“It looks like it’s seen better days…”:

Exploring the drinking water system in Woody Point, NL

Principal Investigator: Dr. Kelly Vodden
Report Author: Alice Will
Photographs: Alice Will

Environmental Policy Institute
Memorial University

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Contents

List of acronyms

BWA	Boil water advisory
DBP	Disinfectant by-product
DOEC	Department of Environment and Conservation
DOHCS	Department of Health and Community Services
DWQI	Drinking Water Quality Index
GMNP	Gros Morne National Park
GS	Service NL/Government Services
HAA	Haloacetic acids
ICSP	Integrated Community Sustainability Plan
LI	Langelier Index
MBSAP	Multi- Barrier Strategic Action Plan
MIGA	Municipal and Intergovernmental Affairs
MNL	Municipalities Newfoundland and Labrador
MUN	Memorial University of Newfoundland
NL	Newfoundland and Labrador
OETC	Operator Education, Training, and Certification
PMA	Professional Municipal Administrators of NL
THM	Trihalomethane

List of figures and tables

Introduction

1.1 Project overview

In rural Newfoundland and Labrador (NL), watersheds provide drinking water supplies, while also supporting other resources and activities that form our culture, identity, and economy. Healthy drinking water supplies are dependent on healthy watersheds as well as on supporting water policies, practices, and infrastructure. The *Exploring Solutions for Sustainable Rural Drinking Water Systems* study, led by Dr. Kelly Vodden, aims to identify the types of risks and challenges influencing drinking water quality and availability in rural areas, with a particular emphasis on communities of 1,000 residents or less in NL. Factors for success and possible solutions are also being examined. This project is in partnership with Memorial University of Newfoundland (MUN), Municipalities Newfoundland and Labrador (MNL) and the Professional Municipal Administrators of NL (PMA).

This interdisciplinary research addresses knowledge gaps related to drinking water systems in NL by providing a current and comprehensive picture of drinking water issues in small communities from a multitude of angles. This has been accomplished by drawing from current and past research and existing sources at federal, provincial and municipal levels, as well as research from other jurisdictions. Dialogue with stakeholders has also been a key method for understanding the issues and solutions for drinking water systems in rural NL.

One component of the project is the completion of case studies; at least one for each of the six Municipalities of Newfoundland and Labrador regions. The objective of this case study research is to profile key issues, challenges and solutions related to public drinking water systems in rural NL. The method of inquiry consists of semi-structured key informant interviews using an interview guide and the review of key documents. During March and April 2014, eight key informant interviews took place for the Woody Point case study. These consisted of interviews with three representatives of the municipal government, a community health professional, a focus group with three residents, a local business owner, a Gros Morne National Park (GMNP) representative, and a provincial government representative. All but one of the interviewees, agreed to be audio-recorded. The methodology is further described in Appendix A and the interview guide is located in Appendix B. The following document contains the case study for Woody Point, which represents the case study for the Northern Region of Newfoundland[1].

[1] To see all MNL regional boundaries please visit the project website: http://nlwater.ruralresilience.ca/?page_id=17

1.2 Community description

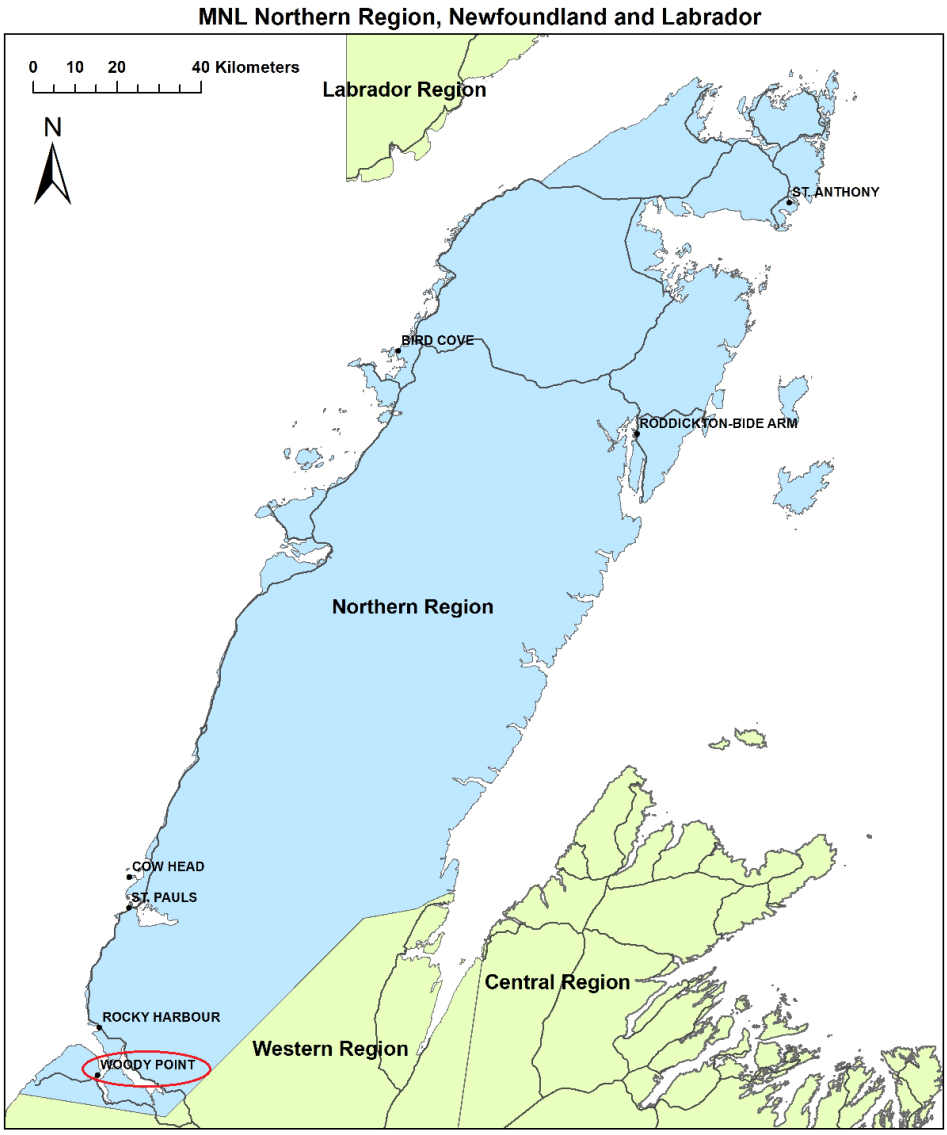

Figure 1. MNL Northern Region, Newfoundland and Labrador and location of Woody Point

Woody Point is a community located on the northwest coast of the island of Newfoundland (Figure 1). With a total population of approximately 300 residents, the town encompasses three areas: Curzon Village, Woody Point, and Winterhouse Brook. Located in sheltered Bonne Bay, the area was used by various Aboriginal peoples for thousands of years and

was frequented by English and French fishermen for several hundred years until the English settled in Woody Point around 1900 (Woody Point, 2013). Today the town is still home to a fish plant, but the main driver of the economy is tourism related to the town's proximity to Gros Morne National Park (GMNP), especially in summer months. As a picturesque Registered Heritage District, the town is catered to tourists; with heritage buildings, art studios, restaurants, accommodation, craft shops, convenience stores, and a dock for boaters including the water taxi. As host to various festivals and events and with national park attractions such as the Discovery Centre within the town boundary and proximity to world-renowned geological and natural features, Woody Point receives thousands of visitors annually. Other businesses and services include a community health centre run by Western Health, churches, a post office, a garage, a public library, a Royal Canadian Legion, an arena, and a theatre.

1.3 Community water system

Source Water Supply

Woody Point's drinking water source is Winterhouse Brook (also known as Payne's Brook), which is surface water. This river originates from the Tablelands Mountains inside Gros Morne National Park (GMNP). This municipally –managed gravity-fed water source has supplied the Town of Woody Point since approximately 1975.

Tablelands mountains, Gros Morne National Park

Infrastructure

Although the source water for Woody Point originates inside GMNP, all water supply infrastructure is outside the park boundary. The majority of the water infrastructure was installed in 1975. The infrastructure consists of:

- **Dam:** A cement dam across Winterhouse Brook creates a water catchment area

- **Pump house:** Water is gravity-fed to the pump house where water treatment in the form of liquid chlorination takes place. Water is electrically pumped to the water tank

- **Water Tank:** Water pumped from the pump house is held in a 40-foot tall metal tank. Water is then gravity-fed to locations that receive publicly-supplied water

- **Pipes, valves, service lines, and fire hydrants:** There is underground piping from the pump house to the water tank, and then to locations that receive publicly supplied water. Materials include ductile iron, PVC piping, and copper pipes which run to the homes.

A second pump house belonging to the national park also exists in town to supply the Discovery Centre with water. This water is obtained from the municipal supply.

