2010 GNWT Report on Drinking Water

Northwest Territories

September 2011

Water is a defining feature of the Northwest Territories (NWT) environment. The North has an abundance of clean lakes and rivers on which the people of the NWT rely for their public drinking water supply. Water from these lakes, rivers and groundwater wells is treated at 30 community water treatment plants (WTPs) to ensure it is safe to drink.

The management of drinking water is the shared responsibility of all levels of government. Community governments are responsible for operating and maintaining WTPs. The Government of the Northwest Territories (GNWT) is responsible for the regulation of water supply systems, providing certification, training and support to WTP operators, and for working collaboratively with stakeholders to implement the NWT Water Stewardship Strategy. The GNWT also inspects WTPs and reviews water quality data from communities to ensure the treated water is safe.

Drinking water quality guidelines are developed by a committee with representation from federal, provincial and territorial governments. The Guidelines for Canadian Drinking Water Quality (GCDWQ) are published by Health Canada and the majority of jurisdictions across Canada, including the NWT, adopt them in regulations. Understanding and meeting water quality guidelines is an important component of a multi-barrier approach to safe drinking water.

The GNWT's responsibilities are shared among four departments – Health and Social Services (HSS), Municipal and Community Affairs (MACA), Public Works and Services (PWS) and Environment and Natural Resources (ENR). Work is coordinated through a technical committee which provides recommendations to the Interdepartmental Water and Wastewater Management Committee, made up of four deputy ministers, one from each department. The committee's work is guided by the GNWT's *Managing Drinking Water in the NWT: A Preventative Framework and Strategy* and associated action plans developed annually. The strategy's goals include keeping NWT water clean, making water safe to drink and ensuring drinking water is safe.

This report provides an overview of the initiatives that are new and ongoing in the area of drinking water quality. Information on community drinking water systems can be found in the table on page 10 of this report. Detailed drinking water quality information for communities can be found on the Internet at:

http://www.maca.gov.nt.ca/operations/water/WaterQ_Main_MenuSQL.asp.

If you do not have access to the Internet please contact your regional environmental health office if you have questions about the water quality in your community. Contact information is provided on the back page of this report.

Keeping Drinking Water Clean

Community Public Water Source Supplies

Inuvik Region	
Aklavik	Mackenzie River
Fort McPherson	Deep Water Lake
Inuvik	Mackenzie River and 3 Mile Lake
Paulatuk	New Water Lake
Sachs Harbour	DOT Lake
Tsiigehtchic	Tso Lake
Tuktoyaktuk	Kudlak Lake
Ulukhaktok	RCAF Lake
Sahtu Region	
Colville Lake	Colville Lake
Délı̨ne	Great Bear Lake
Fort Good Hope	Mackenzie River
Norman Wells	Mackenzie River
Tulita	Great Bear River
North Slave Region	
Behchokǫ̀ (Edzo)	West Channel
Behchokǫ̀ (Rae)	Marian Lake
Dettah	see Yellowknife
Gamètì	Rae Lake
Łutselk'e	Great Slave Lake
Wekweètì	Snare Lake
Whatì	Ground Water
Yellowknife	Yellowknife River
South Slave Region	
Enterprise	see Hay River
Fort Providence	Mackenzie River
Fort Resolution	Great Slave Lake
Fort Smith	Slave River
Hay River	Great Slave Lake
Hay River Reserve	see Hay River
Kakisa	see Hay River
Dehcho Region	
Fort Liard	Ground Water
Fort Simpson	Mackenzie River
Jean Marie River	Mackenzie River
Nahanni Butte	Ground Water
Trout Lake	Trout Lake
Wrigley	Ground Water

Trout Lake Raw Water Reservoir

Tuktoyaktuk Raw Water Reservoir

Info on Raw Water

1. Raw water is usually from surface water and groundwater wells, which has had no previous treatment and is entering a water processing system or device.
2. Raw water should not be considered safe for drinking or personal hygiene without treatment.
3. Raw water reservoirs are used in the NWT either to store water when the quality is best or when there is no year-round access to a water source.

NWT Water Stewardship Strategy

Northern Voices, Northern Waters: the NWT Water Stewardship Strategy (May 2010) is based on input from Northern residents. The GNWT and Aboriginal Affairs and Northern Development Canada (AANDC) are the Water Strategy leads with guidance from the Aboriginal Steering Committee. The Water Strategy sets a guiding vision, goals and approaches for water users, planners and regulators. Its vision is for the waters of the NWT to remain clean, abundant and productive for all time.

Of the numerous keys to success identified in the Water Strategy, there are three prominent activities currently underway that work towards keeping NWT drinking water clean:

- Mapping and protecting community public water supply sources;
- Community-based aquatic monitoring; and
- Partnership Development.

Mapping and Protecting Community Public Water Supply Sources

People who live and work in communities are in the best position to identify what water values are important to them, including those related to water quality and quantity and the aquatic ecosystem health of their watershed.

ENR is working with communities to help identify local water values that may be at risk from activities taking place on the land. When residents and officials are knowledgeable about the lakes and rivers that are part of their drinking water supply watershed, and are aware of which parts of that watershed may be affected by activities on the land or in waterbodies, they can make informed decisions. They can then decide whether special protective measures may be necessary.

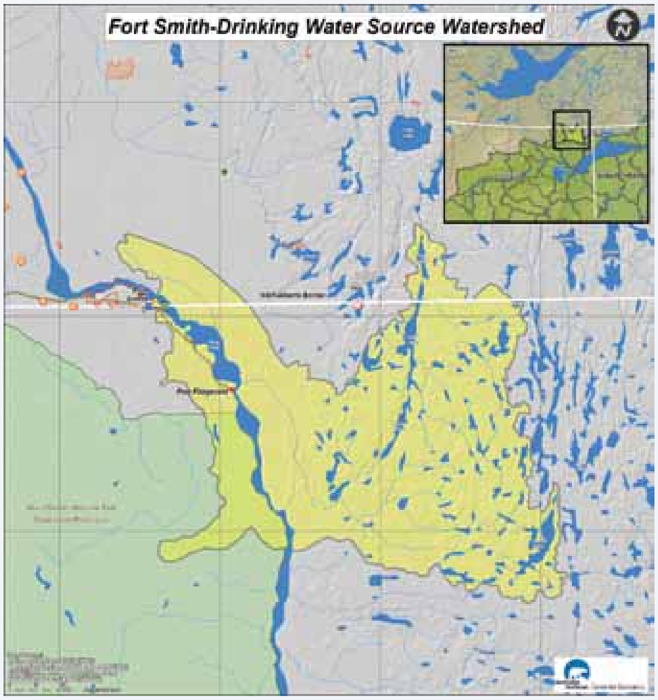
ENR is updating watershed maps with input from communities. Current versions are electronically available for each NWT community at:

http://maps.gnwtgeomatics/portal/watershedmaps.jsp.

Updated versions will be posted once complete. The maps will assist with source water protection planning.

The term 'source water protection' refers to surface water (e.g. rivers or lakes), or a groundwater planning and management program within a watershed with a specific goal of protecting water quality. Source water protection is the first barrier in the multi-barrier approach to water management. The goal of the multi-barrier approach to drinking water management is to reduce the risk of drinking water contamination by building in barriers, such as source water protection, within a water management system.

The Water Strategy supports the development of community source water protection plans. The first step in this process is to develop a model for community source protection plans that would be applicable for different sized communities and different water sources. The model plan will provide a broad framework for NWT communities to use in the development of a source water protection plan. The GNWT worked together with the University of Saskatchewan to develop a model plan. Fort Smith, Fort Resolution, Yellowknife, Behchokǫ̀, Inuvik and Aklavik were part of the first stage of the project to identify community concerns that need to be addressed in future source water protection plans.



Drinking Water Source Watershed - Fort Smith

Community-based Monitoring and Developing Partnerships

One of the main goals of the Water Strategy is that all water partners, including communities, Aboriginal groups, government agencies, academics, etc. will work together to realize the vision of the Water Strategy.

Work currently underway regarding source water protection and identification of potential aquatic ecosystem health indicators are part of the implementation of the Water Strategy.

Another important initiative under the Water Strategy is to support communities in becoming more involved in water stewardship and aquatic monitoring by developing community-based monitoring programs.

In 2010, the Slave River and Delta Partnership was formed with the intent to coordinate and maximize community-based monitoring efforts along the Slave River and Slave River Delta. The partnership includes members of community, territorial, federal, and Aboriginal groups and governments, environmental non-governmental organizations and academics.

The partnership will conduct a vulnerability assessment of the Slave River and Delta. The project includes a state of the knowledge report that will synthesize existing western science and traditional knowledge, regarding water, sediment and the aquatic ecosystem. The second part of the project is to conduct workshops to assess vulnerabilities and identify monitoring priorities.

