

**AGLG**

PERSPECTIVES SERIES

MARCH 2019



AUDITOR GENERAL FOR  
LOCAL GOVERNMENT

ACCESSIBILITY • INDEPENDENCE • TRANSPARENCY • PERFORMANCE

CONSIDERATIONS FOR LOCAL  
GOVERNMENT ADMINISTRATORS

# INTEGRATED DRINKING WATER MANAGEMENT

RELATING TO AGLG AUDIT TOPIC:  
Local Government's Role in Ensuring Clean Drinking Water

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This booklet offers suggestions to all local governments interested in drinking water management practices. We recognize that every local government faces unique circumstances, including their size, community characteristics and the maturity and capacity of each organization. How each local government chooses to implement these suggestions will vary accordingly.



## THIS BOOKLET

This Perspectives series booklet is the third in a four-part series on drinking water.

The first booklet (published in April 2018) focused on Emergency Management (including drinking water). The second, a drinking water primer, was written mainly for elected officials, to give them a high-level overview of the importance of drinking water management and activities that elected officials could support within their local government.

This third booklet complements the primer by providing additional information, some of which is similar but more in-depth, for local government administrators and senior management on integrated drinking water management. We hope this booklet will help local governments develop strategies to increase the resilience of their drinking water system.

Information on topics such as asset management, full cost recovery pricing and performance management are covered in more detail in the fourth booklet on sustainable financing.

All of the AGLG Perspectives series booklets on drinking water have been developed with support from subject matter experts.

## THE AGLG PERSPECTIVES SERIES

The office of the Auditor General for Local Government (AGLG) was created to carry out performance audits of local government operations in British Columbia and provide local governments with useful information and advice. The AGLG's goal is to help local governments fulfil their responsibilities to be accountable to their communities for how well they take care of public assets and achieve value for money in their operations.

The AGLG Perspectives series of booklets is designed to help improve local government performance. These booklets complement the AGLG's performance audit reports by providing local governments across the province with tools and more detailed information relating to the topics we examine.

Some AGLG Perspectives booklets are written mainly for elected officials, while others are directed more toward local government staff. These booklets are also helpful to others who take an interest in local government in British Columbia.

## HOW THE AGLG'S AUDIT WORK CONTRIBUTED TO THIS BOOKLET

The AGLG recently conducted audits on local government drinking water management. From our audit findings and further research, we learned that local governments often face a variety of challenges in managing these systems:

- Gaps in the processes they need—both systemic and proactive—to provide safe drinking water including risk assessment and management, and comprehensive maintenance schedules
- A tendency to do short-term planning and not develop a long-term vision
- Complexities of decision-making in a multi-jurisdictional /multi-scale environment
- Limited knowledge of, and relationships with, neighbouring First Nations
- Incomplete source water protection planning and mitigation
- Limited stakeholder and community engagement and participation
- Lack of integration/collaboration across local government departments
- Ad-hoc conservation and demand management strategies and tools
- Lack of conservation-oriented water pricing
- Gaps in asset management planning and implementation
- Lack of full cost recovery accounting and barriers to full cost pricing
- Limited performance measurement and informal approaches to continuous improvement
- Lack of business continuity planning and areas for improvement in emergency management
- Lack of understanding of water system vulnerabilities based on formal risk assessments
- Implications of climate change on drinking water



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**UNDERSTANDING  
INTEGRATED WATER  
MANAGEMENT:  
KEY PRINCIPLES**



# INTRODUCTION



## 1 WHY SHOULD LOCAL GOVERNMENTS BE CONCERNED ABOUT DRINKING WATER?

Access to safe, reliable, clean drinking water is essential to the well-being of every British Columbian. Many local governments across our province are responsible for providing drinking water to their communities.

Sustainable water management is critical to human health, food and energy production, economic prosperity and the welfare of wildlife and habitats. Water management is gaining increasing attention and some conventional approaches—underpricing, over-use, water wastage and inefficient use—are costly and unsustainable. More and more, competing water demands, social amenities, environmental protection concerns, inter-generational equity and climate resilience are becoming increasingly significant considerations in local government policy and decision-making.

Local governments face a broad range of challenges including ageing infrastructure, evolving workforces, changing populations, drinking water guidelines and regulations (such as building and plumbing codes), groundwater and surface water quality, invasive species (such as Zebra mussels), over-extraction of water, flooding, water shortages, seismic risk and the effects of climate change.

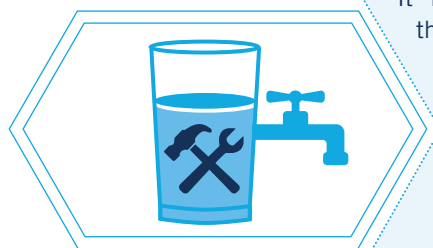
Poor water quality is also a major concern for some local governments and other water system operators. Outbreaks of water-borne disease can be caused by:

- Poor infrastructure maintenance and treatment practices
- Insufficiently trained water operators
- Inadequate attention to the protection of wellheads from sanitary and other releases
- Improper land application and disposal of manure, sewage sludge or wastewater
- Leaking septic tanks, cesspools, sewers or landfills
- Failure of water treatment systems<sup>1</sup>
- Introduction of contaminants through cross connections or water main breaks
- Weather (such as heavy rainfall and spring runoff)
- Poor mining or forestry practices and lack of proper riparian buffers
- Water contamination from highway and road runoff, fuel spills, or foreshore development

Protection of water supply is an important aspect of ensuring water quality and is essential to long-term sustainability.

Fresh water is not limitless. Most local governments should be aware of the amount of water available to meet the needs of their communities and surrounding areas. Water availability is even more important in the context of climate change as this may have considerable impact on regional freshwater availability and quality.

### DRINKING WATER SYSTEMS



It is estimated that more than \$60 billion\* is needed to repair or replace ageing drinking water systems in Canada.

\*Source: Federation of Canadian Municipalities, *Canadian Infrastructure Report 2016* pg 12

<sup>1</sup> Source: Charrois, J. (2010). *Private drinking water supplies: Challenges for public health*. Canadian Medical Association Journal, 182, 1061–1064, pg. 1062

Even though discussion of climate change often focuses on greenhouse gas emissions, we experience climate change primarily through water. For example, intense rainfall, floods, mudslides, storms and related ocean storm surges, low snow pack levels, droughts and waterborne diseases. In fact, 90 per cent of all natural disasters are water-related<sup>2</sup>.

Climate change predictions for B.C. suggest that we can expect:<sup>3</sup>

- Wetter winters, with more extreme precipitation events that can cause localized flooding and increased run-off
- Warmer winters, with changes in snow packs
- Earlier and warmer springs, with peak river flows occurring earlier in the year
- Longer, hotter and drier summers, typically with little or no rain, with potential increases in forest fires.

- Increasing demand for irrigation due to reduced moisture
- Some of the smaller rivers in southern B.C. may dry up during the summer and early fall
- Most small glaciers in southern B.C. will likely disappear
- Salmon migration patterns and success in spawning are likely to change

All of these environmental factors can have a significant impact on watersheds and local governments' water sources.

In addition to climate change, the short-term effects of El Niño and La Niña should be taken into consideration.

These natural weather phenomenon affect precipitation and can result in floods or droughts in varying regions.

