“We got it good here”:

Exploring the drinking water system in Makkovik, Nunatsiavut

A community case-study report for the *Exploring Solutions for Sustainable Rural Drinking Water* Systems Project

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List of Acronyms

BWA	Boil water advisory/boil order
DBP	Disinfectant by-product
DOEC	Department of Environment and Conservation
DWQI	Drinking Water Quality Index
GS	Service NL/Government Services
HAA	Haloacetic acids
ICSP	Integrated Community Sustainability Plan
LI	Langelier Index
MBSA	Multi-Barrier Strategic Action Plan
MICG	Makkovik Inuit Community Government
MNL	Municipalities Newfoundland and Labrador
MUN	Memorial University of Newfoundland
NG	Nunatsiavut Government
NL	Newfoundland and Labrador
PI	Principal Investigator
PWDU	Potable Water Dispensing Unit
THM	Trihalomethane

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Introduction

1.1 Project overview

In rural Newfoundland and Labrador (NL), watersheds provide drinking water supplies, while also supporting other resources and activities that contribute to 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 MNL regions[1]. 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 the spring of 2014, the author of this case study conducted a number of interviews in the Nunatsiavut community of Makkovik. Interviews were conducted with business owners, town council representatives, town employees, Nunatsiavut Government (NG) employees and residents from various backgrounds. The majority of the interviews were audio recorded for note taking accuracy, but it was requested that the recordings be destroyed once notes were complete. The methodology is further described in Appendix A and the interview guide is located in Appendix B.

It is the goal of this report to bring together multiple sources of information in order to gain a more comprehensive understanding of the issues, successes and challenges the community of Makkovik faces in regards to drinking water.

[1] For maps of the MNL regions as well as a full list of reports associated with this research project please visit the project website: http://nlwater.ruralresilience.ca/?page_id=17

1.2 Community description

Makkovik is one of five communities that make up Nunatsiavut. It is physically located on the north coast of Labrador. While Inuit have lived in the territory for over a thousand years, Makkovik was not settled until 1860 (JW Consulting Associates, 2009).

Figure1. MNL Labrador Region. Nunatsiavut community of Makkovik (Tourism Nunatsiavut, 2014)

The community of Makkovik has a population of approximately 365 people (JW Consulting Associates, 2009). Although the community falls under the jurisdiction of the NG, individuals in the community are made up of Inuit and Settler descendants (JW Consulting Associates, 2009). The community of Makkovik is only accessible by plane, boat (during summer) or snowmobile (during winter). This means that shipments of any goods or access to local natural resources are subject to weather conditions depending upon the time of year. This in some cases also impacts the availability of work as Makkovik has its own fish plant that operates during the summer, which also attracts workers from outside communities (JW Consulting Associates, 2009). While the Torngat Fish Producers Cooperative is the community's major employer, construction, office jobs, education and

retail make up a significant portion of employment in Makkovik (JW Consulting Associates, 2009).

Table 1. Makkovik's Major Employers

Major employers are:

▪ Town of Makkovik	15
▪ School	14
▪ Health and Social Development	9
▪ Torngat Fish Producers Cooperative	75

(JW Consulting Associates, 2009, p. 18)

Figure 2. Photo of Makkovik Bay (photo taken by Janine Lightfoot)

In addition, there is a small proportion of the population who travel in and out of the community to Voisey's Bay to work 'in camp'. Shifts there typically operate on a two-week turn around (JW Consulting Associates, 2009). Present day Makkovik is growing in size both in population and infrastructure. Statistics show that in Makkovik the total birth rate (ratio of live births to the population expressed per 1,000) for 2012 was 27.8, in contrast to 8.6 for the province (Government of Newfoundland and Labrador Statistics Agency, N.D.). Also, since 2009 Makkovik has built: a new subdivision, a teen center, a new craft center, and a new government building, which also houses a larger children's daycare than the community previously had (JW Consulting Associates, 2009). Although infrastructure is expanding, according to the Integrated Community Sustainability Plan (ICSP) it is projected

that the quantity of drinking water from the watershed should be sufficient to meet the needs of the growing community.