Participants at the Workshop - "Monitoring the Health of the Slave River and the Slave River Delta" (Fort Smith)

For more information on the noted activities, please contact ENR's Land and Water Division at (867) 920-3256. A copy of the Water Strategy Action Plan can be viewed online at:

http://www.enr.gov.nt.ca/_live/pages/wpPages/water.aspx

Snare Lake - Raw Water Source in Wekweètì

Water Licence Funding

The objective of a water licence is to help protect community drinking water sources through the management of land and water use and the deposit of waste into the environment. A licence defines how much raw water a community can take and how to dispose of waste so it does not harm water bodies.

Water licences are a regulatory requirement and are issued by one of five water boards in the NWT: the NWT Water Board, the Sahtu, Gwich'in, Wek'èezhìi or Mackenzie Valley land and water boards. AANDC resource management officers inspect the water, wastewater and solid waste facilities to make sure water licence requirements are followed. Some requirements include annually reporting water use and sewage disposal volumes, sampling sewage effluent and landfill leachate, reporting sampling results and spills and developing operations and maintenance manuals. Water boards have been working closely with community governments on compliance with the terms and conditions of their water licence. The Mackenzie Valley Land and Water Board recently published *Guidelines for Developing a Waste Management Plan* which will be very helpful for those communities who need, or are in the process of, developing their plans.

Communities are required to have a water licence under the federal *Northwest Territories Waters Act*. The Hay River Reserve is exempt because they use the water and waste facilities in Hay River, and Kakisa is exempt because they are too small to need a water licence. The tables on pages 10 and 11 show which communities have existing water licences, which communities do not have water licences, and those pending the approval of the land and water boards. Communities that do not need a water licence are listed as N/A (not applicable).

Since 2006, MACA has been providing funding to community governments for water licence application development. Priority is given to communities that do not have an existing water licence, but funding has been provided to communities that were submitting water licence renewal applications. Ten communities received funding for water licence applications and renewals since 2006.

It is anticipated that Łutselk'e, Wrigley, Jean Marie River and Trout Lake will be submitting water licence applications as a part of an upcoming water treatment plant upgrade project that the GNWT is managing.

Drinking Water Quality Sampling Requirements

It is hard to determine the quality of water simply by looking at it; therefore, sampling and testing are required to understand its quality and the necessary treatment required to make it safe for consumption. In the NWT, the chief public health officer is provided authority under the *Water Supply System Regulations* to direct operators and owners of public drinking water systems to conduct and perform sampling and testing. The NWT drinking water sampling and testing requirements include both raw and treated water. A summary table listing the sampling requirements can be viewed on page 9 or on the HSS website at:

http://www.hlthss.gov.nt.ca/pdf/brochures_and_fact_sheets/environmental_health/2007/english/nwt_drinking_water_sampling_and_testing_requirements.pdf.

Handheld Testing Equipment
Turbidimeter (measures turbidity)
DR890 (measures chlorine, iron, manganese and more)

OnlineTurbidimeter
Service Scatter (measures high level turbidity)

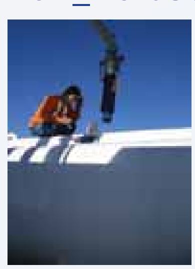
Testing Raw Water Quality

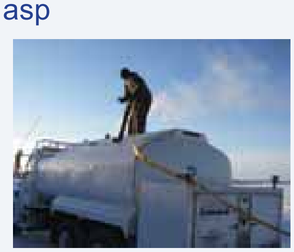
Regular testing of raw water is required to monitor any changes of the source water that could potentially affect the treatment systems. HSS requires daily testing for turbidity and as required other site specific parameters, monthly bacteriological testing, and annual chemical testing of the raw water. Community governments are responsible for daily raw water testing and monthly bacteriological testing. Environmental health officers that enforce the *Public Health Act* and *Water Supply System Regulations* collect the annual chemical samples to ensure consistency in sample collection. Raw and treated water quality data can be used to determine how well the water treatment process is working.

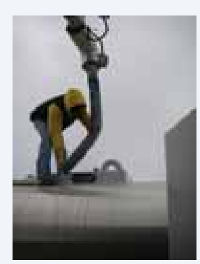
Communities that receive their water from other communities are not required to take raw water bacteria samples. Communities that only add chlorine to the water and do not have any other treatment, do not need to take raw water chemical samples because there is no treatment process in place to alter the water quality.

Treated chemical water quality data collected in 2010 is summarized in a table on page 12 and 13. Recent and historical water quality data can be viewed on the public water quality database at:

http://www.maca.gov.nt.ca/operations/water/WaterQ_Main_MenuSQL.asp







Filling Water Trucks

Making Drinking Water Safe

Water Treatment Plant Upgrades

In conjunction with the Government of Canada Municipal and Rural Infrastructure Fund, the Government of the Northwest Territories entered into a bundled design build contract to construct five WTPs in the communities of Behchokǫ̀ (Edzo), Délı̨ne, Tuktoyaktuk, Aklavik and Ulukhaktok. As of March 22, 2010, this project was substantially complete. All five WTPs are currently producing water that meets or exceeds the Guidelines for Canadian Drinking Water Quality.

Four of the five plants have been officially transferred over to the community governments where they now own, operate and maintain the water treatment facilities. This project included an advanced operator training program that continues to provide training and troubleshooting support on an ongoing basis for community governments during the two year warranty period.

As part of the commitment by the GNWT and community governments, another similar project is underway which will see the construction and implementation of five new WTPs in the communities of Fort Good Hope, Łutselk’e, Trout Lake, Jean Marie River and Wrigley.

Contract negotiations were complete on November 24, 2010, with all five plants scheduled to be constructed and fully operational by March 31, 2014. Łutselk’e and Jean Marie River will be the first to see their WTP’s installed.

The Government of Canada has contributed significantly to this project as Building Canada Funding plays a major role in financing the construction of each water treatment plant. The remaining funding will be provided by the community governments and the GNWT.

Water Treatment Plants (Left to Right): Jean Marie River, Łutselk’e, Wrigley, Trout Lake, and Fort Good Hope

The GNWT departments of Public Works and Services and Municipal and Community Affairs are teaming up to provide project management, training and commissioning support for the second bundled project.

Mackenzie River

Exclusion from Filtration in the NWT

Typically, filtration is part of the treatment process, along with chlorination, to ensure drinking water is free of harmful microorganisms. However, filtration systems can be difficult and expensive to operate. Alternatively, with approval from HSS, an exclusion from filtration can be granted if a source water is relatively clean and considered a pristine source, and the design calls for the use of two disinfectants. This dual disinfectant method has been approved in Ulukhaktok and Délı̨ne where the source water is pristine. The new water treatment plants in Ulukhaktok and in Délı̨ne are using ultraviolet (UV) disinfection followed by chlorination. UV is very effective at inactivating protozoa microorganisms (*Giardia* and *Cryptosporidium*) and is very good against bacteria as well. Chlorine is very effective against viruses and bacteria and has the added advantage of leaving a residual amount in the water to prevent recontamination in the distribution system. This can be as effective and safe as filtration with chlorination.

Ultraviolet Reactor: Ulukhaktok

UV Lamp

Water Plant Operator Certification

The GNWT approved *Water and Wastewater Operator Certification Guidelines* in 2006. The guideline set standards for classifying water treatment plants and certifying water treatment plant operators.

In the NWT there are four different water treatment plant classifications: Small Systems, Class I, Class II and Class III. Classifications are based on a number of criteria, some of which include: type of treatment, source water quality, and the chemicals used in the treatment process. Individual plant classifications are provided in the table on page 10 and 11.

Operator certification became mandatory on April 1, 2010, with the adoption of *Water Supply System Regulations*. The GNWT Water and Wastewater Certification Committee has approved an option for restricted certification of operators. Restricted certification may be issued on a case by case basis by the certification committee to an operator who was able to meet some, but not all, of the certification components. It is the responsibility of the operator to apply for restricted certification. With the letter requesting restricted certification, the operator and their employer must identify a plan for him/her to reach full certification. If the certification committee awards restricted certification it will be non-transferrable, limiting the operators certification to their own facility. These changes are reflected in the updated guideline.

The level of certification required by an operator is dependent on the water treatment plant classification. If an operator is running a Class II water treatment plant then they must maintain a Class II certification. Achieving certification involves both a written exam on which an operator must receive 70% in order to pass, and work experience.

Certification of an operator is issued for two year periods, and in order to renew/maintain certification the operator must obtain two continued education units (CEUs) within the two year period they are certified. A list of approved CEUs is provided in the certification guidelines.

What Are CEUs?

CEUs provide a measurement on how much training and education an individual has received. CEUs are quite often required annually for professions where a licence or certification is required and the individual has to be continually educated about new technologies and changing information. Water treatment plant operators qualify as a position in the NWT that requires CEUs.

Generally 0.1 CEU is awarded for each contact hour of participation in an organized training session under responsible sponsorship and qualified instruction as approved by the certification committee. CEUs can also be awarded as a flat rate instead of per hour.

