Examining Models of Water Service Delivery Systems for First Nations on Reserves in Canada

Melissa Penner, MADR candidate
School of Public Administration
University of Victoria
June 2016

Client:	Fiscal Policy and Investment Readiness Directorate Economic Research and Policy Development Branch Indigenous and Northern Affairs Canada
Supervisor:	Dr. Kimberly Speers, Assistant Teaching Professor School of Public Administration, University of Victoria
Second Reader:	Dr. Lynda Gagne, Assistant Professor School of Public Administration, University of Victoria
Chair:	Dr. Lindsay Tedds, Associate Professor School of Public Administration, University of Victoria

Acknowledgements

I would like to thank all of the individuals who made this project, and the completion of my degree, possible:

My manager, Stéphane Arabackyj, without whose insight, expertise, and desire to make meaningful change this project could not have been written. You consistently allowed this paper to be my own work, but steered me in the right direction time and time again.

My supervisor, Dr. Kim Speers, for her thoughtful comments and guidance throughout the process.

My roommate Caroline, and my friends across the globe, for providing me with unfailing support and care throughout my years of study. This accomplishment would not have been possible without you.

Finally, I must express my very profound gratitude to my partner, Sam, who inspires me to fly. With endless patience, encouragement, and support you have been my rock as you stood by my side during this season. You were always there to remind me, "*You got this*."

Thank you.

Executive Summary

Introduction

Many First Nations reserves across Canada do not have access to reliable, safe drinking water, which has hindered and continues to hinder community and economic development and poses a serious risk to human health. This research examines drinking water service delivery on reserves in Canada and recommends a policy direction for Canada to pursue to support the long-term, effective delivery of drinking water on reserves.

Methodology and Methods

Three lines of evidence are examined to understand the history, current state, and potential solutions for drinking water on reserves. A document review examines government websites, reports, and other "grey" literature pertaining to the subject. A literature review examines the scholarly and peer-reviewed academic research. A comparative case study examines the models of delivering drinking water on reserves including individual treatment systems, private wells, municipal service agreements, and regional Water Authorities. The findings from these three lines of evidence were compared and analyzed to produce policy options and recommendations.

Key Findings

The document review, literature review, and case studies revealed the following six key themes underlying the clean drinking water shortage on reserves:

- Insufficient operation and maintenance capacity is the greatest barrier to safe drinking water on reserves.
- The regulatory gap increases threats to water safety, but regulations will not ensure safe drinking water if communities cannot comply.
- There is insufficient funding available from Canada and in communities.
- Governance failures contribute to water quality problems when operations and maintenance practices do not have sufficient management, support, and oversight.
- Many First Nations communities face additional challenges that increase water quality risk due to their small sizes and/or remote locations.
- Institutional support is a widely recommended option to help with capacity and other barriers and regional First Nations Water Authorities provide a promising way to do this.

Options to Consider and Recommendations

The options to consider are:

- Continue the current models with a regulatory regime and enhanced funding;
- Advocate that provinces are mandated to run water systems on reserves; or
- Support the creation of regional First Nations-led water institutions that can provide capacity support to communities.

It is recommended that Canada pursue Option 3: support the creation of regional First Nations-led water institutions to provide capacity support for participating communities in the delivery of clean drinking water on reserves. The first step is for Canada to consult broadly with First Nations to determine interest in this program, and to customize it based on feedback from communities. Should there be sufficient interest from First Nations, Canada should provide adequate financial, administrative, and political support to establish and sustain regional institutions that would support First Nations in managing the clean drinking water.

List of Acronyms

APC - Atlantic Policy Congress of First Nations Chiefs Secretariat
INAC – Indigenous Affairs and Northern Development Canada
MSA – Municipal Service Agreement
OAG – Office of the Auditor General
O&M – Operations and Maintenance
SSCoAP – Standing Senate Committee on Aboriginal Peoples
SCAAND - Standing Committee on Aboriginal Affairs and Northern Development – House of Commons

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1.0 Introduction

First Nations living on reserves in Canada often face drinking water shortages and risks that are frequently associated with regular, persistent, and enduring boil-water or do-not-consume advisories. This situation poses risks to human health and inhibits the nation-to-nation relationship between First Nations and Canada. This report examines the models of water service delivery on reserves and the barriers and potential solutions to providing clean, safe drinking water in a sustainable manner.

1.1 Defining the Problem

In 2010, clean drinking water was declared a human right by the United Nations General Assembly when they called upon countries to provide "safe, clean, accessible and affordable drinking water and sanitation for all" (UNGA, 2010, p. 2-3). The standard of living is relatively high in Canada, which ranks 8th on the United Nations' Human Development Index and most Canadians, especially in urban areas, tend to take clean drinking water for granted (UNDP, 2014, p. 159). Despite this high standard of living, many First Nations communities in Canada do not share this experience, and live in conditions that resemble poverty-stricken countries ranking much lower on the Index (Anaya, 2013, para. 6). A recent investigation by CBC News found that two-thirds of all First Nations communities in Canada have been under a drinking water advisory in the last decade, the longest of which has been in place for 20 years, demonstrating that many Indigenous people in Canada do not have access to clean drinking water (Levasseur & Marcoux, 2015, para. 1 & 2).

This lack of access to clean water on reserves is seen to be the deprivation of a basic and essential biological need, has been interpreted as a failure of Canada's fiduciary responsibility[1] to First Nations, and causes conflict between First Nations and the Government of Canada (Boyd, 2011, p. 132; Hewson, 2014). For example, four Alberta First Nations are suing Canada for having breached "its fiduciary duty" and "the Honour of the Crown" by "creating and sustaining unsafe drinking water conditions" (Tsuu T'ina Nation et al, 2014, p. 3). In addition, in February 2016, the United Nations Committee on Economic, Social and Cultural Rights considered reports by Amnesty International and Human Rights Watch alleging that Canada's failure to protect and provide safe and clean drinking water for First Nations has led to negative effects on health, education, criminal justice, and addictions (Amnesty International, 2016 p. 29; Human Rights Watch, 2016a, p. 9).

Resolving this conflict requires solving the underlying problems of providing adequate clean drinking water on reserves. Though part of the problem is what some have called the "chronic underfunding and systematic negligence" of community infrastructure (Galloway, 2012, para. 6), even if sufficient money is provided, there is a host of other barriers that remain. For example, the current Liberal government has committed to providing enough funding to end the boil water advisories on reserves by 2020 (Walker, 2015, 14:30-15:56) but as noted, financing is not the only barrier to providing First Nations with adequate and equitable access to clean water. Even with increased funding, the question of *how* to deliver the service to over 600 vastly different communities—many of which are rural, remote, or extremely small—poses a daunting problem. Currently there is a lack of governance, processes, and capacity, in addition to a lack of funding and regulations, which has led to the lack of a basic provision necessary for life. In addition, any proposed model of service delivery needs to also take into account the principles of self-determination for First Nations, a right both asserted by Indigenous peoples and acknowledged by Canada (Wherrett, 1999, p. 2).

A great deal of money has already been spent building water treatment facilities, and yet it has not consistently provided systems that make safe and clean water available in an efficient manner over a long period of time. According to a Library of Parliamentary report (2010): between 1995 and 2008, $3.5 billion was spent on water and wastewater systems on reserves; Budget 2008 and 2010 both committed $330 million over two years, and Budget 2009 invested $165 million for water and wastewater infrastructure projects on reserves (p. 3-4). Nevertheless, funding alone has not been able to solve the water problem; regulatory and capacity deficits serve

[1] Canada's fiduciary responsibility is further explored in Annex A.

as a major barrier to long term solutions. Effective implementation is needed along with increased funding in order to resolve the disputes and prevent further conflict.

The Economic Research and Policy Development Branch at Indigenous and Northern Affairs Canada (INAC) is seeking to develop recommendations on the capacity supports required for clean water delivery systems on reserves to become a sustainable reality.

1.2 Project Client

The client for this project is the Economic Research and Policy Development Branch within the Lands and Economic Development Sector at INAC. This research was prepared at the request of the client, but all work is entirely that of the author and does not necessary represent the views of the Branch or the Department. INAC does not guarantee the completeness, accuracy, or reliability of the information contained.

The mandate of the Lands and Economic Development Sector is to help Indigenous communities increase "their economic development potential by investing in community readiness, entrepreneurs and businesses, land management, and strategic partnerships" (INAC, "Lands", para. 1) as well as removing the legislative barriers to First Nations participation in economic and business development on reserve. To support this work, the Economic Research and Policy Development Branch provides evidence-based policy recommendations to improve fiscal policy and address barriers to Indigenous economic development.

The work of the Branch includes the *First Nations Fiscal Management Act* and its associated institutions, namely, the First Nations Financial Management Board, First Nations Finance Authority, and the First Nations Tax Commission. These by-First Nations for-First Nations institutions focus on improving the capacity of First Nations to generate own source revenues, and the Branch wants to explore the possibility of exporting this model to other policy areas. The goal of these institutions is to enable First Nations to take up jurisdictional responsibilities and generate revenues so as to deliver quality services and infrastructure to citizens.

Clean water is fundamental to community development and to creating communities that are ready for business opportunities. As a necessary background to supporting resilient communities ready for economic development, the Branch is seeking to develop policy recommendations on the institutional and capacity supports necessary for delivering drinking water on reserves in a way that is successful over the long term, cost effective, and respects the principles of Indigenous self-determination. The Economic Research and Policy Development Branch will use this research and the recommendations as background for developing policy positions to support sustainable access to clean water on reserves.

1.3 Project Objectives and Research Questions

The purpose of this project is to examine models of public service delivery of drinking water on reserves. The objective of the report is to analyze these models, in the context of Canadian First Nations, to inform policy development by recommending a policy direction for the Canadian government that would support long-term, sustainable, efficient solutions to providing clean drinking water on reserves. The main research question is:

- What approach to policy and implementation should the Canadian government pursue to support all First Nations in addressing the lack of clean drinking water on many First Nations reserves, in a long-term, efficient manner?

The secondary research questions are:

- What are the issues leading to a lack of clean drinking water?
- What are the models of service delivery for water systems on First Nations reserves?
- What supports do First Nations need to ensure effective, long term delivery of clean drinking water?

1.4 Background

The Government of Canada has a fiduciary responsibility and duty of care to First Nations people in Canada (Library of Parliament, 2002, p. 2), as laid out in the Supreme Court of Canada decision *R. v. Sparrow* (1990, p. 1114). This means that Canada is obligated to act towards their best interests. To fulfill this duty, INAC and Health Canada share responsibility with First Nations for the management of water on reserves (Health Canada, "First Nations"). It is INAC's responsibility to provide funding and advice for water service, such as design, construction, operation and maintenance of water and wastewater facilities, as well as the training and certification of the operators (Health Canada, "First Nations"; INAC "Roles"). In 2013, the Government of Canada passed a bill to enable them to make regulations regarding water on reserves. Though provinces and territories create their own legally binding standards for safe drinking water, on First Nation reserves, Canada has jurisdiction to regulate: the quality of drinking water; the training and certification of water and wastewater system operators; the treatment of water and wastewater; the monitoring, testing, sampling and reporting; and, the protection of sources of drinking water located on reserve (INAC, "Backgrounder").

Capacity requirements are another major barrier to clean drinking water. First Nations have the responsibility to:

- Own, manage and operate water and wastewater systems
- Monitor water and wastewater systems
- Design and construct facilities in accordance with established standards
- Issue Drinking Water Advisories, typically on the recommendation of Health Canada, or on their own initiative in emergency situations (INAC, "Backgrounder").

Compared to some remote, tiny, or impoverished First Nations, provinces have a vast amount of resources to put into designing, constructing, managing, operating, and monitoring water systems. In addition to the gap in the regulatory framework on reserve, there is also a lack of institutional support and capacity to fulfill requirements throughout the life cycle of the asset.

Not only does the government have responsibility for clean water on reserves, but the new mandate of the Minister of Indigenous and Northern Affairs is to advance reconciliation by renewing a Nation to Nation relationship between the Government of Canada and Indigenous peoples. This includes specific direction to "make real progress on the issues most important to First Nations, the Métis Nation, and Inuit communities – issues like housing, employment, health, […and] improve essential physical infrastructure for Indigenous communities" (Trudeau, 2015, p. 2). This appears to show that the political will is in place to make substantive change in order to solve the epidemic of unsafe drinking water on reserves.

1.5 Organization of Report

The objective of this project is to provide the client with background information and analysis to inform policy direction. The project will be divided into nine chapters:

- Chapter One provided the reader with an introduction and background on the topic.
- Chapter Two will explain the methodology and methods used in this report.
- Chapter Three will present the findings of a document review that outlines the current state of water delivery and themes about the problems.
- Chapter Four is an academic literature review of the scholarly work on drinking water on reserves, exploring the problems and recommendations in the literature.
- Chapter Five is a comparative case study analysis of models of water service delivery.
- Chapter Six will discuss and analyze key findings from the document review, literature review, and case study.
- Chapter Seven will offer policy options and recommendations for the Economic Research and Policy Development Branch.
- Chapter Eight is the conclusion summarizing the findings and recommendations.

2.0 Methodology and Methods

This chapter describes the research methodology and methods and focuses on how information was gathered and analyzed.

2.1 Methodology

This research project uses a qualitative methodology to explore drinking water on reserves and gain an understanding of the issue by examining the context of the situation (Creswell, 2007). Qualitative research tends to be of a more exploratory nature and generates non-numeric, descriptive data. The research in this study is highly complex, focused in scope, with non-numeric data making a qualitative methodology ideal (Soy, 1997, para 1). When working with Indigenous populations as a member of the dominant culture, it is important to integrate cultural sensitivity in order not to replicate colonial frameworks, expropriate Indigenous identities, or impose top-down solutions that do not respect local values, traditions, culture, and knowledge. It is important, therefore, to value and "foreground" Indigenous voices in research and not impose presupposed Western concepts and thus replicate colonial patterns (Denzin and Lincoln, 2008, p. 21). For this reason, a grounded theory approach was used to examine the context of water service delivery systems on First Nations reserves. In a grounded theory methodology, the interplay of data collection and data analysis allows for themes to arise as the research progresses, from which a theory can emerge during the research process (Bowen, 2006, p. 2). This allows First Nations voices and experiences of drinking water problems on reserves to shape the findings.

In addition to a document review and literature review, a comparative case study analysis was conducted. A case study is the qualitative analysis of a "real-world" example of a particular phenomenon, in which the unit of analysis is the individual case, allowing for the systematic and context-specific exploration of the phenomenon (Beasley & Kaarbo, 1999, p. 372; Patton, 2002, p. 447). In this report, each case is a model of water service delivery. A comparative case study is the systematic comparison of several models of delivery (Beasley & Kaarbo, p. 372). Patton (2002) provides a framework for the methods to be used in a case study: first is to assemble the raw case data, then construct a case record, and finally construct the case study narrative (p. 450).

2.2 Methods

This study triangulates findings from three lines of evidence: a document review, a literature review, and case studies of the models of drinking water delivery on reserve.

First, a document review was conducted to examine grey literature pertaining to drinking water delivery on First Nations reserves. Documents were analyzed that were significant and relevant to inform the research questions, and to understand the history, context, and current state of First Nations water, but were not part of scholarly and peer-reviewed academic research. The data was gathered and coded according to the common themes that appeared, as per the grounded theory approach. Data was collected by reviewing existing public documents, both electronic and hard copy, in a comprehensive and systematic manner to find and interpret themes and patterns in the texts (Patton, 2002, p. 453). These documents included: Parliament research publications; provincial water reports; documents from the departments of INAC, Health Canada, Environment and Climate Change, and the Office of the Auditor General including: websites, promotional material, and evaluation reports; submissions to the United Nations; the Safe Drinking Water for First Nations Act; and special commission reports including the 2006 *Report of the Expert Panel on Safe Drinking Water for First Nations*, the 2007 *Standing Senate Committee Safe Drinking Water for First Nations* report, and the 2011 *National Assessment of First Nations Water and Wastewater Systems*; and research and policy reports by think tanks and consultants. In total, 52 documents were reviewed.

Second, a literature review was conducted to examine the research from the academic and scholarly community on water service delivery on First Nations reserves. Literature was analyzed that was significant and relevant to

answering the research questions. Specifically, the aim was to provide a systematic review of the existing research on the causes leading to drinking water system failure and the proposed solutions that are supported by the research. The data was gathered and coded by the themes that emerged, as a grounded methodology stipulates (Patton, 2002, p. 453). Sixteen studies and articles were analyzed for the literature review. The research included data analysis of water system risk scores; studies of water system operators and administrators, through interviews, surveys, focus groups; and case studies of First Nations water systems.

Third, case studies of the models of delivering drinking water on reserves were conducted. The client identified the four models of water service delivery on reserves: (1) individual community water systems; (2) individual wells; (3) municipal water sharing agreements; (4) aggregation of water systems in multiple communities, owned and operated by a third party organization. Each of these models was examined to demonstrate what the models of service delivery are, how they work, and the challenges faced by communities using each particular model. The data gathered for the case studies comes from a mixture of publically available reports, news articles, letters, studies, community resources, and opinions, along with internal documents provided by the client that include briefing notes, memos, emails, internal databases, and project reports.

2.3 Data Analysis

Data gathered from the document review, literature review, and case studies was analyzed through a thematic data analysis approach. The purpose of thematic data analysis is to identify and categorize "patterns of meaning" in the findings that are relevant to the research question (University of Auckland, n.d., "About Thematic Analysis"). With this approach, the research is organized and then analyzed by the themes that appear within the data. Thematic data analysis seeks "to unearth the themes salient in a text at different levels" (Attride-Stirlinger, 2001, p. 387).

The first step is to read and become familiar with the data before coding it, or labeling the relevant themes that it contains. Based on the conceptual framework, the first iteration of coding elements was: funding, regulation, capacity, jurisdiction, and governance. Next, these themes were used to review the data, generating a second wave of findings about each of the themes and adjusting the themes to better represent the data. Finally, the second iteration of themes was reviewed and validated against the original data set. This process involves refining the themes by narrowing or widening themes, adding or combining themes, and splitting or discarding other themes (University of Auckland, "About"). Challenges and promising practices were identified through this approach, in order to provide the client with the necessary analysis to pursue policy options that may improve the state of drinking water on First Nations reserves in Canada. The document review, literature review, and case studies were coded and analyzed according to the themes that emerged from the research. They were then interpreted and evaluated in Chapter 6 of the report, exposing patterns and revealing conclusions.

2.4 Project Limitations and Delimitations

This project is limited by its narrow scope and lack of human research. This research is part of an examination of innovative models of delivery of public services for First Nations, which is a vast topic. Previous work has examined First Nations financial institutions to enable First Nation governments to access to capital at similar rates as municipal government, and ongoing work is being done around Indigenous education. Therefore, to answer the research question in appropriate depth and keep the report a manageable size for the client, the scope of this report is deliberately kept narrow: the research and recommendations for this report will focus only on the delivery of the public service of clean drinking water on First Nations reserves. Due to time and funding constraints and to limit the scope of the project, this report provides the first step in obtaining information by gathering and analyzing existing information. The next step to further the research would be to interview First Nations on the topic, in order to ascertain the perceptions from the people most affected by the problems and potential solutions.

This project will focus on First Nations reserves in the provinces. Due to the limitation of available research, most of which is focused on water in the South, this paper will not study water in the Territories. Additional research may be needed to determine if the findings are the same in the North and whether different solutions might be needed. Though wastewater systems are closely connected to drinking water systems, they will not be included in this report. The state of wastewater on reserves impacts drinking water due to contamination, and many similarities exist between the two systems, but more research should be conducted to determine if the findings in this study are the same for wastewater systems. An overview of the technical specifications of water systems will be provided but the specifics of engineering and mechanical aspects of water systems will not be examined in detail. A financial cost-benefit analysis of the models is beyond the scope of this paper and requires further research. Some discussion of financing options is included; however, the focus of this research is to examine the challenges that remain to delivering drinking water on reserve even if sufficient money is available. A secondary study on funding options should be completed to answer questions of implementation.

By examining only documents for the research and not conducting human research, new perspectives from participants are not discovered. This limitation means that the voices of First Nations themselves are less prominent so to mitigate this, recent studies with interviews and surveys of First Nations water operators were included. In addition, a large amount of research has already taken place to examine local perspectives and First Nations proposals. More research is not needed, but rather consolidating the research that has already taken place to determine what the evidence-based consensus is on the problems and possible solutions. The benefits of not conducting human research are this study remains non-invasive and does not contribute to research fatigue. Another limitation of using only existing material is the information may be biased. Triangulating the lines of evidence and reviewing a broad array of documents helps to mitigate this. This is an exploratory study, so the recommendations suggest an implementation strategy for further study and consultation, but do not proscribe how the model should be enacted on First Nations. General conclusions are made, but sustainable solutions must be First Nations-led and must be arrived at in partnership with Indigenous people.

2.5 Conceptual Framework

The research question asks about what approach Canada should pursue to support clean drinking water on reserves. The first theory that I had going into this research is that providing clean drinking water relies on three pillars: funding, regulations, and capacity—and like a three-legged stool all of the pillars are necessary but insufficient to ensure the safety of drinking water (see Figure 1). All three pillars are needed together and one pillar cannot ensure safe water without the other pillars. The first pillar, funding, has to do with the costs of collecting, treating, and distributing water. The second pillar, regulations, requires enforceable standards and guidelines for quality. The third pillar, capacity, means that at every stage there is the necessary knowledge, resources, people, infrastructure, and oversight.

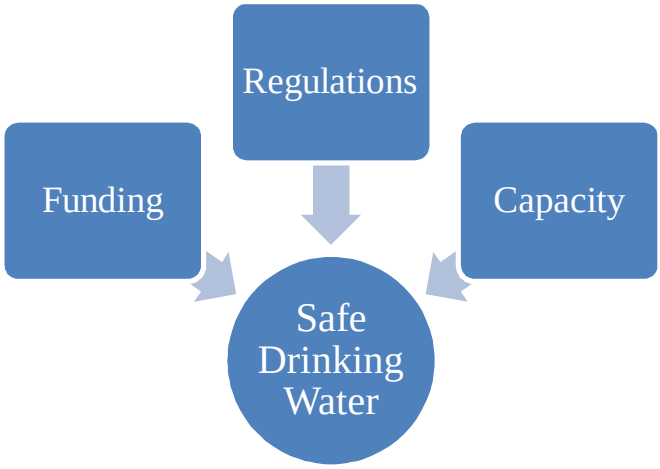

Figure 1: Three Pillars of Safe Drinking Water

Capacity building must, therefore, accompany increased funding and regulations. Capacity theory includes five dimensions of capacity that must be met:

- Financial (internal source of revenue, community economy);
- Institutional (administrative and financial management);
- Technical (infrastructure, skills and training);
- Political (governance arrangements); and
- Social (operator certification, networks, relationships) (Kuikman, Singh, Spence & Walters 2012, p. 10).