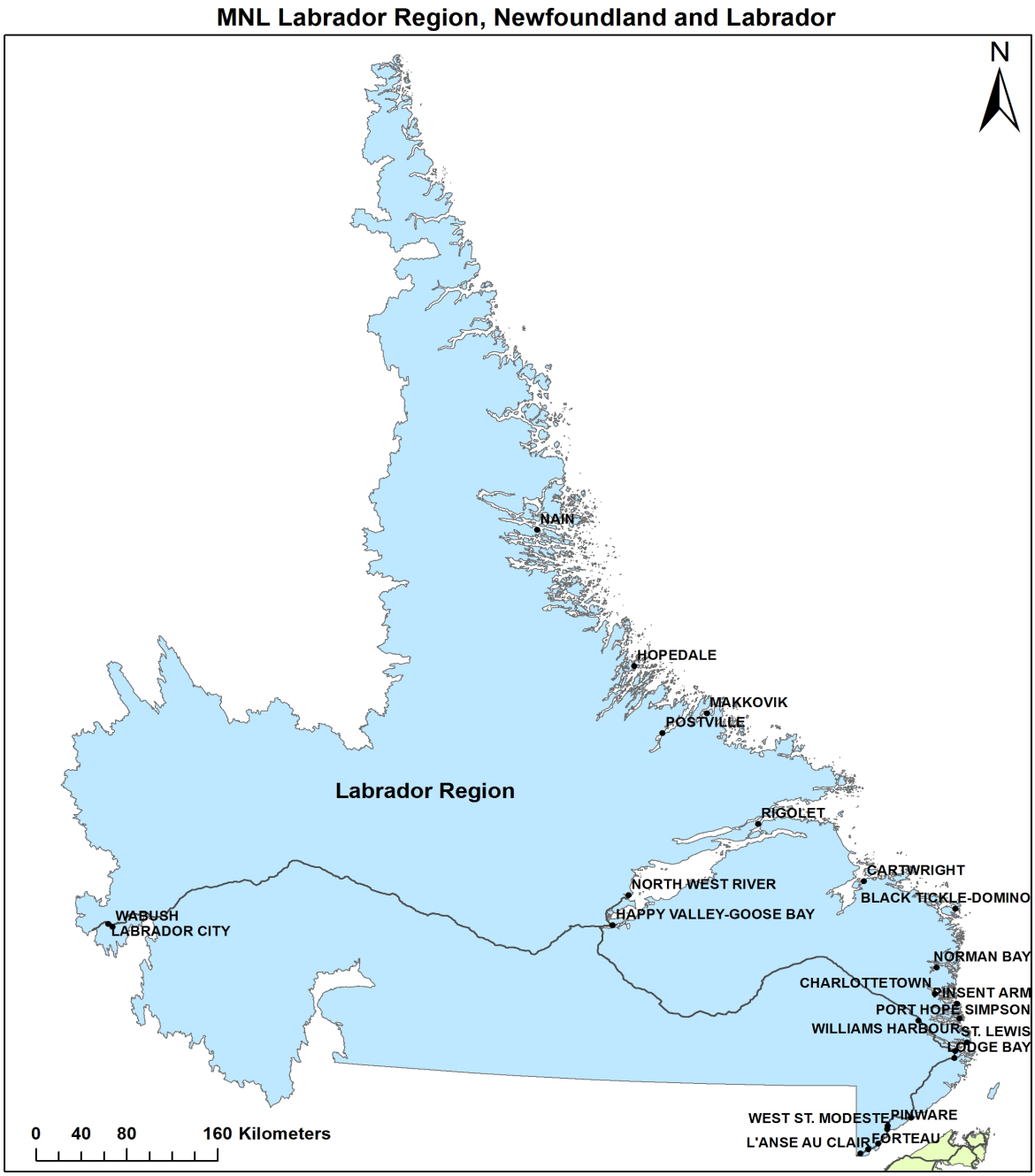

Figure 3: MNL Labrador Regional Map

1.3 Municipal water system

Source water supply

Makkovik's source water supply is, "from Ranger Bight Pond, which has a water storage level of 76m, with a maximum preferred service elevation of 50m (based on service pressure of 35 psi)" (JW Consulting Associates, 2009, p. 25). This water source is a "protected watershed area and is designated as a Protected Public Water Supply under Section 39 of the Water Resources Act" (JW Consulting Associates, 2009, p. 25).

Infrastructure

Makkovik's water infrastructure starts from Ranger Bight pond, a protected source that draws surface water. From Ranger Bight the water is piped through two pump houses up to a storage tank and then gravity fed to the community. Every house in the community receives piped water to their house. There are a few private artesian wells but they are no longer used for drinking water. The pipes used to deliver water to the community are the original pipes, which date back to around the 1970's. There are a few exceptions like the new buildings and subdivision, which have new pipes.

Work is scheduled for this summer to begin on new drinking water infrastructure. The community is due to get a potable water dispensing unit (PWDU) for its citizens. The PWDU uses three steps of filtration. First is a set of filters, then the water passes through ultra violet light, and then the final step is reverse osmosis. This PWDU will be located in the new fire hall (Municipal Affairs, Environment and Conservation, 2011).

Local governance

Makkovik is a community within Nunatsiavut (meaning our beautiful land in Inuttitut). The Nunatsiavut Government is an Inuit regional government. Although Nunatsiavut remains part of Newfoundland and Labrador, the government has authority over many governance areas including health, education, culture and language, justice, and community matters (Nunatsiavut Government, 2014).

Locally, the Makkovik Inuit Community Government (MICG) governs Makkovik. The MICG has an Angajukkak (mayor) with six councillors (JW Consulting Associates, 2009, p. 33). The town also employs a town manager, a town clerk, and five permanent maintenance workers, plus approximately five seasonal maintenance workers. Each of the workers are well trained and fulfill many different roles in the community. This adaptability generally reflects the nature of work and planning in Makkovik; for example the town is well planned with four planning documents. These documents are:

- Makkovik Walking Trail Plan
- Integrated Community Sustainability Plan
- Makkovik Municipal Plan
- 2014-2017 Strategic Plan

They can be found on the MICG website at: http://www.makkovik.ca/home/3

With the exception of the Walking Trail Plan each plan touches on the drinking water system, however the main planning document for drinking water, sewage and infrastructure is the ICSP (JW Consulting Associates, 2009).

Figure 4. Fresh water from Ranger Bight meeting salt water (photo by Janine Lightfoot)

Research Findings

The following four sections outline issues in Makkovik 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

The town of Makkovik's source of drinking water comes from Ranger Bight pond, which is fed by a river. The area is fenced off and consists of a reservoir, intake and dam. Currently there is a trail that runs near the river, which has raised the concern of potential contaminants. And while this is still a worry it has been deemed an improvement as, in previous years people used to travel right on the pond to get to Postville during winter, but travel has since been rerouted by the town council. While this particular concern has been addressed, there are still a few residents that are concerned about people possibly swimming in the water supply. Part of this problem has been addressed through signage around the area asking residents to stay out of the pond. Concern here is not just for the

drinking water quality but also for the safety of the individuals. As previously mentioned there is a water intake located in the pond, which has the potential to harm swimmers.

Human activities are not the only issue impacting water quality; there are times of the year when the weather can impact the colour of the water. High winds and heavy rain in particular can change the water clarity level.