## DRINKING WATER ISSUES MANY LOCAL GOVERNMENTS FACE

**Lack of sufficient data** which leads to inaccurate costing

**Incomplete inventories** of water system infrastructure assets

**Maintenance backlogs** which can compound into major problems if small problems are left unattended for too long

**Inadequate pricing** which leads to inadequate funding of the system

**Declining revenues** due to decreased water consumption arising from successful conservation efforts

**Insufficient reserves** leading to the need for crisis financing to deal with the unexpected

**Increased system costs** as with other services

**Population growth** which can result in increased demand

**Changing climate** such as an increasing incidence of drought and floods, which affects demands on the system.

**Smaller water systems** may face additional challenges such as:

**Difficulty accessing laboratory services** in a timely manner for water quality testing

**Little to no real-time monitoring** and alarm equipment in place

**Trouble attracting and retaining** trained and certified operators

Source: Canadian Water Network, *Canadian Municipal Water Priorities Report—Towards Sustainable and Resilient Water Management 2015*

<sup>2</sup> Source: *UN Water: Coordinating the UN's work on water and sanitation (2015)* and *World Water Development Report 2012*

<sup>3</sup> Source: *Indicators of Climate Change for British Columbia 2016 Update*. Pg. 4 and 8



## WHAT IS WATER GOVERNANCE AND HOW DOES IT WORK?

Broadly, water governance is the political, social, economic and administrative system that influences the use and management of water. As individual local governments are not often the sole decision-making authority on matters that affect their drinking water, ‘water governance’ is an emerging term that includes how authority and responsibility for decisions may be shared among levels of government (from local to federal), individuals, businesses and other non-governmental organizations.

Governing bodies involved in water decisions may include varying levels of governments, including First Nations. At the municipal or regional level, local governments receive guidance from legislation and institutions to help govern water use. Local governments govern by establishing and implementing water policies and clarifying roles and responsibilities of government, civil society and the private sector in relation to water resources and services.

In 2018, the Cowichan Valley Regional District secured sustainable funding through taxation to establish a Drinking Water and Watershed Protection Service to support regional programs related to drinking water and watershed protection.

This approach to regional programs was designed to help establish support for better collaboration among various water users and providers and improve cooperation among decision-makers for a more comprehensive and integrated approach to watershed health. This service also enhances and allows for better resource and data sharing to support freshwater sustainability.

Source: *Cowichan Valley Regional District Establishes New Drinking Water and Watershed Protection Service*, Watershed Governance Dispatch, Jan. 2019

Water governance may include a diverse range of ‘non-state’ actors such as corporations and non-government organizations, public–private partnerships and quasi–governmental boards, which can also play key roles in the way drinking water is managed.

In B.C. and elsewhere, there are some recent examples of formalized processes for water governance that include various levels of government and other organizations making commitments to make water decisions in a more integrated way than in the past.

**\*For more information on different types of governing bodies,** see Appendix 1: Summary table comparing characteristics of different governing bodies

In 2018, K’ómoks First Nation (KFN) and Comox Valley Regional District (CVRD) signed a Mutual Benefit Agreement confirming cooperation and collaboration in the management of water resources in the region.

The agreement includes plans to extend water services in future to K’ómoks lands south of Royston and for greater participation by KFN in the management of regional water resources. KFN and the CVRD have also agreed to collaboratively manage and conserve water resources throughout the Comox Valley.

Source: *K’ómoks First Nation and CVRD Sign Water Agreement*, Comox Valley Regional District web contents

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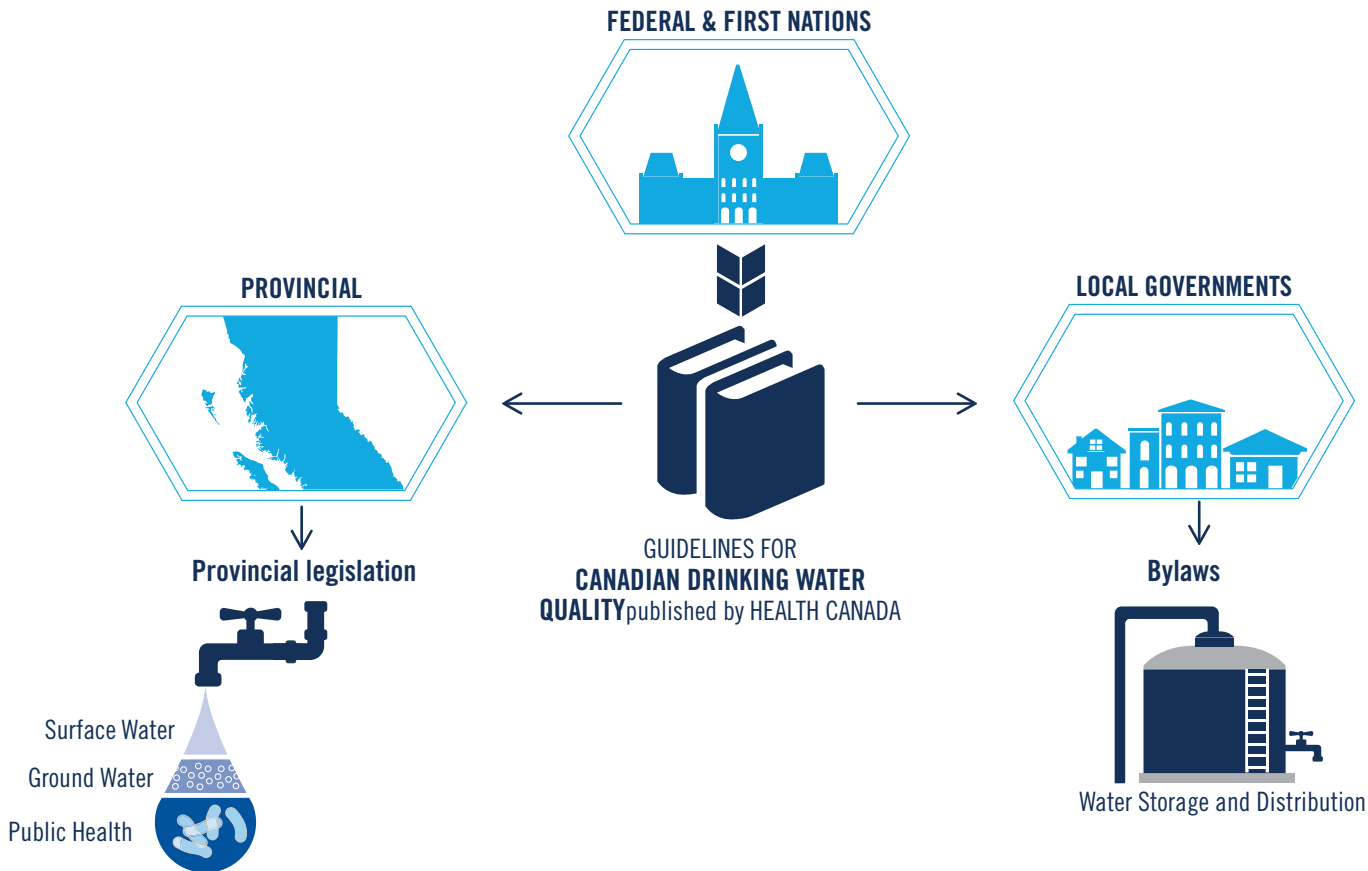
### WHO IS INVOLVED IN THE GOVERNANCE OF DRINKING WATER IN B.C.?

Providing safe and reliable drinking water is a shared responsibility among multiple levels of government.