The second theory underpinning the research is that resilient communities require increasing First Nations jurisdiction. Community resilience is the ability to use available resources to withstand and recover from challenges in order to maintain health, self-reliance, and community well-being. Jurisdiction is an important part of Indigenous self-determination. For a government to be able to exercise jurisdiction, they must have the appropriate institutional capacity to do so. The three pillars of drinking water are part of a larger, dynamic system and as such are exposed to changing conditions and risks over the project life-cycle. For example if a health crisis strikes the community, the funding and human resources that used to be sufficient to safely run the water treatment plant may be diverted to addressing the emergency, and become stretched beyond their ability to continue safely delivering water. Resilient communities require jurisdiction over areas of importance and having the capacity to exercise it. Conferring jurisdiction must be paired with effective institutions of governance in order to meet capacity requirements for successfully delivering clean and safe drinking water on reserves.

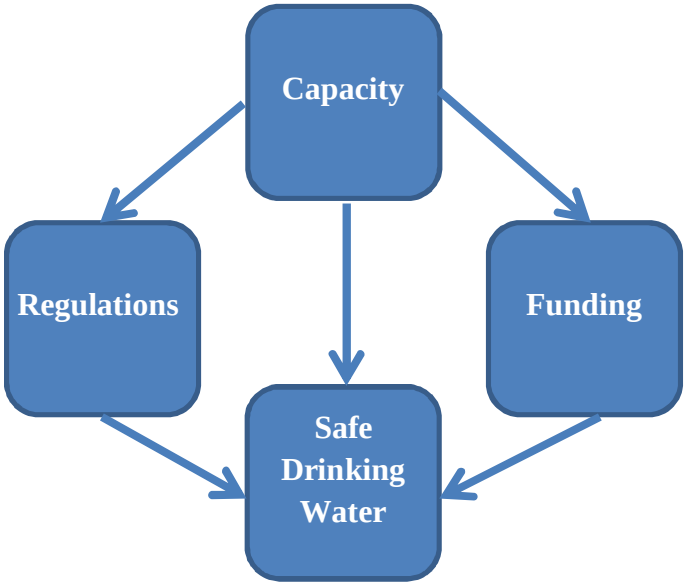

Figure 2: Capacity and Safe Drinking Water

The conceptual framework will be used as a starting point to guide the data analysis of the findings. Funding, regulation, capacity, jurisdiction, and governance will be used as initial coding elements of the data set from the findings. Since this research is using a thematic data analysis approach however, the final themes used will be organized according to the most salient patterns that emerged from the research, rather than from pre-determined categories.

3.0 Document Review Findings

3.1 Introduction

Accessing clean drinking water on many First Nations reserves in Canada is a challenge. To understand the nature of the problem, this chapter presents the findings of the Document Review. Fifty-two documents were examined that were significant and relevant to understanding the context of drinking water on reserves and answering the research questions, including government reports, consultant studies, and government websites on water programs. Data was collected by reviewing existing public documents, both electronic and hard copy, in a comprehensive and systematic manner to find and interpret themes and patterns in the texts.

These documents were analyzed to inform the research questions and to provide an understanding of the Government of Canada's activities pertaining to drinking water on reserve. The document review revealed six key themes that will organize the chapter, including the background, funding, legislative and regulatory contexts, governance concerns, capacity for operations and maintenance (O&M), and the potential for institutional support.

3.2 Background

For a history and examination of the division of responsibilities for delivering drinking water on reserve, see Annex A: History and Responsibilities. For an overview of the technology used on reserves for treating and delivering drinking water, see Annex B: Drinking Water Technology.

3.2.1 CURRENT CONDITIONS

Canada's water quality is 4th out of 17 comparable countries, according to analysis by the Conference Board of Canada (2016, p. 1). This high water quality is not available on many reserves however, and it has been a problem for a long time. As of January 31, 2016, there were 135 Drinking Water Advisories in effect in 86 First Nation communities across Canada, excluding British Columbia (which is monitored separately) (Health Canada, 2016, "Drinking Water"). As of February 29, 2016, there were 26 Drinking Water Advisories in effect in 23 First Nation communities in British Columbia (First Nations Health Authority).

The Office of the Auditor General (OAG) reported that in 1995 Indigenous and Northern Affairs (INAC) estimated one quarter of the water systems in First Nations communities posed potential health and safety risks, in 2001 three quarters of systems posed a significant risk, and in 2011 more than half of the drinking water systems pose a significant risk (OAG, 2005, p. 1; OAG, 2011, p. 15). In 2005 and in 2011, the Auditor General reported that despite federal actions and hundreds of millions of dollars spent on water systems, it has not led to significant improvements on reserves (OAG, 2005, p. 9; OAG, 2011, p. 2). The *National Assessment of First Nations Water Systems* reported that of 807 systems serving 560 communities, 314 (39%) systems posed a high risk to the quality of water and human health, and 278 (32%) posed a medium risk, and only 54% of water systems had a fully certified primary operator (Neegan Burnside, 2011, p. i).

Amnesty International estimated that 20,000 First Nations people across Canada do not have access to running water and that at any given time, more than 100 of the First Nations communities with running water are under a boil water or do not consume advisory due (Amnesty International, 2016, p. 36). A special report by CBC News in 2015 found that since 2004, more than 90% of Saskatchewan First Nations have had at least one drinking water advisory (Woloshyn, 2015). The special report profiles a Saskatchewan First Nation which built a new treatment plant in 2006 but a few years later implemented a boil water advisory due to the high mineral content and chlorine in the water. A reverse osmosis system was installed, however to receive clean water community members must fill up jugs at the treatment plant—the tap water in people's homes is still not drinkable. The Winnipeg Free Press reported that according to data they received from Health Canada, in 2014 73% of drinking

water cisterns on Wasagamack First Nation tested positive for the potentially dangerous coliform bacteria (Welch, 2015).

The document review supported this anecdotal evidence that systems are not primarily failing simply because they are old and are at the end of their lifespan. Human Rights Watch told the United Nations Committee on Economic, Social and Cultural Rights that of the 99 drinking water advisories affecting Ontario First Nations communities in 2015, 56 of the systems were built after 1991 and 12 were built after 2000 (2016a, p. 9). As a point of comparison, the city of Winnipeg says that with normal upkeep, their water treatment plant is expected to last 75 years (City of Winnipeg, 2015), and the Treasury Board policy: *Account Standard – Capital Assets*, states that infrastructure like drinking water systems should last 20-40 years (Treasury Board, 2001, "Amortization"). In their analysis of clean and safe drinking water for First Nations, the Auditor General and Standing Senate Committee on Aboriginal Peoples also did not cite the age of water treatment facilities as a cause of their failure, referencing instead everything from "the design, construction, operation, and maintenance" of systems (OAG, 2005, p. 2), including insufficient capacity to develop and administer water regulation, and lack of resources (SSCoAP, 2012a), and contaminated source water, lack of band capacity, insufficiently trained or certified operators, lack of regulations, and inappropriate technology (SSCoAP, 2007). In a 2010 publication, Indigenous Affairs (INAC) also admitted that the underlying cause of water quality problems is not primarily the fault of physical treatment plants but stems from deficiencies in the "water source, the design of the system, the operation of the system, the training of the operator, and the monitoring and record keeping related to the system" (INAC, 2010a, p. 10). This becomes a negative feedback loop where contaminated source water and the wrong technology for the location exacerbate the issues and create greater water problems.

3.2.2 SPECIAL CHALLENGES

70% of reserves have fewer than 500 residents (INAC, "Aboriginal Demographics"). Many of the drinking water challenges faced by First Nations are similar to those faced by all small and rural systems across Canada, such as:

- construction and operating costs are high;
- attracting, training, and keeping qualified operators is difficult;
- remote systems cannot be consolidated;
- emergency help and supplies are difficult to receive and are not timely; and
- capacity to manage the system is lower (Expert Panel, 2006a, p. 19).

The C.D. Howe Institute (2011) reported that Canada has tangible water safety problems in small communities all across the country, and it will be a significant challenge to bring them up to standards (p. 2). For many First Nations, these problems are enhanced by facing multiple barriers. Complicating this challenge for First Nations is that fact that many are not just small or rural but are remote and isolated, accessible only by ice roads in the winter or by flying in. The difficult terrain many reserves are located in make it both more technically difficult and costlier to provide water services, and electricity is limited for some (OAG, 2005, p. 5). In addition, First Nations face a lack of clarity about service levels, lack of a legislative base, lack of an appropriate funding mechanism, and lack of organizations to support local service delivery that municipalities do not contend with (OAG, 2011, p. 2).

Navigating the bureaucracy of the government provides an additional challenge to First Nations. Off-reserve, many small communities rely on individual private wells or water systems that service fewer than five houses, however private wells or treatment devices are not funded by INAC, only systems that are centrally managed by the band. Even small and rural reserves must choose more complicated water management systems unless they have sufficient own-source revenue, which is less likely for small and rural reserves (OAG, 2005, p. 3). Even signing a self-government agreement does not necessarily help First Nations with issues of legislative and organizational support as agreements to date have not addressed issues of drinking water well (Graham & Fortier, 2006). Despite providing jurisdiction for First Nations over water, they have not provided fully functioning regulatory regimes or sufficient water governance structures (p. 12).

Another challenge is that the historical deprivation of clean water and prevalence of water-related illnesses has created a deep distrust of government-funded water systems, and other community challenges exacerbate water problems. The Auditor General reported on a First Nation community that refused to use their brand new water treatment plant, due to unaddressed concerns about the water source and design of the plant (2005, p. 8-9). This is exemplified in the case of Kashechewan First Nation, which was evacuated in 2005 when water in the community tested positive for E. coli and distressing pictures of local infants with severe skin rashes were widely reported. The C.D. Howe Institute (2011) examined the issue and found that though a harmless strain of E. coli *was* present, it was not the pathogenic E. coli O157:H7 (p. 5). Eleven years later and community trust in the water has not been restored, and neither have the underlying housing or health concerns. CBC reported in 2016 of skin rashes in children at Kashechewan First Nation, and executives at Health Canada claim the water has been tested and is completely safe but the Grand Chief of the Nishnawbe Aski Nation is requesting an independent assessment of the water quality, as the only way to assuage the community's mistrust (Rutherford, 2016). In addition, the problems of overcrowding and insufficient access to appropriate healthcare persist in the community, exacerbating water fears.

Such underlying issues of lack of healthcare access, historic water problems, community mistrust, bureaucratic red tape, isolated and remote communities, and small water systems are added challenges that First Nations face in providing clean drinking water.

3.3 Funding

Though a detailed analysis of funding and financing is beyond the scope of this report, funding plays a significant role in the problem of unsafe drinking water on reserves. The three primary aspects of funding identified in the document review are construction funding, operational costs, and the funding cycle.

3.3.1 AMOUNTS

INAC is responsible for funding the full amount of the capital costs of water projects, including the design, construction, and upgrading. INAC pays for 80% of the ongoing operations and maintenance (O&M) costs based on a formula of costs. The government also covers 80% of the costs when a First Nation gets water from a neighbouring municipality through a service agreement. INAC and Health Canada also provide communities with some funding for operator training and certification, and Health Canada supplies funding to sample and test drinking water. The First Nation is responsible for the remaining costs that are not covered, which according to the formula used is meant to be 20% of the total cost. (Health Canada, "First Nations and Inuit Health"; INAC, "Roles"; Watt, 2008; OAG, 2005, p. 4).

A report by the Library of Parliament (2010) breaks down federal spending on water systems on reserves in the past: approximately $1.9 billion between 1995 and 2003, $1.6 billion between 2003 and 2008, $660 million between 2008 and 2012, and $165 million in 2009 (Library of Parliament, 2010). In the Departmental Performance Deport for 2014-2015, INAC reported that between 2008 and 2016, the total federal funding allocated under the *First Nations Water and Wastewater Action Plan* was $3.1 Billion (INAC, 2016, p. 1). In *Budget 2016*, Canada committed $141.7 million over five years to improve the monitoring and testing of on-reserve community drinking water (Canada, 2016, p. 142), and an additional $1.8 billion over five years for building water treatment facilities (p. 143).

In contrast, the Canadian Centre for Policy Alternatives (2016), a left-leaning think tank stated in their *Alternative Federal Budget 2016* that including operations, upgrades, and construction costs, "addressing water quality will require an investment of $1 billion per year over the next 10 years" (p. 66). The National Assessment estimated that it will cost $2.66 billion to service water systems on reserves, including the costs to repair existing systems, upgrade systems to meet the needs of population growth, and build the needed new

systems, and $253 million a year to run the systems to the level of service required by protocols (Neegan Burnside, 2011, p. 32).

3.3.2 FUNDING ISSUES

The document review shows that a significant cause of drinking water problems in First Nations communities is the underfunding of systems by the government (Amnesty International, 2016 p. 36; Expert Panel, 2006a, p. 29). It especially affects First Nations without alternate revenue streams that are unable to cover their contributions to O&M costs. Some First Nations communities claim actual costs are much higher than the formula INAC uses (Human Rights Watch, 2016a, p. 14). This funding is required for both the construction and upkeep of the facilities, and to pay for the ongoing human capital, treatment chemicals, and spare parts. The Auditor General (2005) reported it is not clear how safety standards are met when there is a gap between the amount of money available and the minimum service standards (OAG, 2005, p. 6).

Based on their research among First Nations, the Expert Panel (2006a) concluded that the water treatment plants that are the cheapest to build can sometimes be the costliest to run. This additional strain on an already-stretched budget may lead to the decision to trade off lower start-up costs for higher running costs (p. 29). INAC states that in order to contribute to the O&M costs of their water systems, First Nations are expected to charge user fees for water service (INAC, "Water and Wastewater"). Despite this, as the Auditor General's research demonstrated, few First Nations collect service fees and "INAC ignores whether First Nations have other resources to meet [the requirement to cover 20%] and has no means to enforce it" (OAG, 2005, p. 19-20). On top of this potential funding deficit, the Expert Panel discussed how the funding INAC provides for O&M is based on a formula that may not always cover actual costs, leaving the First Nation in a serious hardship to try and cover the rest (p. 29).

In addition, the way funding is structured to deliver services on reserves has been seen as a problem. The Auditor General (2011) says the government uses contribution agreements that must be renewed yearly, leading to a problematic situation where often the money provided by the government is not available until several months into the funding period, forcing the First Nation to reallocate money from other pressing concerns in order to pay for water service (p. 3). This yearly cycle of contribution agreements also leads to uncertainty about funding levels from year to year, which hinders long-term planning (p. 4). Canada's funding system also does not cover private wells and systems that service less than five households, leaving it to the First Nation cover these costs using own-source revenue (Human Rights Watch, 2016b p. 53). In addition, when a community is under a drinking water advisory Canada pays to provide safe drinking water, but some communities state that the amount of water allocated per person is lower than World Health Organization guidelines for daily use (p. 14).

3.4 Legislation and Regulations

Legislation, the written laws passed by Parliament, provide the legal basis for regulating, authorizing, and restricting activities. In Canada, provinces and territories have legislative authority over water but it does not cover First Nations' land (Health Canada, "Legislation"; Environment Canada, "Water Governance"). In order to address this problem, in 2013 federal legislation called *The Safe Drinking Water for First Nations Act* came into force. The *Act* provides the basis for the government to create with First Nations enforceable regulations governing drinking water management including collection, storage, treatment plants, water quality, standards, monitoring, treatment, remediation, and distribution including cisterns and wells (INAC, "Backgrounder" & "Chronology"). The *Act* cites existing treaty rights, but states that they can be superseded to ensure the safety of drinking water. It also grants power to the Minister to appoint managers, order work to stop or be done, fix fees for use of water, and establish and enforce offences and penalties (Canada, 2013). The *Act* also gives the Minister the power to require First Nations to charge fees to members for water (Canadian Environmental Law Association, n.d., p. 18).

Concerns have been raised about this legislation for granting power to the government to overstep Indigenous rights, for not respecting First Nations self-government, and for not providing additional resources to make sure the communities' needs are met (Amnesty, 2016, p. 36). Human Rights Watch (2016a) argues that it transfers responsibility to First Nations without making sure they have the capacity for this, especially in a context where many of the systems are already failing (p. 4). In testimony to the Parliamentary Standing Committee on Aboriginal Affairs, Chief Charles Weaselhead of the Blood Tribe expressed that the law transfers liability without authority or consideration of the condition of the technology, setting First Nations up for failure (SCAAND, 2013, p. 4-5). Jim Ransom, of the Mohawk Council of Akwesasne agreed: "[It] deems us owners of our water systems but fails to recognize our authority to self-regulate those same systems. Instead, it transfers liability without consideration of the condition of the assets being transferred to us, and it sets us up for failure without adequate resources to ensure transferred systems are safe and can be maintained" (p. 2).

With the passage of the *Safe Drinking Water for First Nations Act*, there is now a legislative basis that enables the creation of regulations, but they are not yet developed. "Currently, First Nation lands are the only jurisdictions in Canada that do not have regulations for ensuring safe drinking water" (INAC, "FAQ" & "Process"). The regulatory gap means that, though INAC sets standards through protocols for the design, operation, and maintenance of systems, they do not have enforceable provisions to ensure compliance (INAC, "Roles"; INAC 2013). In addition, there remain areas that are not covered by the protocols, including environmental protections, source water protection, and agricultural operations that have direct impacts on water quality and human health. In addition, guidelines on the topics are not consistently implemented (Human Rights Watch, 2016b p. 14; OAG, 2005, p. 2; 11; Graham, 2004, p. 41). Regulations are in development through a region-by-region consultation process. They will be developed based on relevant provincial guidelines with input from local First Nations leaders (INAC, "Backgrounder"). Currently the government is working with local stakeholders to develop regulations in the Atlantic, Yukon, and the Northwest Territories. INAC states that regulations include: protecting sources of drinking water; location, design, construction, modification, maintenance, operation, and decommissioning of drinking water and wastewater systems; Training and certification of operators; treatment, monitoring, sampling, and testing standards; collection, recording, and reporting of information; emergency measures in response to the contamination of drinking water; and verification of compliance with the regulations (INAC, "Process"; Health Canada "Engagement").

Phasing in development of regulations will give sufficient time to bring infrastructure, capacity, and oversight up to the required level, according to INAC (2014, "Action"), but there are concerns about being able to comply. Chief Weaselhead warned that these regulations will not only fail to solve the problem, but will lead to more problems: "When they fail to carry out that responsibility, they will have broken the law and will be subject to punitive measures under the law" despite the fact that the chiefs and councils do not have "the financial resources and the capacity to carry out the responsibilities (SCAAND, 2013, p. 4)." The Expert Panel (2006a) also warned that regulations alone will not bring safe drinking water without an effective management system to oversee and enforce rules (p. 18). Rather than investing a lot of resources in creating a regulatory regime or enforcing it, that money and attention should be spent on investing in operators, management practices, and governance (p. 49).

3.5 Governance

Effective systems for the governance of drinking water are an important part of protecting the safety of the water. Water governance is the array of political, economic, and administrative structures in place to manage and deliver water (O'Conner, 2002, p. 335; Hill, 2013, p. 23). Jurisdiction for managing the delivery of drinking water on reserves is held by bands, as they are the owners and operators of the systems (for detailed explanation, see Annex A). INAC's directive *Water and Wastewater Policy and Level of Services Standards* specifies that band councils also have the role of enforcing water policies and must ensure that water facilities are operated properly by certified operators who conduct the required sampling and testing on schedule. The processes and mechanisms in place to manage and enforce water treatment and delivery is an issue of governance. As the

Auditor General reported, there are gaps in water governance on reserve, and in practice it is often unclear who is accountable for specific levels of service (OAG, 2011, p. 4).

Water governance requires having the authority for setting rules and delineating responsibilities, minimizing overlaps of jurisdiction, and facilitating action on water treatment and delivery. Specifically, this means ensuring construction is according to code, contracts are followed, hiring practices are fair and transparent, water tests are done on time, preventative maintenance is performed according to schedule, operational requirements are followed, and problems are dealt with quickly and properly. In addition, legitimacy and accountability are central aspects of governance, requiring "transparency, participation, justice, efficiency, rule of law, and absence of corruption" (Hill, 2013, p. 19-22). Also, to reduce the vulnerability of a water system, a government needs "economic and physical resources; access to technology, information, and skills; infrastructure; and institutions." There are challenges First Nations face in instituting these important governance aspects (Hill, p. 35; Swain, Lazar, & Pine, 2005, p. 31).

According to Graham (2012), one of the primary challenges that First Nations face is that though communities are typically very small and under resourced, the First Nations governments have a vast set of responsibilities, similar to those of a municipality, province, school board, and health board combined (p. 34). Yet in First Nations governments, Graham reports there is an absence of the range of checks and balances that other governments have (p. 34). Governments of comparable size to most First Nations in Canada have limited responsibilities, with larger issues being the responsibility of better-resourced levels of organization and firewalls against potential conflicts of interest (p. 38). Water operators are the primary people responsible for the quality of water, physically maintaining facilities, administering chemicals, and testing the water quality. As the Expert Panel (2006a) reported however, good water governance means that operators require a framework of management that provides the necessary support and compliance monitoring (p. 14). In addition to receiving appropriate compensation for their job, system operators need the support of the band council officials in charge of the governance. The biggest gap, according to the Expert Panel, is ensuring that "adequate funds are spent on repairs and maintenance. This is a challenge in almost every community (p. 14). In addition, Graham (2003) says water testing on reserves often does not happen as often as required by guidelines and standards because there is a lack of transparency and accountability procedures (p. 1). Support for First Nations capacity to manage the operation of water systems on reserves, in other words support for water governance, is of critical necessity (p. 4). On top of individual and organizational support, Graham & Fortier (2006) also includes the importance of system-wide governance, which includes the engagement of funders, Tribal Councils, and service organizations. The theme of capacity will be explored in more depth in the following section.