Local Governance

The Municipality of Woody Point is administered by a Town Council, consisting of seven elected volunteers. These include a Mayor, Deputy Mayor, Fire Chief and representatives for Community Living, Finance and Administration, Public Works. The town has three full-time employees, consisting of a Town Manager, Office Assistant, and a Maintenance person. The Maintenance Department also consists of two part-time employees.

Administration and management of the town on a day-to-day basis is overseen by the Town Manager. This individual provides leadership, management, and support to the council in enacting their decisions through daily interaction with municipal staff and other affiliates (Town of Woody Point, 2013). Day-to-day drinking water system maintenance is handled by the Maintenance Department; primarily by its full-time employee who reports back to the Town Manager.

Research findings

The following four sections outline issues in Woody Point related to:

- Source water quality and quantity
- Infrastructure and operations
- Policy and governance
- Public perception, awareness and demand

2.1 Source water quality and quantity

Though Winterhouse Brook runs through GMNP and the water supply is close to the national park boundary, the water supply is not officially designated as protected by the Department of Environment and Conservation. Very little development or human activity occurs near the water supply, however there is a local skidoo trail bridge that crosses Winterhouse Brook upriver from the dam. Weather, namely heavy rain, has a big impact on the water supply. Heavy rains increase runoff and often result in high turbidity and large pieces of debris damaging water supply infrastructure, such as the dam.

Key Informant Perspectives

"Heavy rainfall, some snow melt. There're the main ones that create a raging torrent of water coming down through our water supply. And that affects the quality and the riverbed, and heavy rains occasionally causes some trees to slip and landslide into the river" – Municipal government respondent

The following information concerning Woody Point's drinking water quality was retrieved from the Community Water Resources Reports displayed on the Department of Environment and Conservation's (DOEC) Water Resources Portal (DOEC, 2014c).

Boil water advisory (BWA)

Boil water advisories (BWA) are issued when water samples are found to have higher than accepted amounts of e-coli or total coliforms (bacteria) detected or when there are deficiencies in chlorination / disinfection or the distribution infrastructure in general (DOEC, 2013). BWA can be issued by the municipality or provincial drinking water management officials, however, only the provincial government may lift the BWA. Two consecutive clean samples taken by Environmental Health Officers must occur at least a week apart before the BWA is lifted. There are no boil water advisories currently in effect in Woody Point, but in the past two years BWAs have been issued. When they do occur, it is generally due to difficulty obtaining a chlorine residual number after heavy rainfall. Local key informants indicate that the number of BWAs are not a problem in the community; the

only inconvenience is the wait time occasionally required to have a BWA lifted by the provincial government.

Key Informant Perspectives

We (don't) have boil water advisories (...) too often. (In) the last year (to) year and a half we probably had two or three, which was a lot. We sometimes go years without one. I know towns in Newfoundland that they haven't even been off a boil advisory - they're on them all the time! That would concern me. (... They're) a good thing because once you get a boil advisory, then you know. If you had a problem and didn't put a boil advisory on, someone could get in trouble. Once you have them on there, that's a relief actually. You're not giving nobody bad water, right" –Municipal government respondent

"Our boil orders would normally be a lot shorter if the provincial government had the resources to get people down when we needed them down here. They only come down when they're available to come down. So we could be working on a plan to get the boil order removed and we'd lose that opportunity because the provincial health staff don't come down to check. Because ultimately they're the ones who can take it off. We can put it on - but they have to take it off. So there's a capacity issue there with the government" –Municipal government respondent

Drinking Water Quality Index (DWQI)

Between May 29, 2009 and September 13, 2013 Woody Point received a Drinking Water Quality Index (DWQI) ranking of "excellent" (DOEC, 2013). The only notes in these reports refer to four aesthetic exceedances and one turbidity exceedance out of nine reports in this timeframe. A score of excellent (DWQI Value 95-100) indicates that conditions are very close to pristine when compared to the *Guidelines for Canadian Water Quality* (Health Canada, 2012).

Physical parameters and major ions

The Department of Environment and Conservation's Water Resource Portal (DOEC, 2013) displays results for the following physical parameters and major ions in source water and tap water, based on the listed maximum acceptable concentrations in the *Guidelines for Canadian Drinking Water Quality*:

Alkalinity	Colour	Conductivity	Hardness
pH	TDS	TSS	Turbidity
Boron	Bromide	Calcium	Chloride
Fluoride	Potassium	Sodium	Sulphate

Nine sample dates are displayed for tap water and eight sample dates are displayed for source water, with the last sample date for each on September 16, 2013. Results show one source water turbidity exceedance in May 2002 and one tap water turbidity exceedance in January 2013. No exceedances of the recommended guidelines for any of the other parameters were found.

High levels of turbidity in drinking water can shield pathogens in water. However, increasing chlorine levels as a counteraction can raise DBP levels (Conestoga-Rovers & Associates, 2010).

Nutrients and metals

The Department of Environment and Conservation's Water Resource Portal (DOEC, 2013) displays results for the following nutrients and metals in source water and tap water, based on the listed maximum acceptable concentrations in the *Guidelines for Canadian Drinking Water Quality*:

Ammonia	Dissolved Organic Carbon	Nitrate(ite)	Zinc
Aluminum	Antimony	Arsenic	Barium
Cadmium	Chromium	Copper	Iron
Lead	Magnesium	Manganese	Mercury
Nickel	Selenium	Uranium	Total phosphorous
			Kjeldahl nitrogen

Results for both the source water and tap water show no exceedances of the recommended guidelines for any of the above parameters for the eight sample dates displayed. The last sample date was September 16, 2013.

Chlorination disinfection by-products (DBPs)

Chlorination DBPs are compounds formed through the interaction between naturally occurring organic matter and chlorine used in water treatment. These include Haloacetic acids (HAAs) and Trihalomethanes (THMs). According to the NL Department of Environment and Conservation's Water Resources Portal (DOEC, 2013), Woody Point has had HAA and THM readings below the *Guidelines for Canadian Drinking Water Quality* in all of the past 21 and 22 respective seasonal collections dating back to Summer 2008. In the latest sample, Summer 2013, Woody Point had an HAA average of 26.20 µg/L, which is below the 80 µg/L guideline set out by Health Canada (Health Canada, 2012). Summer 2013 results also show a THM average of 34.17 µg/L in Woody Point, which is below the 100 µg/L guideline set out by Health Canada (Health Canada, 2012).

Langelier Index (LI)

This index refers to the approximate degree of saturation of calcium carbonate in water. It is calculated using pH, alkalinity, calcium concentration total dissolved solids, and tap water temperature (DOEC, 2014b). A negative reading indicates that water will have a tendency to be corrosive in the distribution system; a positive reading means water will tend to deposit calcium carbonate in the distribution system; and a Langelier Index of around zero means that the water will be neither corrosive nor calcium forming. All of the Langelier Index samples displayed on the DOEC Water Resources Portal for Woody Point have been between -1.55 and -3.76; indicating that the water is somewhat corrosive to the metallic components of the water distribution system (DOEC, 2014b).

2.2 Infrastructure and operations

Existing infrastructure

Drinking water infrastructure is made up of fixed capital assets for public use or benefits (Government of NL, 2005) and is composed of water treatment, storage, and distribution systems (Government of Canada, 2006). Servicing a population of less than 500, Woody Point's water distribution system is considered very small (Government of NL, 2014a). As with 63% of public water sources in Newfoundland and Labrador, Woody Point operates from a surface water supply (Government of NL, 2014a). The system was installed in 1975 and since then there have been some minor repairs, but no system upgrades. There are no documents or maps available which describe the water system infrastructure; therefore the following description of the water system has been compiled based on the key informant interviews conducted in this study.

Water from Winterhouse Brook is collected in a dam and is subsequently gravity-fed through a filter to a nearby pump house where disinfection takes place. Several forms of disinfection exist in NL, including chloramines, ozone, mixed oxidants, and ultraviolet light (Government of NL, 2014a). However, Woody Point uses the most widespread form of disinfection in NL – chlorination. Required sodium hypochlorite (liquid chlorine) levels are determined by a water meter, based on the volume of water being pumped. The water operator then adds the recommended amount of chlorine and conducts regular chlorine residual tests from the beginning to the end of town. Treated water from the pump house is then electrically pumped approximately two kilometres to a 40-foot high metal holding tank. Water is subsequently gravity-fed to various locations, which receive publicly supplied water. Regular flushing of the water lines occurs approximately two or three times per year to help keep the lines free of silt and organic build-up.

Challenges

Although the water system in Woody Point is functioning to provide residents with adequate drinking water, there are several important challenges that the system faces.