Legislated powers are complicated in Canada, as there is overlapping jurisdiction and delegation by the federal and provincial government. The management of potable drinking water on First Nations reserves is a shared responsibility between First Nations and the federal government.

In B.C. approximately 14 provincial government agencies have responsibilities relating to drinking water and source protection and there are numerous relevant statutes.<sup>4</sup>

The *Community Charter* and the *Local Government Act* enables a local government to establish terms and conditions for the services it provides and for the development of land and its impact on the community.



<sup>4</sup> The exact names and numbers of provincial agencies change periodically as a result of the reorganization of B.C. ministries and transfer of primary drinking water protection regulatory responsibilities; Source: Office of the Provincial Health Officer. *Action Plan for Safe Drinking Water in British Columbia 2015* pg. 7

Local governments may be most familiar with these pieces of legislation, but there is a variety of other statutes and regulations that also need to be considered when dealing with drinking water.

While local government councils or boards are ultimately responsible for their decisions and operations, senior management should know and understand these regulatory requirements as they are distinct from best practices and must be adhered to when providing drinking water to the public. Other levels of staff, as required by their positions, should also understand relevant regulations.

**\*For additional pieces of legislation related to drinking water in B.C. see the AGLG's Primer on Drinking Water Management in British Columbia**

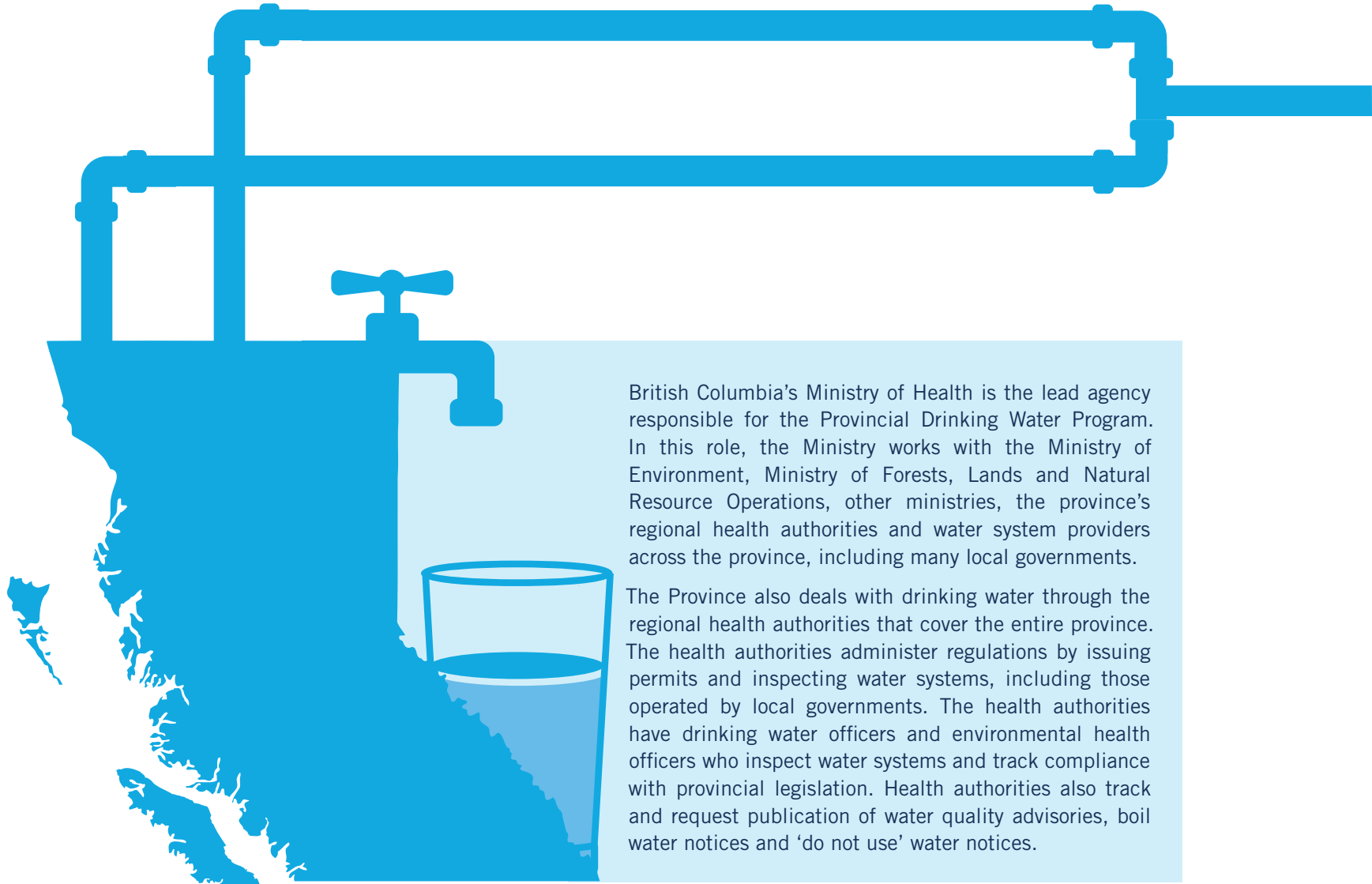
### UNDERSTANDING THE DIFFERENCE BETWEEN WATER GOVERNANCE AND WATER MANAGEMENT



The fundamental difference between water governance and water management is that water governance is about 'oversight' whereas management is the administration and routine decisions made in daily operations of a water system.



# REGULATION OF DRINKING WATER IN BRITISH COLUMBIA



British Columbia's Ministry of Health is the lead agency responsible for the Provincial Drinking Water Program. In this role, the Ministry works with the Ministry of Environment, Ministry of Forests, Lands and Natural Resource Operations, other ministries, the province's regional health authorities and water system providers across the province, including many local governments.

The Province also deals with drinking water through the regional health authorities that cover the entire province. The health authorities administer regulations by issuing permits and inspecting water systems, including those operated by local governments. The health authorities have drinking water officers and environmental health officers who inspect water systems and track compliance with provincial legislation. Health authorities also track and request publication of water quality advisories, boil water notices and 'do not use' water notices.



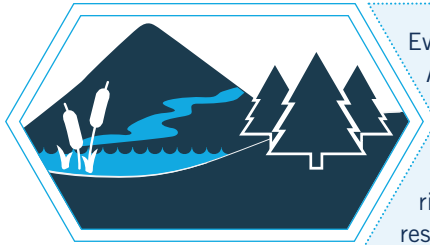
B.C.'s *Water Sustainability Act* came into effect in February 2016, focusing on water use and extending the licensing of surface water to include groundwater (wells).

It recognizes the importance of environmental flows to fish and incorporates the idea of water objectives. When the B.C. Government establishes water objectives for a body of water, local governments must take them into account when planning for regional growth or land use.



There are other *Acts* and regulations that may apply to drinking water. For example, the *Forest and Range Practices Act* and *Oil Gas and Activities Act* and their regulations protect drinking water from the activities of those industries.

## WHAT IS INTEGRATED WATER MANAGEMENT?



### DEFINING A WATERSHED

Everyone lives in a watershed. A watershed is an area of land that drains streams and rainfall to a common water body such as a river, lake, the outflow of a reservoir, or mouth of a bay or an underground aquifer. A watershed consists of the land surrounding and draining into lakes, streams, reservoirs and wetlands or the underlying groundwater. Larger watersheds contain many smaller watersheds. The terms catchment or drainage basin are also used to describe a watershed.