3.6 Operations and Maintenance (O&M) Capacity

Consistent in the documents reviewed was the finding that the lack of capacity in many First Nations for the ongoing O&M of water systems is one of the primary problems. Providing safe drinking water is a complex undertaking that requires a great deal of ongoing, highly technical work. This is difficult for many First Nations, since many communities have fewer than 500 residents (OAG, 2005, p. 2). Chief Rose Laboucan, of Treaty 8 First Nations of Alberta said to the Standing Committee on Aboriginal Affairs: "Don't waste the money by giving us water treatment facilities that we can't even operate and maintain" (SCAAND, 2013, p. 7).

Canada provides several forms of capacity support, but O&M of systems continues to remain a problem. Health Canada developed a *Water Advisory Tool Kit* and *Procedure for Addressing Drinking Water Advisories* for operators to use, provides funding and training through the Community-Based Water Monitor program, and upon request will come sample and test drinking water quality (Health Canada, "National Training"). INAC provides capacity support by funding training for operators, and runs the Circuit Rider Training Program—experts who travel to First Nations communities to train operators. They provide help on how to operate, service, and maintain the technology, with the goal of helping operators achieve certification, helping in emergencies, making systems more reliable, and developing local capacity to manage systems (INAC, "Roles" & "Circuit Rider"). The document review found, however, that the Circuit Rider program, which is supposed to

help solve capacity issues, has problems of its own. It has been found that the available help is often fragmented and inadequate, and Circuit Riders typically spend their time in a community troubleshooting and resolving immediate problems instead of providing training (Library of Parliament, 2010, p. 6; OAG, 2005, p. 18; Expert Panel, 2006a, p. 14).

The Anishinabek Ontario Resource Management Council (AORMC)'s policy document asserts that the O&M of systems is under resourced, and communities need to increase capacity for the management of drinking water systems (AORMC, 2009, p. 21-23). Similarly, the Expert Panel (2006) heard from many communities that inadequate resources to run water systems was not simply a financial problem but a human capital deficit, including a shortage of trained people and a lack of support at the Chief and Council level for water operations (p. 27), a sentiment was repeated throughout the document review (Human Rights Watch, 2016a, p. 9; SSCoAP, 2007, p. 3; OAG, 2005; Council of Canadians, 2015, p. 5; C.D. Howe Institute, 2011, p. 14; Swain, Lazar, & Pine, 2005, p. 57). Evaluation findings from INAC also demonstrated communities with low capacity struggled to receive project funding or additional resources, because they lacked the basic capacity to complete applications properly and on time, and had to rely on expensive consultants, further draining limited funding (INAC, 2014, p. 38).

Though it is required that all operators be certified to the appropriate level, this is far from the reality. A 2001 assessment found roughly 10% of operators met appropriate certification requirement, in 2007 the Standing Senate Committee on Aboriginal Peoples reported that only 37% of operators were certified (SSCoAP, 2007, p. 1). A 2010 evaluation found that 40% of operators did not even have the lowest certification (INAC, 2010a, p. 9), and a Library of Parliament report (2010) found most operators "do not possess the knowledge and skills required to operate their plants safely" (p. 5). Part of the problem is the difficulty finding and retaining qualified people to operate systems, especially in remote communities and in First Nations that cannot pay premium salaries (OAG, 2005, p. 5; C.D. Howe, 2011, p. 2). It is difficult for small communities to send operators on extensive training, and attracting operators to a community with insufficient funds for running a system is a challenge (Expert Panel, 2006a, p. 13-14).

The document review also shows that much of the testing and maintenance is not conducted on time. INAC's evaluation of the water and wastewater program found that the proportion of communities that conducted water quality testing as often as required was low, as a result of communities lacking the capacity to properly service water systems (INAC, 2014, p. v). In 2005 and in 2011 the Auditor General examined Health Canada files and found that drinking water tests on reserves were not conducted as often as required under departmental procedures. In 2005, some First Nations were found to have failed to test water for stretches of seven months (p. 16) and in 2011 60% of sites were found to not have been tested as often as required (p. 17). In 2005 the Auditor General found that INAC is not aware if identified maintenance and repair had been completed or if more were needed, and in 2011 found that between 2006 and 2010 INAC had conducted only 25 of 80 required annual inspections (p. 17). Despite programs to support operational capacity, the document review found there was insufficient support for operations. This problem is not unique to drinking water systems but includes wastewater, schools, and healthcare facilities, among others. A crisis in one area taxes the resources for other areas as people, time, and funds get diverted. The document review found the greatest risk to drinking water on reserve is inadequate O&M practices due to a lack of capacity.

3.7 Institutional Support

The final theme from the document review is that organizational or institutional support is key to providing a foundation of success for First Nations, as that can provide the needed capacity support for the lifecycle of water treatment. As discussed earlier, First Nations governments have responsibilities that are usually provincial or federal jurisdiction yet First Nations lack the organizational support for service delivery that provinces have. Provinces have health boards and school boards to locally services but individual First Nations must try to meet the administrative requirements of delivering complex services on their own (OAG, 2011, p. 4). To address this, the Auditor General recommended in 2005 that the government should establish an institution(s) to provide

capacity-building and technical support for all First Nations (p. 23), and in 2011 reiterated that the government should try establishing First Nations institutions (p. 10).

What is most important is the need for institutional support of operational realities. A Water Aauthority would have increased capacity to invest in training, monitoring, and back-up systems that is currently lacking in many communities (Swain, Lazar, & Pine, 2005, p. 18). It would have the expertise and authority to sign-off on projects, ensuring work was completed according to contracts, and codes and standards are adhered to (OAG, 2005, p. 31). Such an institution would have the capacity to make complex and highly technical decisions about treatment technology and procurement methods (Expert Panel, 2006b, p. 35). It would also provide capacity support for water quality tests, record keeping, and remittance action (OAG, 2005, p. 31). With this kind of help offered, even small and remote communities could have expert staff and advice and oversite that helps meet quality testing regulations (Swain, Lazar, & Pine, 2005, p. 17).

Though the document review did not come to a consensus on the exact nature of this institutional support, several sources called for similar concepts. For example, the Expert Panel (2006b) called it a First Nations Water Commission, the Senate Standing Committee (SSCoAP, 2012a) called for national or regional First Nations-led water authorities, and Swain, Lazar, & Pine (2005) recommended about a corporate water utility model. Despite the different wording, they all are calling for increased institutional support for First Nations water. Graham (2003) expands that it needs to be a regionally-based, First Nations-run organization (p. 4), a sentiment echoed in other documents. Swain, Lazar, & Pine (2005) recommended that clusters of communities be consolidated, being careful to note that First Nations should be invited, but not required, to join (p. 22). The Expert Panel wrote the Water Authority should be arms-length from the government, composed of members of the First Nations water sector, and could administer contract with provinces, local Tribal Councils, or First Nations organizations for water provision or inspection (2006 b, 43-44). Swain, Lazar, & Pine (2005) recommended that water systems be owned and operated by the Water Authority instead of individual bands, and have strong governance, transparency, financial sustainability, capacity to manage operations, and expertise of qualified professionals (p. 32-33). Most importantly of all, as Graham (2003) and the Auditor General (2011) noted, any such changes or institutions would need to be First Nations-driven. A First Nations organization that supports local delivery of services to communities would be a significant structural change that would fundamentally alter the relationship between the government and First Nations (Graham, p. 22; OAG, p. 6). The document review has been clear that money and regulations alone will not keep systems running long-term. Solutions that support the O&M on reserves are necessary. An institution that can provide that capacity would be a step towards ending and preventing unsafe drinking water on reserves.

3.8 Summary

The document review revealed six key themes. First, many First Nations communities face barriers such as history and location that increase the risk of drinking water problems. Second, the funding amounts and structure contribute to problem. Third, though having water regulations will be a step in right direction, imposing unattainable rules is not a sufficient solution. The fourth theme is that there is a lack of governance, in part because of capacity deficit on First Nations. The fifth theme is that inadequate operations and maintenance pose perhaps the biggest risk to drinking water on reserve. Sixth, lifecycle capacity support, including for running the system and testing the water, is required and could take the form of a First Nations-run water institution.

4.0 Literature Review Findings

4.1 Introduction

This chapter presents the findings of the Literature Review, the second line of evidence towards developing a better understanding of drinking water on First Nations reserves in Canada. Building on the Document Review, which examined government and "grey" works, the Literature Review examines academic and scholarly works that were significant and relevant to answering the research questions. Specifically, the aim was to provide a systematic review of the existing research on the causes leading to drinking water system failure and the proposed solutions that are supported by the research. The literature in this review includes data analysis of water system risk scores; studies of water system operators and administrators, through interviews, surveys, focus groups; and case studies of First Nations water systems.

First the findings of the Literature Review on the background for drinking water on reserves are examined. Next, compounding problems facing First Nations, including regulations, location, consultation, and risk perceptions are presented. The Literature Review then includes governance and the operational and maintenance capacity of communities. The findings related to water system operators are then presented, followed by the potential for support by a First Nations water institution. Finally, the criteria in the literature for institutional success is included.

4.2 Background

The Literature Review's depiction of the current state of drinking water on First Nations reserves aligned with what was found in the Document Review. The literature asserted that Canada has a fiduciary responsibility towards First Nations to provide for basic needs and committed to ensuring services like water are available at similar standards to non-First Nations communities. During the 1990s, the provision of services was devolved to individual First Nations to manage the daily operations and responsibilities, with Canada providing the funding and the band in charge of water service provision. After a decade of funding and targeted efforts at improving drinking water on reserves, the expected improvements have not been realized and many First Nations continue to lack regular access to safe drinking water (Farahbakhsh & McCullough, 2012, p. 2-3; Kuikman, Singh, Spence, & Walters, 2012, p. 1-3; Murphy, Spence, & White, 2012, p. 1-2).

Kuikmam et al. (2012) explain that the best practices for water treatment options are based on a multi-barrier approach which determines the risk level of treatment systems. The first consideration in a multi-barrier approach is source water protection to reduce the threat of contamination, the second is that operating standards for the treatment and distribution of drinking water must be in place and enforced. The third consideration is regular testing and monitoring water quality to ensure standards are met, and fourth is remediation in an instance of threats to water quality (p. 1). Based on this multi-barrier approach, the risk level of drinking water systems is calculated (p. 5). The First Nation is responsible for the design and construction of water systems but Canada has the ultimate control over the project, disbursing funds for design and construction only on Indigenous Affairs (INAC)'s approval (Farahbakhsh & McCullough, 2012, p. 4). The funding that INAC provides to First Nations for the O&M of water systems is transferred to the band annually in a 'block' funding format but does not always arrive on time. This provides local discretion on spending the funds, but the amount is calculated based on a formula and the authors contend it often does not match the actual required budget (p. 5).

Much of the literature acknowledged the cultural importance of water to First Nations communities. Water is critical for its spiritual significance, use in traditional ceremonies, and properties as a healing medicine. As such, First Nations assert they have a duty to maintain and protect it (Cave, 2012, p. 1). Basdeo & Mharadwaj (2013) write about the importance of water as a "sacred gift from the Creator" that affects the social, cultural, and spiritual health of communities, increasing the negative impacts of inequitable and unjust access to clean water on reserves (p. 3-4). Addressing drinking water challenges successfully, caution Farahbakhsh & McCullough

(2015), will require taking First Nations cultural lenses into consideration (p. 292). The *Indigenous Peoples Kyoto Water Declaration* highlighted, among other things, "the special relationship between Indigenous peoples and water and their inherent right to be involved in decisions about water" because water is seen as a life giving and healing element (Baird & Plummer, 2013, p. 1-2). Farahbakhsh & McCullough (2012) point out that First Nations are not a homogenous cultural group but a large collection of many varied cultures with different beliefs who do not speak with one voice (p. 15).

4.3 Compounding Problems

As Basdeo & Mharadwaj (2013) say, there is not one cause of water problems of reserves; problems are complex, interrelated, and exist at all of the stages of the delivery cycle. For solutions to be sustainable, the deficits in funding and training of operators, in the design and construction of facilities, and in the management and monitoring of water systems must be addressed (p. 3). There are compounding factors that make it more difficult to deliver clean drinking water on reserves like the lack of existing water regulations on reserves, the small size and remote location of many communities, lack of consultation, and low levels of trust in water treatment plants in communities. In the absence of a clear regulatory framework, already overstrained communities must navigate a complex patchwork of policies, standards, funding conditions, and programs with multiple stakeholders and jurisdictional authorities (p. 3; Cave, 2012, p. 101). An inadequate regulatory framework, and few strategies for addressing breaches of standards short of withholding desperately needed funds, leads to compromised facilities and infrastructure (Baird & Plummer, 2013, p. 2). Though it is important to have regulations, simply creating a regulatory framework will not result in change. If the new standards cannot be met, they will continue to be unenforceable (Basdeo & Mharadwaj, p. 3).

4.3.1 Size and Location

The literature review demonstrated that small communities have a higher likelihood of facing drinking water advisories, and many First Nations communities are small. Small systems have less access to resources and supplies, as well as technical, financial management, and managerial capacity (Farahbakhsh & McCullough, 2015, p. 274). Communities with populations under 5,000 are more vulnerable to risks, and often lack the capacity necessary to manage drinking water most effectively (Farahbakhsh & McCullough, 2012, p. 2). Research on drinking water in Newfoundland and Labarador showed that systems serving under 500 connections were significantly more vulnerable to boil water advisories, had considerably larger costs per capita, and often had poorly designed treatment systems (Conestoga-Rovers, 2010, p. ii, vi). Even when designed properly, these small systems do not have a multi-barrier approach, and sometimes use water treatment methods that are inappropriate for the likely contaminants the water may carry (p. 67).

In addition to small size, the remote location of many reserves limits economic opportunity, meaning there is less money in the community to address problems (Murphy, Spence, & White, 2012, p. 12). Logistical difficulties come with remote and northern locations: winter-only road access means that equipment can only be brought in on the ice road in winter, but construction can only happen during the short summer season, affecting the cost and timeline of projects. These communities have small pools of skilled-labour, and higher logistical costs for projects, including high energy costs (Farahbakhsh & McCullough, 2012, p. 14; Kuikman, Singh, Spence, & Walters, p. 10). A study comparing the Community Well-Being score with the risk rating of water treatment systems found that low labour force scores had a positive association with high water risk. The researchers posited that just as low employment is associated with geographic isolation, so is a lack of safe water (Brown, Spence, Wachowiak, Wachowiak-Smolikova, & Walters, 2016, p. 104). They caution that it is not a direct measure of water safety risk, however, since variables such as governance, social capital, and colonial legacy also play central roles in determining outcomes (p. 105).

4.3.2 CONSULTATION AND RISK PERCEPTION

Another compounding factor of water problems included in the literature review is the lack of adequate and on-going consultation with First Nations. Jackson & Palmer (2012) say that while internationally governments make declarations of support for Indigenous rights and water management practices, the legislation and policies often disregard or even obstruct Indigenous wishes and well-being (p. 14). In Canada, Murphy, Spence, & White (2012) say that there has been a lack of adequate an on-going consultation with First Nations communities (p. 6). As the users familiar with their specific context, who know the needs and priorities of their communities, local communities must be directly involved in developing solutions to their drinking water challenges (Murphy et al., p. 18). Different communities have different needs, wants, and visions, so one-size-fits-all formats will fail to meet most communities' needs (Farahbakhsh & McCullough, 2012, p. 15). Consultation is often done on an issue-by-issue basis, with limited comprehensive community planning taking place. Jackson & Palmer show that best results are achieved when Indigenous representation is included from the initial planning phases through implementation, and incorporates Indigenous social, spiritual, and community priorities (p. 9).

In Canada, one of the direct outcomes of a lack of First Nations voice in water management is in source water protection. Kuikman, Singh, Spence, & Walters (2012) explain that in Ontario, municipalities within source water protection regions form protection committees. Local First Nations have the ability to join these committees, but only if they agree to pass bylaws complying with provincial legislation, which some communities are opposed to and can be time consuming and costly (p. 2). Without the ability to protect source waters, politically and economically disadvantaged communities are vulnerable to pollutants entering their water and surrounding environment from local agriculture, industry, waste, and commercial activity (Basdeo & Mharadwaj, 2013, p. 4-5; Murphy, Spence, & White, 2012, p.11).

Community trust in the treatment process is also important, since delivering safe water that people refuse to consume is a problem. Spence & Walters (2012) say that given the ongoing problems that First Nations face and the number of communities with long lasting or recurring drinking water advisories, it is unsurprising. Policies and programs must clearly communicate to the community the risk level of a water system and the risk management strategies employed (p. 14). Improvements to treatment facilities, water quality, and water management must be accompanied by appropriate communication strategies so that community members have informed and justified perceptions water quality risk (p. 16). When interviewing water staff and community members in Oneida First Nation, Cave (2012) found that there was low community trust in the water treatment, with residents automatically suspicious of their tap water (p. 84).

4.4 Funding

The literature review found that insufficient resources are available to adequately run water treatment systems and respond to crises as they arise. This is despite the $4.76 billion the government spent on water and wastewater on reserves from 2003-2013 (Brown, Spence, Wachowiak, Wachowiak-Smolikova, & Walters, 2016, p. 100.) Authors cited drinking water problems stemming from insufficient capital to build new projects and lack of adequate financial resources to manage operations and address problems (Brown et al, p. 101; Murphy, Spence, & White, 2012, p. 6; Farahbakhsh & McCullough, 2012, p. 3). These types of budgetary inadequacies cause: "compromised facilities, infrastructure, and a lack of qualified personnel" (Baird & Plummer, 2013, p. 2). Additionally, in their analysis of government policies, programs, and processes of First Nations drinking water, Farahbakhsh & McCullough (2012) found that since Canada has limited funding to allocate for water infrastructure, INAC prioritizes cost-savings and frugality in water delivery, rather than value-maximization. What is cheapest to build is not necessarily the cheapest to run, which means the options chosen do not necessarily provide the best value-for-money (p. 11).

Insufficient funding for conducting proper operations and maintenance (O&M) is also a problem. Each band is responsible for 20% of the O&M budget but for many communities, coming up with those funds is unfeasible.

Communities are expected to charge user fees, but that is not affordable for communities with high unemployment and low income levels (Farahbakhsh & McCullough, 2012, p. 16). To pay for supplies, operator salaries, and repairs, these communities may have to "take money out of other programs, education or child welfare for example, in order to make up the 20%" (Murphy, Spence, & White, 2012, p. 17). On the other hand, shortfalls in funds to operate social programs in the community intensify the pressure on O&M budgets (p. 17). Corston-Pine, McBean, Murphy, & Post (2015) report that each year it is projected to costs $419 million to operate and maintain First Nations water and wastewater systems up to standard in Canada, much of this cost being operator salaries and training (p. 1).

The funding process that Canada uses was another issue identified as a problem. INAC uses contribution agreements to transfer funds to the band. Murphy, Spence, & White (2012) say this process inhibits communities from long-term planning since the funds are disbursed in annual transfers that are not guaranteed from year to year. In addition, the agreements can be time consuming to be settled, leading to situations where funding for the year does not arrive until partway through the year, forcing communities to "cannibalize" funds from other programs to keep their water running (p. 15). This cycle also means that funds must be spent by March 31st—the end of the fiscal year—which is difficult for construction projects in remote and northern locations that take time to plan and require summer construction or the beginning stages of projects that require a "feasibility study, preliminary design, detailed design, and contract document preparation stages" (Farahbakhsh & McCullough, 2012, p. 16). Funds are first directed to communities that have previously been identified as high priority, but this system leaves many risky systems unattended if they are not currently presenting a crisis (Farahbakhsh & McCullough, 2015; Kuikman, Singh, Spence, & Walters, 2012, p. 20; Basdeo & Mharadwaj, 2013, p. 3).

4.5 Governance

The next theme was issues of the governance of drinking water systems on reserves. Governance refers to the process of decision-making and the formal rules of management to be followed (Kuikman, Singh, Spence, & Walters, 2012, p. 1). Many water issues in the world stem from mismanagement and poor processes—i.e. governance failures (De Loe & von der Porten, 2013, p. 1). First Nations band councils are responsible for the governance of water systems on reserves, but often find themselves burdened by the governance and managerial responsibilities and lacking the necessary support structures (Farahbakhsh & McCullough, 2012, p. 3). Effective water governance means implementing and enforcing a practical system for the proper management of water, including rules and actions regarding water quality and quantity and facility upkeep (Cave, 2012, p. 101). A study of water systems in Newfoundland and Labrador found that governance played a role in system vulnerability, as loosely-governed rural areas had higher levels of drinking water advisories than municipalities which had tighter rules and stricter enforcement (Conestoga-Rovers, 2010, p. ii). Key principles for good governance of water include transparency, communication, equitability, and long-term sustainability (Cave, de Loe, & Plummer, 2013, p. 13).

Another aspect of governance is that though First Nations are the owners and operators of water systems, INAC has a great deal of control over decisions that are made. In a study of Ontario First Nations water technicians, Farahbakhsh & McCullough (2012) found that unlike municipalities First Nations do not have the ability to direct resources to the community's priorities: "INAC didn't ask us what our priorities are…Somebody in an ivory tower set those priorities...They're the exact opposite of what our are here…a one-way relationship, where decision-making authority is maintained outside the First Nation's realm of influence" (p. 9). Similarly, in focus groups with water operators Murphy, Spence, & White (2012) heard that First Nations do not feel they play much role in the decisions about investments in water infrastructure (p. 8). The decision-making process is done away from the communities and does not facilitate the community's adaptability to respond to water issues (Kuikman, Singh, Spence, & Walters, 2012, p. 4).

For a community to have safe drinking water, Chief and Council must understand and provide for maintenance, prevention, and repair activities. Operators interviewed spoke about common challenges they face that inhibit

their ability to adequately run drinking water treatment and distribution systems. Interviews with operators revealed that the lack of funding and support available to them make it hard to perform the necessary O&M activities, leading to system vulnerabilities and breakdowns. Corston-Pine et al. (2015) conducted interviews with and surveys of water operators and found that the two challenges most commonly cited by operators were: "lack of support from band councils" and "lack of funding for operation and maintenance", along with other top problems listed as limited technical support, difficulty obtaining supplies, no back-up operator, and lack of council support to purchase equipment (p. 8, 10). This struggle was mentioned by other operators in this and other studies (Conestoga-Rovers, 2010, p. 71; Murphy, Spence, & White, 2012, p. 12). Requests to Chief and Council for required supplies were sometimes denied if it was not seen as a priority or there was simply not enough money, meaning preventative maintenance often is neglected and only when significant problems arise are they dealt with.