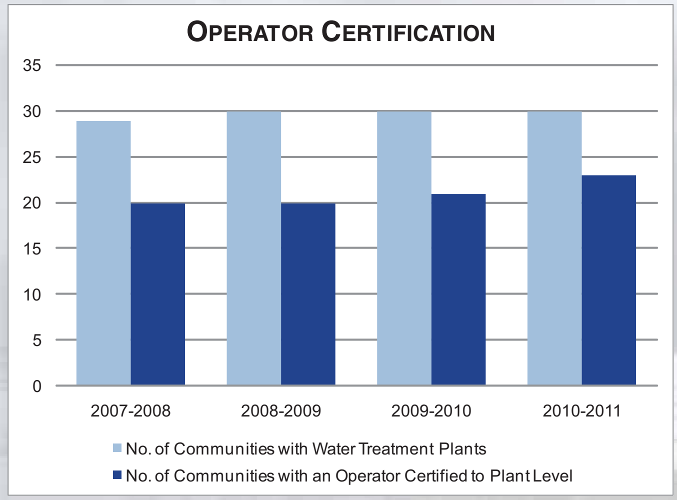
The overall goal of the GNWT is to have operators and back-up operators in every plant that are certified to the required level. The ongoing challenge in the NWT is the high rate of operator turnover, and more recently, the increase in the classifications of water treatment systems as a result of the required upgrades to the systems to meet the Guidelines for Canadian Drinking Water Quality. Continuous training and hands-on assistance is necessary and is offered by the GNWT on an ongoing basis. (see the table on page 7 for certified operator numbers).

How Do Operators Get CEUs?

There are a variety of training programs operators can attend to receive CEUs; some examples include classroom training, safety meetings, water conferences and onsite training.

WTP Operator Certification Requirements

Level	Exam Score	Education	Plant Experience	Equivalent Experience
Small Systems	70%	Grade 8 or Equivalent	6 months	There are minimum education requirements for the different levels of WTPs; however, equivalencies are accepted as per the Operator Certification Guidelines.
Class I	70%	Grade 12 or Equivalent	1 year	
Class II	70%	Grade 12 or Equivalent	2 years	
Class III	70%	Grade 12 or Equivalent	3 years	



Since 2002, MACA's School of Community Government has been responsible for delivering the operator certification program. The Water and Wastewater Program consists of eight courses now offering instruction in the areas of water treatment, water distribution, wastewater treatment and collection, and solid waste management.

Six courses were offered from the Water and Wastewater Program in 2009-2010, with a total of 41 participants and 60 participants in 2010-2011. There are six courses scheduled for 2011-2012 and it is anticipated that registration will increase as a result of the requirements for mandatory certification.

In 2010-2011, hands-on water quality sampling equipment and chlorine injection pumps were purchased for use in the delivery of the operator certification courses. This equipment will be used to introduce a hands-on component into the courses in 2011-2012.

Support Material for Operators

The Operators' Corner website was developed to give operators easier access to operations and maintenance information. Some information available on the website includes:

- Water quality sampling instructions
- Log sheets for regular operations and maintenance tasks
- Training and certification information
- Safety and emergency response checklists and information
- Standard operating procedures

Information is continuously updated and there will be some new additions to the website in 2011. To visit the Operators' Corner go to:

http://www.maca.gov.nt.ca/operations/water/opCorner.htm

In 2011, training videos that walk operators through the daily chlorine, turbidity and bacteriological sampling, were produced and will be distributed to all water treatment plants this year.

Public Awareness

The GNWT has been working towards increasing public awareness of drinking water safety through numerous different programs. The department of ENR has been public with their Water Strategy, and as part of the Interdepartmental Water and Waste committee the departments of HSS and MACA have been developing material for the public through videos and pamphlets. The household water tank cleaning video was initially circulated in 2009-2010, and is still available to be shipped upon request to any resident of the NWT. A public service announcement to raise awareness of the requirement to clean household water tanks is aired during the summer months on CBC's *Northbeat*.

Soon to be released in 2011 is a public awareness video titled "*Chlorine: How It Works and Why We Use It*". The video was produced to inform the public of the importance of the use of chlorine as a disinfectant in the water treatment process.

These videos are all available for viewing on HSS's YouTube channel:

http://www.youtube.com/user/HSSCommunications

What is routinely called the most significant public health measure in the last 100 years? Vaccination against deadly diseases like small pox? Blood transfusions? The 'miracle drug' penicillin?

The answer may surprise you, for more than a hundred years it has quietly saved millions of lives and made it possible for populations to grow and thrive. It's name... CHLORINE!

Summary Table - Drinking Water Sampling and Testing

Parameter	Raw Water	Treated Water
Bacteriological *E. coli* and total coliforms (presence/absence test)	One sample per month, upstream of the water treatment process.	Minimum four samples per month and one additional sample per month for every 1,000 in population over 4,000. Samples should be taken every week. *Piped Water Distribution* - At least one sample taken immediately after treatment, with the remaining samples taken from different locations in the distribution system. *Trucked Water Distribution* - At least one sample must be taken from each water truck in use that month, with the remaining samples taken from different public buildings.
Chlorine	Not applicable.	Plants with treated water storage should test using on-line continuous monitoring and must maintain a free chlorine residual of at least 0.2 mg/L after 20 minutes. Plants without water storage (truck-fill) must test a minimum of three times per delivery day and must have a free chlorine residual of at least 0.4 mg/L after 20 minutes.
Turbidity	One sample per day, upstream of the water treatment process.	Where practical, on-line continuous monitoring downstream of the treatment process is required. Where online monitoring is not practical, grab samples may be taken; one sample per delivery day plus one additional sample every four hours of plant operation.
Trihalomethanes (THMs)	Not applicable.	Quarterly samples are required with a minimum of four samples per year. Environmental health officers can assist with sampling.
Chemical and Physical Parameters	If disinfection, i.e. chlorination/UV light, is the only water treatment process, then raw water samples are not required. Otherwise, one sample per year of the 28 parameters listed below is required.	One sample per year is required for each of the 28 parameters listed below. Environmental health officers can assist with sampling.

1. Alkalinity	5. Cadmium	9. Copper	13. Nitrate	17. pH	21. Total Hardness	25. TSS (Total Suspended Solids)
2. Aluminum	6. Chloride	10. Cyanide	14. Lead	18. Selenium	22. TDS (Total Dissolved Solids)	26. Turbidity
3. Arsenic	7. Chromium	11. Fluoride	15. Manganese	19. Sodium	23. TOC (Total Organic Carbon)	27. Uranium
4. Barium	8. Colour	12. Iron	16. Mercury	20. Sulphate	24. DOC (Dissolved Organic Carbon)	28 Zinc

Community	Water Source	Water Licence	Certified Operator	Certified Backup Operator	Treated Water Bacteria Tests (52 required) (216 for Yellowknife)	
					2009	2010
Aklavik	Mackenzie River (Peel Channel)	✓	✓	×	54	60
Colville Lake	Colville Lake	✓	✓	×	BWA	BWA (3)
Déline	Great Bear Lake	✓	×	×	31	60
Dettah	Yellowknife River	✓	N/A		0	13
Behchokǫ̀ (Edzo)	Frank Channel	✓	✓	×	96	42
Behchokǫ̀ (Rae)	Marian Lake	✓	✓	×	81	64
Enterprise	Town of Hay River	×	N/A		N/A	
Fort Good Hope	Mackenzie River	✓	✓	×	40	48
Fort Liard	Groundwater Well	✓	✓	×	97	109
Fort McPherson	Deep Water Lake	✓	✓	✓	45	47
Fort Providence	Mackenzie River	✓	✓	×	35	122
Fort Resolution	Great Slave Lake	✓	✓	×	31	57
Fort Simpson	Mackenzie River	✓	✓	✓	56	60
Fort Smith	Slave River	✓	✓	✓	56	56
Gamètì	Rae Lake	✓	×	×	200	93
Hay River	Hay River	✓	✓	✓	51	107
Hay River Reserve	Town of Hay River	N/A	N/A		65	54
Inuvik	Mackenzie River and 3 mile Lake/Hidden Lake	✓	✓	✓	54	76
Jean Marie River	Jean Marie River or Mackenzie River	×	✓	✓	22	36
Kakisa	Town of Hay River	N/A	N/A		N/A	
Łutselk'e	Great Slave Lake	×	×	×	31	10
Nahanni Butte	Groundwater Well	×	✓	×	18	16
Norman Wells	Mackenzie River	✓	✓	×	63	111
Paulatuk	New Water Lake	✓	×	×	46	48
Sachs Harbour	DOT Lake	✓	×	×	23	23
Trout Lake	Trout Lake	×	✓	×	5	20
Tsiigehtchic	Tso Lake	✓	✓	×	41	38
Tuktoyaktuk	Kudlak Lake	✓	✓	✓	43	63
Tulita	Great Bear River	✓	✓	×	31	44
Ulukhaktok	RCAF Lake	✓	✓	×	41	44
Wekweètì	Snare Lake	✓	✓	×	32	63
Whatì	Groundwater Well	✓	×	×	132	176
Wrigley	Groundwater Well	×	×	×	11	14
Yellowknife	Yellowknife River	✓	✓	✓	393	503