Source: US Geological Survey web content

Because communities rely on healthy watersheds to ensure safe, secure, and adequate supplies of water for domestic, agricultural, environmental, commercial, industrial, recreational and firefighting uses, local governments must not only understand varying pressures on water; they also must use that understanding to manage these challenges.

As integrated systems, actions in one part of a watershed can impact other aspects of a watershed, affecting water quality and quantity. For example, the removal of wetlands or forests that help filter pollutants and slow runoff can create water quality issues and cause damage to property. Likewise, wastewater effluents containing pollutants may be released into the environment and potential water sources which could affect fish and wildlife, deplete oxygen levels and cause restrictions on water use.

Integrated water management includes analyzing and adapting to varying challenges that may threaten current and future water supplies. It considers multiple options when planning for water use, and includes a collaborative, holistic approach to all planning that is affected by or has an impact on water and watersheds.

Integrated water planning has many benefits that can help establish and maintain a safe, secure supply of water for a wide variety of uses:<sup>5</sup>

- Balance water use for irrigation and domestic use
- Determine appropriate water use and rates of consumption that can be supported by the available water supplies seasonally, annually and over the long term
- Manage water supplies in ways that do not compromise the health and biodiversity of fish, wildlife, ecosystems and watersheds while meeting human consumption demands
- Manage wastewater discharges within the environment's capacity to absorb and assimilate waste
- Manage land and resource management practices and day-to-day human activities in ways that do not adversely impact water quality
- Manage human development patterns to reduce the community's vulnerability to water-related hazards, such as flooding and erosion
- Maintain and strengthen community resiliency by preparing for climate change and its impacts on water and aquatic ecosystems

<sup>5</sup> Source: *Rethinking Our Water Ways*, Fraser Basin Council (2011), pg. 33

# 5

## WHAT IS A RISK-BASED APPROACH AND WHY IS IT IMPORTANT?

Risks are foreseeable future events or hazards<sup>6</sup> that may negatively impact water quality or quantity, finances, service levels, public confidence, or other community priorities. Some local governments may assess various risks by looking at the likelihood of an event (probability) and its impact (significance) on the water system.

A risk assessment identifies potential internal and external threats to water quality, quantity and service continuity throughout the system, from the water source all the way through to the customer, including the water treatment plant, storage and distribution system.

The local government estimates the likelihood of each threat occurring and how often it might occur and identifies possible response strategies (risk management). Risks need to be balanced with available mitigation options that can be undertaken with available resources.\*

In many sectors (such as food production) risk assessment and management are central to operations and protocols.

Comparatively speaking, formalized, explicit and routine risk assessment practices in the water sector are newer and less widespread.

\*Source: The Water Research Foundation, *Risk Governance: An Implementation Guide for Water Utilities* 2013



Risk management is a proactive approach where local governments look comprehensively at the entire water system from the source to the tap and make decisions to address identified issues that might impact services. Increasingly, this preventative approach is considered a more reliable and cost-effective way to protect public health compared to an approach that only focuses on treated drinking water (end product testing at the tap) and identifies a potential health problem after the water has been consumed.<sup>7</sup> A risk-based approach should be considered at all levels where decision-making impacts policies and procedure development.

A hazard and threat inventory can be readily compiled using the following:

- Records, such as permits and licences, for operations of interest, such as landfills, gas stations or hazardous waste storage facilities
- Infrastructure information such as utility pipelines for sewer, oil and gas, which are often mapped accurately and readily available
- Identified transportation routes—noting how hazardous goods are transported
- Land use data that can be used to map potential hazards, based on the typical hazards associated with a particular land use type



<sup>6</sup> Hazards show what can happen and how they can impact water quality or quantity through pollution (contaminants), human error, technical failure and malicious acts. Water quantity can be threatened through overuse, competing uses, changing precipitation patterns, natural or human disasters and technical failure.

<sup>7</sup> Current approaches to microbial water quality testing include a time delay between taking the water sample and getting the results (culture-based testing takes 18–24 hours to generate results, plus transport time to the laboratory). *E.coli* is used as a surrogate indicator for all pathogens; however, *E.coli* is not always predictive of pathogen occurrence, particularly for viruses and protozoa. This means that the absence of *E.coli* is not a guarantee that a water sample is pathogen-free.

## SOME EXAMPLES OF 'THREATS' TO DRINKING WATER INCLUDE:

**Overuse:** Extensive water use can be a contributing factor to depleting water supplies



**Ageing infrastructure:** Treatment and distribution facilities have limited lifespans and require ongoing funding for operation, maintenance, and replacement

**Climate Change:** Higher temperatures and extreme, unpredictable, weather conditions affect rainfall, snowmelt, river flows and groundwater



**Water Utility Amalgamation:** Adopting a system with poor service quality and/or water system deterioration could lead to added costs for the adopting system or utility

**IT Security:** As more and more utilities connect their water systems to new technology and the internet, cyberattacks or IT failure can have significant impacts



**Water contamination:** With multiple users, contaminants from runoff or recreational, agricultural and industrial activities could enter waterways

**Regulation compliance:** With no single agency responsible for all aspects of water, water suppliers have to navigate and ensure compliance with various legislation and drinking water guidelines



**Emergencies:** Natural or human-made incidents may disrupt water supplies or water quality for extended periods of time





## WHY SHOULD LOCAL GOVERNMENTS UNDERTAKE LONG-TERM PLANNING?

In our drinking water performance audits, we found that some local governments lacked important plans and policies to guide their long-term water-related decision making.

Short-term thinking about drinking water inevitably results in local governments being forced to react, putting the health or safety of their communities at risk and often leading to unanticipated and substantial, perhaps unaffordable, capital investments.

Long-term planning can enable local governments to be better prepared to address challenges that lie ahead. Examples of such challenges include:

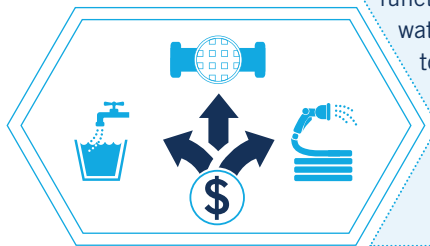
- ▶ The fact that over one-third of B.C.'s water system operations workforce is close to retirement (see more on this in question 17). A local government can take steps to prevent future knowledge loss (for example, by introducing effective record-keeping systems) and begin succession planning through training, mentoring and job shadowing.

- ▶ A local government that foresees water supply issues over the long-term may want to consider implementing a comprehensive range of strategies that use existing water resources more effectively and efficiently. To help address pressures on limited groundwater or surface water supplies and reduce the need to undertake expensive large-scale capital projects, a local government may consider implementing a suite of short-term strategies to address long-term concerns. Examples include leak detection, metering, summer watering restrictions, fit-for-purpose water use, rain gardens and stormwater harvesting. Combined, such activities could increase the long-term sustainability of existing resources and may reduce, delay or eliminate the need for expensive reservoir expansion or new groundwater sources.

» A local government may wish to develop a desired ‘vision’ of its future drinking water environment. It could integrate water planning and land use planning, focus on healthy functioning watersheds, and work to ensure that water use stays constant even as population and economic activity grows. It can identify short, medium and long-term strategies to help achieve this goal.