Operators also shared that they struggled with a lack of information flow, and felt there was a disconnect in many communities between the council and water managers regarding the importance of backup systems and operators (Murphy, Spence, & White, 2012, p. 8-9). Corston-Pine et al. (2015) also heard from operators that often there is a lack of transparency between the council and operators regarding the budget that is available to operate and maintain the water treatment and distribution system (p. 13). The researchers concluded that: "Band council members may not be adequately trained in water plant operation […and] the annual costs associated with consumables, routine maintenance, and repairs... As a result, this knowledge gap may be leading to the inadequate forecasting of annual budgets and/or the withholding of funds as routine preventative maintenance activities may not be seen as a priority by band council over other more immediate needs" (p. 14).

4.6 Capacity for Operations and Maintenance (O&M)

Capacity issues impact the previously identified barriers, including governance, ability to access funding, communicating about risks, participating in consultation, managing systems in small communities, and ability to operate without federal regulations. Also, as will be discussed in the next section, it is an important part of challenges that operators face. For the O&M of water systems, the literature indicated that capacity is the primary concern. The theoretic frameworks for capacity development from the literature can be found in Annex C.

The reason that capacity for O&M is so important is that infrastructure alone does not provide clean drinking water. It is the "consistent, diligent operation" of the infrastructure that protects health and safety and ensures a long life of the infrastructure. If preventative maintenance was a regular focus of effort and resources, the need to respond to problems would greatly decrease (Conestoga-Rovers, 2010, p. 70). Analyzing the differences between the risk scores of First Nation and non-First Nation water systems in Ontario, Kuikman, Singh, Spence, & Walters (2012) demonstrated that there is a "clear gap in capacity to access safe and adequate drinking water" (p. 13) and when digging further found that in many cases, service standards that ensure that drinking water is safe were not being met in First Nations (p. 16). Having true ownership of the process, not just liability, part of what Farahbakhsh & McCullough term "owner's attitude" is a critical part of success (2015, p. 288).

The financial side of capacity cannot be fully separated out, as it costs money to pay operators, administrators, managers, and enforcement officers. Inadequate financial resources for other programs will strain the capacity to operate and maintain drinking water systems (Kuikman et al., 2012, p. 5). Smaller communities tend not to have the necessary resources that they needed to run their water systems according to best practices. Without large revenue bases or being able to take advantage of economies of scale, communities lacked the resources to fund proper operations and management (Conestoga-Rovers, 2010, p. v). This has important implications for the lifespan of the infrastructure as well. The study found that in most cases, infrastructure will not reach its expected lifespan if the community has limited funding for O&M because the necessary upkeep and upgrades will not be completed (p. viii). Murphy et al (2012) assert if it was simply a question of shortfalls in funding, however, drinking water problems on First Nation reserves would be a much easier fix (p. 1).

There is a wide variety of capacity levels among First Nations communities. Farahbakhsh & McCullough (2012) found that there was no heterogeneity among First Nations, and though lower capacity was positively correlated with more northern geography, being southern did not predict being high capacity (p. 4, 13). Kuikman et al. found that the size and location of water systems did not predict the risk category (p. 14). Murphy, Spence, & White (2012) found that the problems common to communities with poor systems are shortfalls in operating funding, insufficient training of operators, and need for improved management to run the infrastructure (p. 6). They also found that barriers to the maintenance and management of facilities are because either the initial design of the infrastructure was not appropriate and the technology does not meet the band's needs, or because "the management entity responsible for the water and waste disposal infrastructure assets is itself not sustainable and lacks appropriate authority, structure, and/or technical, managerial, or financial capacity" (p. 10).

4.7 Operators

The Literature Review included studies that conducted interviews, surveys, and focus groups with First Nations water operators and managers. It is important to hear from the technical practitioners on the ground, who are responsible for keeping systems working, about the problems they face and what solutions they see. A study of drinking water systems in Newfoundland and Labrador (including but not limited to First Nations), found that poor O&M practices, low operator training and effort, and inaccessibility of spare parts contributed to the highest levels of drinking water advisories in communities (Conestoga-Rovers & Associates, 2010, p. iii-iv). Other findings of the study were that systems under boil water advisories were consistently found to have inferior operational practices and were less likely to have highly trained operators running the systems. In fact, none of the operators in high risk systems had average training of more than 2 hours a year, despite the recommended level being 13 hours per year (p. v).

Based on interviews with First Nations water operators in Ontario, Farahbakhsh & McCullough (2015) recommended the following to support operators: increase certification, training and technical support; implement managerial and financial management training programs and support systems for band administration and tribal council staff; and support access to resources, recruit and retain long-term organizational capacity (p. 290). They also found that there was a great deal of value placed on using local operators, contractors, and tradespeople to work on projects in the community (p. 282). Retention is also a difficult issue, operators who left communities cited finding better paying jobs, that they were not prepared for the responsibility of the job, had disagreements with the Chief and Council, or because they were not certified (Corston-Pine, McBean, Murphy, & Post, 2015, p. 5). A common finding in the Literature Review was that the availability and presence of qualified operators is a persistent barrier (Corston-Pine et al, p. 1; Murphy, Spence, & White, 2012). "The delivery of adequate and safe drinking water is a complex technical task. Each step in the multi-barrier approach requires highly skilled persons and adequate equipment to ensure people have access to safe drinking water" (Kuikman, Singh, Spence, & Walters, 2012, p. 20). Federal risk evaluations of water systems are weighted towards technological threats, meaning the needs of operators and other social dimensions receive lower priority (Brown et al, 2016, p. 101; Spence & Walters, 2012, p. 16).

Corston-Pine et al. (2015) found from interviewing operators that few improvements have been made since 2011 when only 54% of First Nations water systems had a certified primary operator (p. 1, 8). In their survey of B.C. operators, 42% reported they did not have the certification level required to run their system of which 11% reported they had no certification at all (p. 5). Despite these findings, when they analyzed the risk information that INAC collected on First Nations water operators in Ontario, Kuikman et al. (2012) found that only 22% of the systems had medium or high risk risks in the operator category (p. 12). Farahbakhsh & McCullough's (2015) interviews with water operators in Ontario, found that training was an important but hard to attain necessity for ensuring community health and safety. The most prevalent theme in operator interviews was operator certification, which study participants used as a direct measure of success for communities. Operators spoke about the numerous barriers that prevent many from attaining adequate certification, including northerly or remote location, and lack of high school diploma or GED (p. 280).

4.8 Institutions

The literature includes a number of solutions to remedy and alleviate the challenges mentioned previously in providing clean drinking water on reserves. The final theme is that to address the problem of drinking water on reserves, solutions that provide for capacity support are required and a First Nations water institution or institutions could play this role and provide a foundation of success for First Nations drinking water. Institutions are established and recurring patterns of behavior that structure political, economic, and social interactions (Cave, 2012, p. 9; North, 1991, p. 97). Cave explains that institutions structure behavior because they set rules, monitor them, and have sanctioning mechanisms to enforce the rules (Cave, p. 13). In terms of water, institutions shape how water is governed, meaning they structure decisions regarding the development and management of drinking water (p. 17). The literature called for First Nations water institutions to support communities in providing clean drinking water by supplying the necessary capacity to deliver it effectively.

Conestoga-Rovers and Associates (2010) conclude that communities must: provide adequate compensation, training, and support to operators; make proper tools, equipment, and funding for O&M available; and outsource or consolidate the maintenance tasks among communities (p. 95). Since the current conditions cause problems, to achieve these steps communities should work on consolidating resources through collaborative regional approaches, sharing systems where proximity makes that possible, and otherwise sharing operators or management of operations with nearby communities (p. 74, 94). The authors argue this regionalization would improve the ability to supply the other criteria for success, like ensuring tools, equipment, and funding are available, operators have proper certification, and operational activities like water tests and preventative repairs are undertaken per guidelines. Similarly, Farahbakhsh & McCullough (2012) write of the need to develop a First Nations-centric institution to support autonomy-building and self-determination, along with providing the non-technical factors, including human and management capital, necessary for drinking water success (p. 17-18). In 2015, Farahbakhsh & McCullough found that these recommendations were echoed in their new research. The study found that delivering clean drinking water on reserves will be best supported through: the "transfer of control and authority over water-related decision-making to First Nations" with Indigenous-led "institutional support akin to that provided by provinces to municipalities" which would "consolidate regional technical and managerial capacity into aggregate entities." This First Nations water institution could provide a range of services to accommodate different levels of community capacity (2015, p. 276-277).

A collaborative, regional approach was recommended in the literature. Murphy, Spence, & White (2012) state that the goal is for First Nations to run their own water systems and report to an Indigenous Water Authority, run by regional Aboriginal organizations (p. 15). This would be a critical step towards Indigenous self-determination. Increasing capacity to effectively deliver clean water will provide positive feedback that expands sustainable development in the community, which in turn supplies more capacity for other similar issues to water (p. 15). Murphy et al. state that the key is having an "Indigenous controlled Water Commission" that has authority over water delivery and can monitor compliance in communities (p. 16). Murphy, Spence, & White (2012) found from their research that work was not always of sufficient quality on reserves. They heard from focus group participants, including water operators, many examples of decisions and work that was substandard, causing problems over the life of the asset (p. 9). An institution could provide the expertise to hire consultants and review their work, get project approval, tender, negotiate, and manage contracts, and evaluate that work was performed properly.

The regional nature will enable the water authorities to have execution formats that provided localized, context specific support, rather than imposing one-size-fits-all model that provides an unaccommodating operating platform that meets no one's needs (Farahbakhsh & McCullough, 2012, p. 18). Farahbakhsh & McCullough (2015) give examples of regional organizations that already exist to assist operators whose experience and knowledge should be drawn on. These organizations include the Aboriginal Water and Wastewater Association of Ontario (whose URL in April 2016 was http://www.awwao.org/) where operators can receive training and support, and the Ontario First Nations Technical Services Corporation (whose URL in April 2016 was http://www.ofntsc.org/about) which provides technical and advisory services to operators (p. 273). A First

Nations' water institution should continue to provide these regional capacity supports for O&M of water systems to communities.

The literature emphasize that this institution must be First Nations centric, enabling Indigenous self-determination over their lands and resources, as nations with the rights to self-government (Farahbakhsh & McCullough, 2012, p. 17; De Loe & von der Porten, 2013, p. 2-4). A First Nations water institution must not only be *for* First Nations but also *by* First Nations, moving away from federal, paternalistic requirements that place demands and liability on First Nations without the tools to fulfil them (Murphy, Spence, & White, 2012, p. 18). The institution must also not be imposed on individual bands, who remain free to choose instead to exert sole jurisdiction over their lands, to defer management to the state, or to opt-in to a First Nations institution (De Loe & von der Porten, p. 7). The Literature Review found that a First Nations-led institution that provides support to communities through regional water authorities could help address the complex problem of delivering clean drinking water on reserves by supplying the capacity and authority that some communities currently lack.

4.9 Summary

The Literature Review found that the causes of drinking water problems on reserve are complex and interrelated, with the central issues referenced being financial problems and capacity issues. Chronic underfunding limits the appropriateness and longevity of technology, and makes it difficult to pay operators appropriate salaries. In addition, many operators are not certified and communities cannot afford to provide them with sufficient training or technical support, and band councils lack the capacity to manage operations (Brown, Spence, Wachowiak, Wachowiak-Smolikova, & Walters, 2016, p. 99; Corston-Pine, McBean, Murphy, & Post, 2015, p. 15; Murphy, Spence, & White, 2012, p. 15). In the face of these challenges, De Loe & von der Porten (2013) point out that the capacity of First Nations communities to respond is hobbled by the colonial legacy they must contend with (p. 2). Other contributing problems include: a lack of regulations, small and remote communities, lack of consultation, high distrust in the water systems, limited funding, and insufficient governance. In addition to increasing funding and developing regulations, the Literature Review concluded that developing a First Nations-led water institution could support increased capacity for constructing, running, and governing even small and remote water systems, providing a foundation for long-term success.

5.0 Case Study Findings

5.1 Introduction

Chapters 3 and 4 reviewed the grey literature and academic literature pertaining to drinking water on reserves. They examined the history, context, and current conditions of the situation, demonstrating the research conclusions about causes of drinking water insecurity on reserves and potential solutions to the problems. To continue answering the research question, Chapter 5 examines models of water service delivery systems that are currently used on reserves to understand what the models are, how they work, and the specific challenges communities face under each model. The documents reviewed to support these case studies are primarily internal memos, notes, and correspondence. Internal documents are noted as such by a coded document number.

Local and municipal services, such as the delivery of drinking water, are central to providing for communities. The model of service delivery refers to the systems for managing how water is delivered. Chapter 5 is not examining the technological systems but rather the management systems for water service delivery. There are a number of ways to deliver municipal services, it can be delivered entirely by the government body or the government can contract it to a private company, but this distinction is also not what Chapter 5 is examining. As Chapters 3 and 4 established, First Nations own and are responsible to operate their drinking water systems. Regardless of whether a First Nations band contracts out the service or establishes a public-private partnership to administer it, that individual band remains ultimately responsible for setting up and managing the contract, and is liable for its outcome. The models of service delivery that this chapter examines have to do with who is responsible for the service.

The client identified the four models of water service delivery on reserves:

1. Centrally managed community water systems, owned, operated, and managed by each individual First Nation band;
2. Individual wells managed by property owners in rural areas;
3. Municipal water sharing agreements to buy water from a neighboring city in;
4. Aggregation of water systems in multiple communities, owned and operated by a First Nations institution for a Water Authority. The case studies will look at each of these models in turn.

The *National Assessment of First Nations Water and Wastewater Systems* found that in 2011, there were a total of 807 water systems serving 560 First Nations, with 86% of homes on First Nations reserves served by communal water systems—72% receiving piped water and 14% receiving truck-delivered water— in addition, 13% of homes are serviced by individual wells and 1.5% receive no water service (Neegan Burnside, 2011, p. 4, 35). 19% of water systems are shared with a nearby municipality (p. 35).

5.2 Individual Water Systems

5.2.1 BACKGROUND

As explained in the document review, the capital costs and 80% of operating costs for drinking water systems are provided by the Government of Canada. Indigenous Affairs (INAC) provides the funding for four distinct levels of water service, when they are operated by the First Nation band or contracted to an authorized third party. In most First Nations, the band is the entity that collects the water, treats it, and distributes the water. As laid out in the *Water and Wastewater Policy and Level of Services Standards (Corporate Manual System)*, the four types of water systems that INAC funds for First Nations are:

1. Piped water systems: water is centrally treated and sorted, and the pressurized, treated water is piped to the buildings in the community;
2. Trucked water delivery: treated water is brought to individual residential water storage tanks;

3. Centrally managed on-site systems: a decentralized system, such as a group of wells, cisterns, and small water treatment units, that is centrally managed—continuously operated, maintained, and monitored—by the First Nation band council; and
4. Communal watering points: a temporary solution where residents can come and receive clean drinking water from a watering point.

These are all forms of model one: individual community systems. INAC's *Protocol for Centralized Water Systems* and *Protocol for Decentralized Water Systems* sets standards for the design, construction, operation, and maintenance of water systems funded by INAC. Centralized water systems are piped delivery whereas decentralized systems are groups of band-managed on-site water systems (as opposed to individually-managed systems) (INAC, 2010b). On-site water systems are simpler and less expensive than piped water systems and usually include wells, drinking water treatment units, and water storage tanks (cisterns) (INAC, 2010c).

The *National Assessment of First Nations Water and Wastewater Systems* found that of the piped water systems, 17% were found to be operating at or beyond their estimated capacities and were unable to accommodate community growth (Neegan Burnside, 2011, p. 14). The total number of piped connections was 81,026, with an average length per connection of approximately 58 meters (p. 15). 39% of water systems were categorized as high risk, 34% as medium risk, and 27% as low risk (p. 16). Overall, the risk level of the water system was positively correlated with remoteness, with more remote systems 2.5 times more likely to be high risk than low risk (p. 19). In addition, the smaller and simpler the treatment facility, the more likely it was to have a high or medium risk classification (p. 23).

5.2.2 COMMUNITY EXAMPLE: NESKANTAGA FIRST NATION

As an example of problems that some First Nations face under this model of water service delivery, Neskantaga's persistent water crisis will be examined in more detail. Neskantaga First Nation has been under the longest running boil water advisory in Canada, implemented in February 1995 (Health Canada, "Drinking Water Advisories"). The community is located 560 kilometers north of Thunder Bay in Northwestern Ontario and has a population of 450, with 326 individuals living on reserve There are 74 housing units in the community, of which 46 are considered "adequate" by INAC, and electricity in the community is supplied by diesel generator. It is accessible by air or winter road but has no permanent road access— in 2015-2016 the winter road was open 40 days for commercial traffic (Doc #6, p. 7). In 1999, Neskantaga was put under default management by Canada due to poor financial performance. (Doc #2, p. 1).

In a submission to the United Nations, Human Rights Watch pointed out the impacts that the water problems have on the community. From an interview with a young mother in Neskantaga concerned about bathing and feeding her four-month-old infant with a heart condition, the following was recorded:

> "It takes 10 minutes to walk [to the watering point], and longer to come back because the treatment plant is downhill… To bathe the baby, she boils the water, lets it cool, and uses a small tub. This takes about two hours, and she does it every other day with the help of her partner… It takes an hour to do [wash the baby's bottles]" (Human Rights Watch, 2016a, p. 10-11).

Human Rights Watch noted that many of the other families surveyed in Neskantaga reported skin infections, eczema, and infection that they believed were caused or made worse by the water (p. 11).

In 1991, a new water treatment plant was built on Neskantaga First Nation, however in 1995, a Boil Water Advisory was implemented as a result of a design flaw in the water treatment plant and has been in effect ever since (Doc #2, p. 6-7). This water system serves 74 houses and has an overall risk ranking of High). Four years after the plant was constructed, high chlorine levels in the distribution line to homes was determined to be too high, particularly at the farthest points from the treatment plant. Upon inspection, INAC determined the cause of the problem was "design issues, as well as operator and maintenance issues" (Doc #3, p. 5). The water treatment plant treats the water using slow sand filters and sodium hypochlorite, which are inadequate for local conditions. There are no certified water operators within the community to perform operations and maintenance "properly

and on a routine basis" (Doc #4, p. 1), and the current primary operator requires a grade 12 equivalency before the certification training can start (Doc #5, p. 2).

A reverse osmosis unit was installed in 2009 as a temporary communal watering point for community members to fill up their water jugs. It is not hooked up to the running water system, and the First Nation is responsible for monitoring the water quality from the unit (Doc #4, p. 1; Doc #6, p. 3). It was installed as an interim measure, as per guidelines in the *Water and Wastewater Policy and Level of Services Standards*, to offset the cost of providing the community with bottled water; however, the unit has been in use ever since, despite the fact that it breaks down a couple times a year (Doc #2, p. 8). Between 2011 and 2013, INAC contributed $100,809 for bottled water to the community. The reverse osmosis unit was only intended to be an interim measure until a full water treatment plant is completed, however in 2013 the First Nation was given additional funding to replace to reverse osmosis unit, as no treatment plant upgrades had been completed (Doc #2, p. 7). Annually, INAC provides approximately $229,000 for O&M of water and wastewater at Neskantaga, in addition to operator salary, this amount must cover chemicals, testing, spare parts, and all supplies being flown in and out of the remote community for the treatment plant, reverse osmosis unit, and waste treatment facility (Doc #3, p. 5).

In 2009, INAC provided funding for a feasibility study to ascertain long-term, cost effective solutions for water treatment in Neskantaga. The study was completed in June 2013 and recommended the construction of a new treatment system inside the existing building and creating additional reservoir storage (Doc #5, p. 1). These upgrades were estimated to cost approximately $5,850,000, but in April 2014 Neskantaga was informed that request exceeded the funding available (Doc #2, p. 7). In October 2015, INAC committed $363,000 to replace the filtration system at the current water treatment plant. Such repairs are not enough to eliminate the Boil Water Advisory, but "may improve water quality" until the construction of a new plant (Doc #3, p. 5). The material was purchased and shipped during the winter of 2015-2016 and is scheduled to be installed during the summer of 2016 (Doc #6, p. 3).

At the same time, INAC committed to funding the design phase of a new water treatment plant in 2016-2017 (Doc #3, p. 6). As of October 2015, the updated estimate of upgrading the water treatment plant is $6,710,000; though the feasibility study is required to be updated with the latest technological recommendations (Doc #5, p. 1). This estimate does not include costs of work required to upgrade the distribution system (Doc #6, p. 3). After a feasibility study is completed, the First Nation must publish a Design Application Request, process the applications they receive to design the treatment plant, choose a winning bid, and negotiate a contract for the design (Doc #7, p. 3-4). Once the design is completed, then the First Nation will issue a Request for Proposals for construction, award a winner, and negotiate a contract. This process to design and construct the new water treatment plant will take a minimum of three years to complete (Doc #6, p. 3).

INAC noted in an internal memo that key challenges for improving water in Neskantaga are they have "demonstrated difficulty managing the issue and have not utilized departmental funds to improve water/wastewater infrastructure," such as how $53,875 was allocated to the community for wastewater O&M in 2014/2015 but only $16,465 was expended (Doc #2, p. 8). However it was also noted that INAC officers have identified that when funding is being moved around in communities' budgets, it almost always is taken from infrastructure budgets first, and reallocated to higher, more pressing priorities (Doc #2, p. 8).

5.2.3 CONCLUSION

INAC's evaluation of the *First Nations Water and Wastewater Action Plan* looked at the 21 top priority First Nations water systems being delivered through this model and found the following problems: the system was poorly designed or required upgrades (4 communities), inadequate chlorination (2 communities), contamination (2 communities), or that the necessary O&M work was not being done (13 communities). Solutions included: "A contract with the Ontario Clean Water Agency was signed in May 2006 to provide certified oversight. As a result, operation and maintenance of the facilities has improved" (INAC, 2010a, p. 19); "The First Nation now receives funding from the Ontario Region's Safe Water Operations Program to assist with the oversight of the

water treatment system" (p. 20); "The First Nation selected Northern Waterworks Inc. (NWI) as the service provider to provide certified oversight" of water operations (p. 22). As highlighted through Neskantaga First Nation, it is evident there are many problems with the drinking water being provided through this model of individual water systems procured, operated, and maintained in communities that lack the capacity to do these things.