Treated Water Chemical Tests (1 required)		Plant Classification	Water Treatment Process
2009	2010		
1	1	Class II	Conventional (Coagulation, Flocculation, Sedimentation and Filtration), Chlorination and Storage
1	1	Small System	Cartridge Filtration, Chlorination, Storage
2	1	Small System	Cartridge Filtration, UV, Chlorination, Storage
N/A		N/A	Chlorination
1	1	Class II	Conventional (Coagulation, Flocculation, Sedimentation and Filtration), Chlorination and Storage
1	1	Class II	Conventional (Coagulation, Flocculation, Sedimentation and Filtration), Chlorination and Storage
N/A		N/A	see Town of Hay River
1	1	Small System	Chlorination
0	3	Class I	Potassium Permanganate Assisted Greensand Filtration, Softening, Chlorination, Storage
1	1	Class II	Conventional (Coagulation, Flocculation, Sedimentation and Filtration), Chlorination and Storage
2	0	Class II	Conventional (Coagulation, Flocculation, Sedimentation and Filtration), Chlorination and Storage
1	1	Class II	Conventional (Coagulation, Flocculation, Sedimentation and Filtration), Chlorination and Storage
0	0	Class II	Conventional (Coagulation, Flocculation, Sedimentation and Filtration), Chlorination and Storage
1	1	Class III	Upflow Clarifier, Filtration, Chlorination, Storage
1	1	Small System	Chlorination
1	0	Class II	Conventional (Coagulation, Flocculation, Sedimentation and Filtration), Storage and Chlorination
N/A		Small System	See Town of Hay River + Rechlorination
1	2	Class I	Sand Filtration, Chlorination, Fluoride, Storage
1	1	Small System	Chlorination
N/A		N/A	see Town of Hay River
1	1	Small System	Chlorination
1	0	Class I	Potassium Permanganate Assisted Greensand Filtration, Softening, Chlorination, Storage
1	1	Class II	Conventional (Coagulation, Flocculation, Sedimentation and Filtration), Chlorination and Storage
1	1	Small System	Chlorination
1	1	Small System	Cartridge Filtration, Chlorination
1	1	Small System	Chlorination
1	1	Class I	Nano-Filtration, Chlorination, Storage
1	1	Class I	Pressure Filtration, UV, Chlorination, Storage
0	1	Class I	Micro-Filtration, Chlorination, Storage
1	1	Small System	Pre-Filter, UV, Chlorination, Storage
1	1	Small System	Chlorination
1	1	Class I	Potassium Permanganate Assisted Greensand Filtration, Softening, Chlorination, Storage
1	0	Small System	Storage and Chlorination
1	2	Class I	Chlorination, Fluoridation, Storage

Community	Aluminum	Arsenic	Barium	Cadmium	Chloride	Chromium	Colour	Copper	Cyanide	Fluoride	Iron
Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	TCU	mg/L	mg/L	mg/L	mg/L
IMAC											
MAC		0.01	1.0	0.005		0.05			0.2	1.5	
AO	0.1/0.2				<=250		<=15	<=1.0			<=0.3
Aklavik	0.06	<0.0002	0.06	<0.00005	9	<0.01	<2	0.013	<0.0001	0.08	<0.06
Behchokǫ̀ (Edzo)	<0.04	0.0097	0.02	0.000009	25	<0.01	<2	0.19	<0.001	0.13	<0.06
Behchokǫ̀ (Rae)	<0.04	0.0008	0.02	0.000022	3	<0.01	<2	0.073	<0.001	0.06	<0.06
Colville Lake	0.07	0.0005	0.05	0.00001	6		3	0.061	0.002	0.07	0.32
Délı̨ne	0.28	0.0007	0.02	0.000079	6	<0.01	<21	0.0056	<0.0001	0.13	<0.06
Fort Good Hope	0.04	0.0002	0.07	0.000005	14		5	0.077		0.1	0.07
Fort Liard	0.01	<0.0005	0.622	<0.002	11	<0.002	20	<0.002	<0.01	0.13	0.813
Fort McPherson	0.13	<0.0002	0.05	<0.0005	5	<0.01	13	0.027	<0.001	0.06	<0.06
*Fort Providence	0.22	<0.0004	0.0488	<0.0001	10		<2	0.0088	<0.002	0.05	0.029
Fort Resolution	0.23	0.0012	0.04	0.000013	10			0.0046	0.0029		0.23
*Fort Simpson	0.263	<0.2	0.048	<0.0005	11.5		<5	0.0036	<0.002	<0.1	<0.05
Fort Smith	0.031	<0.0002	0.038	<0.00005	11.7	<0.0001	<5	0.0011	<0.002	0.5	<0.005
Gamètì	<0.04	0.0005	0.02	<0.00005	8	<0.01	2	0.0068	<0.0001	0.14	<0.06
*Hay River	0.0577	<0.0002	0.0434		10.6		6		<0.002	<0.1	
Inuvik	0.016	0.0006	0.045	<0.00001	9.2	<0.0005	15	0.024		0.52	0.13
Jean Marie River	<0.04	0.0004	0.04	0.00001	4	<0.01	13	0.013	<0.001	0.06	0.1
Łutselk'e	0.013	0.0005	0.04	0.000006	11	<0.001	<2	0.0044	<0.001	0.06	<0.06
*Nahanni Butte	<0.04	0.0002	0.29	0.000008	8	<0.01	<2	0.0017	<0.001	0.14	<0.06
Norman Wells	0.042	0.0003	0.03	0.000005	10	<0.01	<2	0.028	<0.001	0.1	<0.06
Paulatuk	0.008	0.0015	0.05	0.000005	9	<0.01	<2	0.42	0.0001	<0.05	<0.06
Sachs Harbour	<0.04	0.0003	0.12	0.000021	130	<0.01	2	0.11	<0.001	0.12	<0.06
Trout Lake	<0.04	0.0004	0.01	0.000023	3	<0.01	7	0.0094	<0.001	<0.05	<0.06
Tsiigehtchic	<0.04	<0.0002	0.02	0.000005	3	<0.01	<2	0.013	<0.001	0.005	<0.06
Tuktoyaktuk	<0.04	0.0009	0.19	0.000011	33	<0.01	4	0.013	0.002	0.14	<0.06
Tulita	0.015	0.0013	0.03	0.000007	6	<0.001	<2	0.053	<0.001	0.1	<0.06
Ulukhaktok	<0.04	0.0003	<0.01	<0.00005	18	<0.01	<2	0.0018	<0.001	0.2	<0.06
Wekweètì	<0.4	<0.0002	<0.01	<0.00005	1	<0.01	6	0.025	<0.001	0.06	<0.06
Whatì	0.002	0.0015	0.27	0.00008	13	<0.001	10	0.0049	<0.001	0.31	<0.06
*Wrigley	0.012	0.0004	<0.01	0.0000018	62	0.001	<2	0.0027	0.002	0.64	<0.06
Yellowknife	0.0462	0.0005	0.0047	<0.00005	5.3	0.0002	17	0.0534	<0.002	0.5	0.041