» By considering its future need to replace or expand water infrastructure, a local government can plan financially for the long-term such as by a full-cost asset management approach, and anticipate and put aside critical funds for construction and ongoing maintenance of water infrastructure.

### LONG-TERM PLANNING STRATEGIES FOR EXTENDING DRINKING WATER SUPPLIES



As drinking water infrastructure projects often require substantial funding and time to develop, it's important to consider various strategies that can help extend current water supplies while maintaining affordable water costs:

**Strengthening water efficiency:** Using techniques to reduce the amount of water used to accomplish a function. Strategies could include using water-saving technologies such as low flush toilets and shower heads, leakage control, metering, education on efficient water use and building codes and pricing.

**Fit-for-purpose water use:** In place of treated drinking water, rainwater or greywater could be used to water gardens, public parks and golf courses as well as other purposes that do not require treated drinking water such as toilet flushing. Greywater (typically water from dishwashers, showers, washing machines and sinks) can require minimal treatment to be re-used for non-drinking purposes. Note that ‘Black water’ typically refers to sewage.

**Stormwater harvesting:** Rainwater and runoff from buildings, roads and parking lots could be redirected and stored rather than being carried into local waterways. Frequently seen as a nuisance, stormwater is increasingly viewed as an additional source of water for a range of (non-drinking) purposes.



## WHY IS IT IMPORTANT TO BUILD RESILIENCY?

Resilience is determined by how well people, communities or ecosystems are prepared for and able to withstand disruptive natural and human-made events, recovering and adapting to a ‘new normal’ with more frequent and extreme events.


The increasing economic cost of disasters can be a significant incentive for local governments to focus more on resilience.

Water-related disasters can have both direct impacts such as damage to buildings, infrastructure and crops, and loss of life and property as well as indirect impacts such as effects on human health, losses in productivity and livelihoods, increased investment risk and indebtedness.


By incorporating a proactive, integrated risk-based approach with an eye to long-term planning, local governments can increase the resiliency of their communities to meet unexpected or extreme conditions.

As local governments depend on critical services such as drinking water to ensure their community’s survival and resilience during and after any type of disruptive event, they could use risk solutions, business continuity and emergency response plans and procedures to prepare for potential service interruptions.


### TYPES OF WATER-RELATED HAZARDS & EMERGENCIES in B.C. THAT COULD AFFECT LOCAL GOVERNMENT RESILIENCE




**Technological:** power outage/disruption, pump failure, broken water main, chlorine gas leaks, backflow conditions, leaking pipes, treatment process breakdown or dam breach.




**Weather:** heavy rainfall, flooding, drought (loss of source), heat waves, snow and storm surges.




**Source contamination:** Leakage of gas or other hazardous material into a water course or groundwater recharge zone, animal activity near intake, failing septic system close to source.




**Fire:** wildfire/forest fires, interface fire, using water supply to fight a fire, fire at the water supply system, aerial fire retardant in watersheds.



**Landslides:** mudslide or avalanche above intake.



**Human-related:** human error, intentional (e.g., vandalism and terrorism), staff absences. Hazardous material events such as oil spills or spills of disinfected water into fish-bearing streams.



**Geological:** earthquakes, volcanic activity and tsunami.

Source: Emergency Management British Columbia, The All-Hazard Plan (2012)

The background of the page is a dark blue surface covered with numerous water droplets of various sizes. A large, semi-transparent blue circle is centered on the page, containing white text. The text is arranged in two main sections, with the top section being larger and more prominent.

**UNDERSTANDING  
WATER  
MANAGEMENT:**

**ROLES AND  
RESPONSIBILITIES**



## WHAT RESPONSIBILITIES DO LOCAL GOVERNMENTS HAVE RELATED TO DRINKING WATER?

Local governments may have various objectives, policies and responsibilities related to water, which often include:

- Regulating water collection and use through local land use planning and controls on the development of private lands
- Engaging in water and watershed planning
- Protecting drinking water sources by preserving and managing watersheds, surface water, reservoirs, rivers, streams, aquifers, riparian areas, wetlands and other sensitive habitats
- Delivering safe drinking water that meets the requirements of the *Drinking Water Protection Act* and Drinking Water Protection Regulation as well as the conditions set by operating permits
- Distributing water from point of collection to treatment and the eventual delivery of the water to users
- Collecting water after use through means such as drainage and wastewater treatment systems and disposing of it in an environmentally sustainable manner
- Inspecting water infrastructure such as treatment and storage facilities and dams<sup>8</sup> ensuring they meet engineering standards
- Employing flood risk management techniques in land use planning
- Managing water supply and demand by instituting water conservation programs
- Ensuring only certified operators are working in water treatment and distribution systems and staff are adequately trained<sup>9</sup>
- Ensuring water requirements for fire protection are met

<sup>8</sup> The Dam Safety Regulation (O.I.C. 114, B.C. Reg. 40/2016) under the *Water Sustainability Act*, came into effect February 29, 2016 and is intended to mitigate loss of life and damage to property and the environment from a dam breach by requiring dam owners to inspect their own dams, undertake proper maintenance on them, and ensure that these dams meet ongoing engineering standards.

<sup>9</sup> Operator certification and classification of drinking water systems in B.C. are the responsibility of the Environmental Operators Certification Program (EOCP). Operators of water systems serving more than 500 individuals must be certified. [www.eocp.ca](http://www.eocp.ca)





## HOW CAN LOCAL GOVERNMENTS MEET THESE RESPONSIBILITIES?

Many local governments are building on established ways of managing water sustainably by:

- Developing official community plans and regional growth strategies that support water objectives
- Participating in or leading multi-sector water planning initiatives
- Conducting risk assessments and developing mitigation strategies
- Ensuring appropriate professionals (such as engineers, geoscientists, chemists, and microbiologists) are involved in water system development and operations
- Developing floodplain management plans and strategies
- Developing water conservation plans and drought management plans
- Developing liquid waste management plans and integrated stormwater management plans
- Developing integrated watershed management plans



## WHAT TYPES OF PLANNING SHOULD A LOCAL GOVERNMENT CONSIDER?

Water management is an interdependent system that relies on information provided from various departments in a local government. It is important to note that appropriate water-related information is required at various levels of planning so that informed decision-making can take place. Preparing water management strategies that determine municipality or regional district-wide objectives and goals first can help provide the guidance and support for stronger local government planning.

A local government will likely have a number of policies, plans and initiatives related to drinking water, which should be reviewed regularly to ensure they are adequate and effective. Some examples are listed below:

- **Strategic plans:** Official community plans, regional growth strategies<sup>10</sup>, financial plans and master plans for drinking water, stormwater and drainage, liquid water management and integrated watershed management
- **Separate standalone plans:** Asset management, facilities management, long-term water supply, water conservation, drought management, drinking water protection and source assessment, emergency management, contingency and business continuity plans

\* For more information on strategies, see Appendix3: Water Management Resources and Strategies

<sup>10</sup> Regional growth strategies are strategic plans that direct long-term planning for regional district and municipal official community plans.