5.3 Individual Well and Septic

5.3.1 BACKGROUND

The *National Assessment* (2011) found that 13% of homes on First Nations reserves are serviced by individual wells (Neegan Burnside, p. 9). It recommended that when groundwater conditions permit, individual wells and septic systems should be considered for small communities because they are considered to be an economic solution (p. 44). As was established in Chapter 3, there are two models for managing wells on First Nations reserves in Canada. In the first model, referenced in the preceding section, a group of wells supplying water to houses and their corresponding on-site water treatment units are centrally managed by the First Nation's band council through a hired water operator. This is known as a decentralized system because although the management is centralized, the physical infrastructure is not. The centralized nature of the management, with responsibility falling on the band council, falls prey to the same problems as large piped water systems including regulatory gaps, uncertified operators, inadequate water testing and system repair, insufficient funding, and unavailability of supplies. The second model which will be examined in this chapter is individual wells owned and managed privately by individual property owners. This is how many rural non-First Nations communities get drinking water, so this delivery model will be examined in a First Nations context.

5.3.2 PRIVATE FUNDING AND INDIVIDUAL RESPONSIBILITY

Canada only provides funding for wells on reserves if they are centrally managed by the First Nations band. "To qualify for funding from [INAC], on-site systems must be band managed. A band-managed system is one that is managed and operated by a band, by a band-owned utility, or by a qualified third party operating under contract to the band" (INAC, 2010c, p. 1). Individual wells must be privately funded, though the band could choose to pay for them out of their own revenue. As was established in the Document and Literature Reviews however, communities suffering from water insecurity also often face funding shortages and lack the ability to even cover 20% of the costs of water operations, much less the full cost for installing and running private wells (OAG, 2011, p. 3).

Many First Nations communities also have high unemployment and low income levels, meaning that downloading the costs of water operations to individuals on reserves is often unfeasible (Farahbakhsh & McCullough, 2012, p. 16). The Document and Literature reviews have established that even when 100% of construction costs and 80% of operating costs are provided by Canada, having adequate funding to conduct sufficient water testing and technological maintenance remains a problem. The 2011 Census revealed that while the non-Indigenous employment rate was 61.2%, for First Nations living on reserve it was only 35.4%, meaning 64.6% of individuals age 15 years and older living on reserve were not working (this figure includes retired individuals) (National Aboriginal Economic Development Agency (NAEDB), 2015b, p. 15). Furthermore, the 2011 Census also revealed that while the non-Indigenous median income in 2010 was $30,195, for First Nations living on reserve the median income was $13,182 (p. 20).

In addition to the costs of a private well, the responsibilities for testing, operating, and maintenance are the responsibility of the individual well owner. First Nations residents are "responsible for ensuring the quality and safety of their drinking water by visually inspecting and maintaining their wells" (Health Canada, 2010, p. 2). Health Canada will provide bacteriological sampling and testing services upon request, but individuals are responsible for requesting this testing as needed. Residents are responsible to inspect their wells at least once a year, test the water 2-3 times a year, and maintain up to date inspection logs (p. 6). Testing for heavy metal such

as uranium is also the responsibility of the resident. Unfortunately, First Nations living on reserves face among the highest unemployment and lowest income levels in Canada, and are a vulnerable population, so transferring the full cost and responsibility onto individuals to have access to clean drinking water is not a step towards ensuring there is clean drinking water on reserves.

5.3.3 REGULATORY GAP

The Safe Drinking Water for First Nations Act is the legislation covering drinking water on reserves that came into force in June 2013. This legislation covers drinking water systems on reserve including wells (Canada, 2013, p. 2). Through the Act, Canada has legal authority to create regulations about the location, design, construction, modification, maintenance, operation, and decommissioning of wells on reserves, however these regulations have not yet been created (p. 3). This means that as of 2016, there are still no enforceable laws that well owners on reserves must follow to ensure safety. There are recommendations and guidelines, which reference the provincial regulations, but since INAC does not provide funding to construct and operate private wells on reserves they cannot therefore withhold funding to compel owners to comply with the guidelines. These include rules regulating water quality monitoring, pump maintenance, water pump replacements, well flushing and cleaning, annual well inspections, and the O&M of small treatment systems (INAC, 2010c, p. 31).

Off-reserve, it is the provinces that regulate wells and have inspection and enforcement powers. In the off-reserve context, there is an integrated framework of regulations that are triggered when land is subdivided or sold, prior to developing the land. This framework includes environmental protections, health codes, building codes, water protections, and agricultural regulations. A development plan, building inspections, and certification are required. In Ontario, for example, if a person has a well on their property, they are legally responsible for it and must obey provincial rules. These regulations include minimum standards for well contractor and technician licensing, the location, construction, maintenance, upgrading, disinfecting, and abandonment of the well, as well as rules on completing and submitting well records (Ontario, “Wells”; Expert Panel Vol 1, 2006, p. 17).

Provincial regulations go into the specific details required to protect the safety of the well water for human consumption. For example, the law requires that the site of a new well must be a minimum 15 to 60 meters away from a septic system (determined by on the type of well and septic system), be at least 15-30 meters from any other contaminant, and be 6 meters deep (Ontario, 1990, sec 12.1-12.2; Ontario 1992, Table 8.2.1.5). The well must be located such that it is accessible for cleaning, treatment, repair, testing, and inspection at all times, and it must be at a higher elevation than the surrounding area (Ontario, Section 12.4-5). The septic system must be at least 3 meters from the property line, 30 meters from a neighbour’s well, and 1.5 meters from a structure (Ontario Onsite Wastewater Association, n.d., slide 18). Similar building code regulations in Newfoundland and Labrador require that the minimum size for a lot to allow water to come from an on-site well is 1860 square meters. This means that lots smaller than that are not allowed to install wells (Newfoundland and Labrador, 2011, p. 1). This can be a problem for wells on reserves where lack of regulations has led to small, crowded lots.

On reserve, an estimated 80% of residential and commercial development is not registered with the provincial or local building authorities. The regulatory gap means the size of lots or number of houses per lot are often not determined by a development plan, but rather by the available funding. Since funding is limited, smaller or more crowded lots are more likely to be constructed. This often precludes use of well and septic systems because they cannot safely be installed without contaminating each other because they would be too close together on small or crowded lots (R. Jenkins, personal conversation, Feb 5, 2016). An additional difference on reserves is that the context of homeownership is different than off reserves. The Standing Senate Committee on Aboriginal Peoples (2015) explains that the *Indian Act* remains a barrier to private home ownership on reserve, and limits the ability of First Nations people to obtain a mortgage (p. 30). The Crown has underlying title to reserve lands and while in many cases, individuals have a Certificate of Possession for the house this does not create the same type of homeownership situation as it is understood off reserve (Baxter & Trebilcock, 2009; Expert Panel Vol 1, 2006, p. 39-40).

5.3.4 COMMUNITY EXAMPLE: SIX NATIONS OF THE GRAND RIVER

Building on the previous section that examined what this model of service delivery is and how it works, this section will examine the challenges that are presented by this service delivery model in Six Nations of the Grand River, to better answer the research questions. In their submission to the United Nations, Human Rights Watch spoke of the conditions on Batchewana First Nation and Six Nations of the Grand River. They conducted interviews with individuals from both communities whose drinking water is serviced by private wells. Human Rights Watch found that in both communities the wells are not regularly tested by Health Canada and not tested at all by the Ontario Ministry of the Environment. Sixty-five percent of residents reported they had to use an alternate source for drinking water rather than the well, citing reasons including "uranium contamination, e.coli contamination, high sulfur content, and high turbidity of the water" (2016a, p. 10).

Six Nations of the Grand River is a First Nations community approximately 25 kilometers southwest of Hamilton, Ontario with an on-reserve population of 12,271. In 2012, the village of Ohsweken on the reserve had a small water treatment plant serving about 2,000 people but most people got their water from wells and cisterns (Six Nations, 2012). More than 300 homes on the reserve have no running water and must supply their own water (Pecoskie, 2013). A water study done on the Six Nations reserve in 2004 found that most of the wells were dangerously polluted: more than a quarter had dangerous levels of E. coli bacteria, 82% had coliforms (a sign of fecal contamination), and counts of sodium in the water was five times higher than Ontario standards permit. Even half of the drilled wells on the reserve, the safest type of well, were contaminated with bacteria. As a comparison, in nearby rural Hamilton 22% of well water tests revealed coliform bacteria and 5% had E. coli bacteria (Marion, 2015).

In 2013, Health Canada reported that 60% of wells tested on Six Nations reserve contained potentially harmful bacteria. This statistic likely underestimates the scale of contamination because Health Canada only samples wells at the request of residents. As a result, most wells on the reserve go untested since few residents requested samples. In fact, between April 2012 and April 2013, Health Canada processed samples from less than 2% of wells on Six Nations reserve (Pecoskie, 2013). The dangerous pollution in these wells primarily comes from contaminated run-off from nearby farms, industry, fuel storage facilities, septic systems, sewage lagoons, dumps and uncontrolled waste disposal, and cemeteries, as well as vermin in the water. The contaminated run-off and pests get into the wells because the wells are improperly sealed or unmaintained. One resident reported that due to his contaminated well he had to spend $1,500 annually to truck in enough clean water to drink and shower (Pecoskie, 2013). Despite these problems, Six Nations does not get funding from Canada to remediate, clean, and fix the wells because they are privately owned by residents. INAC's policy is that "the First Nation is responsible" and all "questions about the services available to residents should be directed to the First Nation" (Doc #9, p. 2).

To address the problem, Six Nations is working to provide piped water from the Ohsweken treatment plant to more residents and is working to protect the source water. In 2014 Six Nations expanded their drinking water plant to include 500 more homes (McNeil, 2014) and another expansion of the piping is underway to include 200 more residents and 2 schools in the water service. That solution still leaves the majority of residents relying on trucked water or private wells that are unsafe to drink (Marion, 2015). Protecting the quality of the source water will protect well water and decrease the risk of treatment plant failure, but it is not directly under the control of Six Nations. Six Nations is in the Grand River watershed, which is overseen by the Lake Erie Region Source Protection Committee. Through that committee, a proposed Plan has been developed which would "protect the sources of municipal and First Nations water systems throughout the Grand River watershed" and be implemented "in areas upstream of Six Nations in the County of Brant, Brantford and other municipalities" (Six Nations, 2015, p. 1). Begun in 2006, the Plan will finally become effective July 1, 2016. It includes a variety of actions to manage and prevent potential risks to drinking water sources, including education, risk management plans, land-use planning, and monitoring (Grand River Conservation Authority, 2015, p. 30).

Though the plan will not fix existing contamination, it will help stop the sources of contamination, thus protecting water in the future.

5.3.5 CONCLUSION

Six Nations of the Grand River is in a position where a large percent of residents rely on private wells for drinking water, which has left residents vulnerable to serious health threats from consuming contaminated water. Without federal regulations to control the run-off affecting water on the reserve and without a source water protection plan in the past, there are currently high levels of contamination as a result of these structural impediments that will not be fixed as soon as the plan is in place on July 1st. In addition, many of the wells on the reserve were not properly installed and have been improperly maintained, meaning they are much more likely to become contaminated and present serious dangers to human health. Furthermore, most of the wells are not being tested regularly for contamination, meaning that dangerous problems cannot be quickly caught and addressed prior to causing health concerns. This model of drinking water delivery provides significant challenges for supplying clean drinking water on reserves.

5.4 First Nation-Municipal Partnerships

5.4.1 BACKGROUND

The third model of water service delivery that will be examined is service agreements that are made between a First Nation and a local municipality for the provision of drinking water on the First Nation reserve. These agreements are interchangeably referred to as a Municipal Service Agreement (MSA), Municipal Development of Service Agreement, Municipal-Type Service Agreement, or Water Service Provision Contract. In this model, a First Nation located within sufficient proximity to a municipality pays the city or town to provide treated drinking water on the reserve. Often the agreement for water provision is part of a larger MSA that includes services like fire protection, waste disposal, and/or policing on the reserve. The biggest limitation of this model of service delivery is that it is only applicable to reserves located close enough to community that has the capacity to provide water to the reserve. This can be used by either an existing reserve adjacent to a city or town, or a First Nation that is gaining ownership of land within or near an urban setting through an Addition to Reserve. The *National Assessment* (2011) found that 19% of First Nations rely on a Municipal Type Agreement for water delivery (Neegan Burnside, p. i).

As the province with the highest number of First Nations, British Columbia has the most service agreements between First Nations and municipalities, with 550 formal agreements in place and many more informal ones. Alberta has 100 formal MSAs despite having only 44 First Nations, and Saskatchewan has the most MSAs for Additions to Reserves resulting from settling outstanding land debts owed according to historic treaties (FCM, 2011, p. 7). An Addition to Reserve (ATR) is when the Government of Canada converts an allotment of land, which has been acquired by a First Nation, to reserve status. These tracts of land can be contiguous to the existing reserve, or can be in another (often urban) area. First Nations have the right to purchase any parcel of land from a willing private party or to convert Crown land to reserve to settle an outstanding claim (OAG, 2009). One of the criteria for approving a parcel of land is “best efforts have been made to address the concerns of municipal and provincial/territorial governments” (INAC, 2012). Municipal concerns often involve developing MSA, outlining the nature and cost of providing municipal services to compensate for property tax revenue that would have otherwise been collected on that land to pay for public services (NAEDB, 2014, p. 7).

5.4.2 OPPORTUNITIES AND CHALLENGES

MSAs are meant to be mutually beneficial partnerships but there are a number of challenges and barriers to implementing effective water service agreements. MSAs can reduce costs by providing economies of scale and avoiding costly duplication of infrastructure and services. They can also enhance social and economic development by providing higher quality of services, foster productive relationships between the two

communities, and build capacity on reserves by including requirements to train and employ First Nations residents (FCM, 2011, p. 9). MSAs are best suited for situations where the capacity is available to provide the service, the water treatment plant can process sufficient water for both communities, it is physically reasonable due to the proximity of both communities, and there is a cost benefit to the partnership (p. 4).

The Federation of Canadian Municipalities (FCM), an organization representing the interests of municipalities in policy and program matters across Canada, has developed the *Service Agreement Toolkit* with advice, case studies, and templates to help facilitate MSAs between First Nations and municipalities. Along with other regional manuals developed to assist in the creation of agreements, they provide an overview of the opportunities and challenges First Nations face in using MSAs to provide drinking water on reserve. These toolkits available can assist communities with limited expertise in negotiating beneficial service agreements.

Despite these benefits, there are a number of challenges to negotiating and maintaining effective water service agreements. Barriers can include distance between the communities, infrastructure capacity, cost, human resource capacity, and relationship concerns (FCM, 2011, p. 9). Large distances between the two communities mean water pressure drops farther from the plant and chlorine diminishes over greater distances, decreasing the quality of the water. Infrastructure capacity means if a community's treatment plant is already supplying water to its maximum population, it cannot also provide water to the reserve (p. 10). The fees provided can benefit the municipality, but a study conducted for Naut'sa mawt Tribal Council (NTC) found a lack of standardization in fees First Nations paid for services. Reviewing MSAs in British Columbia. they found many communities paying unfair rates, either paying less than the value of the service or paying much higher rates than a similar municipal household for the same service, that sometime services are not being delivered as agreed, or contracts are insufficiently clear (NTC, 2014, p. 6, 15).

Another challenge is sometimes community growth makes an agreement obsolete, or creates more demand for water than the treatment plant can facilitate (NTC, 2014, p. 15). Due to the regulatory gap on reserves, this has led to situations of uncontrolled development, and municipal zoning bylaws do not apply on reserves (Lower Mainland Treaty, 2006, p. 6). This means that sometimes in order to complete a water service agreement, band council resolutions will have to be passed creating compatible by-laws in land use and zoning, land development standards and servicing standards—such as the size of water and sewer pipes, connection to water and sewer, and design specification (Manitoba, n.d., p. 42). This can be an onerous process for low capacity communities.

The limited capacity of small communities to negotiate agreements is another barrier to developing them. Even as stand-alone water service agreements that are not part of larger MSAs, water service agreements are highly complex to negotiate and administer. The Standing Senate Committee on Aboriginal Peoples heard a testimony from Ontario Regional Chief Toulouse that for an MSA, First Nations must "negotiate arrangements regarding such matters as joint land use planning, bylaw harmonization, tax loss compensation and municipal service agreements. Unfortunately again, First Nations often lack the necessary capacity to negotiate in all these areas. [INAC] is never a party to these arrangements and only offers to provide technical support during the negotiations. Unfortunately, even the regional [INAC] offices are stretched to capacity" (SSCoAP, 2012b). Technical specifications, bylaws, amount of payment, type of payment structure (i.e. tax equivalency vs. fee for use), dispute resolution mechanisms, and commercial and industrial water use, are issues that must be agreed on among others (FCM, 2014, p. 81). For small communities with limited budgets this can be a huge challenge. The municipality and the First Nation must both have sufficient resources to negotiate, fund, and monitor the agreement, which requires financial and administrative investment (Spicer, 2015, p. 7). A report for the Southern Chiefs Organization (SCO) found that one of the main difficulties was the First Nations often did not have the resources and technical expertise necessary to create an agreement, nor did they have the resources to hire a project manager, so the land manager often tried to negotiate the deal on top of an already full-time job (SCO, 2005, p. 21).

Finally, difficulties in the relationship between the First Nation and municipality, often rooted in misconceptions about First Nations, is another significant challenge that can pose a barrier to developing a water service agreement, as seen in Long Plain First Nations.

5.4.3 COMMUNITY EXAMPLE: LONG PLAIN FIRST NATION

Long Plain First Nation is a community 15 km southwest of the City of Portage la Prairie, Manitoba, with 2,152 residents on reserve as of 2013 (NAEDB, 2015a, p. 97). Long Plain owns a 3-acre parcel in the City of Winnipeg that was purchased in 2006 from Manitoba Hydro, and designated as a reserve in 2013. In 2010, Long Plain and Winnipeg signed an MSA enabling Long Plain to develop the land, which now houses Yellowquill College (Long Plain, 2014). According to Chief Dennis Meeches, "the biggest challenge was negotiating a Municipal Development Services Agreement, which spells out the working relationship between the City of Winnipeg and Long Plain" (Winnipeg Chamber, 2015).

The agreement stipulates that, in exchange for providing municipal services (including water, policing, fire, road maintenance, and sewage collection), the City of Winnipeg will receive a fee equal to the property and business taxes, service charges, and levies they would have received had the land not been set aside as a reserve (NAEDB, 2015a, p. 104). The biggest portion of the delay in getting the land designated as a reserve was the MSA. Chief Meeches testified to the Senate Standing Committee on Aboriginal Affairs about the experience. Though the City of Winnipeg was "helpful" in developing the MSA, "the neighbouring buildings and the owners of those buildings were very difficult in terms of dealing with them" (Standing Senate Committee, 2012b). This matches the experience of other First Nations, who found "local government concerns can be a significant source of delay" (NAEDB, 2015a, p. 39).

These observations are problematic because the relationship between the First Nation and municipality is what ultimately impacts the success of an MSA. Myths about First Nations as an economic drain abound, which sets a negative tone in building that relationship (NTC, 2014, p. 24). "Relationships are at the foundation of any service agreement – throughout the negotiation, and the duration of the service agreement itself. During the process of negotiating or re-negotiating, your relationship will likely be tested" (p. 20). This barrier is largely ideological, as Long Plain First Nation found. Serious misunderstandings between the two communities about each other's needs, wants, and cultural methods styles are a reality, and many prejudiced or uninformed views about Long Plain and First Nations in general remain (SCO, 2005, p. 25). Long Plain, along with other Manitoba First Nations, expressed the frustration of having to become cultural educators about their communities, the value of urban reserves, and the importance of coming to agreement (p. 26). In addition to educating the municipal government they had to dispel many myths about themselves from city members as well. Chief Meeches explained to the Senate committee that they received a great deal of negative pushback from citizens about the perception of First Nation communities, including that there would be wild dogs running around, abandoned cars filling the city, and rundown housing lowering property values. "When a municipality knows that your intention is to convert it to reserve status, they will oppose you. If they oppose you, it will never become reserve status, like the city of Winnipeg and like the citizens around us" (SSCoAP, 2012b).

5.4.4 CONCLUSION

Long Plain First Nation successfully negotiated an MSA with the City of Winnipeg that included the provision of clean drinking water. The benefit of this agreement is that Long Plain, like other reserves that have successfully negotiated MSAs, has clean drinking water on their urban reserve without having to build and operate an expensive and difficult water treatment plant. When a reserve can share water with a local community, they have affordable access to safe drinking water without duplicating efforts, spending a lot of money on construction and upkeep, and remaining vulnerable to the threats facing small treatment systems. By partnering with regional communities, First Nations can achieve better economies of scale by building one large plant rather than two small plants and buying chemicals and parts in bulk. The examination of municipal-First Nations partnerships in delivering drinking water on reserves shows that this option is only available to First

Nations close to other communities, and has many barriers. The two biggest barriers First Nations face are limited capacity to negotiate agreements and municipal reticence to sign agreements.

5.5 Aggregated Water Authority

5.5.1 BACKGROUND

The final model of service delivery that will be examined in this chapter is First Nations water system aggregation. This does not refer to sharing physical infrastructure, which was covered by MSAs in the previous section, but rather aggregating the management systems of drinking water in multiple communities through a First Nations Water Authority, as institutional support for water delivery on reserves was a theme that was identified in both the literature review and the document review. In this model, the treatment and distribution systems in several First Nations communities are "bundled," and owned and operated by a third party organization that represents all of the communities. The responsibility and liability for managing the collection, treatment, and distribution of water is transferred from each individual band to a First Nations Water Authority, a utility that is jointly owned by the participating communities.

Once operational, the Water Authority will oversee building and maintaining the infrastructure, as well as monitoring, sampling, testing, and reporting on water quality and mitigating any problems. This model is designed to supply the necessary capacity, technical skills, and adherence to best-practices that can be challenging in small and remote communities. A localized aggregation—rather than a national-scale organization—would have the ability to choose the proper facility design for individual locations and water conditions, provide customized operator training, and support effective monitoring and reporting regimes in each community, decreasing the number of boil water advisories and increasing community confidence in the water supply. This Authority would also have the expertise and capacity to effectively negotiate with contractors, municipalities, and Canada (Doc #12, p. 1080).