There exists little documentation regarding water infrastructure challenges in Woody Point; therefore the information acquired is primarily based on key informant interviews from this study. The following is a short summary of infrastructure challenges in the Woody Point water system:

- **Dam**: The dam is approximately 39 years old. Though it functions properly, it has sustained significant damages from boulders and other debris carried by the river during high water. This occurs most often in the spring and fall seasons during heavy rainfall events. In recent years, the catchment area next to the dam has filled with debris, such as large boulders, requiring it to be dredged to allow water to flow properly.

Key Informant Perspectives

"Our biggest problem consistently since I've been here is too much water coming out and the fear of breaking the dam structure or overwhelming the pump house. Our problem and most likely again this year is that we tend to have too much water because there's very little holding area – just a small man-made dam at the base of the river. And once there's too much water, it tends to overflow that and push the limits of the infrastructure" – Municipal government respondent

- **Pump house**: The pump house sits next to Winterhouse Brook, just downstream from the dam. The riverbank next to the pump house is eroding away, and the pump house now sits within approximately four feet of the river. In addition, the pumps are designed to automatically fill the water tank when water levels drop by from 40 feet to 30 feet. However, this system has not functioned for several years. It is therefore the daily responsibility of the water operator to manually turn the pumps on in the morning and off at night – depending on demand. Though the system is partially gravity-feed, the water must be pumped to the water tank using electricity.

Key Informant Perspectives

"(The pump house) has gone past its life expectancy. We're keeping it going on a wing and a prayer. And any day if those pipes collapse or just rust through... I mean we got a twelve-inch pipe up there. If that bursts, the town has no water" – Resident respondent

"If we can get our pumps up and running like they should and keep our supply clean, that's the main thing. The sooner the better because I'm running it manually now, (so) you got to know what you're doing. Anybody can't just go in and do it. If an automatic switch (could be turned on to regulate) water pressure (the system would) cut out when the right amount of water goes in the tank. That don't happen here. You got to turn it off when the right amount of water runs in there so she don't run over. You got to turn it on when it gets too low. So it's just what you learn - what's inside your head. If I walked away tomorrow and gave someone else this job, they wouldn't know when to turn the water on or off until someone said they got no water" –Municipal government respondent

- **Water tank**: Though the tank is 39 years old and has sustained rusting on the outside, the interior appears to be in good shape, according to a recent inspection. The roof of the tank, however, is in poor condition. It was convex by design, but has collapsed and has holes, which means that water in the tank is technically exposed to possible contamination. According to the municipality, a new roof is required for the tank

Key Informant Perspectives

"If there's a catastrophic failure of the tank - if the roof falls down through (...) then in some way a secondary pumping or temporary pumping station would have to be set up at the base of the tank, such to help create pressure for the houses in the town - because right now it's gravity that's creating pressure. And without the water in the reservoir, there's no gravity pressure. So it'll have to be generated mechanically" – Municipal government respondent

"My suggestion is repairing. The tank is still solid. The walls are still solid. It's still in good condition except for the main beam is gone, so the roof is collapsed in. But my thinking is, if we build a mushroom roof - a dome - to sit on the existing walls. Take out all the beams. Paint it. You know, sandblast it, paint it up, and a few new connections outside" – Municipal government respondent

- **Pipes, valves, service lines, and fire hydrants**: These are all approximately 39 years old. Heavy rainfall and the subsequent runoff regularly exposes pipes between the dam and the pump house, which means pipes are more susceptible to degradation. In addition, there is evidence that pipes are sustaining corrosion, which has narrowed them. Also, since the system is old, some of the as-built drawings are missing and many of the piping component models are no longer manufactured. If repairs are necessary, the maintenance workers sometimes must make informed guesses about where pipes are located underground and must attempt to fit new piping to the old infrastructure.

Key Informant Perspectives

"The piping from the dam to the pump house is exposed. (And) over time the minerals have built up inside the pipe. So what used to be a twelve-inch pipe is now an eight-inch pipe" – Municipal government respondent

"As-builts - we got part of it. Some of it is missing. (...) It's old, (as-builts have) been missing since before I came here. So lots of time we're working, we're doing it by guess. We think we know the pipe is there and we start digging. Our as-builts are not good at all. They're terrible actually" – Municipal government respondent

- **Human resources**: The full-time maintenance employee is also the water operator. He not only tends to general town maintenance issues, but also carries the majority of the responsibility for day-to-day operations of the drinking water system and has been doing so for 29 years. Due to his many years of experience, he understands the entire system and its unique issues. However, there is no one as fully trained on the system as he is, and no succession plan. Although there are two part-time employees who fill in for the water operator when necessary, the system is unique and difficult to master due to the problems described in the previous sections. For instance, the water operator, based on experience, must estimate without any instruments when and for how long the pumps should be turned on to fill the water tank because the automatic pumping system does not function. Due these issues, the water operator must attend to the water system daily.

Key Informant Perspectives

"We check our water all the time. Even on the weekends when you're not working you go up in the evening. Every day of the year. No reason not to go check it. Like holidays don't make a difference. We got to that pump house twice a day every day" – Municipal government respondent

"Based on my work for the town for everything, it's 40 hours a week, but I'm getting extra hours now with the water because our system's not working like it should so we got to keep a closer check on it. So that means I got to go up every night and on the weekends. So I'm running into 49 hours a week on average now. That's not all to do with water; that's to do with the whole job. But water itself (is) 9 or 10 hours a week plus the maintenance side... Putting chlorine in, could run into 20 hours a week on average" – Municipal government respondent

Addressing Infrastructure Challenges

In recent years the municipality of Woody Point has sought solutions to its drinking water infrastructure challenges. The Department of Municipal and Intergovernmental Affairs is the provincial department responsible for funding infrastructure projects related to municipal drinking water. During the 2012-2013 fiscal year a total of $30,245,000 of funding was approved for new water distribution systems, upgrades to water distribution, new drinking water treatment, and research (Government of NL, 2014a). For the past three years the town of Woody Point has applied for funding for basic repairs and upgrades for its water infrastructure, but applications have not been successful.

Capital works funding was awarded in the last five years to obtain an engineer's report and address problems with the water tank. Once it was completed, the council at the time did not move forward with replacing the tank because at the time it was thought that a

completely new water system (gravity-feed) would be put in place, negating the need for a new water tank. Therefore, the town was not awarded the money for a new water tank.

Unfortunately, though a gravity-feed system would be viable for the town, the estimated cost of installation amounted to $6.8 million. When a town with a population of less than 3000 receives funding, the province's standard policy is to provide 90% of the total cost and the municipality must provide the other 10%. In this case, the municipality's share of the cost would be $680,000; the gravity feed system was therefore determined too expensive for the town. They therefore decided to concentrate on repairing the current water system as funding becomes available.

Key informant interviews indicate that there was also a study completed 15-20 years ago regarding the possibility of combining water needs of Woody Point with those of the adjacent community of Glenburnie. In general, amalgamating the needs of towns can give municipalities a greater tax base to provide basic services and leverage funding from the provincial government. In this case, however, it was determined that this was not a practical option for the towns because the steep hillsides in Glenburnie would make water delivery too challenging.

Key Informant Perspectives

"We feel very comfortable with the source of the water, insomuch that it's a fairly wide catchment area up in the Tablelands. And the stream and the brook that carves its way into Winterhouse Brook - from a natural point of view all appear to be quite acceptable. The dilemmas start at the man-made point with the dam and the pump and the tank. (...) We've identified threats to the provincial government (...) and they have sent people down. They have agreed that we have issues" –Municipal government respondent

"There needs to be a county system (like) Nova Scotia has, where communities that are neighbouring and are close in vicinity come together on things like their water systems. There is none of that in Newfoundland right now. If you are a local service district or a municipality and you border another town and you are not amalgamated, you are completely separate entities. It just doesn't work. You're not sharing with your region. Funding opportunities would become more available if you amalgamate. Tax bases would become larger and there would just be more things available. But people just don't seem to be keen to that idea" – Provincial government respondent

"We have the infrastructure. It's working now. Some problems have been identified with it that need to be fixed. We may go on for another three to five years the way we are now. Or within three or four weeks we may have a massive spring runoff that would takeout our pump house. We are that vulnerable. We are completely exposed, but yet we could be perfectly alright" – Municipal government respondent

2.3 Policy and governance

Ensuring the safety of drinking water in Canada is a responsibility shared between federal, provincial, territorial, and municipal governments (Health Canada, 2012a).

Federal

The principal responsibility of ensuring the safety of drinking water generally rests with the provinces and territories, while municipalities usually ensure the day-to-day operations of treatment facilities and distribution systems. Federally, Health Canada works in collaboration with the provinces and territories, through the Federal-Provincial-Territorial Committee on Drinking Water, to develop the Guidelines for Canadian Drinking Water Quality (GCDWQ). The GCDWQ are published by Health Canada and used by all Canadian jurisdictions (provinces, territories and the federal government) as a basis to establish their own enforceable requirements for drinking water quality (Health Canada, 2012b).

