

Non-Compliance: Operators were not examining continuous monitoring test results or they were not examining the results within 72 hours of the test.

Summary of Events Leading to Non Compliance: An automation company was contracted to replace all PLC equipment and the SCADA computer at the WTP. During the upgrade, a mistake was made by the contractor addressing turbidity values from the PLC to the new SCADA computer. As a result, frozen turbidity values were displayed on the SCADA computer from Nov 6<sup>th</sup> to Dec 18<sup>th</sup>, 2019, and accurate data was not being trended. Operators should have picked up on this when examining the trend page daily, but the trend page was cluttered with too many parameters and operators did not notice that the turbidity pens were missing. Operators also understood the requirement of examining trends to be for all process parameters, whereas the regulation specifies examining the particular parameters required for primary disinfection.

Corrective Actions Taken: A multiple monitor approach was taken with the SCADA computer so that various customized trend screens can be used. One trend screen is now solely used for primary disinfection parameters. This trending data is reviewed every morning, and the operator then signs the logbook detailing the high and low values of concern for the past 24 hours.

During the time in which the SCADA computer was not collecting turbidity data, the turbidimeters were logging the data onto SD cards contained locally on the analyzer. Retroactive examination of the data showed no issues with turbidity throughout the duration of the SCADA issue. No further action is required.

### 5.2 Non-Compliance #2

Non-Compliance: All continuous monitoring equipment utilized for sampling and testing required by O. Reg. 170/03, or Municipal Drinking Water License or Drinking Water Works Permit or order, were not equipped with alarms or shut-off mechanisms that satisfy the standards described in Schedule 6.

Summary of Events Leading to Non-Compliance: This non-compliance is directly related to Non-Compliance #1. During the period of time between Nov 6<sup>th</sup> and Dec 18<sup>th</sup>, 2019 when the SCADA computer was not receiving data from the filter turbidimeters, the alarms and shutdown mechanisms associated with high and low turbidity values would not have functioned. It was confirmed retroactively by examining local data stored on the turbidimeters that there were no occasions where alarms or shutdowns would have occurred had the values on the SCADA computer been accurate.

Corrective Actions Taken: Once the problem was discovered, the automation company responsible for the upgrade was contacted and they immediately logged in remotely and fixed the addressing issue that was causing the values to not be displayed properly. After discussion with the local MECF inspector, a procedure was developed detailing how operators are to confirm that regulatory continuous monitoring and regulatory alarms are fully operational after SCADA upgrades and/or SCADA programming changes. No further action is required.

### 5.3 Non-Compliance #3

Non-Compliance: Continuous monitoring equipment that was being utilized to fulfill O. Reg. 170/03 requirements was not performing tests for the parameters with at least the minimum frequency specified in the Table in Schedule 6 of O. Reg. 170/03 and/or was not recording data with the prescribed format.

Summary of Events Leading to Non-Compliance: At 4:21 am on January 9<sup>th</sup>, 2020 the SCADA computer shut down unexpectedly overnight. It was discovered by operators on arrival in the morning and restarted at 7:57 am. The new SCADA computer from the upgrade had recently been incorporated into a City Workgroup, which unknowingly changed settings on the computer to allow for Windows Automatic Updates. Turbidity data was still collected on SD cards locally, but the clearwell effluent chlorine analyzer did not have this capability. There was approximately 1.5 hours of time where the plant was running but chlorine data was not being recorded due to the SCADA computer being down. It should be noted that all alarms were still functioning during this time, so had the chlorine level dropped to an alarm setpoint operators would still have been called in.

Corrective Actions Taken: IT changed settings on the computer back to where updates will not occur automatically. Operators now manually initialize updates during a plant shutdown when required. IT also changed settings so that the SCADA program automatically runs on start-up, in case of an unexpected restart in the future. The clearwell effluent chlorine analyzer was replaced with a model that has SD backup, so there is now data redundancy in place. No further action is required.

### 5.4 Non-Compliance #4

Non Compliance: O. Reg. 128/04, Section 27. (4) states that “a person who makes an entry in a log or other record-keeping mechanism shall do so in a manner that permits the person to be unambiguously identified as the maker of the entry.” A review of the logbooks for the Kenora distribution system revealed that operators are rarely recording the name of the operator who made the entry.

Summary of Events Leading to Non-Compliance: This was the first time this issue was brought up, so some distribution operators may not have been aware of the requirements to initial or sign their entries in the logbooks.

Corrective Actions Taken: All operators now initial or sign next to their logbook entries, as well as ensure the time of the entry is written. No further action is currently required, and inspector will re-assess during the next inspection.

## 6.0 Flow Data

### 6.1 Effluent Flow Data

In 2020 the Kenora WTP pumped a total of 2,140,110 cubic meters (m<sup>3</sup>) of water to the distribution system. The highest daily flow took place in August, with a total of 8,302 m<sup>3</sup> being pumped on the 19<sup>th</sup>. This is 33% of the plants rated capacity of 25,270 m<sup>3</sup>/day.

Month	Total Monthly Flow (m <sup>3</sup> )	Average Daily Flow (m <sup>3</sup> )	Maximum Daily Flow (m <sup>3</sup> )
January	185,492	6,100	6,820
February	177,260	6,229	7,213
March	190,054	6,248	7,181
April	161,922	5,507	6,018
May	173,722	5,714	6,800
June	173,931	5,911	6,786
July	191,858	6,306	7,389
August	198,724	6,530	8,302
September	173,750	5,910	6,918
October	168,470	5,546	6,546
November	167,036	5,684	6,497
December	177,891	5,856	8,006

### 6.2 Influent Flow Data

In 2020 the Kenora WTP pumped a total of 2,365,834 m<sup>3</sup> of raw water from Lake of the Woods. The highest daily flow took place in August, with a total of 8,481 m<sup>3</sup> being pumped on the 19<sup>th</sup>. This is 33% of the plants water taking limit of 26,000 m<sup>3</sup>/day as set out in the Permit to Take Water (PTTW). The highest instantaneous rate at which water was taken from Lake of the Woods was 23,079 m<sup>3</sup>/day, which occurred on September 10<sup>th</sup>. This is 89% of the limit of 26,000 m<sup>3</sup>/day set out in the PTTW.

Month	Total Monthly Flow (m <sup>3</sup> )	Average Daily Flow (m <sup>3</sup> )	Maximum Daily Flow (m <sup>3</sup> )
January	203,426	6,562	7,236
February	193,407	6,669	7,675
March	207,739	6,701	7,650
April	178,911	5,964	6,789
May	192,943	6,224	7,409
June	192,373	6,412	7,419
July	212,389	6,851	7,931
August	220,049	7,098	8,481
September	194,370	6,479	7,975
October	188,032	6,066	7,206
November	185,875	6,196	7,163
December	196,320	6,333	8,656

### 6.3 Historic Flow Data

Total effluent flow has remained relatively stable, with a slight decrease noticeable in 2016. There is no expectation of significant greater demand on the system in the near future.

Year	Total Effluent Flow (m <sup>3</sup> )	Average Daily Flow (m <sup>3</sup> )	Annual Change	2020 Comparison
2013	2,435,713	6,673	N/A	112%
2014	2,621,655	7,183	+7.6%	120%
2015	2,452,926	6,720	-6.4%	112%
2016	2,066,260	5,661	-15.8%	95%
2017	2,151,431	5,894	+4.1%	99%
2018	2,247,301	6,157	+4.5%	103%
2019	2,229,036	6,107	-0.8%	102%
2020	2,182,328	5,979	-2.1%	N/A