*** 2010 Samples not collected - results shown are from chemical samples collected in 2009**

IMAC - Interim Maximum Acceptable Concentration **MAC - Max**

Lead	Manganese	Mercury	Nitrate	pH	Selenium	Sodium	Sulphate	TDS	THM	Turbidity	Uranium	Zinc
mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	NTU	mg/L	mg/L
											0.02	
0.01		0.001	45		0.01				0.1	0.1/0.3/1.0		
	<=0.05			6.5-8.5		<=200	<=500	<=500				<=5
0.0003	<0.004	0.00006	0.18	7.85	0.0004	8.9	861	228	0.02	0.4	0.0001	0.012
<0.0002	0.19	<0.002	0.18	7.72	0.0009	12	41	164	0.058	0.1	<0.0001	0.011
0.0002	<0.004	<0.0002	<0.01	7.25	<0.0002	8.8	42	84	0.02	<0.1	<0.0001	0.019
0.0046	0.015		0.021	7.72		5.9	12	100	0.009	0.5	0.0005	0.022
0.001	<0.004	0.000005	0.63	7.22	<0.0002	5	18	86	0.006	0.2	0.0003	0.016
0.0007	0.011		0.028	8.06		12	39	140	0.031	0.7	0.0007	0.015
0.0002	0.015	<0.0005	<0.05	7.78	<0.0010	20	25	360		4.1	<0.100	0.016
0.0005	<0.004	<0.005	0.17	7.31	<0.0002	5.5	7	57	0.029	0.2	<0.0001	0.016
0.0003		<0.0002	<0.05	7.8		10	49.2	177	0.02	0.6	0.0001	<0.002
0.0004		0.006		6.97		7.92	51	124	0.02	6.9	0.0003	0.023
<0.0001		<0.0002	0.03	7.77		12.3	37	150	0.045	0.56	0.0001	0.0004
<0.0001	0.0044	<0.0001	0.14	8.1	<0.0003	11.9	21	140	0.017	0.08	<0.0001	0.0008
0.0002	<0.004	0.004	<0.01	8.12	<0.0002	5	43	174	0.01	0.7	0.0012	0.015
			0.04	7.59		7.6	21	151	0.101	0.64		
0.0002	0.053	<0.0001	0.01	7.79	<0.0002	4.6		120	0.09	1.3	<0.0005	0.007
0.0003	<0.004	<0.002	<0.01	8.19	<0.0002	5	7	102	0.054	0.6	0.0001	0.023
<0.0002	<0.004	0.000001	0.65	7.09	<0.0002	8.9	21	120	0.01	0.2	0.0004	0.005
<0.0002	<0.004	0.0000066	0.03	7.96	<0.0002	9.1	5	370	0.005	0.1	0.0026	0.004
<0.0002	<0.004	<0.00001	0.72	7.21	<0.0002	8	33	130	0.023	0.2	0.0002	0.006
0.0003	<0.004	0.000002	0.08	7.42	<0.0002	5.6	881	290	0.011	0.2	<0.0001	0.008
0.0004	<0.004	<0.00005	0.008	8.09	<0.0002	26	611	570	0.024	0.4	0.0005	0.017
<0.0002	<0.004	<0.00002	<0.1	7.93	<0.0002	2.9	1	64	0.047	0.3	<0.0001	0.005
0.0007	<0.004	<0.000002	<0.01	7.71	<0.0002	1.8	<1	47	0.018	<0.1	<0.0001	0.014
0.0007	<0.004	0.00002	<0.003	7.4	<0.0002	17	15	170	0.039	0.4	0.0002	0.01
0.0004	<0.004	<0.00001	0.8	7.33	<0.0002	4.8	19	120	0.009	0.3	0.0003	0.003
<0.0002	<0.004	<0.000005	0.004	8.14	0.0002	12	10	180	0.043	0.2	<0.0001	<0.003
<0.0002	0.006	<0.0005	0.07	6.65	<0.0002	2	0.6	<50	0.018	0.4	<0.0001	0.013
0.0004	0.029	0.000002	0.04	8.21	<0.0002	23	28	346	<0.02	0.3	0.0003	0.011
<0.0002	0.19	<0.00001	<0.01	8.27	<0.0002	130	170	610	<0.02	0.7	0.0036	0.043
0.0001	0.0027	<0.00001	0.07	6.71	<0.0005	1.7	4	32		2.02	0.00002	0.0019

imum Acceptable Concentration

AO - Aesthetic Objective

Aluminum - A health-based guideline or AO has not been established for aluminum in drinking water. The number provided is an operational guideline value, designed to apply only to water treatment plants using aluminum-based coagulants. For plants using aluminum-based coagulants, operational guidance values of less than 0.1 mg/L (100 µg/L) total aluminum for conventional treatment plants and less than 0.2 mg/L (200 µg/L) total aluminum for other types of treatment systems (e.g., direct or in-line filtration plants, lime softening plants) are recommended. These values are based on a 12-month running average of monthly samples. Aluminum is the most abundant metal on earth, comprising about 8% of the earth's crust. It is found in a variety of minerals. Aluminum is also found as a normal constituent of soil, plants and animal tissues.

AO - Aesthetic Objective. A maximum concentration, set in the Guidelines for Canadian Drinking Water Quality, above which water is considered unpleasant because of taste, odour, colour, tendency to build up scale, etc. Does not affect human health.

Arsenic - The MAC for arsenic in drinking water is 0.01 mg/L. Levels of arsenic in natural waters generally range between 0.001 and 0.002 mg/L. Sources of arsenic in ambient air are the burning of fossil fuels (especially coal), metal production, agricultural use and waste incineration. Arsenic is introduced into water through the dissolution of minerals and ores, from industrial effluents and via atmospheric deposition. Natural sources, such as the dissolution of arsenic-containing bedrock, often contribute significantly to the arsenic content of drinking water and groundwater.

Barium - The MAC for barium in drinking water is 1.0 mg/L (1000 µg/L). Barium is present as a trace element in both igneous and sedimentary rocks. Although it is not found free in nature, barium occurs in a number of compounds, most commonly barite ($BaSO_4$) and, to a lesser extent, witherite ($BaCO_3$).

Cadmium - A MAC of 0.005 mg/L (5 µg/L) for cadmium in drinking water has been established on the basis of health considerations. Cadmium is a silvery-white, lustrous, but tarnishable metal; it is soft and ductile and has a relatively high vapour pressure. It closely resembles zinc and occurs by isomorphous replacement in almost all zinc ores. Most commonly it is found as the sulphide, also known as greenockite or cadmium blend, which is often associated with the zinc ore, sphalerite (ZnS).

Chloride - An AO of 250 mg/L has been established for chloride in drinking water. At concentrations above the aesthetic objective, chloride imparts undesirable tastes to water and to beverages prepared from water and may cause corrosion in the distribution system. Chloride is widely distributed in nature, generally as the sodium (NaCl) and potassium (KCl) salts. By far the greatest amount of chloride found in the environment is in the oceans. The presence of chloride in drinking water sources can be attributed to the dissolution of salt deposits, salting of highways to control ice and snow, effluents from chemical industries, oil well operations, sewage, irrigation drainage, refuse leachates, volcanic emanations, sea spray and seawater intrusion in coastal areas. Each of these sources may result in local contamination of surface water and groundwater. Chloride is generally present at low concentrations in natural surface waters in Canada; concentrations are normally less than 10 mg/L and often less than 1 mg/L.

Chromium - A MAC of 0.05mg/L for Chromium in drinking water has been established on the basis of health considerations. Trivalent chromium, the most common natural state of chromium, is essential in humans and animals for efficient lipid, glucose and protein metabolism. It is considered to be non-toxic; however, if it is present in raw water, it may be oxidized to hexavalent chromium during chlorination. Concentrations of total chromium in drinking water are normally well below the MAC.

Colour - Colour in drinking water may be due to the presence of coloured organic substances, metals such as iron, manganese and copper or highly coloured industrial wastes. Although presence of colour in drinking water is not directly related to health, experience has shown that consumers may turn to alternative, possibly unsafe sources, if their drinking water contains aesthetically displeasing levels of colour. The AO for colour is 15 or less TCU (total colour units).

Copper - The AO for copper in drinking water is ≤1.0 mg/L; this was set to ensure palatability and to minimize staining of laundry and plumbing fixtures. Copper is an essential element in human metabolism, and deficiencies result in a variety of clinical disorders, including nutritional anemia in infants. Although the intake of large doses of copper has resulted in adverse health effects, the levels at which this occurs are much higher than the aesthetic objective. Copper occurs in nature as the metal and in minerals.

Cyanide - Because cyanide is toxic to humans, a MAC of 0.2 mg/L (200 µg/L) for free cyanide in drinking water has been set. Cyanides may be released into the aquatic environment through waste effluents from the organic chemical and from various industries such as gold mining. Representative data suggest that Canadian drinking water has very low concentrations (<100 µg/L) of cyanide. Contamination through industrial spillage or transport accidents could result in high cyanide levels in raw water supplies.

Fluoride - The MAC for fluoride in drinking water is 1.5 mg/L. Fluoride-containing compounds are employed in the artificial fluoridation of drinking water for the prevention of dental cavities. Fluoride can occur naturally in surface waters. Groundwater can also contain high concentrations of fluoride owing to leaching from rocks. Fluoride can be present in plant and animal tissues.

IMAC - Interim Maximum Acceptable Concentration. The Guidelines for Canadian Drinking Water Quality (GCDWQ) recommend maximum acceptable concentrations (MACs) of contaminants that affect human health. Where the recommended MAC is less than can be reliably measured or achieved by existing water treatment technology, an “interim MAC” is developed and a recommendation is made to improve existing analytical or water treatment methods.

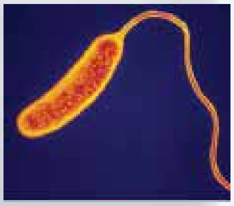
Iron - The AO for iron in drinking water is <=0.3 mg/L (<300 µg/L). Iron is the fourth most abundant element in the earth’s crust and the most abundant heavy metal; it is present in the environment mainly as Fe(II) or Fe(III). The concentrations of iron in Canadian surface waters are generally below 10 mg/L. Iron is generally present in surface waters as salts containing Fe(III) when the pH is above 7. Most of those salts are insoluble and settle out or are adsorbed onto surfaces; therefore, the concentration of iron in well-aerated waters is seldom high. Under reducing conditions, which may exist in some groundwaters, lakes or reservoirs, and in the absence of sulphide and carbonate, high concentrations of soluble Fe(II) may be found. The presence of iron in natural waters can be attributed to the weathering of rocks and minerals, acidic mine water drainage, landfill leachates, sewage effluents and iron-related industries.

Lead - The MAC for lead in drinking water is 0.010 mg/L (10 µg/L). It is recommended that faucets be flushed before water is taken for analysis or consumption. Lead is present in tap water as a result of dissolution from natural sources or from household plumbing systems containing lead in pipes, solders or service connections to homes. The amount of lead from the plumbing system that may be dissolved depends upon several factors, including the acidity (pH), water softness and standing time of the water, etc.