The federal government is directly involved in Woody Point's water system as the Discovery Centre, a Gros Morne National Park building, is within the municipal boundary. Though they use the municipal water, a separate pump house is used to pump water uphill to the Discovery Centre. Since it is a federal building, the park does not technically pay a water tax; rather they make a contribution to the town and the sum is equal to that of the water tax.

Provincial

The province of Newfoundland and Labrador is responsible for providing safe drinking water to the public, as per the provisions of the *Municipalities Act*, the *Municipal Affairs Act*, the *Environmental Protection Act*, and the *Water Resources Act* –by following the Canadian Drinking Water Guidelines. This service occurs via a total of 478 public water sources in the province (Government of NL, 2014). Four provincial departments share the responsibility of managing public water supplies in NL under the Multi-Barrier Strategic Action Plan (Government of NL, 2014).

The Multi-Barrier Strategic Action Plan (MBSAP) consists of three levels, as is further described in the Drinking Water Safety in Newfoundland and Labrador Annual Report 2013 (Government of NL, 2014):

Level 1:
- Source water protection
- Drinking water treatment
- Drinking water distribution

Level 2:
- Monitoring
- Data management and reporting

- Inspection and enforcement
- Operator education, training, and certification
- Corrective measures

Level 3:
- Legislative and policy frameworks
- Public involvement and awareness
- Guidelines, standards, and objectives
- Research and Development

Further information on specific roles and responsibilities of various departments in implementing MBSAP can be found in the Drinking Water Safety in Newfoundland and Labrador Annual Report 2013 (Government of NL, 2014). However, a brief description of the roles and responsibilities of the four departments in managing public drinking water systems is briefly described.

1. Department of Environment and Conservation- Water Resources Management Division:
   1.1. Acts as the lead agency
   1.2. Regulates development activities within protected public water supplies
   1.3. Samples and reports on chemical and physical drinking water quality parameters in public water supplies from source to tap
   1.4. Operator Education, Training, and Certification (OETC) program
   1.5. Annual Clean and Safe Drinking Water Workshop

2. Department of Health and Community Services
   2.1. NL Public Health Laboratory and regional drinking water testing locations where municipal and private water supplies are tested for bacteriological indicators (*E. coli* and total coliform bacteria)
   2.2. Conduct drinking water safety initiatives and review guidelines related to water to enhance health and prevent disease

3. Municipal and Intergovernmental Affairs
   3.1. Financial support to communities for the provision of drinking water infrastructure
   3.2. Involved in NL Drinking Water Safety Initiative and installation of Potable Water Dispensing Units

4. Service NL
   4.1. Samples and reports bacteriological water quality parameters in public water supplies from source to tap.

Provincial Public Reporting

The Department of Environment and Conservation releases several public reports relating to drinking water quality (Government of NL, 2014). These include:

- **Seasonal Community Drinking Water Quality Reports**: an interpreted report of seasonal drinking water monitoring. Indicates parameters that exceed the *Guidelines*

for Canadian Drinking Water Quality. Provided to all communities with a public water supply.

- **Exceedance Report**: a report delivered via fax or email to communities as soon as a water quality laboratory result is above the *Guidelines for Canadian Drinking Water Quality*.

- **Annual Drinking Water Safety in Newfoundland and Labrador Report**: Provincial report released annually. Describes the province's activities under the MBSAP.

- **Web Documents on Drinking Water Quality**: The Water Resource Management Division's website contains a regularly updated online tool with information on drinking water quality. See: *http://www.env.gov.nl.ca/env/waterres/whatsnew/index.html*

Municipal

The Town Council of Woody Point is governed by the *Municipalities Act* (Government of NL, 1999). The town operates a public water supply system and charges property owners who receive this service a water tax, as described in the *Municipalities Act* (Government of NL, 1999). This tax is a fixed amount determined by council and is paid annually. The following is a list of the various water tax rates in the municipality of Woody Point for the 2014 taxation year (Woody Point, 2014):

- Residential Water Tax $175.00
- Residential Water/Sewer Tax $260.00
- Commercial Water Tax $200.00
- Commercial Water/Sewer Tax $280.00
- Industrial Water Tax $500.00 Flat Rate
- School Water/Sewer Tax $5.25 per Person

Woody Point's water system services a population of less than 500 residents, putting the water system in the category of "very small system" (Government of NL, 2014a). Though there is no current town plan available that addresses water issues, or are there water system maps, the town keeps logbooks and water quality reports. The municipality is also responsible for testing chlorine residuals in the water on a regular basis. This is undertaken by the town's full-time maintenance employee who acts as the water operator. Although this individual is not a certified water operator under the DOEC Operator, Education, Training and Certification (OETC) program, he attends DOEC seminars and has 29 years of experience as the water operator for the town.

There are the 304 public surface water supplies in NL; 85% of which are designated 'protected' under the *Water Resources Act* (Government of NL, 2014). It is the responsibility of each municipality to submit an 'Application for Protection of a Water Supply Area' to the Water Resources Management Division of the Department of Environment and Conservation (Government of NL, 2013). Amongst other things, designated protection officially limits development in the watershed area, and results in mandated surveillance of the area by the municipality and periodic inspections by an Environmental Scientist from the provincial government (Government of NL, 2013). Woody Point has not initiated the protection designation process with the provincial government. This may be partially due to the water source's proximity to the national park boundary and the assumed protection that this allows, as well as the challenging terrain and the notion that few people travel or would decide to build in the area. Municipal government respondents say that the designation process is something that should be addressed.

Key Informant Perspectives

"We have an unregulated catchment area so there probably isn't significant signage around the area where the water originates to come into our Winterhouse Brook. But typically that hasn't been conceived of as an issue because it's national park property and they sort of look after things. So there hasn't been any situation where anyone has gone and dumped hazardous materials in the immediate area or whatever and there's no expectation that that would happen." – Municipal government respondent

"(Water system protection) is something that we do have to work on. In working on our new land use planning and new town planning we discovered that it's not designated" – Municipal government respondent

Federal, Provincial, Municipal Relationships

The level of interaction between the municipal government and higher levels of government appears to be low in Woody Point, however, this does not seem to be a problem. Provincial government officials take regular water samples and report back to the town. If the town has any problems or questions, they call the provincial government for clarification. One challenge for the municipality as it relates to the provincial government is the difficulty in securing funding for water system repairs and upgrades – which appears to be a province-wide challenge as well, according to the key informants from the province and the municipality. Secondly, due to the nature of the provincial government's water sampling schedule, when a boil water advisory is issued it can be logistically challenging for the province to return in a timely manner on two separate occasions to take water samples and lift the BWA.

Key Informant Perspectives

"We get a lot of calls (from communities) for interpreting the water quality reports, so that's why it's important that I be here to help them because they don't have that technical background. And the report is unfortunately a bit technical! So that's part of my role - to help communicate that information to them in a way that's easier to understand" – Provincial government respondent

"I don't know exactly what our relationship is, which is probably a good thing. Because if it was a bad relationship it probably would have made its way into the Council chambers. By and large we download the responsibility of communicating with the government to our town staff and they would let us know if there's any issues. The only issues - the one I just alluded to was it appears that the response time is out of our control. We kind of have to just wait for them. Other than that, I expect that it's just pretty good" – Municipal government respondent

"I understand why the government has to look at where they spend their money in rural Newfoundland. Some towns are destined to dry up and blow away. There's just no demographic there to justify the need for improving infrastructure. It's akin to the old resettlement days. That has a pretty bad connotation If you have towns that used to have a couple of hundred and now they have twenty or thirty families, you've got to wonder why a two or three million dollar investment would be warranted. So I'm sure that issue has been talked about. We continue to promote our town as ... We use the analogy of a one in a hundred or maybe a one in fifty towns that will survive regardless of the demographic that's currently going against us. There's no doubt that our population is shrinking but it will get to a core and we believe it will increase back up just because of it's location. And because it's an enclave of the park, people will want to live and visit here. So we feel that we're an exceptional case and that we're a town that needs to be supported. We can support ourselves to a certain extent but we need to be supported in our infrastructure requirements because of the tens of thousands of people that come to visit Woody Point every year" – Municipal government respondent

2.4 Public perception, awareness, demand and practice

Perception

Water Quality

Key informant interviews reveal an overall positive perception of the drinking water in Woody Point and the level of attention that the water system gets from day-to-day. Despite turbidity during heavy rainfall events, some see the water supply as cleaner than water supplies due to its rural location away from possible pollutants. Other sources of water in Woody Point include approximately ten private wells and roadside spring water collection. Some respondents regard those sources as very pure and say that they enjoy the taste of these sources more than town water because it is not chlorinated. Others worry about the lack of regulation. Bottled water is sold in the community at corner stores and restaurants. It is seen by some who own businesses as a standard expected by tourists, while other respondents indicate that local tap water is preferable.