**Well (Aquifer) Protection**  
 Developed to provide protective measures to minimize and prevent undesirable impacts from land use activities on subsurface water sources; more effective in delivering water quality benefits compared to individual wells and considers broader connections of multiple wells and pollution sources

**Water Sustainability Plan†  
 (formerly Water Management Plan)**  
 Area-based plans intended to address the impacts of land-based activities on the water resource, in addition to addressing issues related to water allocation.  
 Also designed to address conflict among users, between users and the environment, risks to water quality, and watersheds that require restoration

**Rainwater Management**  
 Ensures that rainwater is viewed as a valuable resource and is captured at the source or managed so that runoff resembles natural runoff patterns and does not transport pollutants or sediment from the land into watercourses; considers the dynamics of the entire watershed and identifies how development can use “green infrastructure” to maintain natural systems and protect buildings

**Drinking Water Protection**  
 In B.C. these plans are sometimes called source water protection plans and are designed to protect drinking water from health hazards; typically developed for a specific drinking water source like a watercourse, watershed, reservoir or aquifer and generally required when other plans have failed to address or prevent threats to drinking water

**Watershed Management**  
 A flexible framework that uses collaborative, iterative steps to characterize existing conditions, identify and prioritize problems, define management objectives, develop protection or remediation strategies, and implement and adapt selected actions when necessary; to assess the watershed and present management information based on analysis, actions and the views of participants required to develop and implement the plan

**Source Water Assessment Plan**  
 Generally developed after source water assessments† are completed to identify reasonable measures to address identified threats to drinking water

**Water Use**  
 A formal agreement clarifying how water is shared among all water licences while providing adequate flows for fish and wildlife; helps resolve conflicts among competing water users

**Water Conservation**  
 Help communities manage water demand, reduce consumption, and improve water use efficiency

**Drought Management**  
 Minimize impacts of water shortages and droughts and address extreme circumstances brought on by drought



- NEW AND UPCOMING PLANS
- GOOD MANAGEMENT PRACTICES
- MAY BE REQUIRED BY THE PROVINCE

Note: The titles used for these plans may not be universal and may vary depending on the type of water source, use and requirements or conditions set by your drinking water officer (or health officer)  
 † Source water assessments may be required by drinking water officers to assess drinking water sources in relation to land uses and activities within a watershed that may affect a source, inventory the water supply system, assess monitoring requirements for drinking water sources and supply systems and identify current and potential future threats to drinking water  
 ‡ Source: Comparison between Water Use Plans (WUPs) and Water Sustainability Plans (WSPs), Okanagan Basin Water Board web contents



## WHAT SHOULD A REGIONAL DISTRICT CONSIDER WHEN DEVELOPING A WATER MANAGEMENT STRATEGY?

In developing a water management strategy, a regional district should ask itself a range of questions:

- Do you have overarching principles and water management objectives that consider the entire water cycle?
- Does your regional growth strategy or official community plan state the water quantity or quality management<sup>11</sup> objectives that need to be achieved?
- Have you identified and described the issues likely to influence your water management strategy due to existing infrastructure, water system transfers, land use, or factors affecting groundwater?
- Have you considered whether past land uses have potential to cause contamination?
- Have you assessed and identified potential water sources for drinking or other uses, including irrigation of open spaces, and considered the impacts of allocating infrastructure?
- Do you understand your surface or groundwater and report on their status based on monitoring and modelling and regular assessments of quality and quantity?
- Does your planning include long-range such as 100 years flow paths and levels, peak flow rates and storage requirements and regular discussion of stormwater management practices?
- Have you considered ‘opportunity projects’ which are not required as part of the provision of core services but provide other benefits?
- Have you identified areas or issues that require further investigations to assist water management at later planning stages?
- Do you consider best management practices and utilizing water sensitive urban design to manage water?
- Do your regional growth strategies or plans provide recommendations to municipalities to guide and control land use and development as necessary to meet regional water objectives or advocate monitoring and data analysis of water sources?

The Regional District of Nanaimo has a Drinking Water and Watershed Protection Program to help protect the region’s water resources. This initiative includes an Action Plan that has seven programs:

- Public awareness and involvement
- Water resources inventory and monitoring
- Management of land use and development
- Watershed management planning

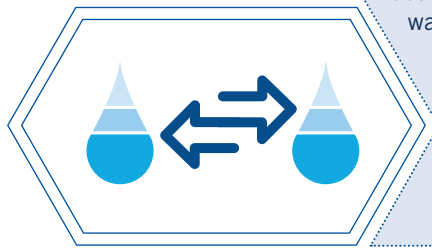
- Water use management
- Water quality management
- Climate change adaptation

Program information is used to make better land use decisions and help communities protect the environment.

Source: Regional District of Nanaimo web contents

<sup>11</sup> Best practice principles for water quantity management include ensuring post-development annual discharge volumes and peak flows are maintained relative to pre-development conditions whereas water quality management includes maintaining surface and groundwater quality at pre-development levels and possibly improving water quality leaving the area able to maintain and restore ecological systems—*Better Urban Water Management* (2008)

## WATER SYSTEM TRANSFERS



Utility owners may sell or transfer water systems to another individual or company, a society, municipality, regional district or an improvement district.

Some utility transfers are requested due to poor service quality and/or deterioration of the water system. Local governments may want to consider the following when deciding whether to purchase or adopt a water system:

- Do you know the status of the system, including all risks and liabilities associated with it?
- Do you have a business and financial plan that will adequately cover the

costs of adopting the system, including required capital improvements, operational and maintenance activities and administrative activities?

- Do you have the ability and capacity including trained staff to operate and manage the system?
- Do you have sufficient and allocated reserve funds?
- Do you need rights and licenses to access and use acquired assets and water resources?
- What are the legal or business implications in transferring ownership of the system?
- Are there any other administrative requirements necessary to approve the transfer?

Source: *Transferring a Water System*, Province of B.C.





## WHAT SHOULD A MUNICIPALITY CONSIDER WHEN DEVELOPING WATER MANAGEMENT STRATEGIES?

In developing a water management strategy, a municipality should ask itself a range of questions:

- Has your municipality identified water resource management objectives that consider environmental, social and economic factors in your local area and proposed strategies to achieve them?
- Have you mapped surface and/or groundwater catchments (including sub-catchments) and significant water resources like waterways and wetlands and identified critical issues such as water quality?
- Have you analyzed past land uses for their potential to cause contamination and developed strategies to address these?
- Have you considered water sources and supply for drinking as well as other future needs and identified existing or future water sources and infrastructure requirements, such as treatment plants?
- Have you factored in the relevant connections between stormwater, ground and wastewater for fit-for-purpose<sup>12</sup> needs?
- Have you determined the location of conservation reserves or waterways and wetlands that need to be protected?
- Have you ensured that all relevant information about surface and groundwater quality and quantity is available at the appropriate times to inform future land use planning and decision-making?

The City of Vernon has been reusing residential, commercial and industrial water since 1930.

Reclaimed water is treated and used for irrigation purposes (including golf courses, nursery, forestry and agriculture uses as well as public areas, such as Marshal fields) during peak demand period (April-October).

<sup>12</sup> Water that is matched to a certain quality for use that is appropriate to that quality of water.

The background of the page is a close-up photograph of water droplets on a surface, creating a textured, shimmering effect. Overlaid on this is a large, semi-transparent circular graphic. The circle is divided into four quadrants by a white cross. The top-left quadrant is yellow, the top-right is light blue, the bottom-left is light green, and the bottom-right is a darker blue. The text is centered within the circle.

**WORKING  
EFFECTIVELY  
WITHIN LOCAL  
GOVERNMENT TO  
MANAGE WATER**



## HOW CAN ADMINISTRATORS ADOPT AN INTEGRATED MANAGEMENT APPROACH?

Local governments would do well to know their water, how it is affected by climate change and changing population demands, industrial change and resulting new development. Water should be managed so the community is resilient to the impacts of climate change and population growth, while ensuring economic stability, maintaining built infrastructure and protecting aquatic environments.