Manganese - The AO for manganese in drinking water is 0.05 mg/L (50 µg/L). The presence of manganese in drinking water supplies may be objectionable for a number of reasons. At concentrations above 0.15 mg/L, manganese stains plumbing fixtures and laundry and produces undesirable tastes in beverages. As with iron, the presence of manganese in water may lead to the accumulation of microbial growths in the distribution system. Even at concentrations below 0.05 mg/L, manganese may form coatings on water distribution pipes that may form black precipitates. The element manganese is present in over 100 common salts and mineral complexes that are widely distributed in rocks, in soils and on the floors of lakes and oceans. Manganese is most often present as the dioxide, carbonate or silicate.

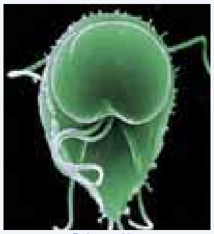
MAC - Maximum Acceptable Concentration. The Guidelines for Canadian Drinking Water Quality (GCDWQ) recommend maximum acceptable concentrations of contaminants that affect human health.

Pathogens - There are many micro-organisms on earth and many are not harmful; however, some micro-organisms can be a threat to human life. Pathogens are micro-organisms that cause disease. In addition to the chemical tests collected annually, we also test for the presence of total coliforms and e.coli as an indication of the safety of our drinking water supply.



Cholera

Cryptosporidium



Giardia
"Beaver Fever"

Mercury - Mercury is a toxic element and serves no beneficial physiological function in man; a MAC of 0.001 mg/L (1 µg/L) in drinking water has therefore been established. The presence of mercury in water has become a source of concern because of the finding that organic mercury is bio-concentrated by fish. Elevated mercury levels have been found in all freshwater fish taken from areas with suspected mercury contamination and frequently render the fish unacceptable for human consumption. Long-term daily ingestion of approximately 0.25 mg of mercury as methyl mercury has caused the onset of neurological symptoms; however, even in heavily polluted Canadian waters, mercury concentrations rarely exceed 0.03 mg/L. The MAC for mercury therefore provides a considerable margin of safety. Mercury levels in both surface water and tap water are generally well below the MAC.

Nitrate - The MAC for nitrate in drinking water is 45 mg/L. (In cases where nitrite is measured separately from nitrate, the concentration of nitrite should not exceed 3.2 mg/L.) Nitrate (NO_3) and nitrite (NO_2) are naturally occurring ions that are ubiquitous in the environment. Both are products of the oxidation of nitrogen (which comprises roughly 78% of the atmosphere) by micro-organisms in plants, soil or water and, to a lesser extent, by electrical discharges such as lightning. Nitrate is the more stable form of oxidized nitrogen but can be reduced by microbial action to nitrite, which is moderately reactive chemically.

pH - An acceptable range for drinking water pH is from 6.5 to 8.5. Water with a pH below 6.5 is considered acidic and may cause corrosion. Water with a pH above 8.5 is considered basic, and may result in incrustation and scaling problems. As pH increases, there is a progressive decrease in the efficiency of the chlorine disinfection process.

Selenium - The MAC for selenium in drinking water is 0.01 mg/L based on health considerations. Food is the main source of selenium for people who are not occupationally exposed; thus, toxic effects have most often been associated with food. A safe and adequate range of selenium intake of 0.05 to 0.2 mg per person per day has been recommended for adults, with correspondingly lower ranges for infants and children. Drinking water containing selenium at the MAC would be the source of between 10 and 25 percent of total selenium intake; the MAC provides a reasonable factor of safety from adverse effects of selenium. Selenium is not considered a contaminant of concern in the Northwest Territories.

Sodium - The AO for sodium in drinking water is ≤200 mg/L. The taste of drinking water is generally considered offensive at sodium concentrations above the aesthetic objective. Sodium is not considered a toxic element; up to 5 g/day of sodium is consumed by normal adults. Although the average intake of sodium from drinking water is only a small fraction of that consumed in a normal diet, the intake from this source could be significant for persons suffering from hypertension or congestive heart failure who may require a sodium-restricted diet. Sodium is a soft, silvery-white, highly reactive metal that is never found in nature in the uncombined state. Sodium, an alkali-metal element, has a strong tendency to exist in the ionic form. In biological systems and even in solids such as sodium chloride, sodium remains distinctly separate as the sodium ion.

Total *Coliforms* - *Coliforms* are a type of bacteria found throughout the environment. Most *coliforms* are relatively harmless and are easily treated with chlorine. The presence or absence of total coliforms in treated drinking water is an indicator of how well the disinfection process is working. If *coliform* bacteria are found in treated drinking water, the problem is investigated right away, and the water is re-tested. If the problem cannot be corrected a boil water advisory may be issued.

Sulphate - The AO for sulphate in drinking water is ≤500 mg/L, based on taste considerations. Because of the possibility of adverse physiological effects at higher concentrations, it is also recommended that health authorities be notified of sources of drinking water that contain sulphate concentrations in excess of 500 mg/L. Sulphur is a non-metallic element. The three most important sources of sulphur for commercial use are elemental sulphur, hydrogen sulphide (H_2S, found in natural gas and crude oil) and metal sulphides such as iron pyrites. Sulphates occur naturally in numerous minerals, including barite ($BaSO_4$), epsomite ($MgSO_4 \cdot 7H_2O$) and gypsum ($CaSO_4 \cdot 2H_2O$ sulphur, principally in the form of sulphuric acid, is one of the most widely used chemicals in industrialized society. Most sulphur is converted into sulphuric acid.

Trihalomethanes (THMs) - The MAC for total THMs in drinking water is 0.1 mg/L. THMs are the by-products that result when chlorine is mixed with organic particles. If raw water has a lot of organic material, THMs can be produced during disinfection. Drinking water with a lot of THMs over a very long period of time may be linked to cancer, but drinking water that is not disinfected with chlorine is a much bigger health risk.

Total Dissolved Solids (TDS) - An AO of <=500 mg/L has been established for TDS in drinking water. At higher levels, excessive hardness, unpalatability, mineral deposition and corrosion may occur. At low levels, however, TDS contributes to the palatability of water. TDS comprise inorganic salts and small amounts of organic matter that are dissolved in water. The principal constituents are usually the cations calcium, magnesium, sodium and potassium and the anions carbonate, bicarbonate, chloride, sulphate and, particularly in groundwater, nitrate (from agricultural use). TDS in water supplies originate from natural sources, sewage, urban and agricultural runoff and industrial wastewater.

Turbidity - The MAC for turbidity varies with the type of filtration system in operation. For chemically assisted filtration the MAC is 0.3 NTU, for slow sand or diatomaceous earth filtration the MAC is 1.0 NTU, and for membrane filtration the MAC is 0.1 NTU. Turbidity is a "measure of the relative clarity of water." Turbidity in water is caused by suspended and colloidal matter, such as clay, silt, finely divided organic and inorganic matter, plankton and other microscopic organisms. However, turbidity is not a direct measure of suspended particles in the water. It is, rather, a measure of the scattering effect that such particles have on light. A directed beam of light remains relatively undisturbed when transmitted through absolutely pure water, but even the molecules in a pure fluid will scatter light to a certain degree.

Uranium - The IMAC for uranium in drinking water is 0.02 mg/L (20 µg/L). Uranium is present in water supplies as a result of leaching from natural deposits, its release in mill tailings, emissions from the nuclear industry and the combustion of coal and other fuels. Phosphate fertilizers, which may contain uranium at concentrations as high as 150 mg/kg, may also contribute to the uranium content of groundwater.

Zinc - The AO for zinc is 5.0 mg/L. Zinc is an essential element and is generally considered to be non-toxic. Drinking water is not considered an important nutritional source of this element. Water containing zinc at concentrations above 5.0 mg/L tends to be opalescent, develops a greasy film when boiled, and has an undesirable taste. Zinc is an abundant element. The most common zinc mineral is sphalerite (ZnS), which is often associated wth the sulphides of other metallic elements, such as lead, copper, cadmium, and iron. Zinc is not considered to be a contaminant of concern in the Northwest Territories.

Escherichia coli (E. coli) - Of all contaminants in drinking water, human and animal feces present the greatest danger to public health. *E. coli* are naturally occurring fecal coliforms found in human and animal intestines. While the strain of *E. coli* known as *E. coli* 0157:H7, which contaminated the water in Walkerton, Ontario, is very harmful and potentially deadly, most strains of *E. coli* are relatively harmless. The reason *E.coli* is relied on so heavily as a measure is that it is a good indicator of the bacteriological safety of drinking water. It is the only species in the *coliform* group that is exclusively found in the intestinal tract of humans and other warm-blooded animals and it is excreted in large numbers in feces. If *E. coli* is found in the water, it means that the water has been contaminated by human or animal feces that can harbour a number of other pathogenic, or disease causing, organisms. The maximum acceptable concentration (MAC) of *E. coli* in drinking water is zero.