Key informant perspectives

One time it was really dirty after a big wind storm (the water). I flushed the toilet and the water was brown. It was all stirred up.–Resident

However, through interviews with residents it was identified as not being a regular occurrence. It is worth noting that according to the Physical Parameters and Major Ions report for Makkovik the water colour score from 2005-2011 has consistently been above the recommended aesthetic parameters set by the provincial guidelines (Government of Newfoundland and Labrador DOEC, 2014). These findings are also consistent with the levels of turbidity, which also tend to be close to the parameters set by DOEC testing (Government of Newfoundland and Labrador DOEC, 2014). In particular the readings for the fall months, when it tends to be windier, are higher than in other seasons when the weather is calmer, such as in August. Although this is what the testing has shown, interviews with multiple respondents reveal that most residents do not seem to mind or be bothered by the aesthetics of the water. They were more concerned about the taste of the water.

Key informant perspectives

Tastes better than Goose Bay. It's not nasty and chlorinated, I'm ok with it being a bit cloudy...it is what it is. It comes from a pond back there. –-NG employee

Sometimes you can taste too much chlorine, but if you run it long enough, it gets clearer if you run it. –Resident

Boil water advisory (BWA)

It is explained that, "boil water advisories are issued when water sampling and testing detects higher than accepted amounts of coliforms (bacteria) or if there are deficiencies with regard to chlorination or other forms of disinfection" (Government of Newfoundland and Labrador, 2014a). When a BWA is enacted it could be for a variety of reasons, such as self-imposed by the local government for precautionary reasons when doing construction or maintenance. Or the BWA could come from the provincial government as a result of its regular testing not complying with provincial regulations. Makkovik has been fairly fortunate in that it does not have regular BWAs. This is something that both local residents and new residents have noticed as well.

Key informant perspectives

I think it's been good, like since I've been working here. I don't know if it's really changed. I think we had a couple of boil advisories over the years but I think it was mostly related to the samples we took at the building. Like they had contaminated taps or something. So like most often when we do have advisories come on, it's because of that, not because like nothing that I know of that's in our water. –Municipal representative

We don't have nearly as many boil orders as we had in Nain. –NG employee

Drinking Water Quality Index (DWQI)

Makkovik has not received a DWQI rating from the DOEC since 2011 because of the high levels of THMs and HAAs measured in their water supply (Government of Newfoundland and Labrador, 2014b).

Physical parameters and major ions

The DOEC has a website called the *Water Resources Portal*. This source is important for giving feedback on drinking water "physical parameters and major ions" in NL. This source provides information on what the acceptable levels are for drinking water.

Table 2. List of physical parameters and ions tested in drinking water by DOEC

Physical parameters	***Ions***
- Alkalinity	- Boron
- Colour	- Bromide
- Conductivity	- Calcium
- Hardness	- Chloride
- pH	- Fluoride
- TDS	- Potassium
- TSS	- Sodium
- Turbidity	- Sulfate

(Daniels, 2014)

Testing results for drinking water show that in Makkovik on average pH levels are within the acceptable parameters. As previously stated colour has exceeded the aesthetic ratings on every report since 2005, while the other physical parameters have been within recommended levels (Government of Newfoundland and Labrador DOEC, 2014).

Nutrients and metals

This next table of results concerns data about the nutrients and metals tested in drinking water in NL.

Table 3. List of nutrients and metals tested in drinking water by DOEC

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

(Daniels, 2014)

Testing results for nutrients and metals tested since 2006 have all remained within the accepted guidelines provided by the DOEC (Government of Newfoundland and Labrador DOEC, 2014).

Chlorination disinfection by-products (DBPs)

Disinfectant by-products are chemicals formed from treating drinking water with chlorine. Disinfectant by-products (DBPs) are chemical compounds that form when water containing natural organic matter reacts with chlorine used for treatment (Government of Newfoundland and Labrador, 2013). This raises concerns because DBP's are a potential human carcinogen (Health Canada, 2006, p. 3). However, communities continue to use chlorination as a disinfection method due to its effectiveness for treating other water borne bacteria and diseases (Government of Newfoundland and Labrador, 2013).

The health risks from disinfection by-products, including trihalomethanes, are much less than the risks from consuming water that has not been disinfected. Utilities should make every effort to maintain concentrations of all disinfection by-products as low as reasonably achievable without compromising the effectiveness of disinfection (Health Canada, 2006, p. 1).