Key Informant Perspectives

"(Before) I was kind of like everyone else (thinking) that (the) water is brown so therefore it is disgusting. But now knowing the readings and getting the reports back and seeing the annual drinking water reports -- there's nothing wrong with the water other than the naturally occurring discolouration. (...) The water's running off the Tablelands and look - the Tablelands are rust coloured therefore water is going to be rust coloured.(...) It's picking up the minerals. But everybody needs a few extra minerals. It's not going to hurt you" – Municipal government respondent

"My preference is a water system operated by the town as opposed to a well. I think it's a positive thing for me as a business to have a town water system.(...) It's one less thing that we are responsible for" – Business owner respondent

"I think it (has) got a lot to do with the amount of chlorine in it. (Some residents) just don't like the taste" – Resident respondent

"I see far too much bottled water use when we have a very well-established and safe drinking water system in place. (...) Look at how bottled water is processed and regulated -- or lack thereof! I still see restaurants selling bottled water, which is sad because our water is very safe" – Community health respondent

In regards to chlorination disinfectant by-products (DBPs), some respondents see them as hazardous but the 'lesser of evils' in a public drinking water system. The water must be treated to mitigate immediate health problems, such as *E. coli*, and chlorination is an economical means of protecting humans from illnesses caused by such bacteria. A representative of the provincial government suggests that while disinfection is necessary in

public drinking water systems, the formation of chlorination DBPs can be mitigated through removal of organics via regular system flushing and filtering.

Key Informant Perspectives

"(THMs and HAAs) are a necessary evil. In my line of work I've come to realize that if you have to avoid every possible contaminant everywhere, you might as well wrap yourself up in a bubble and stay there. So does it affect health? Probably. But I don't know enough about it. I do know that I like my (well) water better because it is pure and it does avoid those things." – Community health respondent

"There are so many other factors (in relation to the formation of DBPs) that really you need to look at the system as a whole. So, how much organics are coming from your source water? Are you filtering? Maybe there's some sort of additional treatment that might help remove the formation of those disinfection bi-products. Your distribution system's going to matter. Are you maintaining it? Are you flushing? (...) Flow meters are a big deal when it comes to the right amount of chlorine as water's being used. You need to optimize your system to kind of lessen the impact of those negative compounds forming." – Provincial government representative

Government

Respondents believe that compared to other rural regions in general Woody Point is one of the few rural NL towns that will thrive. Woody Point's survival is due to the tourism related to being in close proximity to a UNESCO World Heritage Site, GMNP – and for that reason it would be worthwhile for the provincial government to invest in water infrastructure. Some key informants believe that in deciding how to fund infrastructure in municipalities, the provincial government does not take the local context into consideration. Key informants also point out that the provincial water quality monitoring program is critical to the area. They say that municipal testing alongside the provincial sampling means increased water security.

Key Informant Perspectives

"It's like a lot of government programs. They do what they think is best. They don't consult with the town. We'll tell them this is what we need and this is why we need it. And they'll come back and say "well based on our engineering study, you don't really need that and we're going to apply the broad spectrum; the general way to do things". But what works in one town may not work in another town" – Municipal government official

"Sometimes we're forgotten (by the provincial government). Rural towns are the last to be addressed because we're only a few people, really. It's that mentality. It shouldn't be. Government should be concerned about every single resident of this province and MNL is kind of working to make the provincial government more aware that rural towns have the same issues as the larger towns have. So it's a constant battle. I understand that there's limited funds to go around and there's probably twenty other towns crying out for the same funding - probably for the same issue. Learn to prioritize! Expect some spending" – Municipal government official

"The monitoring program (...) is critical to the water. (...) We test our water ourselves. But then the provincial government sends their inspectors down and (they) test the water quality as well. (...) They catch what we don't catch" – Municipal government official

Threats

Perceived threats to source water are not extensive, according to respondents from Woody Point. Threats mentioned by respondents include landslides into the water source, power outages, and occasional animal carcasses in Winterhouse Brook. Some people mention that there is a snowmobile trail bridge that crosses the river upstream from the dam, but it is not concerning to some local respondents who say that the bridge has been approved by the provincial government. There is also a notion that the water source is protected by the national park since it is partly within the GMNP boundary and a feeling that the watershed area is not an ideal place to build or develop due to the topography. Nonetheless, a provincial government respondent stresses the importance of provincial source water protection, which would legislate the analysis of possible threats to the water supply, such as anthropogenic structures and activities.

Another possible threat mentioned by a respondent is the issue of possible hydraulic fracturing activities in the area. There is a concern that if hydraulic fracturing does occur, the industrial traffic would impact the road to Trout River, which follows Winterhouse Brook, the water supply. There is a concern that such traffic may pose a threat to the drinking water supply.

The largest perceived threat to the water system amongst respondents is the age of the water infrastructure itself. There is a fear that the system will fail in the near future if repairs to the dam, pump house, and water tank are not addressed. Some believe that

repairs now will help mitigate costlier repairs, should one of those components fail in the future.

Key Informant Perspectives

"There is a skidoo trail that crosses our water supply. (...) The bridge was falling apart and they just replaced that a couple of months ago before the winter or just as winter started. But other than that there are no real threats to our water supply because it is coming from the Tablelands and of course that's park area. So the park regulations come into effect to protect it near the park. So we're pretty covered there "– Municipal government respondent

"A recent issue is this whole fracking debate on the West coast and the traffic. (...) To access to Chimney Cove, which is South of Trout River on the coastline, they would have to come through Woody Point to get the trucks out there. And they would have to cross over the bridge. Now if they want to cross over the bridge, they would have to drive along the road to Trout River. It follows our water supply. So if trucks were to go out over the hill, they're going in our water supply" – Municipal government respondent

Climate Change

Climate change is a concern amongst some respondents. The biggest change some Woody Point respondents have seen as a result of possible climate change has been extreme changes in weather, sometimes resulting in heavy rainfall or early spring runoff in Winterhouse Brook.

Key Informant Perspectives

"The extremes in the weather has affected the runoff" – Community health respondent

"The storms are getting worse" – Residential respondent

"In the last few years we've been getting heavier rains, which means a lot of things are moving in the brooks. A lot of shrubs, trees, dirt, rocks and gravel moving through all the time. Which means that eventually there's going to have to be something done to the dam so we can keep maintaining the amount of water we've been getting. And then the quality of water - that's another thing because once you have trees falling in the brook and all that debris and stuff, eventually it's going to make a difference to it. (...) That's been only the last five to ten years maybe that we're starting to get bigger rains" – Municipal government respondent

Awareness

Municipal officials had an informed understanding of the problems within their water system – namely infrastructure and funding problems. Other local informants were aware of some infrastructure issues, such as the rusty water tank and the look and taste of the water itself (i.e. turbidity, chlorine). In terms of levels of protection, only one local key informant was aware that the Woody Point water source is not officially designated as protected. In terms of infrastructure, although some residents see the rusting water tank as a problem, the reality is that the inside is in good condition but the roof is in need of repair. There may not be a high level of awareness regarding the state of the water infrastructure in general amongst residents.

Key Informant Perspectives

"Perhaps the infrastructure (is a challenge). I don't know a lot about it, but I think just looking at our water tank -- it looks like it's seen better days!" – Business owner respondent

"I'm more comfortable with the tank as it is right now and I'd address the pump house rather than the tank. But aesthetically, perception is everything! Not discounting that the tank does need to be addressed, but for me the money would go to the pump house first. [People] see a rusty old tank on a hill (...) therefore if it's rusty on the outside, it must be rusty on the inside" – Municipal government official

"I think people think that (the municipal water system) will magically look after itself. Sometimes I think they wonder why there's a maintenance man there and what he does. I think they think water magically appears from (the tap)" – Resident respondent

In terms of water quality, most key informants said that a common preconceived notion amongst residents is that turbidity in water is associated with poor water quality. Likewise, despite many people acknowledging that wells and springs are unregulated, it was also observed throughout the interviews that many respondents associated the clarity and good taste of these sources with safety.

Key Informant Perspectives

"My thoughts are, if we've been drinking (well water) for 25 years now and it hasn't hurt us yet, it's probably safe. And our well is well maintained by our own people. That's the only drawback (of private wells). I know (chlorination is) for safety reasons and once you get into the public realm (...) you have to follow the regulations" – Resident respondent

"The general public tend to base their opinions and perceptions of drinking water on what they see. (...) It's pretty much what we all do. If the water looks brown, you're not going to want to drink it. That being said, arsenic is clear and colourless, and that glass could be full of it and (you think the) water tastes delicious! (Among) the general public (there is) a lack of knowledge of what water quality really means" – Provincial government respondent

Residential Demand

With a permanent population of approximately 300 people, there are about 250 residences in the Municipality of Woody Point. The majority of these are occupied year-round, but some are used as summer homes. Water use includes consumption demands (i.e. drinking), indoor non-consumption demands (i.e. showering), and outdoor non-consumption demands (i.e. garden care). A small number of homes (less than 5) use both municipal water and well water or are entirely reliant on well water.