In local governments, water management is sometimes addressed in an un-coordinated manner, with various operations managed independently. For example, even though land use activities have a direct impact on the quantity and quality of water, land-use planning and water management are typically separated in local government organizations.

Local governments can ensure that critical water knowledge and resources are shared among staff and management is regularly updated on key issues. Doing so can reduce inefficiency and information gaps that can lead to overuse, degradation of waterways and often the need for large and expensive infrastructure solutions.

Since no single action can address all water-related challenges, a combination of actions is usually needed at a variety of scales, from household to neighbourhood, community and regional.



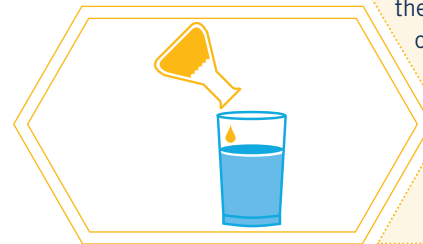
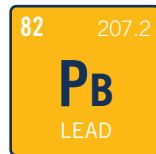
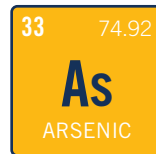
## HOW CAN MANAGEMENT REDUCE RISKS?

Although a comprehensive understanding of risks (existing and potential) is important for critical services such as drinking water, local governments may not apply comprehensive risk assessments.

A risk-based approach considers the susceptibility<sup>13</sup> of the system. For example, surface water may be susceptible to overuse or contamination, such as through natural drainage pathways both on the ground and in groundwater discharge areas. To assess the susceptibility of groundwater, one might examine the ease with which contaminants, introduced at the surface, can move down to an aquifer. Mines, open pits, or boreholes into the subsurface (including geotechnical and water wells) provide pathways through which a contaminant from the surface can move directly into a deep aquifer.

Local governments could aim to be aware of emerging contaminants in drinking water such as pharmaceuticals, psychoactive substances, and pesticides. Similarly, local governments should pay attention to customers who are especially vulnerable, such as the elderly or those with compromised immune systems.

### SOME OF THE MOST COMMON CHEMICALS IN DRINKING WATER:



The number of potentially harmful chemical contaminants identified has expanded as methods to detect them have improved. In terms of risks to human health it is difficult to accurately identify the duration and magnitude of exposure in a given population and human health outcomes. For example, water is often not the only source of exposure to chemicals. Arsenic, fluoride and nitrate/nitrite are some of the most important examples of chemicals that have shown demonstrable health effects from consumption of contaminated drinking water.

Source: World Health Organization web content

<sup>13</sup> A system is susceptible or vulnerable based on the potential for damage caused by various hazards such as contamination or over-use, offset by the natural protection provided by the physical (unaltered or altered) system. Loss can be economic, environmental or health-related due to the deterioration of a water resource.

<sup>14</sup> *Risk Governance: An Implementation Guide for Water Utilities*, Water Research Foundation (2013)

A preventative risk-based approach should include some of the following:

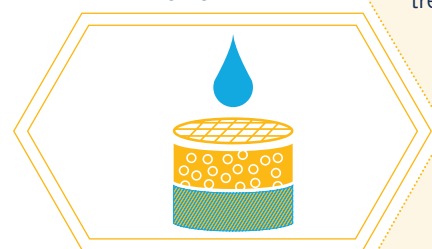
- Adoption of best practices and continuous improvement
- Real-time process control wherever feasible, such as the continuous monitoring of turbidity, chlorine residual and disinfectant contact time
- Effective operation of robust multiple barriers to protect public health
- Preventative rather than strictly reactive strategies to identify and manage risks to public health
- Implementation of cross connection control programs to reduce contamination

A local government can help manage risks by conducting risk assessments on a routine basis rather than ad hoc or on a project-by-project basis. By focusing on prevention and mitigation actions, local governments can lower their vulnerability and increase their resiliency.

The surest way to keep drinking water clean, safe and reliable, is to understand and minimize the risks at each stage of the system in an integrated way, from source to tap where it is consumed:

- Source water protection
- Effective water treatment
- Secure water distribution system
- Water quality monitoring (at source, treatment plant and tap)
- Operator training
- Emergency response procedures

### MULTI-BARRIER APPROACH



Source: Canadian Council of Ministers of the Environment (CCME)

### WATER SAFETY PLANS



A Water Safety Plan is a risk-based preventative approach to manage drinking water safety from catchment to consumer (source-to-tap). It is an iterative process that characterizes and incorporates the following into planning:

- Threats to the system
- Capacity of the system to cope with threats
- Ability to respond if barriers fail
- Measures to improve the system

Water safety plans complement and enhance drinking water quality standards and procedures. They are advocated by the World Health Organization (WHO), and in 2011, Alberta became the first jurisdiction in North America to require all of its water suppliers to implement a drinking water safety plan approach.

Source: *WS Portal: Health through Water*  
 Source: *Drinking Water Safety Plan*, Government of Alberta  
 Source: Gagnon, G., & Castleden, H. (n.d.). *Drinking Water Safety Plans (Rep.)*  
 Canadian Water Network.





## HOW DO LAND USE DECISIONS AFFECT WATER?

Some land use decisions have the potential for significant negative impacts on water and watersheds as land is used for various purposes. It is critical that local governments consider, in all land use-related planning decisions, how they may affect future water resources.

Land use planning, such as through zoning can help to achieve established goals and improve a community’s water resource management. For example, a local government might consider how water services will be affected, including the cost of water distribution infrastructure like pipes or reservoirs to provide water to new developments. Local governments could consider concentrating new development in areas where fewer new connections will be required or where existing water lines already exist, leading to fewer challenges related to access and potentially reduced long-term maintenance, operational or asset replacement costs.

Intensively developed areas usually have larger impervious surfaces such as roads, parking lots, sidewalks, rooftops and so on. Impervious surfaces prevent water from filtering into the ground, reducing the ability of groundwater sources (aquifers) to recharge and increasing surface rainwater runoff.

### THE RIGHT DEVELOPMENT, IN THE RIGHT PLACE, AND AT THE RIGHT TIME

Local governments have many factors to consider as their communities grow. New developments may require extending roads, fire protection, sewer and water services, and in some cases population densities may be too small to adequately support these services and their infrastructure over the long term.

Long-term land use planning and water management that considers the full costs of service extensions can help a local government minimize future economic and environmental impacts.

Source: *A Guide to Green Choices: Ideas & Practical Advice for Land Use Decisions in British Columbia Communities*, 2008, pg. 9 of 78

Increased runoff can lead to water pollution and other physical damage to the environment. This can result in higher costs—to repair and maintain infrastructure, treat contaminated water so it is safe to consume and to find other options for continuous water supply. These challenges can be mitigated through thoughtful and comprehensive long-term land use planning.