5.5.2 COMMUNITY EXAMPLE: FIRST NATIONS CLEAN WATER INITIATIVE – ATLANTIC

The Atlantic Policy Congress of First Nations Chiefs Secretariat (APC) has been working with INAC and Dalhousie University on the First Nations Clean Water Initiative—Atlantic Region to develop a Water Authority to serve as a central body to manage water and wastewater assets for the Atlantic First Nations. Initiated in 2009 as a pilot project, this initiative seeks to create a Water Authority by 2018 that will be a First Nations-owned utility to operate and maintain water infrastructure for participating communities for 25 years. The objective of the First Nations Clean Water Initiative-Atlantic Region is to provide centralized ownership and management, expertise, and financial management to support the level of service standards for drinking water as those found off-reserve (Doc #10; Doc #11).

The initiative includes 33 interested communities in New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador. Of these, 24 have signed Band Council Resolutions signifying commitment to the Water Authority as of December 2015 (Doc #14, p. 4). Some of the interested communities rely on well and septic systems, some communities have treatment and distribution plants, and some communities have municipal service agreements but remain responsible for operating and maintaining the portions of the infrastructure on the reserve. Due to the limitations of each system as previous discussed, all of the communities need a more structured and robust approach to the O&M of their systems. In addition, some of these communities need their existing infrastructure rehabilitated to ensure safety, while some need it replaced entirely (Doc #12, p. 222-223). As of February 2015, the estimated value of the water and wastewater assets for communities in the initiative exceeded $50 million and included over 12,000 people (Doc #12, p. 150-152).

With the average on-reserve population in the Atlantic less than 500, aggregating water services could leverage economies of scale and provide the same protections that larger municipalities have. The anticipated size of the water demand for the utility will be approximately 16,200 m^3/day, making it comparable to the town of Turo,

Nova Scotia (at 10,000 m^3/day) or Charlottetown, P.E.I. (19,000 m^3/day). The APC and INAC anticipate that by aggregating the service delivery, First Nations communities will be able to:

- Reduce operating costs through common technology, purchasing and planning;
- Increase the lifespan of facilities and improve performance through central maintenance planning, purchasing and expert capacity;
- Improve the ability to attract and retain expert technicians and operators;
- Provide mechanisms by which funding is not diverted away from critical maintenance;
- Move away from the current break/replace cycle;
- Depoliticize community infrastructure planning and maintenance (Doc #13, p. 4).

The Water Authority will have all of the existing water and wastewater assets transferred to its possession, as well as the authority to manage contracts and municipal agreements. It will be a technical organization focused on providing water and it will be set up as a legal corporation, to be run by a Board of Directors. The Board will be responsible to the owners group—the shareholders group made up of all participating First Nations communities. The Water Authority will be a by-First Nations, for-First Nations organization, as it is the communities themselves who will decide on the structure and functions of the Board. The Water Authority will have service accords with participating communities to specify the terms and quality of drinking water service delivery (Doc #12, p. 134-137; 669). The initiative to set up a Water Authority came in response to the anticipated regulations that will be created, but that First Nations leaders say they will be unable to comply with due to present delivery models, inadequate infrastructure, and limited funding (Doc #13). INAC's standards for the Water Authority mirror those of off-reserve utilities and school boards, including: being credible, stable, and legally recognized; legal tenure to infrastructure and authority to operate it; secure funding and ability to borrow funds; ability to generate revenue to offset costs, and ability to absorb liability (Doc #13, p. 5).

5.5.2.1 Land Designations

Off-reserve, municipalities can give exclusionary rights to utility corporations, allowing them exclusive legal access to the water treatment facility. This ensures the safety of the water and allows the liability to pass to the utility. On-reserve this cannot be done through a bylaw because there is no First Nations equivalent to the *Municipal Corporations Act*. As a result, the Water Authority is considered to be a third-party, rather than an extension of the band. The communal nature of the land means that external parties cannot expropriate or exclude band members from the land. This protects the land for the future use of the band. In order to transfer the liability to the Water Authority, it must own and be the only entity legally operating the facilities. A "land designation" and lease must take place (Doc #13, p. 6; Doc #14, p. 6).

A land designation is not a surrender of land, but it sets the land aside for exclusive third party use for a limited timeframe, after which the land reverts back to the band's control. Land that has been designated is still part of the reserve and remains subject to bylaws by the Council, but requires a community referendum and a minimum of four Band Council Resolutions, requesting the Minister to sign the lease with the Water Authority. It can take around 18-24 months to complete a land designation process (Doc #12, p. 35, 875; Doc #13, p. 6-7; Doc #14, p. 6-9). This arrangement is advantageous by providing long-term certainty for the Authority to operate the water systems on reserves.

In addition to being a lengthy process, designations are a lengthy process and can be politically risky for the Chief and Council. A designation requires the entire band membership to be completely informed regarding the transaction, terms, conditions, and implications which may be more onerous to bring about than the community has resources for. This is also a potentially risky initiative for INAC, should the project be halted along the way after communities have invested a great deal of time and effort. The Atlantic Policy Congress is "highly vested" in the project, and the communities in the region are reportedly raising their expectations for success, leading to backlash against the government should the initiative be canceled (Doc #13, p. 7, 20).

5.5.2.2 FUNDING

Once functional, the Water Authority will directly receive the funding from INAC for water and wastewater that would have gone to the participating First Nations. As with band-run water systems, this includes 100% of the capital costs of the infrastructure and 80% of the O&M funding. The other 20% of the funding will be transferred from the participating First Nations to the Authority (Doc #11, p. 5). In addition, the Water Authority may be set up so that it can get infrastructure loans, the way a municipality can. This may be through the First Nations Finance Authority—an institution created by the *First Nations Fiscal Management Act* to provide low-cost access to borrowing for First Nations—or it could be through P3 Canada—a Crown corporation that facilitates public-private partnerships for large projects (Doc #12, p. 222; Doc #13, p. 8).

As was demonstrated in previous chapters, INAC supplies 80% of O&M funding based on a formula rather than on the actual costs for running the system. This can leave more than 20% of the remaining O&M costs uncovered. A full analysis to determine the amounts actually spent by First Nations has not been conducted yet, so it is unknown whether the supplied funds will be sufficient to provide water service effectively (Doc #13, p. 8). In additional to assessing the full costs of running the existing infrastructure, the Initiative will have to review the systems and calculate the costs to repair, upgrade, and construct new systems to make them fully compliant with Provincial regulations. INAC supports the initiative on the assumption it will receive current amounts of funding, however First Nations leaders in the Atlantic have contended that additional funding will be required to create and operate a Water Authority (Doc #13, p. 153; Roache, 2016). This means in order to be funded, the Authority will have to demonstrate that it provides value-for-money in the short and medium term.

Since 2014, INAC has invested $1.8 million in the initiative to set up a Water Authority. One estimate put the figure required to create a fully functioning Water Authority is $16 million (Doc #13, p. 17). With 23 communities committed in 2014, the APC estimated that the Authority's administrative costs would be $690,000 a year, and the operating and maintenance costs would be $1.13 million a year (Doc #12, p. 714). In addition, INAC would have to secure 25 years of funding to support infrastructure builds and upgrades (Doc #13, p. 17). At the January 2016 APC all Chief's Meeting though, the chiefs indicated concern that clear support from the Government was lacking (Doc #10, p. 1). Funding delays and limited funding getting approved caused the APC to lay off staff and try to rehire them, without guarantees of future funding (Doc #12, p. 1727). In March 2016, Mi'kmaq leaders in Atlantic Canada said the government was not providing sufficient money for water on reserves, and it was putting the future of the Water Authority at risk (Roache, 2016).

5.5.3 CONCLUSION

The First Nations Clean Water Initiative, if successful in setting up a Water Authority, will be a model that can be replicated across the country. Centralized ownership, centralized management, technical expertise, and financial management are expected to lead to fewer boil water advisories, higher levels of confidence in the drinking water, greater financial transparency, and consistent operating standards. It can be a tool for supporting First Nations abilities to exercise direct jurisdictional control by providing the institutional support some Indigenous communities are lacking. It remains to be seen if this model will work in practice as effectively as it is intended to work. Currently the Water Authority board of directors must be established with rigorous criteria and rules, as well as corporate bylaws and policies that will ensure successful, transparent operations. Next, land surveys must be conducted in all participating First Nations, and engineering assessments must still be done to produce cost estimates and financial analysis to ensure the viability of the Water Authority (Doc #14, p.11-12). This model of drinking water service delivery holds promise but must be managed very carefully and replicated in other regions of the country to determine what applicability it has for other First Nations.

5.6 Summary

These models of water service deliver all present opportunities and challenges for communities in order to deliver clean drinking water on reserves.

6.0 Discussion and Analysis

6.1 Introduction

Chapter 6 examines the findings from the document review, literature review, and case studies to determine how they collectively answer the research questions. To recap, the main research question is:

- What approach to policy and implementation should the Canadian government pursue to support all First Nations in addressing the lack of clean drinking water on many First Nations reserves, in a long-term, efficient manner?

The secondary research questions are:

- What are the issues leading to a lack of clean drinking water?
- What are the models of service delivery for water systems on First Nations reserves?
- What supports do First Nations need to ensure effective, long term delivery of clean drinking water?

6.1.1 THEMES

The document review, literature review, and case studies revealed six key themes underlying the clean drinking water shortage on reserves which help answer the research questions. Based on the answers to the secondary research questions, Chapter 7 will discuss options for answering the first research question. Table 1, found in Annex D, provides a side-by-side comparison of the findings of the document review, literature review, and case studies on these themes. To answer the research questions:

- The primary models for delivering water service are through individual band-run systems, private wells, municipal partnerships, and water authorities that aggregate regional water systems.

The issues leading to a lack of clean drinking water are as follows:

- Insufficient operation and maintenance capacity is the greatest barrier to safe drinking water on reserves;
- The regulatory gap increases threats to water safety, but regulations will not ensure safe drinking water if communities cannot comply;
- There is insufficient funding available from Indigenous Affairs (INAC) and in communities;
- Governance failures contribute to water quality problems when operations and maintenance practices do not have sufficient management, support, and oversight; and
- Many First Nations communities face additional challenges that increase water quality risk due to their small sizes and/or remote locations;

Suggested supports to ensure effective, long term delivery of clean drinking water:

- Institutional support is a widely recommended option to help with capacity and other barriers—and regional First Nations Water Authorities provide a promising way to do this;

6.2 Conceptual Framework

Through the lens of the conceptual framework, the findings revealed three key phases in delivering clean drinking water on reserves: protecting source water, constructing the technology, and operating the systems. This report demonstrated that across Canada, many First Nations people living on reserves do not have reliable access to clean drinking water from their taps. The conceptual framework that began the research posited that safe drinking water depends on funding, regulations, and capacity. The findings showed that each of these are necessary but not sufficient to ensure the safety of drinking water. Of these three, the findings indicated capacity remains the toughest part of the problem to address. Money alone is not sufficient to provide capacity, though inadequate funding decreases capacity. Furthermore, the regulations being developed will do no good if there is no capacity to follow or enforce them. As Kuikamn, Singh, Spence & Walters (2012) laid out, capacity has multiple dimensions, including financial, institutional, technical, political, and social aspects (p. 10). Despite Canada's commitment to end boil water advisories on reserves in five years, the problems will reoccur and persist if the full range of capacity issues are not addressed.

These findings also brought to light that on many reserves, First Nations have to deal with deficits in funding, administrative and financial management capabilities, infrastructure, training, governance structures, and/or human resources. In the face of such challenges, many band councils (especially in communities that are small, remote, or lack a revenue base) are overburdened and struggle to exercise their jurisdictional authority without the resources and institutional supports on which other levels of government rely. This has turned communities' infrastructure assets into community liabilities with the potential to harm residents. Enhancing the clean drinking water supply requires that First Nations have the supports needed to fully exercise their jurisdictional authority and build the resilience to withstand crises and disasters. To achieve these outcomes, the conceptual framework revealed three key phases where funding, regulatory, and capacity deficits introduce risks into drinking water systems on reserves. It found that a multi-barrier approach to providing clean drinking water on reserves must include the abilities to: (1) protect the source water, (2) build and upgrade appropriate technology, and (3) follow best operating practices and standards, including testing, treatment, monitoring, and remediation. As the system is currently set up, these three phases (source, construction, and operations) all pose risks to drinking water due to the capacity deficits to address them sufficiently in some reserves across Canada.

6.2.1 SOURCE WATER

Source water is the ground or surface water that is treated and distributed to residents. It can come from underground aquifers or surface water sources like rivers, lakes, and streams. Surface water is particularly vulnerable to contamination but pollution and runoff can also easily contaminate groundwater. Failures in source water protection primarily constitute an issue of regulatory and governance gaps. This theory is well supported in the document and literature reviews in Chapters 3 and 4, and was demonstrated by the contaminated wells on Six Nations of the Grand River in Chapter 5. Since pollutants move across reserve boundaries, protecting source water requires that harmonized regulations exist both on and off reserve that are sufficiently strict and that properly enforced. On Six Nations reserve, many wells were contaminated with run-off from farms and industry, fuel storage, septic systems, and dumps. This was a failure of having the necessary rules in place, but also of having the governance capacity to enforce the existing standards.

Without regulations that apply on reserves or the ability to control what happens to the water before it enters the reserve, First Nations have higher risks of having their source of water contaminated. Contamination makes source water more difficult and expensive to treat, and increases the threat to human health. Six Nations will be included in the Drinking Water Source Protection Plan when it is enacted in 2016, but they have had many years of no influence. Being part of the Watershed Planning District will give Six Nations greater say in how their source water is protected, but it will not solve the existing problems. Limited influence is also a problem for many First Nations who are not part of watershed planning districts to protect source water with other local communities. For some communities, it is because they lack the capacity to participate in the complex process. Other do not have the time, technical expertise, or funding to spend on adopting sufficient bylaws to qualify to join. Still others feel that their governance is being overstepped due to the requirements to incorporate provincial legislation. The more contaminated or at risk of contamination the source water is, the more expensive and complicated the technology is that is required to treat it. Pollutants from farms, industry, resource development, fuel storage, sewage and septic, landfills, and commercial development can all increase the risk of unsafe drinking water and make it harder for communities to provide clean drinking water.

6.2.2 PROCUREMENT

First Nations also face capacity issues in constructing treatment plants. Many reserves are small or remote, which increases the costs and logistical difficulties of building plants. Building seasons are short and winter roads make transporting workers and material difficult. In addition, having the right technology for the location can be a problem. Small, under-resourced communities may not have the ability to hire top contractors or evaluate highly technical proposals, and thus may end up with poor designs or shoddy work. This was seen in the design flaw of the original water treatment plant constructed in Neskanta First Nation in 1991 that lead to a

boil water advisory that has been in place since 1995. Conducting feasibility studies, environmental impact studies, approving the designs of the engineering consultant, negotiating construction contracts, and monitoring and signing off on the work to ensure it meets standards are expensive, time-consuming, technically complex tasks. Small communities or those facing more pressing crises sometimes cannot divert already strained financial and human resources to procuring upgraded water treatment.

In addition, funding hinders procurement opportunities. Funding from INAC is contingent on the government's approval of the treatment plant. Adhering to guidelines for treatment plants is one criteria, but the document and literature review both indicated that limited funding sometimes supersedes other considerations. The funding that is available each year to construct vital community infrastructure is insufficient to keep up with the need. Many communities like Neskantaga remain on long waiting lists for many years for funding. The funding cycle also hinders First Nations in a unique way, because unlike municipalities and provinces that can borrow to finance expensive infrastructure projects and pay for it over time, First Nations rely on INAC to pay for the plants up front. This "cash management" approach puts First Nations at a disadvantage over municipal governments. The literature and document review also both indicated that the option that is cheapest to build does not necessarily provide the best value-for-money. Such an option might ultimately prove to be more difficult and expensive to run than an alternative that costs more at the outset.

The lack of a regulatory framework also means that currently there are few legally enforceable rules for the design and construction apart from adhering to a contract. In addition, those that are in place are virtually unenforceable if there is no capability to comply with them. This issue affects individual treatment plants and private wells. If the design was faulty or the construction shoddy, the First Nation (or private well owner) is liable for the problem, since they approved the contract. Municipal service agreements are sometimes hindered by the incompatible regulatory regimes on the reserve, causing conflict, delays, and struggles to create bylaws that match the municipal context. The proposed First Nations Water Authority in the Atlantic examined in Chapter 5 may be better positioned to address procurement issues if it is structured and governed carefully, but its ultimate success remains to be evaluated.

6.2.3 OPERATIONS AND MAINTENANCE (O&M)

After plants are built they need to be run right. The findings showed that the greatest threat to the water supply that many First Nations face is capacity deficits impacting operations and maintenance (O&M) of water systems, contributing to unsafe drinking water. The document review, literature review, and case studies revealed deficits in the human capital, tools, and management needed to operate systems according to best practice standards. Human capital includes having properly trained and certified operators and being able to keep them in the community. Tools includes all of the other factors to do the job, including operators having funding and support from Chief and Council, access to parts, chemicals, supplies, and technology. Management deficits is the lack of a sufficient governance structure or capacity to oversee a proper management of system with rules, monitoring, record keeping, prevention, testing, maintenance, and enforcement. Reserves that are small and remote have a more difficult time running their systems, and as the case of private wells showed they are often do not have sufficient maintenance and treatment conducted. Findings showed that a lack of funding for running water systems is an issue in all of the models, with the document review, literature review, and case studies asserting that insufficient funding is provided from INAC, and that many First Nations lack the resources to pay their share of the costs. Small and remote communities are more likely to have small treatment options that are prone to problems but remain too complex for an untrained operator to fix. They are also less able to have the human recourses, tools, and management systems mitigate these issues.

The document and literature reviews consistently showed that an enduring, and undervalued, part of the problem leading to lack of clean drinking water on reserves is the O&M aspect. The people in charge of running water systems on reserves—the technicians, maintenance personnel, and manager—have one of the most important roles to play in delivering clean drinking water to residents. No matter how great the technology is, if it is operated improperly it will not deliver clean drinking water over the long term. Water will quickly become

unsafe without proper operations and diligent maintenance, and that requires oversight and enforcement, which the findings demonstrate is often lacking. For example, many communities do not have processes in place to detect if an operator is not sampling the water and sending it to be tested.

In addition, it is important that operators have the right training and certification to run their systems. Based on extensive consultation, the C.D. Howe Institute's report concluded that: "Given the choice between a gold-plated water treatment plant with an inadequate operator and a limited water treatment plant with a highly competent operator, the latter would be the best choice for safe drinking water" (2011, p. 12). In small communities, water system operators often perform many public works functions beyond drinking water facilities, which hinders the amount of time and effort they can put into the water system. The findings showed that small communities are also less likely to have spare parts for repairs and may not have the resources to hire fully trained operators. There are also no regulatory oversites to establish and monitor operator compensation rates across communities, leaving it open to the creation of a two-tiered system where already struggling communities will lack the funds to hire and retain trained and competent operators. Investing in capital facilities without investing in the continued training and support for operators is not a sustainable solution to water safety issues. It is cheaper and more effective to invest sufficient time and funds in preventative maintenance and proper operation of systems, instead of having to pay for major repairs and new facilities. The proposed First Nations Water Authority in the Atlantic may show that an aggregated water institution can be better positioned to address the challenges of running water systems, but that has not yet been demonstrated.

6.3 Institutional Support

The document review, literature review, and case studies indicated that a First Nations run water institution could provide many benefits to struggling communities, addressing the challenges they noted. Institutional support would help with the issues of scale that face First Nations water provision on reserves. As has been established earlier in the document review, most First Nations communities are relatively small and many are rural and remote, requiring small systems and making it unfeasible for most communities to share physical infrastructure. Despite the distance, they could still potentially benefit from shared ownership and operations. It remains to be seen if the Atlantic Policy Congress's Water Authority will deliver on providing these supports, but it remains a promising pilot project to monitor. A regional institution like the Water Authority could also be the representative for multiple First Nations in watershed planning districts and provide capacity support to bands creating bylaws to protect source water. In addition, they could amplify the voices of First Nations concerned about external contaminants impacting their source water. The findings also demonstrated that all First Nations must be able to opt-in to this support, but not be required to join. It must not be so complicated or expensive to participate in a Water Authority that the lowest capacity communities—who need the support the most—are excluded, and it must not infringe on First Nations self-determination and nationhood.

6.3.1 PROCUREMENT

The findings concluded that a First Nations Water Institution could provide procurement support for First Nations. As has been seen, building a new treatment plant is not a simple process and communities with low capacity may not have the ability to manage the stages or negotiate advantageous contracts. An institution could help ensure technology choices are the best option for mitigating local risks, are right sized for the community, and include scalability considerations to enable future development. An institution would have the capacity and experience required to get feasibility studies conducted and reviewed, then approved by INAC, preliminary and detailed designs conducted and then approved, and environmental protections approved, all before a construction contract can even be started. It could also have the resources and experience to prepare construction contract tenders, evaluate bids, and negotiate contracts. In addition, an institution could have the capacity to review construction milestones and issue final approval upon completion according to contract. This process requires a great deal of time, effort, technical expertise, and contract expertise that could be built in to a First Nations Water Authority. A Water Authority could be set up in such a way that it has access to financing on similar terms as municipalities, alleviating the bottle neck for desperately needed construction and upgrades.

6.3.2 OPERATIONS AND MAINTENANCE (O&M)

In addition, an institution could provide the needed capacity support for ongoing O&M of water systems and facilities. Cave (2012) explained that an institutional context would address operational realities by enhancing water governance—the decision-making and oversight functions—and management strategies—the day-to-day operations functions—of First Nations drinking water systems (p. 4). These aspects would not only increase the lifespan of the infrastructure but would lower risk to human health by improving safety features. In addition, it would increase the ability of communities to protect the lifecycle of the water from enacting stringent source water protection plans all the way to decommissioning old treatment facilities. A First Nations water institution would provide a collaborative governance model that would build capacity for self-management in communities while empowering operators to run systems effectively with adequate support, being able to take advantage of the larger scale that such aggregations provide. Smaller systems are higher risk, have more adverse test results, and are costlier to run. As Swain, Lazar, & Pine (2005) recommended, to increase scale and capacity, communities should join forces and create larger water service areas, which will be financially stronger and especially will be more sustainable in running the facilities (p. 17). Another benefit is that economies of scale come into play and an overarching institution could purchase bulk procurement of chemicals and supplies and have better ability to negotiate favourable contracts for testing or operation (p. 19). These larger water services could join forces with neighbors or be in charge of contracting out O&M for multiple systems, being able to afford higher quality of management, planning and execution, oversight, and reporting. Consolidating systems, or contracting the operation of multiple systems to a single operator team, provides a lot of savings.