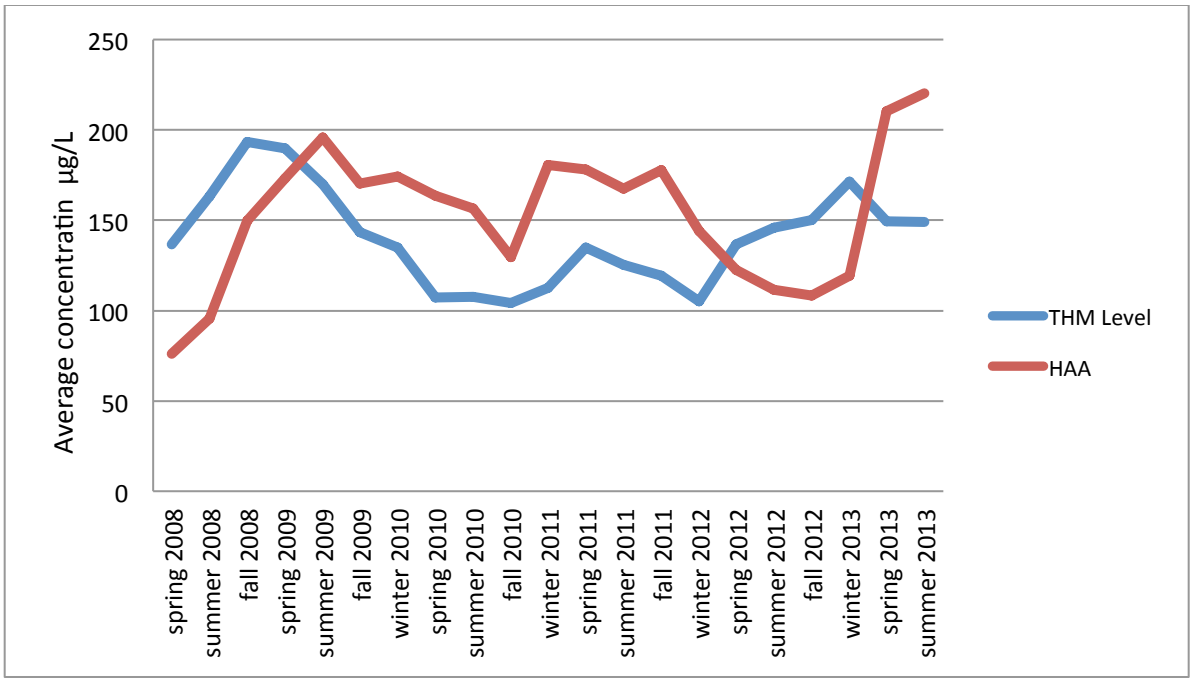

Figure 5. THM and HAA levels for Makkovik based on DOEC reports (Government of Newfoundland and Labrador DOEC, 2014)

Health Canada guidelines state that, "The maximum acceptable concentration (MAC) for trihalomethanes (THMs) in drinking water is 0.100 mg/L (100 µg/L) based on a locational running annual average of a minimum of quarterly samples taken at the point in the distribution system with the highest potential THM levels" (Health Canada, 2006, p. 1). According to the DOEC reports, Makkovik has consistently reported THM levels above the guidelines since 2008 (Government of Newfoundland and Labrador DOEC, 2014).

This graph also shows that the HAA levels for Makkovik have also been above the Health Canada guidelines since the summer of 2008. "The maximum acceptable concentration (MAC) for total haloacetic acids in drinking water is 0.08 mg/L (80 µg/L) based on a locational running annual average of a minimum of quarterly samples taken in the distribution system" (Health Canada, 2008, p. 1).

Langelier Index (LI)

According to the DOEC the LI is an indicator of calcium carbonate saturation. The LI indicates:

- LI is negative, then the water is under saturated with calcium carbonate and will tend to be corrosive in the distribution system.
- LI is positive, then the water is over saturated with calcium carbonate and will tend to deposit calcium carbonate forming scales in the distribution system.
- If LI is close to zero, then the water is just saturated with calcium carbonate and will

neither be strongly corrosive or scale forming. (Government of Newfoundland and Labrador, 2014c).

DOEC data show that the LI for Makkovik has had negative readings since 2001, indicating the corrosive potential of the water in the distribution system (Government of Newfoundland and Labrador DOEC, 2014).

2.2 Infrastructure and operations

Existing infrastructure

Drinking water infrastructure is made up of fixed capital assets for public use and includes water treatment, storage, and distribution systems (Government of Newfoundland and Labrador, 2005). While this is the case for each community in NL, Makkovik has an added layer of jurisdiction as it is within the NG land claims area. According to the community's ICSP, Makkovik's

> "…infrastructure is sound, and Makkovik was the first coastal community in Labrador to commit to the provision of water and sewer services to residents… In the end, this has paid huge dividends to residents by providing clean drinking water that meets both provincial and national drinking water standards, and underground infrastructure that is properly maintained and operated by the towns qualified professional staff".
>
> (JW Consulting Associates, 2009, p. 10).

Existing infrastructure consists of the water intake, a dam, two pump houses, and a storage tank and a lift station. Water is gravity fed down to the community from the holding tank, which has the capacity to hold enough water for three days. The community is set to have a PWDU available sometime in summer 2014 in an effort to address the high levels of THMs and HAAs in the drinking water (the PWDU does not use chlorination).

Key informant perspective

Overall I think our water system is pretty good. We maintain it... We don't like, just you know [take it], from the reservoir and expect it to be good. You know we have good operators, good staff, hired on. He does good maintenance, like flushing out our line every so often and we have a good water system... Other than the pumping system that pumps the water up to the hill up to the tank we have a gravity flow system. We have a million litres underground storage tank up there.

I guess there's a little bit of aging I suppose. I don't know if, there is because we were one of the first communities on the coast outside of Goose Bay, to get the first water and sewer. That would have been the 70's. There are some areas, like down in the lower part of town that could use some upgrading, because we have a lot of ductile iron, and over the years that can corrode and that. But we do a lot of maintenance flushing our lines and that. But after a while they just give out, like with the ground settling and that you know could be anything. But our boys are quick to respond to any leaks and stuff like that. –Municipal representative

Challenges

The reports by the DOEC show that Makkovik is within regulations for: *Nutrients and metals*, and most *Physical parameters and major ions* (Government of Newfoundland and Labrador DOEC, 2014). Although the water system in Makkovik is operating well, and the community has an adequate quantity of drinking water there are still challenges for the community. The following section is a summary of some of the challenges to the drinking water system for Makkovik.

- **Water source security**

Makkovik's drinking water source comes from a pond located within the boundaries of the town. While it is a protected water source and it is fenced off, there are still concerns around the security of the area. Because it is a surface water source that is near a trail that locals can still access on snowmobile and ATV, as noted above, possible contamination from human or animal activities could happen.

Key informant perspectives

Four wheelers and skidoos are a vehicular threat (to water quality). –Business owner

I guess one thing is swimming in [and] around Ranger Bight. It's kind of close to the reservoir. Kids try to get up into it, but we got signs up around they'll get into the reservoir. Really it's kind of dangerous because we got the intake up there and we always tell them to stay away from that area. That's the only thing I can think of that would impact the drinking water quality. And some people take rides up past the reservoir up towards the dam. Like people traveling up there. Like it's hard to stop it really. But in the summer time you can stop it. But wintertime its kind of hard to stop it because people go up on machines you know. That's the only thing I can really think. It's really hard to stop people you know, because the river comes right down you know. It's over a kilometer long you know. Like it comes down over to Ranger Bight. In that time it can collect a lot of (contaminants) you know from people dumping garbage you know, even animal feces. - Municipal representative

- **Water lines**

Although the majority of Makkovik's water lines are in good condition, with new lines having been put in, water line freeze up from the main pipes to individual homes remains a threat. During winter, pipes in the community have frozen on a regular basis for some homes. To combat this, some households run their water continually during winter months.

