



DRINKING WATER SAFETY PLANS

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CANADIAN WATER NETWORK
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WHY DID WE DO THIS RESEARCH?

Everyone wants to know that their tap water is safe to drink, however, risk will always be present in a complex system, and water treatment and delivery is no exception. Through sound management, risk can be controlled and reduced so that consumers can drink their tap water with confidence.

One of the best ways of managing risk in a water supply is to 'know your system' from water source to consumer tap (Hrudey 2011). Knowing your system means taking a proactive approach to water management by identifying weaknesses in your system and addressing risks before they cause problems. There are many ways to use this style of water management, including Health Canada's *Multiple Barrier Approach*, the World Health Organization's *Water Safety Plans*, and the province of Alberta's *Drinking Water Safety Plans*. At their core, each includes an assessment of risk and the development of risk monitoring, mitigation and communication strategies.

"Sound management and operational systems help prevent, not simply react to, the contamination of drinking water."

– O'Connor 2002 (The Walkerton Inquiry)

In 2011, Alberta became the first jurisdiction in North America to require all of its water suppliers to implement a Drinking Water Safety Plan (DWSP) approach¹. DWSPs outline a proactive approach for assessing real and potential risks to drinking water quality. The DWSP can be customized to apply in any water system regardless of size or other factors. To be effective, a DWSP must be continually updated to reflect changes (positive or negative) as they occur within a system.

Alberta's DWSP is based on four principles:

1. Collect and evaluate the best information available about a water supply
2. Analyze and understand potential risks
3. Assess risk mitigation options – how can risks be reduced to an acceptable level?
4. Determine what resources and actions are necessary to ensure identified risks are reduced (AESRD, 2013)

"The most effective means of consistently ensuring the safety of a drinking water supply is through the use of a comprehensive risk assessment and risk management approach that encompasses all steps in water supply from catchment to consumer."

(Bartram et al. 2009)

Supporting effective risk management in a drinking water supply requires a management culture that is focused on safety. In the absence of a safety culture, one must be created, encouraged and built. The implementation of the DWSP requirement in Alberta allowed for an opportunity to explore water policy impacts on operators and water management culture in the Canadian context. The impact of this requirement on small communities (those with water supplies serving fewer than 5,000 people²) is of particular interest. Many small communities face challenges in meeting water policy goals due to local-level barriers. These barriers include financial constraints, operator issues, rural or remote locations, small population size, and others. The lessons learned from Alberta's experience could help other jurisdictions transition towards a similar approach.

Understanding how DWSPs impact individuals and communities requires a careful approach. The success of a new water policy is best achieved when people understand and support the outcome of that policy. Unlike surveys that only capture a small set of data, this research uses face-to-face in-depth interviews to learn about the experiences, thoughts and issues facing those directly involved with DWSPs.

"A Drinking Water Safety Plan (DWSP) represents a system-wide approach to ensuring that the quality of water delivered to consumers is of good and consistent quality."

(Alberta Environment and Sustainable Resource Development, 2013)

¹ For all drinking water safety plan guidance documents, including training materials, visit: <http://environment.alberta.ca/apps/regulateddwq/DWSP.aspx>

² Small systems are defined differently across Canada. For this research, the definition of 5,000 persons or less is used (Health Canada 2013).

WHAT DID WE DO?

The objective of this research was to understand the impact of the DWSP requirement on operators and water management culture in Alberta's small communities. Data collected through face-to-face in-depth interviews with operators of small systems were transcribed and analyzed using a constant comparative method common in qualitative research. From the analysis, we identified several major themes.

The research was divided into three tasks.

- TASK 1: Understand the impact of the DWSP requirement on operators. For this study, 16 operators were interviewed.
- TASK 2: Understand the capacity of the DWSP requirement to influence a culture change in water management. For this study, 17 operators and 29 decision-makers were interviewed.
- TASK 3: Understand how community readiness for change influences DWSP acceptance and modify an existing model for assessing and building capacity for use in water policy implementation.

WHAT DID WE FIND?

TASK 1: IMPACT OF THE DWSP REQUIREMENT ON OPERATORS

The DWSP requirement in Alberta was not implemented as a stand-alone policy. It included a two-year implementation phase (2011 – 2013) accompanied by training and support: in-depth group training sessions targeted at small communities, in-community and one-on-one support from provincially-employed drinking water safety officers, online training sessions offered by the regional water operator's association, and online training manuals. Most operators who took advantage of this training found it helped them to complete their DWSP. Some operators noted they were not aware of the more in-depth training opportunities until after they had occurred.