Industrial Demand

As with many municipalities in Newfoundland and Labrador, Woody Point's municipal water system services its local fish plant (Government of NL, 2011). This fish plant is operational for part of the year; generally in the summer months and water is normally running through the system 24 hours a day. The result is that when the fish plant is operational, there is an increased demand on the public system. On occasion, water use by the fish plant will lower water pressure in other parts of the town. When that occurs, the town asks the fish plant to turn off their water to allow the system to recharge. Key informants say that high water use by the fish plant means that water is not sitting in the system for long, which improves the taste of the drinking water.

Fish plant (middle), Woody Point

Key Informant Perspectives

"(The fish plant) runs away a lot of water. If they're processing this week and then go a week without processing, their water keeps on running. It costs us a lot more to run our pumps, but what do you do? It keeps everything clean too. They run it over the floors and they keeps the system clean. Like I say, if they shut it down and you open it up and start processing, the first shot of water you're going to get is going to be dirty in amongst your fish. So I guess there's a reason for it, right?" – Municipal government respondent

Commercial and Institutional Demand

In Woody Point, commercial and institutional users also exert demand. The frequency, volume, and schedule of their water use are unique to each type of user (Government of NL, 2011). For instance, the local school is most likely to exert demands on the water system from 8AM until 5PM during the months of September-June. Since Woody Point is a popular destination for tourists visiting Gros Morne National Park, businesses catered to tourists, such as restaurants, will exert more water demand in the summer months of June-September. The following is a list of commercial and institutional users in Woody Point:

School (1)
Churches (3)
Public library (1)
Health clinic (1)
Theatre (1)
Arena (1)
Convenience stores (2)
Accommodation (6)
Gas station/Garage (1)
Senior's home (1)
Restaurants/Bars/ Coffee shops (6)
Municipal office (1)
Post office (1)
Laundromat (1)
Craft shops / Galleries (8)
Parks Canada – Discovery Centre (1)

Downtown Woody Point

Conclusion

This *Exploring Solutions for Rural Drinking Water* case study profiles the key issues, challenges, and solutions related to drinking water in Woody Point, NL. Using key documents and semi-structured key informant interviews, the case study describes the source water supply, infrastructure, policy and governance, and public perception, awareness and demand surrounding drinking water in this small rural community.

The water source water in Woody Point, Winterhouse Brook, is not a designated protected water supply, however a municipal respondent indicates that designation may be pursued. DOEC data regarding drinking water quality indicates that water quality in Woody Point in general is quite good, with a Drinking Water Quality Index ranking of "excellent". In recent years there have been few exceedances of the *Guidelines for Canadian Drinking Water Quality* water quality parameters, aside from two high turbidity readings.

Aging drinking water infrastructure appears to be the biggest challenges for Woody Point. Several problems exist within the infrastructure, including problems with the dam, pump house, and water tank. The community has researched new water systems, but the options they have looked at are quite costly. Their focus now is to repair the existing infrastructure. However, as with many rural NL communities, access to provincial or federal funding to complete these tasks has proven to be a challenge. It is therefore necessary for the water operators to perform tasks manually that were designed to be automatic. Given the flaws in the system, the water operator, who deals with it daily, is the only person who knows how to keep the water system running smoothly. This could pose a potential risk to Woody Point's water system if no succession planning occurs regarding personnel who can operate the system in the future.

Ensuring the safety of drinking water in Canada is a responsibility shared between federal, provincial, territorial, and municipal governments. The provinces regulate water quality by the following *Guidelines for Canadian Drinking Water Quality*. Led by the Department of Environment and Conservation, four departments within the provincial government share responsibility in managing public drinking water supplies. Woody Point and other NL municipalities have the day-to-day responsibility of supplying residents with publicly supplied drinking water. The municipality operates the water system, tests the water, issues and communicates boil water advisories, and charges a residential water tax. In Woody Point, the relationship with higher levels of government is not strong, but it is not seen as a problem. They communicate with the necessary government officials on water quality issues when necessary. A challenge, however, is due to provincial government human resources constraints, when a BWA are issued the towns may be waiting for several weeks before it is lifted.

Public perception and awareness regarding drinking water in Woody Point varies. Many people like town water and feel that the municipality works hard to deliver safe drinking water. Occasionally residents complain of turbidity or the taste of chlorine. For some, chlorination by-products, though worrisome, are one consequence of having a water

system free from illness-causing bacteria. These by-products can be mitigated by regular system flushing and filtering, according to the provincial government. Other concerns about the water system vary. For example, key informants mentioned snowmobile bridges, landslides, power outages, and possible hydraulic fracturing in the area as concerns. However, the biggest threat discussed is possible infrastructure failure due to the age of the system.

Main Suggestions by key informants moving in the future:

In the future, some key informants would like to see the following:

- More research completed on the local water system, such as a risk analysis
- DOEC offer short annual refresher courses in water quality management to designated municipal water operators
- Provincial government take a pro-active approach to funding water infrastructure upgrades and repairs that takes into account individual community needs to mitigate potential disasters and subsequent costly emergency repairs

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Appendices

Appendix A. Case study methodology

Case study Methodology

Objective

In depth profile of key issues, challenges and solutions related to public drinking water systems in rural NL.

Methods

- Semi structured key informant interviews (an interview guide will be used):

  *Note depending on size and human resources in the community the below informants may not be available

  - Water Operator (at least 1)
  - Town administrator (at least 1)
  - Mayor/Council/LSD Committee rep (at least 1)
  - Business owner/heavy users (~2-3)
    - Include businesses that sell bottled water
  - Environmental or watershed groups (if they present) (at least 1)
  - Health office for community/region
  - Environmental Officer who tests water for that town
  - Residents
    - Best done in a focus group format (possibly by attending another meeting)
    - Seniors groups, family resource centres, youth groups, community groups, etc
- Review of documents
  - Project's administrator/operator survey results
  - DOEC data on community/drinking water supplies
  - Development regulations and by laws related to water
  - Any studies done on drinking water/infrastructure
  - Any other pertinent drinking water related documents
  - Media articles (preliminary database on basecamp)
- At least 3 days' worth of interviews done with 1-3 trips
- At least 1 trip reporting back to the town and requesting feedback at a town council meeting/town hall meeting

Requirement of Case Study Community

- Community of 1000 or less
- At least one per MNL region
- On a public drinking water supply (mix of groundwater, source water and PWDU)

- Willing to be part of study (most likely a town that answered the admin survey)

Possible Topics

- LSDs and Municipalities
- PWDU
- Community trying something new and working (alternatives/solutions)
- Impact of industry/tourism/high water user
- Regional water operators
- Drought issues
- Chronic/long term BWAs
    - How do towns with long term BWAs cope?
- Compliance with BWAs
- Aboriginal communities- Labrador issues→ training for operators, access to water workshops, capacity, infrastructure, sampling
- Roadside springs
- Metering
- Aging infrastructure
- High DBP's
- Chlorination issues
- Real time water quality monitoring
- DWQI/Langlier index
- Use of bottled water/safety of bottles water
- Bacteriological outbreak
- Resident perceptions

Community Contact

*May vary, for example Theresa will require permission from the Nunatsiavut

- Initial informal contact.
- Formal letter of request to Mayor and Council/LSD committee
- Follow up to confirm participation and identification of key contact in community
- Discussion with key contact re methods, available documents, and arranging field visits
- Circulation of report drafts to the town contact and arrangements for feed back visit

Final Reports for Each Case Study

- Each case study community will have an overall community case study outlining the state of the drinking water system, as well as individual topic based reports that are specifically related to drinking water issues or innovations in the community. What will be included in these reports will vary depending on the community and topics identified, however some basic requirements are described below.