Key informant perspectives

Not in the past years. A good many years ago the town supply froze, so everybody had to haul water. But it was a really bad year for snow and cold. And the thing froze up. They had to wait until spring until they could dig it out and the main water was froze up. –Resident

I think there's a problem that we don't engineer our water system for our climate and for our geotechnical challenges. It seems like less of a problem here than in Nain. Maybe we're just lucky at our house we haven't had any problems with freeze ups but other people do. It's because it's badly engineered. Um it's not, I mean technology is being done differently elsewhere and there's no need for it to be done this way anymore. It's the north coast there's no reason for us to try to put in any water and sewer system that's based on the island, when we have completely different geotechnical issues. And it's not like we are the only place in the world that has lived in the subarctic with discontinuous permafrost and has geotechnical issues. I know that we have bedrock. But Alaska, Nunavut, NWT everyone's doing it… Have you looked at anything else? Have you even put in a heat trace on your water pipes? So they don't freeze? So you can flick a switch if it gets cold, easy, easy to do. And they do it elsewhere. A little insulation, a little heat trace, done. It's easy to do a heat trace done, but only when you're building, pretty hard to retrofit –Resident

Addressing infrastructure challenges

The community of Makkovik has been fairly fortunate in the past in that it was one of the first Nunatsiavut communities to receive its water system. Also with good planning, a strong budget and a number of skilled workers its water system has been operating fairly well (JW Consulting Associates, 2009). Every home in the community is on town water and sewer, there has been a new lift station installed and moved to meet the needs of the community. These projects have been successful with the help of the provincial government and the Nunatsiavut Government.

Key informant perspective

Yes they collect local water taxes, I think there's $118,000 or something like that. But it's nothing compared to what the actual cost really is. Our funding from Nunatsiavut Government to help pay for all the staff we have to hire on and pay for repairs and maintenance. Like we're buying a new (fusing machine) this year, that kind of thing. The fusing machine costs like $40,000. The cost of our water and sewer tax doesn't even touch that. For operating we get so much dollars from NG every year and it's based on the formula. You'd have to see them to find it. It's based on a percentage. They get money through Inuit community transfers and we get a percentage based on the households in Nunatsiavut. –Municipal representative

It is through these supports that Makkovik has been able to address its infrastructure issues, which may be contributing to high levels of THMs and HAAs in the water. Because the current water system is not able to solve the THM and HAA problems, the community is getting a PWDU so that residents can have access to treated drinking water that does not have THMs or HAAs. The town's PWDU is scheduled to be located in the new fire hall in town. This will admittedly not fix the problems with THMs and HAA exposure. Residents will still be exposed to THMs and HAAs by tap water, as you can be exposed to THMs and HAAs through skin contact with water (Government of Newfoundland and Labrador, 2013), but the hope is that this measure will reduce the overall exposure.

Key informant perspective

Like the only thing that I know of that's high is the THM is high. And apart of how we are dealing with that is that we are installing a Potable Dispensing Water Unit. We got one project where we are putting one attached to our fire hall. This will be done [in the] summer but it's the only thing I can think of... It mostly came from, I guess on the north coast there was a mostly a provincial initiative because of the high THM levels. They did pilot project communities, like before they gave money to different communities that had high THM levels. –Municipal representative

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, 2006).

Federal

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 are used by all Canadian jurisdictions (provinces, territories and the federal government) as a basis to establish their own enforceable requirements for drinking water quality. The GCDWQ is mostly a framework and adherence to these guidelines is optional; provinces and territories are not required to enact legislative or policy measures to meet them.

The water system and operations for Makkovik falls under the responsibility of the municipality, with the oversight of the MICG. It is their duty to uphold the GCDWQ from the federal government but the federal government does not control the day-to-day operations in the municipality.

Provincial

In NL, the provincial government is the main body responsible for ensuring public access to safe drinking water based on the provisions of four main legislative acts: the *Municipalities Act* (1999), the *Municipal Affairs Act* (1995), the *Environmental Protection Act* (2002), and the *Water Resources Act* (2002). It must also follow the previously mentioned GCDWQ. Currently there are 315 protected public drinking water sources (Government of Newfoundland and Labrador DOEC, 2013) in the province. In NL, the provincial government has four departments that oversee the public water system: the DOEC, the Department of Health and Community Services (DOHCS), the Department of Municipal and Intergovernmental Affairs (MIGA), and Service NL (Government of Newfoundland and Labrador DOEC, 2013). These departments work under the Multi-Barrier Strategic Action Plan (MBSAP) (Government of Newfoundland and Labrador DOEC, 2013). This plan is then the responsibility of all levels of government. The departments' specific roles are outlined in Table 5 of this report. (Daniels, 2014)

Table 4. Multi-Barrier Strategic Action Plan – Three levels of governance

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

(Daniels, 2014)

Table 5. Roles and responsibilities of provincial departments managing drinking water in NL

Department of Environment and Conservation-Water Resources Management Division	- Acts as the lead agency - Regulates development activities within protected public water supplies - Samples and reports on chemical and physical drinking water quality parameters in public water supplies from source to tap - Operator Education, Training, and Certification (OETC) program - Annual Clean and Safe Drinking Water Workshop
Department of Health and Community Services (DOHCS)	- 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 - Conducts drinking water safety initiatives and review guidelines related to water which to enhance health and prevent disease
Municipal and Intergovernmental Affairs (MIGA)	- Financial support to communities for the provision of drinking water infrastructure - Involved in NL Drinking Water Safety Initiative and installation of Potable Water Dispensing Units

Service NL (or Government Services)	- Samples and reports bacteriological water quality parameters in public water supplies from source to tap

(Daniels, 2014)

The DOEC also releases several public reports relating to drinking water quality (Daniels, 2014; Table 6.).