6.4 Conclusion

The findings of this study demonstrated that across Canada, many First Nations face significant hurdles in providing clean drinking water on reserves. Compounding challenges like size and location, limited funding, insufficient legislation and regulation, governance barriers, and insufficient capacity for O&M make it harder to protect source water, procure appropriate technology, and run water systems. These findings also demonstrated that providing drinking water on reserves in a long-term, sustainable, safe manner requires institutional support. Aggregated water authorities could assist First Nations in filling the three main deficits: human capital, tools, management. Human capital includes properly trained and certified operators (receiving training, retaining operators). Tools to do the job includes getting the funding and support from Chief and Council (funding, access to parts, chemicals, supplies, and technology). Management includes regulations and governance (proper oversight, inspection, and enforcement system in place). First Nations would need to voluntarily be actively engaged in the development of any new organization. Individual communities have the right to determine the direction they wish to pursue; they must be provided with the option of seeking First Nations institutional support to exercise their jurisdiction as fully as they wish.

7.0 Options to Consider and Recommendations

7.1 Introduction

Based on the analysis of the findings, this chapter examines policy options for the Canadian government to pursue in order to support First Nations in addressing the lack of clean drinking water on many First Nations reserves, in a long-term, efficient manner. Based on the findings, increased capacity must be supported while respecting self-determination and increasing First Nations' ability to exercise their jurisdiction. Respecting the Nation-to-Nation relationship between First Nations and Canada, no options should be pursued without first validating the idea through consultation with First Nations and amending it based on that feedback.

7.2 Options to Consider

The options to consider are practical alternatives that could be undertaken in an attempt to address the situation:

1. Continue the current models with a regulatory regime and enhanced funding
2. Provinces mandated to run water systems on reserves, or
3. Support the creation of regional First Nations water authorities.

7.2.1 Option 1: Regulatory Regime and Enhanced Funding

The first option is continuing the status quo of water delivery models while enhancing funding and creating a regulatory regime. In this option, the government will continue to pursue the same course of action they are currently undertaking. Regulations will be developed under the *Safe Drinking Water for First Nations Act* and more money will be delivered as promised in *Budget 2016*, but individual communities will remain in charge of procuring and running their own drinking water systems on an ad hoc basis. The findings have demonstrated that this course of action will provide improvements from the current state of drinking water but will be insufficient to solve the problem in the long term.

As the findings showed, regulations are important for ensuring the safety of drinking water. The development of regulations in consultation with local First Nations is a positive step, but regulations that cannot be complied with are unenforceable. The regulations by themselves will make little difference other than to make a two-tiered categorization of communities who have the resources to comply with the regulations and those who do not. The communities whose systems are struggling because they lack the capacity to operate them properly will not only remain unable to provide safe drinking water, they will end up on the wrong side of the law. Many of the existing facilities do not meet the standards and require significant upgrades. Additional resources must be paired with regulations, but the current funding is not sufficient to solve the problems.

Budget 2016 committed $1.8 billion over five years for drinking water infrastructure and $141.7 million over five years to improve monitoring and testing of water on reserves. The document review noted estimates that providing safe drinking water will cost more than that. One author estimates it requires an immediate investment of $2.66 billion for infrastructure and an additional $253 million each year for O&M (Neegan Burnside, 2011, p. 32), another estimates that combined, building and running water treatment facilities on reserves will cost $1 billion every year for ten years (Canadian Centre for Policy Alternatives, 2016, p. 66). The nearly $2 billion over five years that is currently available is insufficient to address the problem. Even if brand new treatment facilities are installed in every community, the research suggested that many communities will face unsafe drinking water again within a few years because they lack the human resources, governance and management capacity, financial base, and availability of tools to maintain the systems. The option of continuing the status quo is not going to achieve the goal of safe, clean drinking water on reserves in a long-term, sustainable manner.

7.2.2 OPTION 2: PROVINCES MANDATED TO RUN WATER SYSTEMS

The second option is for the federal government to mandate that provinces take over the role of delivering drinking water on reserves. In this model, they would contract with the provinces to have the responsibility to approve contracts, manage operators, inspect facilities, and enforce regulations. Provinces have a great deal more structural, financial, human resource, and institutional capacity than individual First Nation bands. If sufficient federal support was provided to the provinces to carry out this role, this option could provide greater assurances that drinking water facilities and systems are being constructed and run according to industry best practices. Another benefit is this option would take the liability for old, poorly designed, broken down infrastructure off of individual bands and put it on provinces. By having provincial-wide management, this approach could take advantage of economies of scale in procuring facilities, supplies, and even operators.

Despite these potential benefits, this option is not a viable solution to the water crisis as it does not respect First Nations' rights to self-determination as Nations. Canada has promised a renewed relationship with First Nations based on a Nation-to-Nation approach and this option would instead be a paternalistic and colonial act. Instead of supporting First Nations in the ability to exercise their jurisdiction over water, a unilateral decision to pass the responsibility to provinces would be infringing on their jurisdiction. Such a step would also inhibit capacity building on reserves by taking away opportunities and mechanisms to develop capacity. In addition, though drinking water concerns are present on many reserves, there are also many First Nations that are successfully delivering this service. In addition, it would be politically unviable to pursue this option because of the opposition that such a paternalistic, colonial approach would garner. This option would foster discord, overstep the rights of First Nations for self-determination, and hinder capacity building efforts to grow the internal and governance resources of communities.

7.2.3 OPTION 3: SUPPORT REGIONAL FIRST NATIONS-LED WATER INSTITUTIONS

The third option is to support the creation of regional First Nations-led water institutions to provide capacity support for participating communities in the delivery of clean drinking water on reserves. The government should work with First Nations to determine interest and options for this approach, potentially supporting the creation of Water Authorities that could provide a range of services to communities—from advice to manage aggregated water systems for interested communities. The research pointed to a need for institutional support for First Nations in providing drinking water on reserves. In this option, regional First Nations institutions could be set up to act as Water Authorities to own and operate the water systems of participating communities. Each Authority would offer a menu of options to communities, including acting on their behalf as a water utility, jointly owned and governed by the participating First Nations. Regional First Nations Water Authorities could provide capacity support and development to overburdened communities. Participation in the Water Authority would be voluntary and communities who do not wish the Authority to run their water system would still have access to other capacity supports. The centralized ownership and management of multiple water systems would enable the Authority to take advantage of some economies of scale despite the distances between communities.

Each Authority would build and maintain the water infrastructure and manage operations, including inspection, monitoring, and enforcement of standards and regulations for a geographic area. This would increase the quality of operations and maintenance, ensuring contracts are adhered to, water quality samples and tests are performed and reported, maintenance schedules are followed, and problems are remedied. The responsibility and liability for the water systems would be transferred from individual bands to the First Nations Water Authority, but as this would be a voluntary option for communities and they would be part of the governance of the Authority it would respect the principles of Indigenous self-determination. The Water Authorities could be set up with strong governance structures that provide a robust level of financial and administrative management, enabling it to achieve high levels of service standards.

The First Nations Clean Water Initiative by the Atlantic Policy Congress is a promising pilot project for such a regional Water Authority, but it has not yet been implemented and tested so it is unproven how effective it will

be. It is uncertain how well the model will work in practice and whether there is appetite for similar authorities across the country. The overhead costs of such an Authority may be greater than the savings of having a centrally managed system, though if it increases the standards of drinking water on reserve it may still provide positive value-for-money. An additional consideration is that communities would have to pass a land designation to surrender control over their water facilities to the Authority, which in itself is a time consuming and troublesome process. It is unknown how many communities would be willing to surrender their control of drinking water, even to a local First Nations Water Authority.

7.3 Recommendations

The primary research question of this report was: what approach to policy and implementation should the Canadian government pursue to support all First Nations in addressing the lack of clean drinking water on many First Nations reserves, in a long-term, efficient manner?

Recommendation: Based on the findings, it is recommended that Canada work with First Nations to consider the creation of regional, First Nations-led water institutions to provide capacity support for participating communities in the delivery of clean drinking water on reserves. The first step is for Canada to consult and work broadly with First Nations to determine interest and options in this approach, and to customize it based on feedback from communities. Should there be sufficient interest from First Nations communities, Canada should provide adequate financial, administrative, and political support to establish and sustain regional institutions that would support First Nations in managing clean drinking water. To ensure funding is sufficient, in partnership with First Nations, Canada should determine which First Nations are unable to sufficiently contribute to their O&M costs and should cover 100% of the actual operating and maintenance costs.

Individual First Nation bands are the owners and operators of community infrastructure on reserves, meaning even small and under resourced communities they are responsible for the safety of the drinking water—whether or not they have the capacity to do so. Supporting a First Nations institution that offers a suite of capacity support options to communities could help meet the need for safe drinking water in a long-term, sustainable manner while respecting the principles of First Nations self-determination. The findings of the research indicated that insufficient capacity for ongoing operations and maintenance is the greatest threat to drinking water on reserves. The Water Authority could take over the responsibility for running communities' treatment plants and hold the accountability for delivering safe drinking water to residents. Such an institution is possible, as demonstrated by the First Nations Clean Drinking Water Initiative - Atlantic Region's pilot project to create a Water Authority, though its effectiveness has not yet been demonstrated. The ability of the Water Authority to provide life-cycle support—from source water protection, to procurement, to operations and maintenance—would support the long term and effective delivery of safe drinking water.

7.3.1 POSSIBLE INSTITUTIONAL STRUCTURE

Each regional Authority could be a separate institution, or there could be a central administrative institution with different regional branches, each governed by a local board of directors from the First Nations communities it serves. The Water Authority would provide a menu of options providing varying levels of services that First Nations communities can choose to access, such as:

1. **Advice:** the most basic task the Water Authority could perform is to provide an advisory role to First Nations who request this support. The Authority would work with communities and provide information, options, and resources, such as tool kits and templates. Advice could include:
    a. Technical advice:
        i. Feasibility studies,
        ii. Water system options, pricing, and innovative technologies.
    b. Source water protection advice and capacity support to participate in regional planning districts.
    c. Advice on procurement options:

        i. Should they build their own system (including centrally managed wells), through:
            1. Contract with a private construction company,
            2. Contract with the province (alone or with a group of other local municipalities), or
            3. Through a public-private partnership;
        ii. Delegate the procurement to the regional First Nations Water Authority
        iii. Negotiate a municipality service agreement;
        iv. If sufficient resources, become equity owners of joint system with local municipalities.
    d. Direct communities to consultants, lawyers, local construction firms, etc. for their project.
    e. Advisors who can provide support on negotiating agreements and contracts.
    f. Provide outreach support to First Nations community members about options.
2. **Procurement Capacity Support:** the Authority could take over the procurement process for a First Nation upon request. The First Nation would vote to authorize the Authority to act on their behalf, which would require a contract transferring the liability for the construction onto the Authority.
    a. Negotiate construction contracts, municipal service agreements, public-private partnerships, etc.
    b. As currently established, infrastructure funding is provided in full by Canada. The Authority may be set up so that it can secure these funds to get infrastructure loans, the way a municipality can.
    c. Since regulations are in development, the institution must build provincial and codes into contracts to ensure they will remain in compliance with the regulations once developed.
    d. The Water Authority would have the technical and management expertise to monitor work and sign off on completed projects, ensuring they are to standard.
3. **O&M Capacity Support:** Once a band joined the Water Authority as a full participant and passed a land designation, the Water Authority could take over running the water system on the reserve. It would be the legal owner and operator of the infrastructure, in charge of operations and maintenance and liable for supplying residents with safe drinking water.
    a. May need to be governed separately from the branch that provides advice to the First Nations, in order to avoid a conflict of interests.
    b. Funding:
        i. The 80% of O&M funding from Canada straight to the Water Authority.
        ii. The 20% of O&M funding from the First Nation is transferred to the Water Authority.
    c. Mange the human capital, tools, and management aspects:
        i. Provide operator training, certification, and capacity support.
        ii. Support daily operations, maintenance, monitoring, testing, mitigation, and remediation.
        iii. Manage the contract with the local water operator, including inspection and enforcement.
            1. Hire community members when possible, provide training and certification to them.

7.3.2 CONSIDERATIONS

It is significant to note that this solution cannot be a one-size-fits-all solution for communities, and participation must not be imposed on communities. There is a wide diversity of capacity levels across the country among First Nations and their needs and traditions are not uniform. Having multiple regional Water Authorities could allow them to be more attuned to local community needs than a nation-wide institution. Not all communities will want to join a Water Authority. Many communities provide safe drinking water on their own and other communities simply need funding or minor assistance. Still other communities may not be interested in giving control of their water system to a third party. Any solution must include a rigorous performance measurement framework to test internal and external measure of success. Not all measure must be made public, but there must be concrete measures that establish if whether the outcome of safe drinking water on each First Nation is being achieved, and what improvements can be made in each community to better attain this goal.

The Water Authorities would need their own capacity, and might be expensive to run. It is possible that they will not provide value-for-money because the overhead costs of running the Authority may be higher than the savings achieved by bundling systems. In addition, communities with the lowest levels of capacity who most need support may struggle to join the Water Authority. First of all, conducting a land designation can be

complex, time consuming, and costly. Secondly, if each First Nations band is responsible for contributing 20% of the operation and maintenance costs of their system to the Water Authority, this may pose a problem for those communities currently unable to afford this cost. The findings showed that some First Nations communities must use funding designated for drinking water on other priorities that are more immediate. An unintended consequence of requiring communities to contribute 20% to the Water Authority is that it could cause harmful shortages in other areas. Finally, those communities may be too overburdened to participate on the Authority's board of directors.

More research is needed to determine exactly what this institution should look like. Further work must include the perspectives and opinions of First Nations on this proposed solution. Broad consultation means including Aboriginal Representative Organizations like the Assembly of First Nations, individual chiefs and councils, and general community members. If the consultation finds that there is interest in this initiative, Canada should expand the Atlantic pilot project and support First Nations in replicating it in other locations.

7.4 Conclusion

Exercising jurisdiction requires capacity to do so. Capacity includes human, social, structural, institutional, and economic capital. First Nations need appropriate institutional supports to exercise their rights of self-determination and their jurisdiction over drinking water on reserves. A First Nations institution to serve as a Water Authority could fill this role. This institution must be transparent and accountability to First Nations individuals and bands for the safety and quality of water delivery. It must be cost effective: the value residents receive for the money spent is maximized, and the intent of delivering safe, clean drinking water is accomplished. In addition, despite varying abilities of communities to contribute funds to the Water Authority, it must be committed to delivering the highest quality of drinking water to all. An institution must also be able to adapt to local contexts and a changing environment. Regardless of whether the option of a First Nations Water Authority is pursued, however, the research has made it clear that additional funding, regulations, and the capacity to adhere to construction and operations and maintenance best practices must be supplied. Should the status quo continue, even if all boil water advisories on reserves are ended within five years, it is likely that within a few years more, the problem will reoccur and persist. Sustainable solutions that support capacity building and respect the Nation-to-Nation relationship must be implemented.

8.0 Conclusion

The mandate of the Economic Research and Policy Development Branch is to assist First Nations to exercise jurisdictional responsibilities and generate revenues, in order to deliver quality infrastructure and public services. As part of this goal, the Branch is developing policy recommendations on the institutional and capacity supports necessary for delivering drinking water on reserves in a way that is successful over the long term, cost effective, and respects the principles of Indigenous self-determination. Clean water is fundamental to community development and to creating communities that are ready for business opportunities, however the research demonstrated that many First Nations reserves across Canada do not have access to reliable, safe drinking water. This research examined the models of drinking water service delivery on First Nations reserves in Canada in order to analyze the models and inform policy development. A policy direction was recommended for Canada to pursue in order to support the long-term, effective delivery of drinking water on reserves.

The document review, literature review, and case studies revealed six key themes underlying the clean drinking water shortage on reserves.

1. Insufficient operation and maintenance capacity is the greatest barrier to safe drinking water on reserves.
2. The regulatory gap increases threats to water safety, but regulations will not ensure safe drinking water if communities cannot comply.
3. There is insufficient funding available from Canada and in communities.
4. Governance failures contribute to water quality problems when operations and maintenance practices do not have sufficient management, support, and oversight.
5. Many First Nations communities face additional challenges that increase water quality risk due to their small sizes and/or remote locations.
6. Institutional support is a widely recommended option to help with capacity and other barriers—and regional First Nations water authorities provide a promising way to do this.

The research question asked: what approach to policy and implementation should the federal government pursue to support the full spectrum of First Nations in addressing the lack of clean drinking water on many First Nations reserves, in a long-term, efficient manner? Based on the findings of this study, it was recommended that Canada support a First Nations institution that offers a suite of capacity options to communities could help meet the need for safe drinking water in a long-term. The creation of regional First Nations Water Authorities that provide a menu of support options to the First Nations communities who opt to participate. These Water Authorities could provide the institutional capacity support for communities struggling to keep their drinking water safe. Before taking any action, however, the government must consult broadly with First Nations to gauge interest in this program, and support First Nations in customizing institutions that meet their needs. Above all, Canada should provide adequate financial, administrative, and political support that communities need to gather, treat, and distribute clean drinking water, in order to ensure the health and safety of residents.

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10.0 Appendices

10.1 Appendix A: History and Responsibilities for Drinking Water on Reserves

10.1.1 HISTORY

Though drinking water regulation, standards, and guidelines are provincial or territorial responsibility in Canada, First Nations reserves are under the jurisdiction of the federal government. Section 91(24) of the C*onstitution Act, 1867* and subsequent *Indian Act, 1876* grated Canada exclusive jurisdiction over "Indians and lands reserved for the Indians" (Library of Parliament, 2010), meaning authority for legislating and providing water systems on reserves lies with Canada. In addition, the Supreme Court has affirmed that Canada has a fiduciary relationship with Indigenous peoples, stemming from the *Royal Proclamation of 1763*,[2] which means that the government has responsibilities towards Indigenous peoples, and must act with utmost good faith toward them (Boyer, 2004, p. 17-18). This was incorporated into government policy in a 1977 memorandum to Cabinet which stated that the standard of living on reserves, including drinking water, community infrastructure, health, and safety is to be comparable to neighbouring, off-reserve communities (Expert Panel, 2006, p. 22-23). The Auditor General stated that modern government programs for on-reserve drinking water are based on such policies adopted by the government in the 1960s and 1970s, committing to providing equitable standards of living for Indigenous Canadians (2005, p. 3).

In 1991, INAC committed to achieving equal access to safe water on reserves as exists off-reserve by 2001 (Boyd, 2011, p. 88). During the 1990s however, government policy shifted towards downloading the administrative responsibility for community water systems to local band councils, which has impacted outcomes (Chiefs of Ontario, 2001, p. 2). In 1995 the government conducted an assessment of water systems in First Nations communities and found that a quarter of the water systems in First Nations communities posed possible health and safety risks. Subsequently, over the next eight years the government spent approximately $1.9 billion, in order to improve safe drinking water in First Nations communities (OAG, 2005, p. 1). Despite this investment, the 2002 Walkerton report found that "there is ample evidence that the water provided in First Nations communities falls well short of the standards of safety and adequacy that are considered acceptable" (O'Conner, 2002, p. 487).

Since that time, Canada has implemented three strategies in the span of six years to try and improve the safety of drinking water on reserves: the 2003 *First Nations Water Management Strategy*, the 2006 *Plan of Action for Drinking Water in First Nation Communities*, and the 2008 *First Nations Water and Wastewater Action Plan* which was renewed in 2012. These initiatives provided funding for construction, training, operation, and tools for monitoring water quality and mitigating issues. *The Guidelines for Canadian Drinking Water Quality* and the *Protocols for Safe Drinking Water in First Nation Communities* provide standards and rules for water systems and quality, however they are unenforceable legally due to the lack of regulations governing drinking water on reserves. Therefore, funding agreements with First Nation bands state that these guidelines must be followed or money could be denied. To resolve this, in 2013 Bill S-8, the *Safe Drinking Water for First Nations Act* came into force with the goal of protecting drinking water on reserves, and regulations are being developed.

10.1.2 RESPONSIBILITIES

The Government of Canada has a fiduciary responsibility for Indigenous peoples, as discussed in the previous section. In addition, through the I*ndian Act, 1876*, the Crown holds title to reserve lands and properties. Despite this, though Canada holds the title and funds infrastructure on reserves, legal opinion has found that the Crown has only "bare legal title in Indian lands", meaning Canada is not therefore the owner of the infrastructure. In *Brick Cartage Ltd. V. Canada*, it was found that Canada was not liable for a bridge collapse on reserve since

[2] The government's fiduciary responsibility to Indigenous peoples has continued to be upheld by the Supreme Court in case law such as *Calder*, *Guerin*, and *Sparrow*, as well as written into the *Constitution Act, 1982*.

Canada, unlike the band, did not own, occupy, possess, or control the infrastructure (1965, 1 Ex. C.R. 102[3]). In addition, the courts have affirmed that, despite not having title to the land and building, a band or individual nevertheless has "all the incidents of ownership," which would include liability for water facilities (*Squamish Indian Band v. Findlay*, 1981, para. 9).

The courts have affirmed that First Nations band councils are the owners and operators of community infrastructure on reserve, so as the owner it is the band's responsibility to manage and operate the water treatment and distribution systems[4]. This means the First Nation is responsible for designing and procuring infrastructure and running the daily operation of the water treatment systems, including ensuring it is run by trained operators to manage the infrastructure and monitor water quality by sampling and testing the drinking water (Library of Parliament, 2010). If there is a problem with the quality of the water or with the technology, it is the First Nation's responsibility to issue and enforce Drinking Water Advisories and to address the problem affecting the quality (INAC, "Roles"). For wells and water systems serving fewer than five connections, Health Canada provides free sampling and testing services, but the band or individual is responsible for requesting it (Health Canada, 2010).