- The overall community reports should include:
    - 15-30 pages (1.5 spacing)
    - Title page, table of contents
    - Introduction of community and their water system
        - Source water supply (GW/SW)
        - Types of infrastructure
        - Human resources (e.g. water operator)
    - Summary of findings according to research components (from both the background review and the interviews)
        - Source Water
        - Infrastructure
        - Policy/Governance
        - Public Perception, Awareness and Demand
    - Conclusions and Future Directions
    - References
- Community summary document
    - 3-5 pages
    - Headings:
        - Introduction
        - Source Water
        - Infrastructure
        - Policy/Governance
        - Public Perception, Awareness and Demand
        - Conclusions and Future Directions
    - Minimum 1 image per page
    - Formatting instructions to come
- The topic based reports should include:
    - 3-5 pages
    - Introduction of topic and significance to drinking water
    - Description of issue/innovation in the community
    - Description of the issue/innovation in the province wide context
        - If an innovation applicability of using the innovation in other parts of the province
        - If an innovation- has this been used in other parts of Canada/the world? Give examples.
        - If an issue- what has other places in Canada/the world done about this?
    - Conclusions
    - Recommendations for future research
    - References

Conducting Key Informant Interviews

1. When contacting key informant interviews start with an e-mail or phone call. If you do not hear back from the possible interviewee within a week then make a follow up phone call. We suggest making 3 attempts in total to contact the potential interviewees.
2. Arrive on time and prepared for your interview. Make sure you have:
    a. 2 copies of the interview consent form (1 copy for you, 1 copy to be left with interviewee, make sure you and all interviewees sign both copies)
    b. Tape recorder fully charged- always ask and get on the consent form that this is ok
    c. Pen and paper
    d. Copy of the interview guide
3. Before you begin the interview make sure you have the consent form signed and you have asked if you can record the interview, if not takes notes to the best of your ability.
4. When the interview is over thank them for their time and ask them if they would like a copy of the case study.
5. Make sure to get your interviewees contact information so that you can follow up with them later when outputs of the project are available. Confirm how they would like to be communicated with in the future.

Appendix B. Interview guide

*It is likely there will be overlap between the questions, be conscious of linking questions together and following up on comments.
*Should prepare questions in addition to the ones below specific to the case study community. These questions should be derived from the administrator/operator survey results and background research.

Section A:
Background Information on Respondent

1. What town do you live in?
    - How long have you lived in your town?
2. What is your profession? What is your role in your community that relates to drinking water?
    - Are you a paid part time/full time position? A volunteer? A user?
3. How long have you been working/associated [with the subject town]?
4. Are you involved in any other organizations in your town not covered above?

Section B:
General Drinking Water Information
***To be collected from all participants**

1. How would you describe the quality and quantity of your local drinking water?
    - Are you content with the drinking water quality in your community?
    - Do you like the taste/appearance?
    - Has your opinion on the drinking water quality changed overtime?
2. In your opinion what is the general resident's perception of the drinking water quality in your community?
    - In your opinion, are there any (widely held) misconceptions?
3. Do you think your town's drinking water is safe?
    - Are there any factors that you think may be affecting the safety or quality of drinking water in your community?

4. Have you ever felt that the water system/source in your community as being vulnerable/facing particular threats? (If the respondent struggles with this--e.g. presence of disinfectant bi-products, point or non-point pollution, physical obstructions in water source, aging or inadequate infrastructure...*for a complete list see pgs. 12-24 DPSIR document)*

   *NB- *It is key here to have a good working knowledge of those risks/threats for community in question based on the community profile at the Water Resources Portal**

   - Under what circumstances did these threats emerge? (e.g. after a particular evident, access to a new information, speaking with a public official etc.)

   - To what extent do any threats apply to you individually as opposed to a risk for the entire community?

5. How do you determine whether your current water system is safe, or conversely under threat? I.e. What sources of information (people, government, scientific lit..) would you regularly use in determining the safety and quality of your water system/source?

   - Has government been helpful in identifying threats within your water system/water source?

6. Have your perceptions towards the risks associated with water quality changed over time? If yes, how so?

7. What are the positive aspects of the publicly supplied water in your town?

8. Name any negative impacts of the public drinking water on your town? (impacts can be economic, social, environmental etc)

9. What other sources of drinking water do people in your town use other than the publically supplied drinking water (e.g. spring water, bottled water)?

10. What have been the challenges your community has faced in the past regarding drinking water?

    - Does the number of Boil Water Advisories in your community concern you?

11. What would you consider the emerging or more recent challenges for your community's drinking water supply?

12. What kind of development/land use is there in the vicinity of your community's water suppl(y/ies)?
    - In the greater watershed/catchment?
13. Is your water source designated as a protected public water supply area?
    - Are there any activities that are prohibited in or around your water supply?
    - If so, do you think these prohibited activities are appropriate?
        - Are they enforced? Are they violated?
    - Are there any activities that should be prohibited in your town's drinking water source that pose a risk to human health?
14. Have there been problems with the water supply and/or delivery system(s)? Including source water, the pump house, treatment/ filtration or distribution systems?
    - Have they been addressed/resolved? If so, how? If not, why?
    - Is this problem(s) a reoccurring problem?
15. Are you aware of any research that has been done on the local water supply?
    - Has there been an evaluation of the sustainability/capacity of the water supply? Hydrological surveys? Other studies?
16. Do changes in weather ever impact your town's drinking water supply?
    - If so, in what ways?
    - Is there a plan to mitigate these impacts? Are there adaptation strategies in place?
    - Describe any changes in water quality/availability that occurs seasonally and/or after extreme weather events.
17. In what ways do you think being "rural" affects your community's drinking water quality and supply?

Section C:
Role Specific Questions

Water Operator
Water System, Maintenance and Operations

1. What is the local source of drinking water?
    - Is it the only one? Is there a back-up supply?
2. If your town is designated as a protected public water supply area:
    - Why did your town choose to designate as a protected public water supply area?
    - How is the water supply managed/protected?
    - Do you think source protection measures are adequate?
    - Has the council tried any new methods of reducing violations of the town's rules/regulations?
3. How long ago was your town's public water supply (source) developed? Can you tell me anything about the historical development of the drinking water suppl(y/ies) locally?
4. How would you describe the level and quality of water infrastructure in your community?
    - Type of infrastructure
    - Scale appropriate for design capacity?
    - What year was it installed? Have upgrades been made since installation?
5. Do you have water treatment?
    - How long have these systems been in place? Is everything currently working?
    - What kind of treatment system do you use?
    - Are you happy with it?
    - Is there sufficient disinfecting agent available? Has the disinfecting agent expired?
6. Do you have water filtration do you use?

- How long have these systems been in place? Is everything currently working?
- What kind of filtration is used?
- Are you happy with it?

7. How is drinking water currently delivered in the community? Do all residents have piped services?
    - What proportion of your community households rely on private wells?
8. Are there any high risk public facilities supplied by the public drinking water system?
    - Daycare facility?
    - Hospital?
    - Seniors home, long-term facility?
    - School (K-12)?
9. Are there any high water users using the public supply?
    - Fish plants, other industry?
    - Does this impact the quality or quantity of the drinking water?
10. Is there a designated workshop area for drinking water system operation and maintenance?
    - Are there appropriate tools in the workshop to perform basic maintenance?
    - Are there operating and maintenance manuals for the treatment equipment, pumps, etc readily available?
    - Do you have spare parts, consumables, maintenance kits, etc?
11. How often do you check for chlorine residual?
12. Do you have a regular system cleaning program?
13. How many (if any) emergency repairs have been required completed in the last 2 years?
    - Is any emergency repair kit readily available to keep the system operational in an emergency situation (such as back-up pumps?)

14. Are there any re-occurring operational problems?

15. Do you have a cross-connections control program (Connection to prevent back-siphoning and/or backpressure into the town water mains)?

16. Do you have the resources to prepare and maintain up-to-date water treatment system/plant and distribution systems documentation such as As-Built drawings, Process diagrams, Operations Manuals, Log Books, Lab Results, etc?

    - Could you easily locate As-Builts for:

        - Water Treatment System/Plant
        - Distribution System
        - Water Storage Tank

17. Do you feel the water treatment facility, water source area, and/or water storage tank have adequate security to prevent unauthorized entry?

18. How is the municipality currently track potential threats to source water (e.g. point pollution, physical obstructions within the watershed, levels of DBPs, cabin development, flooding etc.), if at all?

    - Would you be interested in mapping these things to assist in strategic planning and development in the future?

19. What other innovative strategies have you used in attempt to address your water challenges (e.g. the Regional Water Operator)?

    - In the case of the Regional Water Operator, how did this come about? Please describe.

        - What were/are the benefits? Drawbacks?
        - How was this funded?

    - What are the future plans in terms of regional strategies to manage water infrastructure/source water?

Certification and Training

1. What is your level of water operating training/certification?

    - Years of experience?

2. What are your typical hours of work as operator?
    - How many hours are spent on work/maintenance related to the water treatment system/plant and distribution system, etc?
3. Are you happy with your compensation?
4. Is there only one water operator in your town?
    - Does anyone replace you while on vacation, training or sick?
    - Does this person have the same training as you?
5. Were your trained with the Operator Education, Training and Certification (OETC) Program provided by the DOEC (Department of Environment and Conservation)? If not, proceed to question 8.
    - What were the benefits of this program?
6. Are there any limitations with operator training in NL?
    - Travel costs?
    - No replacement while on training?
    - Other?
7. Do you have any suggestions on how the province can improve the OETC program?
    - Can you suggest any alternative ways of delivering training sessions?