Table 6. DOEC public drinking water quality reporting

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 immediately after water quality laboratory result is above the *Guidelines for Canadian Drinking Water Quality*
Annual Drinking Water Safety in NL Report	- Provincial report released annually - Describes the province's activities under the MBSAP
Drinking Water Quality web documents	- 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*

(Daniels, 2014)

Municipal

The Town of Makkovik is governed by the Municipalities Act and the NG, therefore it is the responsibility of the MICG (municipality) to operate the public water supply. Those who own property in the community contribute to municipal water and sewer tax. However due to the small size of the community, the tax base is not large enough to completely cover the cost of operations and maintenance. Therefore the province and the NG cover much of the cost for maintenance, staffing and operation of the water system. Makkovik's specific regulations and guidelines are posted in the community. According to Makkovik's ICSP

some of the funding for water infrastructure improvements is secured through the *Gas Tax* funding. The same planning document states that improvements to the town's pump house will be made (JW Consulting Associates, 2009, p. 11). The ICSP is just one of many plans the community has; as mentioned, on the community website five different planning documents are available at www.makkovik.ca. Furthermore, Makkovik's maps and testing information are available for the community's water infrastructure. It is also worth noting that the water operator and other municipal staff have water operator training, and diving training for confined spaces. Diving training for confined spaces is needed in order to do maintenance on the water holding tank.

2.4 Public perception, awareness, demand and practice

Perception

Water quality

General public perception around the water quality in Makkovik is mixed. Most community members feel that the water is of good quality, even noting that people from outside communities prefer Makkovik's drinking water. It was mentioned through interviews that even the boats that come into Makkovik at times will request to fill their water tanks with local water before heading out. However, there are some community members that are concerned about the THM levels and discolouration of the water.

Key informant perspectives

Colour is not aesthetically pleasing. Sometimes you can't see the bottom, it's brownish. It doesn't have a bad taste, no odor really. –Business owner

I just think its going fine for Makkovik, I don't know about other communities. –Resident

I like to think that our water is cleaner and safer than living in the city, I donno why. It's just because it's fresher, I donno, that's just my personal opinion. –Resident

I think it's fine, I don't know what the testing protocols are and I don't know how rigorously they are followed or anything else, we don't have nearly as many boil orders here as we had in Nain. I lived in Nain, and weather that's a measure of the drinking water or, a measure of the communication between the lab and the community government, I don't know. My family hasn't been sick. –Resident

I think it's really good, like right now. It's not a treated system but we do chlorinate it. So like there's good testing done on it. There's testing we send out samples every week to government like every 3 months to government to do different mineral samples and so it's well tested. And there are high readings in some areas, like THMs and stuff like that but overall the feedback that we get from the town, like residents is that the water quality is very good. Even visitors even say that the water quality is very good. We just had one the other day, (people coming in) my sister told me that they said that it's the best tasting water they've ever tasted. –Municipal representative

Government

Community members' perspectives on government have been positive, with a high level of trust at the local level. This is consistent with Community Accounts indicators, which state that the "percentage of population that are very strong or somewhat strong sense of belonging to that community [is] 86.4%" (Government of Newfoundland and Labrador Statistics Agency, N.D.). Local trust in the NG seems to be at a similar level, however trust in the provincial and federal government is where there is deviation.

Key informant perspectives

I believe that the town is doing the best that they can, if only because everyone on town council and staff is drinking the same water. So we all have an interest in making sure it's safe. I have very little faith in the province because all they do is cut budgets for service delivery, in my opinion they're just been cutting budgets on things like environment and natural resource management. Maybe on everything but that's just where I see. And that's a concern. Federally is possibly worse. It's hard to imagine but they just removed all protection for habitat for fisheries in a budget implementation bill!!!! Which is illegal, unconstitutional, immoral, reprehensible, but I don't really know what to do about it so I don't know. –Resident

I have faith in the local community government because I knows they comes and do regular checks, and they do monitor daily the water supply, and there's the chlorine count. There's a bit meter thing that they checks in the garage. They have to check it four times a day. –Resident

Threats

The main threats to Makkovik's water quality are its THM levels and freezing pipes. In regards to THMs, Makkovik has consistently been reported as above recommended levels, which has been a concern for some residence and with municipal staff. However MICG has been taking steps to address the concerns for drinking water options, most recently including the installation of a PWDU that will provide residents with an option for drinking water without THMs.

Key informant perspectives

THMs? Ours was second to Goose Bay, which is quite high. –Resident

Other than there might be a small handful of people who really like to address the THM thing, but overall I think our water system is pretty good… Like it's not going to resolve the THM problem really but you know if you got high THM you can still absorb THM through your body by taking showers and stuff like that. But it will resolve one part of that.–Municipal Representative

Awareness

General awareness around drinking water quality in Makkovik is low around specifics of testing results, however knowledge around MICG testing and activities is high. For example, some residents know that there are high levels of THMs, but are unaware of the high levels of HAAs. However in general, residents know who to contact if there are issues, when and where testing is done, the state of human resources, and people are aware of BWAs when they happen.

Key informant perspectives

It's tested at the hotel, at all public points, houses, etc. Water is readily available and so is information about boil water advisories. –Business owner

And what does that do? (Resident respondent to other respondent).*I'm not sure… but when they gave his reports, that was one of the things he mentioned. And they have divers too, the town hires on divers every so often, they come and go down into the tanks and stuff like that, just to make sure there's no debris or anything. They do, training every so often too so that they can go into closed spaces.* –Resident

They tests the water in the community regularly every month. And then they alert the public by posting notices, around the radio station, that there's a boil order, and then I think there has to be three consecutive readings before the boil water is lifted. –Resident

Residential demand and practice

According to Makkovik's ICSP the community is projected to have enough drinking water to maintain its current system and support future growth. Makkovik also has had the ability to meet the demand of high users seasonally when the fish plant is open.