Multiple parties are involved in different aspects of drinking water on reserves, without much central coordination. Canada maintains the responsibility for legislation and regulation of water, funding water systems, and supporting the capacity to run them. Specifically, INAC is responsible to fund and advise on the design, construction, maintenance of facilities, operation of water systems, and training of operators, as well as to support agreements between First Nations and local municipalities for sharing water services. Health Canada supports drinking water quality monitor programs, provides help to First Nations in identifying potential risks, and verifies the monitoring program in place on reserves, as well as reviewing, interpreting, and sending test results to First Nations (INAC, "Roles"). After a drinking water advisory is implemented, Health Canada supports follow-up sampling of the water quality and investigation into the cause of the problem (Health Canada, "Drinking Water"). Environment Canada is responsible for setting the guidelines on source water protection, drinking water quality standards, the degree of treatment required, wastewater discharge, and sustainable water use (INAC, "Water and Wastewater").

The *Maintenance Management Plan for Drinking Water and Wastewater Systems in First Nations Communities* by Indigenous Affairs (INAC) lays out some operational elements a First Nation must do to keep their systems functional over time. For a system to continue working, it is assumed that: the system operator is qualified to operate and maintain the system; they have access to a Circuit Rider, a Tribal Council technical expert, or other technical support as needed; and they have a detailed O&M manual and the appropriate manufacturer's manuals, drawings and other documents for your system and its components (2014).[5] The *Watertight Report* lists some of the constant operational requirements that must be administered on a perpetual basis, which may be difficult for small communities:

- Personnel: Payroll, training (including conventions, travel, etc.)
- Chemicals and other supplies
- Metering, billing and collecting, including provision for bad debts
- Provision of public information
- Repairs and maintenance, including shop charges and materials
- Fuel and power
- Administration (including accommodation, office equipment, professional services)
- Taxes and service fees, where applicable
- Inspection and enforcement (Swain, Lazar, & Pine, 2005, p. 57).

[3] *Brick Cartage Ltd. V. Canada* [1965] 1 Ex. C.R. 102
[4] http://actionplan.gc.ca/en/initiative/first-nations-water-infrastructure
[5] http://www.aadnc-aandc.gc.ca/eng/1398350727577/1398350921495

10.2 Appendix B: Drinking Water Technology

The document review demonstrated that the technology used to provide clean drinking water on reserves is not substantially different than what is found off-reserve, though there are some unique challenges present on reserve that complicate the technological choices. Across Canada, the Department of Environment and Climate Change estimates that 57% of Canadians are served by water treatment plants, as opposed to individual filtration systems and wells.[6] On reserves, according to a 2011 study, 72% of homes receive piped water, 13.5% receive water by truck delivery, 13% are serviced by individual wells, and 1.5% have no water service, and 19% of communities have municipal service agreements to get was from a nearby community (Neegan Burnside). The discrepancy between the number of individual systems off-reserved as opposed to on-reserve is that, as INAC specifies in the *Protocol for Decentralised Water and Wastewater Systems in First Nations Communities*, the government does not cover the costs for privately owned and individually managed water systems, meaning that to be able to afford clean water, even rural reserves must have centrally managed water systems (INAC, 2010c).

The basic technology for clean drinking water is standard on or off reserves. Health Canada explains: the water is filtered to remove particles and disinfected to kill unwanted microorganisms. The choice of filtration system and disinfectant is chosen based on the source of water, minerals in the water, the most likely contaminants, and the size of treatment facility needed.[7] Chlorine, as the most effective disinfectant, is the most common chemical disinfectant. The First Nation is responsible for the design and construction of facilities, but the project proposals are reviewed by INAC and Health Canada to ensure they comply with the standards in place (INAC, "Roles").

INAC sets out protocols for water treatment facilities and delivery in the *Water and Wastewater Policy and Level of Services Standards*. The water system can include wells, supply lines, intakes, pumping stations, treatment plants, piping and related components, hydrants, house service connections, trucking, storage reservoirs and appurtenances. INAC funds four distinct levels of water service:

1. Centrally managed on-site systems: a decentralized system, such as a group of wells, cisterns, and small water treatment units, that is centrally managed—continuously operated, maintained, and monitored—by the First Nation band council;
2. Communal watering points: a temporary solution where residents can come and receive clean drinking water from a watering point;
3. Trucked water delivery: treated water is brought by vehicle to individual residential water storage tanks;
4. Piped water systems: water is centrally treated and sorted, and the pressurized, treated water is piped to the buildings in the community (INAC, 2010b; INAC, "Water and Wastewater").

The chosen water treatment option can range from a small treatment system housed in little more than a shed, to a large and extremely complex facility. A small community system is designated as one that serves between five and 100 buildings, whereas a community system is one that serves more than 100 connections. Figure 1 shows how complex water treatment technology can be; it is a diagram of the eleven treatment steps water goes through prior to drinking within the City of Hamilton, Ontario. The complexity of this large system is contrasted by Figure 2, which shows a small system can be the size of a single water tank that includes filtration and disinfection within the same unit. Small communities need to use small systems, but they pose the greatest risk-management challenge.

[6] http://www.ec.gc.ca/eau-water/default.asp?lang=En&n=2C3144F5-1
[7] http://www.hc-sc.gc.ca/fniah-spnia/pubs/promotion/_environ/pipe-conduite/index-eng.php

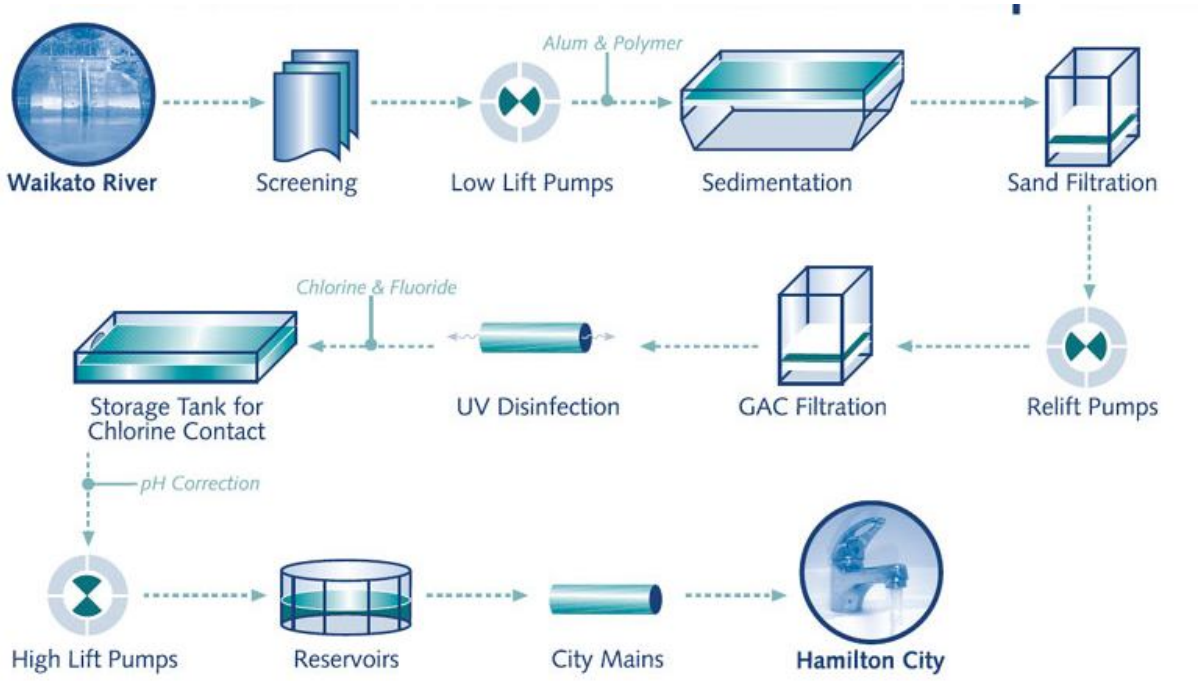
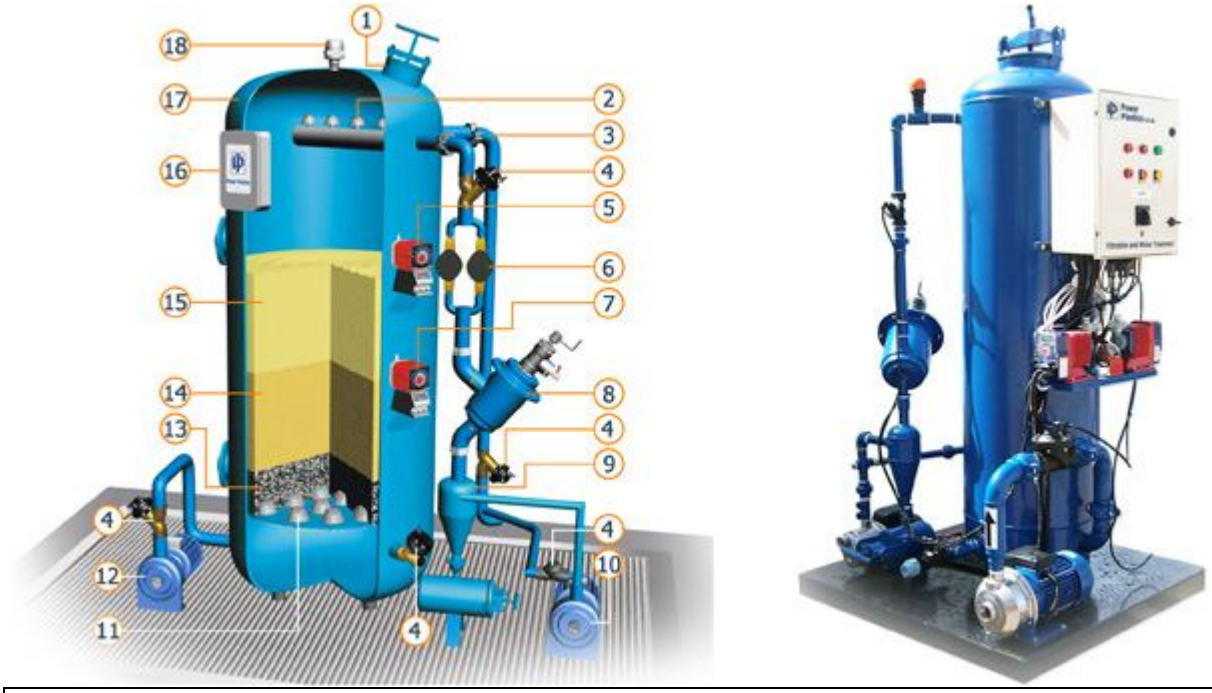


Figure 3: City of Hamilton Water Treatment[8]



1. Upper Service Hole	7. Chlorine Dosing Pump	13. Gravel 3.1 - 5.6mm
2. Upper Water Diffuser	8. SA500 Semi-Automatic Filter	14. Sand 0.8 - 1.2mm
3. Drain	9. Sand Separator	15. Sand 0.5 - 0.8mm
4. Membrane Valve	10. Raw Water Inlet Pump	16. Control Unit
5. Flocculant Dosing Pump	11. Filter Element	17. Filter Body
6. Water Meter Electric Output Signal	12. Flush Water Pump	18. Air Valve

Figure 4: Container Water Treatment System[9]

[8] https://openparachute.files.wordpress.com/2013/07/hamilton-ws.jpg
[9] http://www.powerplastics.cz/mobile-containerized-potable-water-systems/

In a 2005 report on the state of Ontario's drinking water, it was reported that the province has hundreds of small systems, which are less likely to have the necessary depth of technical and human resources, training ability, and sophisticated back-up systems. A correlation was found between the system size and water samples failing to meet quality standards (p. 18). In the U.S. similar findings have been demonstrated. According to a report by the Environmental Protection Agency (1999), systems serving 25-500 connection have the most violations of any category of water treatment system, at 7,164 violations per one million customers, as opposed to systems serving over 10,000 connections which have around 10 violations per one million customers (p. iii).[10] In addition, the Expert Panel on Safe Drinking Water for First Nations (2006) pointed out the added potential for contamination that exists in trucked distribution systems, with added vulnerabilities at the loading, transport, and unloading stages, and the frequent levels of cleaning that the cistern requires to remain safe (p. 11-12).

The necessity of building and using small water treatment systems on reserves thus is a problem that, while not unique to First Nations, is more a problem on reserves. In 2005, the Auditor General noted several troubling findings. In one community, a state-of-the-art treatment plant was built in 1999 for $3 million, yet about half of the houses in the community of 500 did not have connections to the plant to receive running water, and will have to haul water from watering points for at least ten years after its construction (p. 14). This is despite the department's guidelines that state watering point are to be a temporary measure, as shown at the beginning of this section. Human Rights Watch pointed how prohibitive watering points can be for people with disabilities or no transportation (2016a, p. 13). Another problem identified by the Auditor General is that, despite providing guidance to First Nations on choice of technology, and building, upgrading, and repairing systems with identified risks, INAC cannot demonstrate that the issues have been resolved (p. 8).

Overall, technology choices are similar on reserve to off reserve, but can be constrained by the population size and available funding from the government. Few residents on reserve can afford in-house treatment and filtration options, so safeguarding public health in centralized systems on reserve is an important measure (Expert Panel Vol 1, 2006, p. 16).

[10] http://www.ecs.umass.edu/eve/research/epa_ferrate/small%20systems%20characteristics%201999.pdf

10.3 Appendix C: Theoretic Frameworks

10.3.1 CAPACITY DEVELOPMENT

Robins (2007) explains that 'capacity building' is not always appropriately understood, which is an additional impediment. According to the conceptual framework, capacity building includes:

- Human capital (knowledge, skills, experience)
- Social capital (trust and reciprocity, commitment, motivation)
- Structural (networks, relationships)
- Institutional capital (governance arrangements)
- Economic capital (infrastructure, financial resources) (p. 5).

Similarly, Kuikman, Singh, Spence, & Walters (2012) identify the five dimensions of capacity as: financial, institutional, technical, political, and social capacity, but that Canada considers drinking water capacity to be essentially an issue of technology (p. 10). Referring specifically to the capacity needed to operate water systems, Farahbakhsh & McCullough (2012) list the types of capacity as:

- Formalized capacity (education levels, engineering titles, operator certification levels)
- Demonstrated capacity (credit history, project execution track record, budget control)
- Support systems (administrative, technical, and financial management)
- Financial strength (internal sources of revenue, community economy) (p. 11).

10.3.2 INSTITUTIONAL ANALYSIS AND DEVELOPMENT

Cave (2012) provides an Institutional Analysis and Development (IAD) Framework as a guiding principle for ensuring a First Nations water institution is set up for success. The evaluation criteria of the IAD framework are: (1) accountability and transparency; (2) economic efficiency; (3) equity; (4) adaptability, resilience and robustness; (5) conformance to general morality; (6) fostering public trust; and (7) access to financial and technical resources (p. 85). For a First Nations institution, accountability means being accountable to the government as the funder for how money is spent, but even more than that it means being accountable to First Nations for service outcomes, quality of water delivery, and institutional values. Transparency involves communicating the institution in an accessible and clear way both to residents on reserves and the general public so they have confidence in the complex organization (p. 86). Economic efficiency does not mean lowest cost it means that the value community residents receive for the money spent is maximized, and the intend of delivering safe, clean drinking water is accomplished (p. 87-88). Equity is assessed on the basis of equality in the benefit individuals receive from the institution irrespective of differential abilities to pay (p. 89). Adaptive capacity is necessary because if the institution is unable to respond to a changing environment it will not perform well or be sustainable, and will crumble in the face of adversity (p. 90). In the context of a First Nations water institution, conforming to general morality means the institution must encompass the values, meanings, and norms about water of the communities that it serves (p. 92). Earlier in the literature review it was shown that for many Indigenous cultures, water is a sacred medicine with spiritual importance. An institution that tries to impose purely western ideology on the management and governance of water will get little traction in many communities and will be unable to foster public trust.

10.4 Appendix D: Findings Comparison

Table 1
At A Glance: Comparing Three Lines of Evidence

Theme	Document Review	Literature Review	Case Studies
Compounding Challenges	• Small, rural, or remote • Construction and operating costs are high • Remote systems cannot be consolidated • Capacity to manage the system is lower • Difficult terrain • Government bureaucracy • Distrust of government funded systems • Lack of healthcare	• Cultural importance of water • First Nations vary widely • Small systems more prone to problems and more expensive • Mismatched technology for community's need • Small communities often have less resources for problems • Remote make construction and supplies difficult, pricy • Lack of consultation with First Nations • Limited control over source water, vulnerable to contamination • Distrust in treatment process	<u>Individual Systems: Neskantaga</u> • Small, rural, remote • Winter road only • Electricity by diesel generator • Mismatched technology for community's need <u>Private Wells: Six Nations</u> • Small and crowded property lots unsafe for well water • Vulnerable contaminated source water, runoff from farms, industrial, waste, etc. • On Six Nations many improperly constructed <u>MSA: Long Plain First Nation</u> • Must be near municipality • Misconceptions, myths, & bad relationships make it difficult • ATR process very slow <u>Aggregation: Atlantic WA</u> • Pilot project not tested yet • May be hard for remote areas
Funding	• Billions of dollars have been spent in past decades • $1.8 billion committed in Budget 2016 • Insufficient capital funding provided by government • Chosen technology not always best value-for-money • Inadequate operations and maintenance (O&M) funding by government and band • Funding structure: yearly contribution agreements difficult • Band must reallocate money from other important services to pay for water • Insufficient funding for bottled water in crisis times	• Insufficient resources available to construct and run systmes • Chosen technology not always best value-for-money • Insufficient O&M funding • Many communities can't afford user fees • Band reallocate money from other services to pay for water • Bands reallocate water funding to pay for other services • Annual 'block' funding from government does not always arrive on time • Funding process inhibits forward planning • Only highest priority systems addressed	<u>Individual Systems: Neskantaga</u> • INAC spent $100,809 on bottled water in 2011-2013 • INAC committed $363,000 to replace filtration system, but that will not end boil water • Original estimated: upgrades cost $5,850,000, but it's more than INAC will pay • Updated estimate is upgrades will cost $6,710,000 <u>Private Wells: Six Nations</u> • INAC won't fund • Many community members can't afford <u>MSA: Long Plain First Nation</u> • Must afford the time and costs of negotiating an agreement <u>Aggregation: Atlantic WA</u> • 2014-16 INAC gave $1.8 mil • Assets of over $50 million • 20% of O&M funds from FN, how to ensure they afford it • Administration: $690,000/year • O&M: $1.13 million/year • Requesting more money from INAC, facing funding delays • Have economies of scale

			• Must secure 25 years of govt funds
Legislation and Regulation	• Concerns the *Safe Drinking Water for First Nations Act* oversteps rights • *Act* passes liability but does not provide additional resources to manage water • No regulations for drinking water on reserves, meaning few enforcement powers • Regulations are under development • Concerns they will be impossible to comply with	• Lack of regulations a problem • Standards that cannot be met are unenforceable	<u>Private Wells: Six Nations</u> • Regulatory gap means lack of development plans and building codes make many • No legally enforceable regulations for well owners <u>MSA: Long Plain First Nation</u> • Lack of regulations on reserve means sometimes not aligned with municipal standards <u>Aggregation: Atlantic WA</u> • Will be consulted during regulatory development • Will need to adhere to regulations once developed
Governance	• The management of systems • Small and under resourced communities lack the capacity • Absence of checks & balances • Operators are not being sufficiently monitored and standards enforced • Insufficient water testing • Inadequate maintenance, especially preventative	• Formal management structures • Overburdened by managerial responsibilities, lack necessary support structures • INAC retains most control over decisions • Band Councils often lack processes for managing or enforcing standards • Operators face lack of support and understanding, not given sufficient funding for job • Lack of communication between operators and Council • Preventative maintenance not prioritized by Council	<u>Private Wells: Six Nations</u> • Individual responsible inspect and maintain, and request water tests • Band can't control source water (Six Nations will have a Source Water Protection Plan) • Six Nations expanding central treatment plant to provide water to residents <u>MSA: Long Plain First Nation</u> • Requires capacity to negotiate agreement with municipality • Lack of standardized fees • May have to pass many zoning bylaws to match municipality <u>Aggregation: Atlantic WA</u> • Pilot project not tested yet • Band must pass a land designation • Centralized governance for many systems with capacity to monitor & enforce compliance • Board of directors chosen by participating First Nations
Operations and Maintenance (O&M) Capacity	• Lack of capacity to operate and maintain water systems • Due to size, location, funding, lack of human capital • Not enough Circuit Riders, resolve problems not training • Systems break too soon because insufficient O&M • Many operators insufficiently certified for their systems • Hard to retain operators • Testing and maintenance not done on schedule	• Consistent, diligent operation key to safe drinking water • Preventative maintenance reduces costs in long term • Service standards not being met in many communities • Systems break too soon because insufficient O&M • Wide variety of capacity levels • Inappropriate technology for community's need • Low levels of proper training and certification remain • Retention of trainees difficult	<u>Individual System: Neskantaga</u> • No certified water operator • Annually INAC provides $229,000 for O&M • Some money for O&M went unspent in 2014-2015 <u>Private Wells: Six Nations</u> • Not sufficiently tested and maintained <u>MSA: Long Plain First Nation</u> • Future growth/development not always accounted for <u>Aggregation: Atlantic WA</u> • Will have capacity and funds to ensure O&M best practices followed

Institutional Support	• Institutional support would help FN governments deliver services-like other governments have • Support for operating- increase capacity, training, monitoring • Would provide expertise and authority for project sign-off • Make complex technical decisions • First Nations Water Commission / regional First Nations-led water authorities / Corporate Utility • Must be regional • Arms-length from government • Water systems owned & operated by the Water Authority not band • Must be First Nations-driven	• Could provide needed capacity for communities • Regional water authorities could have economies of scale • Support for operating- increase capacity, training, monitoring • Support self-determination • Provide varying service levels for different capacity levels • Indigenous Water Authority / Water Commission / Authority • Provide expertise and authority for project sign-off • Make complex technical decisions • Must be First Nations-driven • First Nations must opt-in	<u>Individual System: Neskantaga</u> • Limited, fragmented support from federal departments, insufficient to protect water <u>Private Wells: Six Nations</u> • Very limited support available upon request <u>MSA: Long Plain First Nation</u> • Templates & toolkits available • Limited technical support for negotiation may be offered • No dispute resolution mechanisms in place to agree <u>Aggregation: Atlantic WA</u> • Would provide the capacity support and separation of powers other levels of government have