Complaints and Reporting

8. Do you keep record of your daily activities (flows, chlorine residuals, maintenance activities, etc)?
9. Do you receive complaints about the drinking water either directly from residents or from the town office?
    - What types of complaints?
    - How often?
    - What is the range of response times to these complaints?
10. Have there been Boil Water Advisories issued in the past 2 years?
    - What protocols are there for notification about a boil water advisory when it is communicated from government services/DOEC to your town?

- What protocols are there for notification at the town level for communicating the advisory to residents?

11. Have you been in contact about water quality issues over the last 12 months with the Department of Environment and Conservation, Municipal Affairs or Government Services?

    - What spurred the contact?

Town Administrator/Staff / Councillor

System

1. What is the local source of drinking water? Is it the only one? Is there a back-up supply?

2. How long ago was this supply developed? Can you tell me anything about the historical development of the drinking water suppl(y/ies) locally?

3. How is drinking water currently delivered in the community?

    - Do all residents have piped services?

    - What proportion of community households rely on well and septic systems?

4. How would you describe the level and quality of water infrastructure in your community?
    - Type of infrastructure
    - Scale appropriate for design capacity?
    - What year was it installed? Have upgrades been made since installation?

5. Heading into the future, how do you see the drinking water system developing?
    - Expansion? (Drivers?)
    - Taking on new systems?
    - Replacement? New Approaches?
6. Do you have any comment on private wells in the area?
7. Within your area can you think of any examples of innovative or unique technology?
    - E.g., Point of entry treatment, mobile treatment units

8. Are there any public facilities supplied by the town water system? For example:
    - Daycare facility
    - Hospital
    - Seniors home
    - School (K-12)
9. Are there any high water users using the public water supply?
    - Fish plants, other industry?
    - Does this impact the quality or quantity of water?

Management/Financials/Policies

10. If your water source is a designated protected public water supply area:
    - Why did your town choose to designate as a protected public water supply area?
    - How is your water supply managed/protected
    - Do you think source protection measures are adequate?
    - Has the council/town tried any new methods of reducing violations of the town's rules/regulations?
11. Do the household water tax rates cover water operation and maintenance expenses in your town?
12. Is either of the following available for the current water system(s)?
    - Inventory/As-Builts/GIS mapping
    - Infrastructure assessment/evaluation
    - Planning document/SOPS
13. Do you have the resources to prepare and maintain up-to-date water treatment system/plant documentation such as As-Built drawings, Process diagrams, Operations Manuals, Log Books, Lab Results, etc?
14. Do you feel that the current water infrastructure is planned and managed sustainably?
    - If no, is this a future goal?

- Have you made progress toward sustainable infrastructure goals? Is sustainable infrastructure included in your ICSP(Integrated Community Sustainability Plan) or capital works plan?

15. Have you requested and/or received capital works funding in the last 5 years for a drinking water related project(s)?
    - For what?
    - Was it received?
16. Have you requested and/or received operation and maintenance assistance related to your water treatment system/plant and/or distribution system in the last 5 years?
    - What was requested?
    - Was it received?
17. Do infrastructure funding programs allow for consideration of local context?
    - If yes, how? If no, what challenges does this present? How do you deal with these?
18. Are there any programs, policies, or standards you consider to be critical or influential when it comes to household/drinking water infrastructure?
    - Foundational
    - Last 5 years
    - Last 10?
    - Last 20?
19. Is there a town/regional/provincial water management plan?
    - Is infrastructure included in this?
20. Do you have the ability within the current regulatory framework to accommodate unique local elements/challenges?
    - If yes, how? If no, what challenges does this present? How do you deal with these?
21. Is there a difference between what is mandated and what occurs on the ground in the provincial policies/regulations?

22. Does your town have difficulty with the availability of qualified water operators?
    - How many replacements have you hired in the last 5 years
23. Has your town ever considered a regional water operator?
    - If so, why?
24. Does your office receive complaints about the drinking water?
    - What types of complaints?
    - How often?
    - What is the range of response times to these complaints?
    - Are these complaints recorded/logged?
25. Have there been Boil Water Advisories issued in the past 2 years?
    - What protocols are there for notification about a boil water advisory when it is communicated from government services/DOEC to your town?
    - What protocols are there for notification at the town level for communicating the advisory to residents?
26. Does you town have an emergency response plan and is drinking water considered in this plan? Please explain.
    - Has this been updated in the last 5 years?

Jurisdiction and Integration

27. Could you please describe the jurisdiction/level of authority you have?
28. Are there other agencies whose jurisdiction overlaps/overrides/conflicts with yours?
    - Do you work with these agencies? If yes, how?
    - Conflicts? Challenges? Please explain.

29. Are there recognized connections between household/drinking water infrastructure and other aspects of water management: water stewardship, source water protection, conservation, regional development?

30. Do you see an obvious link between household/drinking water infrastructure and regional planning and development?

    - If yes, please describe how state of infrastructure influences development (or vice versa).

    - If no – discuss.

31. How is the municipality currently track potential threats to source water (e.g. point pollution, physical obstructions within the watershed, levels of DBPs, cabin development, flooding etc.), if at all?

    - Would you be interested in mapping these things to assist in strategic planning and development in the future?

32. What other innovative strategies have you used in attempt to address your water challenges (e.g. the Regional Water Operator)?

    - In the case of the Regional Water Operator, how did this come about? Please describe.

        - What were/are the benefits? Drawbacks?

        - How was this funded?

    - What are the future plans in terms of regional strategies to manage water infrastructure/source water?

33. Describe your relationship with provincial and federal government departments/agencies, NGOs or private industry regarding drinking water quality? Has the relationship changed over time?

    - Are there any challenges that need to be overcome to ensure effective collaboration/a better relationship? Please explain.

Business Owner

1. Are there any regulations/policies/laws you have to adhere by related to water?
    - Who imposes these policies: federal/provincial/municipal government?
    - Who enforces these policies?
    - Do you feel these policies are appropriate?
2. Is your business ever impacted by the drinking water quality in your town?
    - Please explain.
3. If in food service/food and drink retailer, do you provide patrons with water products other than publicly supplied drinking water? Why or why not?
4. If a food/drink retailer who sells bottled water, is bottled water a common purchase in your town?
5. How would you describe your business' level of water use in your community? (Higher than average, average etc...). Please explain.
6. Describe any attempts within your business and/or with community partners to promote the protection/better management of drinking water.

Environmental and/or Watershed Group

1. What is the mandate of your organization?
    - Are there any mandates specific to drinking water?
    - Do you have any drinking water related programs/educational opportunities?
2. Describe your relationship with provincial and federal government departments/agencies, other NGOs or private industry regarding drinking water quality?
    - Has the relationship changed over time?
3. Is your water source designated as a protected public water supply area?

- Why did your town choose to designate as a protected public water supply area?
- How is the water supply managed/protected?
- Do you think source protection measures are adequate?
- Has the council tried any new methods of reducing violations of the town's rules/regulations?

4. Have you partnered with any groups/organizations regarding water-quality management?

Environmental Health Officer

Ask intro/general questions as much as they pertain to a regional jurisdiction

1. Please briefly describe your mandate as an Environmental Health Officer.
   - What communities do you serve?
2. How much interaction do you have with the municipalities in "your region"?
   - Who, at the municipal level, do you interact with the most?
   - Describe the level of interaction your field staff have with water operators/staff in municipalities.
3. What is the greatest health risks associated with the water quality in (subject town)?
   - Are measures being implemented to reduce these risks?
   - What can be done to reduce these risks?
   - Where does your department stand with DBPs and other 'chemical and physical' parameters as far as the potential health risk they represent from a municipal perspective?
4. At what point do you intervene with respect to drinking water safety?
   - Do you monitor the Drinking Water Quality Reports issued by DOEC?

- Do towns ever approach you to help interpret these reports?
- To what degree do you help municipalities mitigate their specific environmental health risks/concerns?

5. Describe your relationship with other provincial and federal government departments/agencies, NGOs or private industry regarding drinking water quality? Has the relationship changed over time

General Resident

1. Are you aware of any laws/policies surrounding your source water supply?
   - Do you think these laws/policies are adequate/appropriate?
2. As a resident, do you have faith in your government (local, provincial, federal) to provide your town with clean and safe drinking water? Why or why not?

Section D:

Closing Questions for All Respondents

1. How would you like to see the water system in your town develop heading into the future?
   - Future opportunities? Concerns?
   - Links to sustainable development? Climate change?
2. Do you have any other recommendations on how the Department of Environment and Conservation, Water Resources Management Division and/or Department of Municipal Affairs and/or NL Services and/or Department of Health and Community Services can improve their drinking water policies or funding programs?
3. Is there anything else you would like to add? Documents you would like to suggest?
4. Is there anything I can provide back in terms of information that you would be interested in? Get contact information, if not already recorded.