Operators identified three ways the DWSP requirement could impact their work, most notably through its use as a communication tool:

- i. **Communication between Operators and Decision-makers:** The complex nature of any water system can make it difficult for operators to explain the system to non-operators (i.e. decision-makers), including where risks exist, the types of solutions that are available that will work within a specific water system. The DWSP provides a tool to highlight issues and their solutions in a way that is easy to understand. Operators who did not



An operator displays a used filter. Filtration is a relatively recent addition to this small town's water supply.

have a good working relationship with decision-makers were less likely to indicate the tool's potential to be used in this way.

- ii. **Communication between Operators and Provincial Staff:** The drinking water operator specialist (DWOS) program is unique to Alberta. DWOS staff work closely with operators to address treatment challenges, but do not act as a regulator. Some operators viewed the DWOS program as being a significant resource during DWSP implementation. However, not all operators have a good relationship with the DWOS in their area. As a result, some operators were unwilling to openly discuss challenges, pose questions, or ask for help. In some communities these operator-specialist relationships had a significant impact on operator attitudes and actions towards DWSPs.
- iii. **Legacy of communication for future staff:** A DWSP can be a communication tool and legacy document for generations of operators. As a communication tool, a commitment to recording all changes made within a water supply over time is required. As a legacy document, it addresses the longstanding problem of knowledge loss due to operator retirement or replacement. Unfortunately, the volume of paperwork required to complete and maintain a DWSP was discouraging to many operators. Operators can have many roles in their communities, including wastewater and general maintenance duties. As such, few have any additional time to take on new responsibilities such as a DWSP (Perrier et al. 2014).

TASK 2: DWSPS AND THE WATER MANAGEMENT CULTURE CHANGE

A DWSP approach requires a management culture that is focused on safety. At the end of Alberta's two-year implementation period (2013), the majority of decision-makers and operators interviewed had some degree of involvement in developing or reviewing information related to a DWSP approach. Among those interviewed in Task 2, the majority had some idea of how a DWSP approach would impact their own water supply, however, the impact on management culture was less pronounced. The majority of those interviewed favoured DWSPs, citing the focus on responding proactively to risks in a water supply, long-term planning and improved record keeping, and their utility as a communication tool between operators and decision-makers. However, most respondents' positive perceptions of DWSPs were tempered by pragmatic concerns that limited their capacity to fully implement the

newly developed plan. For example, in communities with existing water challenges, the prospect of implementing a new and more detailed program (DWSPs) was often met with frustration and resistance. Both decision-makers and operators were already struggling to meet existing regulatory requirements and fulfill current responsibilities, and many wondered why there was no additional support (particularly long-term financial support) being offered by the province to help with DWSP organization, implementation, and maintenance. Evidence from Task 2 suggests that while DWSPs present desirable options for many small communities the management culture required to prioritize drinking water resulting in action remains underdeveloped. Here, the costs of implementing a DWSP continue to overshadow the intended benefit of a safer drinking water supply.

TASK 3: COMMUNITY READINESS FOR CHANGE

Communities that are ready for change are likely to a) have stakeholders aware of the need for change, b) have leaders who understand the issue, and c) have access to the resources needed to make the change possible. While community readiness is not explicit within the DWSP, it is clear from the interviews conducted as part of Tasks 2 and 3 that some communities are not 'ready' to make water a priority and address problems proactively. We see this as a unique risk factor in DWSP implementation that deserves consideration (Kot et al. 2014). To do this, an existing community readiness model was modified for use in a DWSP context (Figure 1). The model contains a

series of questions aimed at assessing readiness gaps in a community. The responses of local experts (i.e. water operator and/or decision-maker) in eight communities in Alberta were gathered to assess readiness along six 'dimensions': community efforts, community knowledge of efforts, leadership, community climate (attitudes), community knowledge of the issue, and resources related to the issue. After identifying weaknesses and strengths across these six dimensions, the model suggests targeted efforts to help build readiness and prepare the community for a particular change.