Key informant perspective

I think it's really good [the quantity], like right now. Its not a treated system but we do chlorinate it. So like there's good testing done on it. There's testing we send out samples every week to government like every 3 months to government to do different mineral samples and so it's well tested. –Municipal representative

Industrial, commercial and institutional demand

Seasonally when the sea ice has gone and boats are able to access Makkovik's harbour there is an increase in demand on the drinking water system. Boats hook up from the fish plant. The fish plant itself also draws seasonally on the drinking water system. They are the biggest users.

Key informant perspectives

I think there's enough. –Resident

The plant is the biggest user… another thing that I forgot to mention is the freight boats. When they come in they usually want water from here, on the ships and on the long liner and stuff. But we consider that part of the plant. We charge them for that. But the freight boats that's through Woodwards. But they told us they prefer our water. They like our water. –Municipal representative

Conclusion

The Makkovik case study is part of the larger *Exploring Solutions for Sustainable Rural Drinking Water Systems in NL* research project. This case study was put together with the information gathered from municipal, territorial and provincial government documents and reports as well as semi-structured interviews. These interviews were conducted with the help of citizens, town council, the mayor and other municipal employees. It was the goal of these interviews to build a general understanding of the challenges and successes the community is facing and to place it within the larger understanding of the state of rural NL water systems. This specific document has examined Makkovik's source water quality and quantity; water infrastructure and operations; drinking water policies and governance; and public perceptions, awareness and demand for drinking water in the municipality.

By examining the reports from the DOEC along with information relayed by the key respondent interviews, the general picture for drinking water in Makkovik is fairly positive. DOEC reports that tests for: *Nutrients and metals*, and most *Physical parameters and major ions* are within the recommended parameters. However pH levels, colour and turbidity are above the aesthetic guidelines. It is important to note that these are aesthetic guidelines and not contaminant guidelines. Residents also reported that the taste of the water is better in comparison to other communities, although a strong chlorine taste can be detected at times.

What is a concern however is the need for some pipes to be replaced as they are beginning to age. Further issues come from infrastructure problems around freezing pipes in some homes in the community. This has led to some individuals having to continually run their water to keep their pipes from freezing.

Finally the largest problem identified in the case study interviews and through reviewing DOEC data appears to be the high levels of THMs and HAAs, which are both known as possible carcinogens (Health Canada, 2006). Currently Makkovik is trying to remedy part of this problem by installing a PWDU in the community that residents can use for free for their own drinking water. It is hoped that this will reduce resident's exposure to THMs and HAAs. It is clear that this is an attempt to reduce the exposure amount through drinking, but it will not get rid of the current water distribution system. The PWDU will be in addition to the existing system. One of the problems with this issue is that even if the PWDU is used, residents will still be exposed to THMs and HAAs through everyday activities such as bathing. In an interview with the town manager, concern was expressed

about the potential risk residents are subjected to through by skin contact with water containing high DBPs.

Further complications may occur here as well. Although having access to the PWDU will be free, residents will still have to supply their own water bottles at their own cost. Also, due to the location of the PWDU individuals may have to rely on vehicles or rides to transport water from the PWDU to their homes. Considering, "the 2010 gross income for every man, woman, and child (gross personal income per capita) in Makkovik was $21,900" (Government of Newfoundland and Labrador Statistics Agency, N.D.), there is the possibility that the PWDU may not be used by those who need it due to financial barriers.

However, this is not to say that this will be the case. Makkovik's small size and close-knit community is seen as having protective factors. It is a community where people do take care of each other, they offer rides to friends, family members and strangers and so some of the risk associated with lack of access may be mitigated by the strong sense of community belonging

Overall the picture of Makkovik's water system is fairly good. Most DOEC testing is within guidelines (with exception of colour and the THM and HAA levels), and the water quantity is adequate to meet the community needs. Also, with regard to the problem of infrastructure and freezing pipes, the NG has agreed to conduct further research to gain a better understanding of the infrastructure challenges and needs of Nunatsiavut communities (Goldhar, et al., 2012). It is the goal of these communities to work on improving their infrastructure to be more appropriate to their local needs. Findings in the Makkovik case show that respondents seemed fairly knowledgeable about the state of drinking water in the community and they had a fair level of trust in the municipal government and Nunatsiavut Government, and their ability to manage the drinking water system on behalf of the residents. The main point raised when it comes to Makkovik's drinking water is that it's a work in progress. The state of drinking water quality is adequate but there is room for improvement (due to the THMs and HAAs), which the MICG and NG are actively working on with the assistance of the province.

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Appendices

Appendix A. 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.

Appendix C. Research Application NG

The Nunatsiavut Government (NG) receives numerous requests each year to conduct research within the region. Any research conducted in Nunatsiavut should happen only with the full knowledge and participation of the NG, and first and foremost, the Labrador Inuit community.

Any researcher who would like to conduct research in Nunatsiavut must contact the Inuit Research Advisor (IRA), Carla Pamak, before proceeding. A research proposal is required for every potential research project that may take place in Nunatsiavut. A review process specific to each proposal will be initiated and reviewed by the Nunatsiavut Research Advisory Committee (NGRAC). A reply will be sent to the researcher identifying next steps as soon as possible. This will help ensure the review process is as thorough and fair as possible. The Nunatsiavut Government Research Advisory Committee meets once a month. Please keep these facts in mind when submitting an application.

The NGRAC requires the time to give the research project the consideration it deserves. **It is recommended that you submit your research proposal at least two (2) months before the start date of your project. If you are requesting a letter of support, the NGRAC recommends that you submit your research proposal at least six (6) weeks before the deadline for submission of your proposal.**

Our review of the proposed research will be more comprehensive and timely if we have some general information about the research for reference purposes. We ask that you provide us with a **non-technical proposal** that outlines:

1) Research project title

2) Applicant(s) name and contact information (address, phone, fax, email)
    - Name of the Principle Investigator and/or name of the contact person. There should be only one contact person.