Ensuring Drinking Water Is Safe

The GNWT Circuit Rider Program

In 2010, the GNWT circuit rider program continued its operation to provide hands on training for water treatment plant operators, as well as guidance for community administrations in the development of their drinking water treatment program. The main objective of the circuit rider program is to work with operators in their own facility on operational areas they would like more training in, and to work with them to help them in their efforts to achieve certification to the level of the plant they are operating.

Since 2004, the Northwest Territories has been undergoing water treatment plant upgrades as a result of changes to the Canadian Drinking Water Quality Guidelines. The upgrades to some of the water treatment plants have resulted in a change in the plant classification requiring operators to advance their certification level. In addition, the *Water Supply System Regulations,* enacted in September 2009, require mandatory certification for water treatment plant operators. For these reasons, and because of high operator turn over, an increased emphasis on training and certification is needed and the circuit rider program assists communities to address these requirements.

A circuit rider travels to assigned communities between two and three times a year to provide training. A couple of days are spent in the water plant assisting the operator and evaluating the system. A circuit rider can provide assistance in many areas, some of which include:

- Regulatory sampling and reporting requirements
- Routine maintenance
- Equipment calibrations
- Assistance during boil water advisories
- Water tank cleaning training
- Reservoir fill assistance
- Trouble shooting
- Roles and responsibilties
- Classroom and pre-course preparation for water treatment plant operators certification course

In 2010-2011, sixteen different communities received circuit rider assistance. The communities are listed by region below. It is anticipated that Jean Marie River will be receiving a new water treatment plant in 2011-2012, and as a result Jean Marie River will be added to the list of communities receiving circuit rider training.

North Slave	Beaufort-Delta
Gamètì	Aklavik
Łutselk'e	Fort McPherson
Wekweètì	Paulatuk
Whatì	Sachs Harbour
	Tsiigehtchic
	Tuktoyaktuk
Dehcho	Ulukhaktok
Nahanni Butte	**Sahtu**
Trout Lake	Colville Lake
Wrigley	Délı̨ne

System Reviews

The GNWT water supply system and infrastructure reviews have continued throughout 2009-2010. The reports outline the operations and the physical infrastructure condition of the water treatment plant and distribution system in a community. The reviews identify changes that are needed and suggest ways to upgrade or better maintain the community's water supply system. Reviews are completed every two or three years. In the instance that a new water treatment plant has been constructed or a major upgrade has occurred, reviews are typically performed after the water plant has been operating for a couple of years.

Regional environmental health officers (EHOs) and Aboriginal Affairs and Northern Development Canada (AANDC) resource management officers also do regular water treatment plant inspections. EHOs do public health inspections once every six months, and AANDC officers do annual water licence inspections.

A list of things the EHO inspects during a water treatment plant visit is provided on page 21. AANDC inspection reports are available to the public through the appropriate water board's public registry.

A list of the reviews that were completed in 2010-2011 and the planned reviews for 2011-2012 are provided below. The review process typically involves community government staff, MACA and/or PWS, and the EHO.

2010-2011 Reviews	2011-2012 Planned Reviews
Fort McPherson	Colville Lake
Fort Providence	Délı̨ne
Tulita	Behchokǫ̀ (Rae)
Whatì	Fort Resolution
	Gamètì
	Nahanni Butte
	Sachs Harbour
	Wekweètì

Remote Monitoring Strategy in the NWT

There are 30 community water supply systems across the NWT, all of which operate independently. Some of the difficulties and challenges inherent in operating and maintaining water supply systems, especially with smaller communities, include:

- Remote locations
- Limited resources (such as qualified operators)
- Retaining certified operators

As part of the safe drinking water initiatives, GNWT initiated a pilot project in 2007 to install online water quality analyzers and remote telemetry units to allow EHOs to monitor water quality remotely. The primary driver for continuous online monitoring is regulatory. Online turbidity monitoring is required under the updated Guidelines for Canadian Drinking Water Quality. Online chlorine monitoring may be required in the future.

Remote monitoring systems have the potential to strengthen the multi-barrier approach, reduce human health risks and facilitate more cost effective technical support to community operators.

The following table shows which communities in the NWT have been retrofitted and those that will be considered to have online analyzers and remote monitoring installed this fiscal year.

Fiscal Year	Online Turbidimeter	Online Chlorine Analyser	Remote Monitoring Unit
2009	Fort Providence, Fort Resolution, Fort McPherson, Whatì	Fort Providence, Fort Resolution, Fort McPherson, Whatì	Fort Providence, Fort Resolution, Fort McPherson, Whatì
2010	Colville Lake, Sachs Harbor, Tulita	Colville Lake, Tulita	Colville Lake, Sachs Harbor, Tulita
2011	Gamètì, Wekweètì, Paulatuk		Gamètì, Wekweètì, Paulatuk

Boil Water Advisories

Throughout Canada in any given year there are hundreds of boil water advisories issued. Some of these boil water advisories are in place for a short while and others last a long time. In 2010, the NWT only had one boil water advisory, in Colville Lake.

2009	Colville Lake	Operator Training
	Hay River	Spring Breakup - High Turbidity
	Sachs Harbour	Positive Bacteriological Sample
	Tulita	Spring Breakup - High Turbidity
2010	Colville Lake	Regulatory Sampling

The community of Colville Lake has been under a precautionary boil water advisory since the 1990s, first because they did not have an operating water treatment plant, but more recently because they are not meeting the regulatory sampling obligations. The boil water advisory will remain in place until the EHO is satisfied that the regulatory sampling regime is on track. Assistance has been offered to the community government from the EHO and MACA through the regional office and the circuit rider training program. There will be a continued effort to assist the community to train operators and get the boil water advisory lifted.

Boil Water Advisory

An advisory to the public that all water used for drinking should be boiled for 1 minute. This includes all water used for making infant formula, juices, washing and rinsing vegetables, brushing your teeth and washing your hands.

Plant Spotlight: Fort Resolution

The Hamlet of Fort Resolution draws water from Resolute Bay in Great Slave Lake. Due to the constantly changing turbidity, they require a class 2 coagulation/flocculation (conventional) water treatment plant. The Fort Resolution water treatment plant was built in 2000 and has a Zenon Hydromaster packaged plant that utilizes coagulation/flocculation, clarification and filtration. There are two storage cells underneath the building, for raw and treated water respectively. Remote monitoring equipment has been installed in the treated water cell, with online data logging capability as part of the NWT remote monitoring strategy. The water is then pumped into trucks to be delivered to the community using the truck fill arm on the outside of the building.

Left to Right: Vincent Tam (PWS), CJ Lizotte (Fort Resolution), Linda Carpenter (Fort Resolution), Greg Hamman (MACA)

Interview with Fort Resolution Operator Linda Carpenter

How long have you been a water treatment plant operator?

I have been working in the Fort Resolution water treatment plant for 11 years now. I started in 1990 after attending a training course.

What is your level of certification?

I am certified as a Class II water treatment plant operator. I received my NWT certification through the School of Community Government Water and Wastewater Program.

How long did it take you to achieve this level of Certification?

I was certified within three years of beginning work in the water treatment plant, first taking the Class I course, then the Class II and eventually in my third year I took the small systems course.

What made you want to be a water treatment operator?

I was working for the Hamlet office as a labourer doing all sorts of tasks, even shovelling snow and janitorial, and the SAO at the time, Scotty Edgerton, liked my work ethic. When Vincent Tam, an engineer from PWS was in town to run a hands-on training course in the water treatment plant, Scotty signed me up and encouraged me to attend since I wasn't afraid of a new challenge and to "get my hands dirty". I found the initial intro to the water plant intimidating, but after a few hours and some in depth explanations I embraced the challenge and haven't looked back since.

What are your favourite challenges within the water treatment plant?

I love how the job always keeps me on my toes. There are new challenges daily and nothing is more fulfilling than solving a problem from start to finish. After working in the water plant for 11 years, you learn how to read the plant based on the levels (readings) showing on all the meters and the sounds that the pumps and pipes make. Because water changes on an hourly basis sometimes, being able to read my plant has allowed me to troubleshoot and problem solve complicated issues. Nothing gives me satisfaction like knowing I can work from start to finish on issues inside the water plant, and as a result the community has fresh potable water.

Another positive aspect to being an experienced operator is being a trainer to new recruits. I love to show my passion for my profession and try to pass it on to new employees. I have trained three backup operators in my time here and it has been an enjoyable experience that I would recommend to anyone.

What is your least favourite challenge?

Twice a year we have to go underneath the building and clean out the raw water reservoir, although I don't mind getting my hands dirty and taking on new challenges, it is a big, messy job. Since the raw water coming into the reservoir cell is very turbid, a lot of sediment and organic matter builds up on the floor of the reservoir and in order for this to be properly cleaned we need the whole crew down there in coveralls scrubbing and vacuuming for 2-4 days.

What advice would you give to new operators who are just starting out?

Just stick with it! When I first did a tour of the water plant it was intimidating, and the classroom portion was somewhat overwhelming, but once you get your hands dirty and realize you have a passion for the job, just run with it. In 11 years, I have had many challenging and rewarding times, but i have the same passion for the job as I always have!