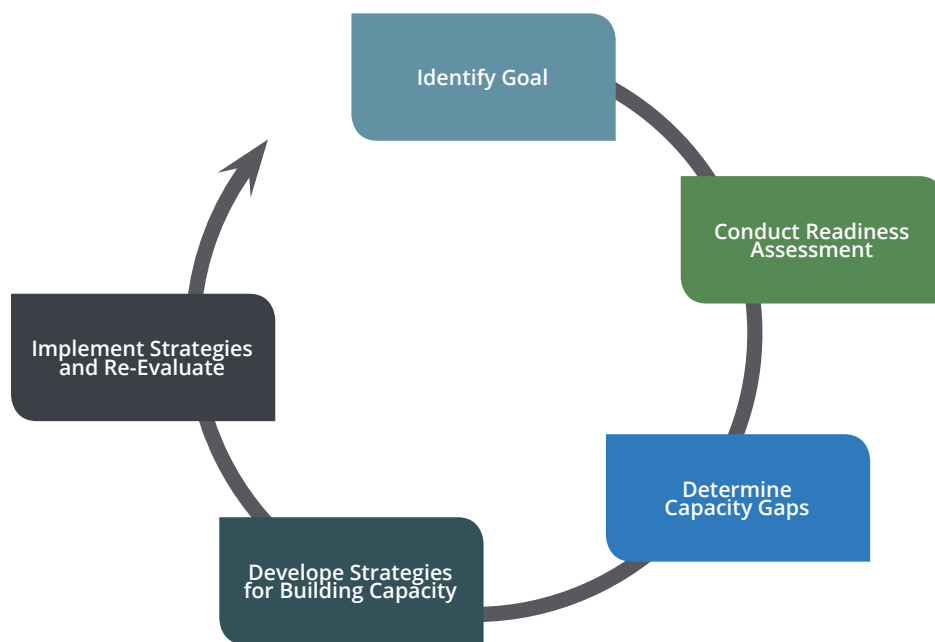


Figure 1: Community readiness for DWSP implementation (adapted from Oetting et al. 2001).

The findings of the eight interviews helped to develop a baseline for DWSP readiness in Alberta's small communities. Each of the communities profiled had very low to moderate levels of readiness, indicating a) a denial of the need for a new water management approach, or b) resistance to the implementation of a new approach. Interestingly, the findings suggest that smaller communities (e.g. a population >1,000) are not less ready for DWSPs than larger communities (e.g. a population of 5,000), indicating that community size has less of an impact on readiness than factors such as leadership, and community attitudes and support. Although this study examined a small cohort, the findings indicate a diversity of factors that can undermine the successful implementation of new water management policies. A community readiness model approach provides a practical option for addressing weaknesses and building support for change in stagnant communities.



A town's history is in its infrastructure: one small municipality shows how delivering water to customers has changed over the years.

WHAT DO THESE FINDINGS MEAN FOR MUNICIPALITIES?

A proactive approach to water management is a significant undertaking for any operator, municipality or regulator. The province of Alberta has developed an easy to use tool for interpreting a significant water management policy at the municipal level. The tool is available online, as are various DWSP training materials. While it is specific to Alberta, the tool could be easily be adapted to suit the challenges being faced in other Canadian jurisdictions. Unlike similar proactive water management approaches, the DWSP tool provides practical outcomes for communities ready for change.

The community readiness for change gap is a major outcome of the research. We anticipate that the community readiness tool could be adapted by Alberta, as well as in other jurisdictions, to assess a community a) in light of a desired change or improvement and b) develop an environment that is supportive of that change. At the provincial level, the tool could help granting agencies to assess funding requests, or help communities or regulators understand and overcome barriers to policy implementation. This research has, from our experience, the potential to address some of the more chronic barriers to water management in Canada.

CASE STUDY: ICELAND'S WATER SAFETY PLAN APPROACH

Iceland was one of the first countries to require all of its water utilities to develop water safety plans. During the early implementation period, it was noted that some of the smaller communities found the approach to be a challenge as many lacked the resources and the time required to accurately complete these plans. In order to include small communities, a simplified five-step water safety plan was developed (Gunnarsdottir & Gissurarson 2008). As a result of Iceland's initiative, a recent study found a 14 % reduction of clinical cases of diarrhoea in areas where water safety plans were in place. Other improvements included better management practices resulting in higher rates of compliance with water quality guidelines, and improved overall water quality (Gunnarsdottir et al. 2012). The findings in Iceland are not unique, and are representative of findings anticipated in other jurisdictions where water safety plans are in place, including Australia, Japan, the UK and Alberta.

CONCLUSIONS

Outcomes from this research highlight reaction to the DWSP initiative from operators and decision-makers working in small communities in Alberta. In particular, the findings show the potential of a DWSP approach as a new and practical option for effective water management, one that can be applied in jurisdictions across Canada. However, the findings are clear in that to be effective, a DWSP must be supported by a management culture that is focused on safety coupled with a willingness among key stakeholders to 'do things differently'. Given the potential for existing challenges to hinder the intended benefit of a DWSP approach, a pre-emptive community readiness assessment presents a valuable and pre-emptive planning step.

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