3) Purpose of the research (research question or hypothesis)

4) Activities/methodology
    - Also, where appropriate, include maps of areas where the research will be conducted in the region.

5) Who/what will be the participants/subjects of the research. Include:
    - Number of participants/samples;
    - Communities to be included (not the names of the researchers),
    - Age or classification categories: i.e. youth, adults, elders, fish, birds, char, etc.

6) Anticipated research start and end dates

7) The benefit of the project to Nunatsiavut, and/or specific communities within Nunatsiavut, for example:
    - Opportunities to train, educate and employ beneficiaries in the field of science
    - Appropriate honoraria for Elders/participants

8) Any community representatives you have already contacted regarding this research (name, community, when)

9) How the community or NG departments will be involved in the planning/conduct of the research

10) How the results will be shared with the individual participants, community, and NG
    - All reports should be shared with the NG;
    - *Inuit express their desire for the inclusion of explicit recognition of all research contributors in final research report and documents.* Publications should include acknowledgement of all research team members, including elders, to the fullest extent possible.
    - Researchers should present the results of the research in the community or the nearest community to where they conducted the research in Nunatsiavut prior to communicating results at conferences, in articles, etc.
    - A plain language summary detailing the work conducted should be provided to the Nunatsiavut Government once the field season is completed and translated into the Nunatsiavut Inuktitut dialect (roman orthography). A list of translators from Nunatsiavut can be obtained from the IRA.
    - We suggest that you consider interviews on the regional radio and TV station (OKalaKatiget Society, Tel: (709) 922-2955).
    - If community members are included in the design, implementation or dissemination of research results, please allocate the appropriate funding within the project budget to enable community research partners to (co)present at conferences and other research forums as is appropriate.

11) The ownership, access to, and other potential uses of the data. Please include, where applicable, the storage and maintenance details for data as per your institutional research requirements.

12) The consent process (licenses, permits, etc.)
    - Participant (adult and youth) consent. Any youth under the age of 18 has to have their parents/guardians signed consent or they cannot participate.
    - Provide PDF copies of any licenses, permits, etc. that are required to conduct your research in Nunatsiavut.
    - Any research inside the Torngat Mountains National Park requires a permit from Parks Canada.

- If you are planning on conducting research in the schools, you will require approval from the Labrador District School Board. Website: http://www.lsb.ca/
- If you are planning on conducting health research within the region you will also require ethics approval from the Health Ethics Research Authority. Website: http://www.hrea.ca/home.aspx.
- If you are planning on conducting health research that will involve community clinic staff and/or resources you may also require research approval from the Labrador Grenfell Regional Health Authority. Email: Carol.Brice-Bennett@lghealth.ca

Here are some of the potential permits from other authorities that may be required:

a) Firearms FAC and transportation permit;
b) Federal permits for research on birds. A scientific permit is required for collections birds, birds tissues (e.g. feathers, blood, etc.), attachment of ancillary markers (e.g. nasal tags, radio transmitters, etc.);
c) Federal permits for banding to mark birds with bands. The banding permit requires special amendments if auxiliary markers are being used;
d) Canadian Wildlife Service Scientific permit;
e) Department of Fisheries and Oceans Canada permits;
f) Consent from your University Ethics Committee/Board;
g) Archaeology permits for research in Nunatsiavut:

- We ask that you please complete the following:
  I. Archaeological investigation permit for research in Labrador Inuit Lands (LIL) can be found at the following website http://www.nunatsiavut.com/en/landsandnaturalresources.php; and
  II. Archaeological research in the Labrador Inuit Settlement Area (LISA) requires a permit from the Provincial Government.

13) Permit to access Labrador Inuit Lands (LIL)

a) Land Use application

Any research activity conducted on Labrador Inuit Lands (LIL) by someone other than a beneficiary of the Labrador Inuit Land Claims Agreement will require a Land Use Permit as per Part 4 of the Labrador Inuit Lands Act. Please submit a Land Use application with your research proposal, which will be processed by the NG Lands Division. The final decision on a Land Use application will be made by the Minister of Lands and Natural Resources based on the recommendations of the Nunatsiavut Inuit Research Advisor.

b) Harvesting permit

For any wildlife sampling activity that may result in accidental fatalities, it is recommended that you obtain a permit to access Labrador Inuit Lands for the purpose of harvesting. Please submit the form, indicating the names of all team members who will be present at the research site, and indicating the team's main contact representative. You can send the form to the Conservation Officer to nearest

Inuit community and s/he will return a signed copy to you which should be held by the team while in the field. Also send a copy to the IRA.

14) Research Funding
- Where have you applied for funding to conduct this research?
- Is it approved or pending?
- Ensure that amounts are budgeted for the dissemination of results, translation and all associated fees for conference attendance (should community members be key partners in the implementation of the research project).

15) How Labrador Inuit traditional knowledge will be considered and/or incorporated into the research

Please ensure that the research proposal and all supporting documents are submitted in English in PDF format.

The Inuit Research Advisor will contact you to confirm that your research proposal and the permit application to access Labrador Inuit Lands (LIL) were received and will provide you with the date of the next NGRAC meeting. You will receive a reply on your proposal soon after that meeting. The research application process will be determined on a case-by-case basis. The NGRAC requires the time to give each research application the consideration it deserves.

Thank you for your interest in conducting research with the Nunatsiavut Government.

Please contact:

Carla Pamak
Nunatsiavut Inuit Research Advisor
Nunatsiavut Government
P.O. Box 70
Nain, NL, Canada
A0P 1L0

Tel.: (709) 922-2942 ext. 225
Fax: (709) 922-2931
Email: research@nunatsiavut.com

For more information on conducting research within Nunatsiavut, you may visit the Nain Research Centre website at www.nainresearchcentre.com

For more information on the Nunatsiavut region, you may visit the Nunatsiavut Government website at www.nunatsiavut.com