Vincent Tam and Linda Carpenter training at Fort Resolution WTP

Environmental Health Officer Inspection Check List	
Source Water Protection Chemical Threats Biological Threats	**Housekeeping and Sanitation** Orderly Storage Floors, Durable and Clean Proper Chemical Storage Reageant and Replacement Filters (if needed)
Test Equipment Good Repair Sanitary Condition Up to Date Reagents Calibration Records Clean Undamaged Test Vials Lab Grade Cleaning Products	**Records** Chlorine: Free and Total Turbidity Operational Chemicals Added Cleaning and Disinfection of Storage Tanks Maintenance Records Operator Certification
Sanitation Hand Washing Facility Test Glassware Washing Capacity Wastewater Storage and Disposal Adequate Sewage Disposal (if applicable)	**Resources** Operation and Maintenance Manuals Test Equipment Manuals Regulations and GCDWQ Standards Dosage Calculations for Batch/Shock Chlorination
Treatment Train - Chlorination Dosage for Pre-chlorination and Primary Disinfection Condition/Operation of Chlorine Pumps Backup Pumps Availability Chlorine Stock on Hand Frequency of Residual Testing **Fluoridation** Fluoride Dosage Condition/Operation of Pump	**Treatment Train - Filtration** Turbidity Outcome Meets GCDWQ Standard Maintentance, Backwash and Filter Replacements Inventory of Replacement Filters/Media on Hand **UV Disinfection** Condition of Units Lamp Service Dosage, UVT Measurements
Treated Storage and Distribution Cleaning and Disinfection Frequency Sanitary Condition Structural Condition	**Structure** Water Production Components in Good Repair Corrosion Leaks Cross Connection

Standardized Weekly Checklist for Regulatory Sampling in a WTP

Northwest Territories

Water Treatment Plant Weekly Log Sheet

Weekly Testing Instructions

1. Minimum free chlorine residual of 0.2mg/l (ppm) after 20 minutes of contact time.
   - Most plants will require higher free chlorine to maintain adequate residual throughout the distribution system.
   - Truck fill plants without treated water storage should maintain a free chlorine residual of 0.4mg/l after 20 minutes contact time.
2. Test free chlorine residue three (3) times a day from tank or truck after 20 minutes of contact time.
3. Record raw water turbidity once (1) a day.
4. Record treated water turbidity three (3) times a day.

Community Name

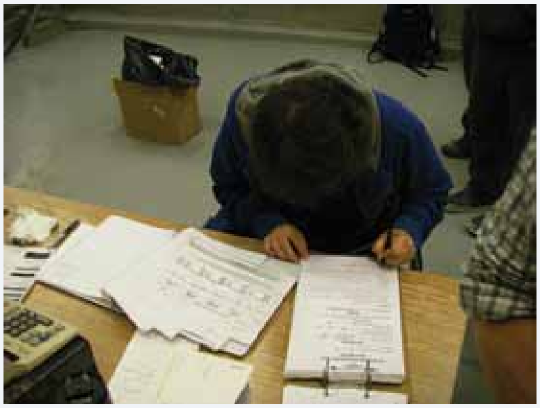
Testing For The Week Of 20

Day ➤	Monday			Tuesday			Wednesday			Thursday			Friday			Saturday			Sunday		
Free Chlorine mg/l (ppm)																					
Total Chlorine mg/l (ppm)																					
Raw Water Turbidity (NTU)																					
Treated Water Turbidity (NTU)																					
Observed Weather (circle best choice)	Temp.	Rain Snow Hail	Sunny Windy Cloud Foggy	Temp.	Rain Snow Hail	Sunny Windy Cloud Foggy	Temp.	Rain Snow Hail	Sunny Windy Cloud Foggy	Temp.	Rain Snow Hail	Sunny Windy Cloud Foggy	Temp.	Rain Snow Hail	Sunny Windy Cloud Foggy	Temp.	Rain Snow Hail	Sunny Windy Cloud Foggy	Temp.	Rain Snow Hail	Sunny Windy Cloud Foggy
Name of Operator(s)																					

Comments and/or Observations ______________________________

NWT1376/0511

➤ When completed - Please fax to: (867) 669-7517 ➤



Water plant operators in (left to right) Paulatuk, Fort Resolution and Fort Providence collect, analyze and record daily regulatory samples

Testing Treated Water Quality

HSS testing requirements for treated water include turbidity and chlorine testing at least three times per day (where practical, online continuous monitoring is a requirement), bacteria testing at least once per week, trihalomethane (THM) testing four times per year, and annual chemical testing.

EHOs continue to work with communities to set up regular bacteria sampling programs and to improve reporting. Over the past couple of years there has been a slow shift to provide onsite bacteriological testing units to community governments. This allows communities to perform their own bacteriological tests on site. With the number of communities receiving onsite bacteriological test kits, it is extremely important to make sure that the standard procedures for transmitting the records from communities to their respective EHO is followed.

The tables on pages 10 and 11 show the number of treated water bacteria and chemical samples each community collected in 2009 and 2010. For the details of the chemical analysis results for each community you can refer to the tables on page 12 and 13. The previous page shows the standardized log sheet for use in a water treatment plant.

Kakisa and Enterprise get treated water trucked in from Hay River, and therefore are not required to take treated water quality samples. Dettah and Hay River Reserve get water from other communities but add chlorine to it. They do not need to take the chemical samples, but do need to take treated water bacteria and THM samples.

Sampling and Testing Training - Small Systems Course

What are Trihalomethanes (THMs)?

THMs are a group of disinfection by-products that can form when the chlorine used to disinfect drinking water reacts with organic matter (e.g., decaying leaves and vegetation) in the water.

The health risks from disinfection by-products, including THMs, are much less than the risks of consuming water that has not been disinfected.

Fluoride

Water fluoridation is the process of adjusting the fluoride level in drinking water to provide optimal dental health benefits. Health Canada has determined the optimal concentration is 0.7 milligrams per litre (ppm). The maximum concentration allowed is 1.5 ppm, set by the Guidelines for Canadian Drinking Water Quality and adopted by regulation in the NWT.

The benefits of water fluoridation are well documented. According to expert research, fluoridated drinking water reduces the number of cavities in children's teeth, which contributes to their healthy development. Reductions of tooth decay have also been observed in adults and seniors who reside in communities with fluoridated water.

More than 90 national and international professional health organizations, including Health Canada, the Canadian Public Health Association, the Public Health Agency of Canada, the Canadian Dental Association, the Canadian Medical Association, the U.S. Centers for Disease Control and Prevention (CDC) and the World Health Organization, have endorsed the use of fluoride at recommended levels to prevent tooth decay. The use of fluoride in drinking water has been called one of the greatest public health achievements of the 20th century by the U.S. Centers for Disease Control. The Department of Health and Social Services supports the addition of fluoride to drinking water as a measure to prevent tooth decay.

Currently Inuvik, Fort Smith and Yellowknife add fluoride, in the form of fluorosilicic acid, to their drinking water. In addition, Wrigley has naturally occurring fluoride at the optimal level in their drinking water supply. Communities that add fluoride to their drinking water must monitor the fluoride levels daily to ensure they remain below the maximum allowed concentration.

Water Quality Database

Community drinking water quality test results are available on the public water quality database located at the following website: *http://www.maca.gov.nt.ca/operations/water/WaterQ_Main_MenuSQL.asp*. HSS continues to keep the website up to date.

Outlook for 2011

In 2011, the GNWT will continue working with communities to:

- Implement community based monitoring, source water protection planning, and other initiatives outlined in the *2011-2015 NWT Water Strategy Action Plan*.
- Complete on-going WTP upgrades and plan for future projects;
- Promote public awareness and education on community drinking water and the important role we all play;
- Strengthen support to WTP operators; and
- Continue to improve water quality reporting.

These steps will help ensure the continued safety of NWT drinking water in years to come.

Questions or Concerns

If you have any questions or concerns regarding community water quality, please contact your regional environmental health office. Contact information is provided in the table on the opposite side of the page. If in doubt over who to contact, call the Yellowknife office and they can direct your inquiry.

Region	Contact
South Slave	Hay River Office Tel.: 867-874-7261 Fax: 867-874-7211
North Slave DehCho	Yellowknife Office Tel.: 867-669-8979 Fax: 867-669-7117
Beaufort-Delta Sahtu	Inuvik Office Tel.: 867-777-7259 Tel.: 867-777-7220 Fax: 867-7773255
Duane Fleming Chief Environmental Health Officer Tel.: (867) 873-2183 Cell: (867) 445-8761 Email: duane_fleming@gov.nt.ca	

HSS YouTube Channel

Don't forget to check out HSS's YouTube channel. You will find all the public awareness video materials related to water prepared by the GNWT there. See below for the link to the channel. We hope that the videos are informative and helpful.

http://www.youtube.com/user/HSSCommunications#p/c/1A775C1399E550C9

Aklavik Water Treatment Plant