For example, rainwater management planning recognizes that rainwater is a valuable resource that should be managed at the site by encouraging infiltration as opposed to dealing with stormwater runoff as it occurs (storms occur less frequently than rain). Local governments can apply a multitude of tools to promote rainwater management, while maintaining infrastructure, water quality and quantity for the future:<sup>15</sup>

- Develop bylaws that encourage rainwater management and the maintenance of rainwater management facilities
- Ensure land use decisions are informed by integrated rainwater management plans
- Update master drainage plans and integrated stormwater management plans
- Encourage developers to use water balance models for onsite rainwater modelling and landscaping solutions to capture, store and release rainwater back into the ground to replenish aquifers or streams

Most importantly, local governments should consider a comprehensive, integrated approach to rainwater management that considers the entire rainfall spectrum.<sup>16</sup>

**\*For more strategies related to sustainable water management, see Appendix 3: Water Management Resources and Strategies**

<sup>15</sup> Source: *Develop with Care 2014: Environmental Guidelines for Urban and Rural Land Development in British Columbia*, Province of B.C. pg 44-45

<sup>16</sup> Rain spectrum defines all the stages of rain from light to extreme storms



## HAS YOUR LOCAL GOVERNMENT CONSIDERED WATER INFRASTRUCTURE AND LONG-TERM SUSTAINABILITY?

When taking into account storage facilities, treatment plants, distribution pipes and pump stations, the size and complexity of water-related infrastructure can be substantial. In addition, local governments should consider other water-related plans that might include rainwater or conservation-focused facilities.

Sometimes, decision-makers may believe that investing in environmentally-sensitive infrastructure projects is too expensive compared to conventional grey infrastructure<sup>17</sup>. However, more information is now available on the relative costs and benefits of green infrastructure<sup>18</sup> alternatives. Well-designed projects provide potential for cost savings partly because green infrastructure may adapt more easily to meet site-specific conditions.

By considering only direct cost savings from grey infrastructure stormwater and wastewater management, plus the reduced cost of treating combined sewage volumes, green infrastructure can often be a viable option. In addition, green infrastructure may help a local government meet larger environmental objectives such as pollution reduction and better water quality.

### NATURAL ASSETS AND INFRASTRUCTURE

Local governments' management of natural assets such as wetlands, lakes, streams, and aquifers can contribute to providing critical services while keeping costs lower than if they pursue manufactured alternatives.

Local governments may overlook the value and importance of maintaining natural assets, resulting in costly efforts to find alternative water sources or build infrastructure to capture runoff or treat polluted water. For example, the cost to maintain an aquifer, including its water quality and supply, may be much lower than the cost of pipes and pumps and the treatment facilities required to draw on other water sources over the long run. Familiarity with local geography and critical natural resources can help a local government undertake planning and development that does not severely impact these assets.

Local governments can use a new methodology<sup>19</sup> to help identify, value and manage natural assets. Several Canadian communities have piloted this methodology finding that natural assets are often more valuable due to their resilience to changing conditions such as climate and development.<sup>20</sup>

Recognizing the value of natural assets includes identifying their operational and maintenance requirements in a similar way as built municipal assets.

#### EXAMPLES OF LOCAL GOVERNMENTS VALUING NATURAL ASSETS

The Town of Gibsons is North America's first community to try integrating natural assets into asset management and financial planning, pioneering a natural asset management strategy that incorporates engineered and natural assets in comprehensive asset management plans.

Such a step-by-step natural asset management strategy can help municipalities across North America to generate a long-term sustainable plan for their water supplies.

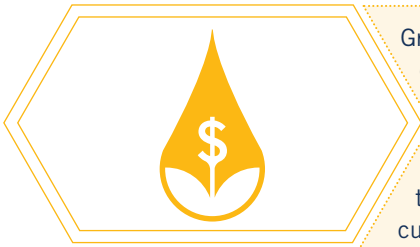
<sup>17</sup> In stormwater management context, grey infrastructure is defined as the hard, engineered systems to capture and convey runoff, such as gutters, storm sewers, tunnels, culverts, detention basins, and related systems (Source: *Banking on Green*, 2012, pg. 2)

<sup>18</sup> Green infrastructure is an approach to wet weather management that uses natural systems—or engineered systems that mimic natural processes—to enhance overall environmental quality and provide utility services (Source: *Banking on Green*, 2012, pg. 2)

<sup>19</sup> Municipal Natural Assets Initiative (MNAI) developed a methodology to help local governments identify, value, and manage natural assets within traditional financial and asset management planning frameworks—watercanada.net

<sup>20</sup> Source: *Nature Bank: Natural Assets in Financial and Asset Management*—watercanada.net





## GREEN INFRASTRUCTURE: A COST-EFFECTIVE APPROACH

Green infrastructure offers opportunities for cost savings and increased cost-effectiveness. Flexible tools can be adjusted to allow local governments to customize more resilient and affordable solutions to address local conditions and strategic objectives.

Some green infrastructure construction costs can be lower than grey infrastructure costs in the long run due to reduced overall stormwater management needs and life-cycle efficiencies.

Green infrastructure may not involve the same amount of operational and maintenance costs as grey infrastructure and green infrastructure can regenerate and strengthen over time, rather than wear down and require replacements or repair. Green infrastructure also reduces energy costs, as water and wastewater systems are some of the largest energy infrastructure. Green roofs have another advantage of providing insulation and shade while reducing heating and cooling costs.

Source: *Banking on Green*, 2012, pg. 15-16

City of Vancouver's Green Infrastructure Program has a target to capture and treat 90% of its average annual rainfall by using green infrastructure tools and design guidelines on public and private property.

Source: City of Vancouver web contents

“...governments have been found to spend twice as much on operations and maintenance of existing systems than on capital expenditures to rehabilitate, modernize or expand existing assets or install new infrastructure”

Source: *Project Delivery for Drinking Water and Wastewater Capital Projects: Literature Review Project #4685 (2017)*, Water Research Foundation

## ENGINEERED INFRASTRUCTURE AND CAPITAL PROJECTS

Water and energy are closely linked. A substantial amount of water is needed to produce energy (for example, hydro-power generation, biofuel cultivation and thermal cooling). Substantial amounts of energy are frequently required to deliver water (for example, to pump groundwater, treat water and wastewater, distribute water and desalinate seawater).

With ageing infrastructure, population growth, and environmental impacts due to climate change, local governments have found an increasing need to upgrade or replace water infrastructure.

While local governments are responsible for addressing water infrastructure needs, they often have access to provincial or federal funding programs such as the Clean Water and Wastewater Fund. They may also consider borrowing to assist with capital project costs. Regardless of the size and cost of particular projects, local governments are accountable to the public and should consider the following questions prior to committing to any capital project:

- How does this project meet the objectives of your long-term strategic plan, priorities within community plans or regional growth strategies?
- Have you made a business case scaled to the size, value and complexity of the project?

- Has this project been considered in relation to other options that may bring about similar or more cost-effective solutions to achieving your strategic objectives?
- Do you understand the service needs and service level priorities, project risks, oversight and governance structure, scheduling and monitoring, reporting, procurement processes and performance measures required for the project?
- Have you considered the public impact of the construction and ongoing operations of the project?
- What type of oversight or governance policies have you set up to ensure appropriate procurement processes and ongoing review of the budget and approval for funding requests throughout the project?
- Have you consulted the appropriate professionals (such as engineers or geoscientists) in the design and development of the project?
- How is the project incorporated into your financial plan?
- Have you considered full lifecycle costs, particularly operations and maintenance?
- Have you considered the impact of environmental factors, such as climate change or other service level priorities (for example, other industries) that may shorten the life of your infrastructure or impact other infrastructure and incur additional costs?
- How will you fund the project, including ongoing maintenance and operational costs and provisions for unforeseen events (such as earthquakes) over the project's lifecycle?
- Does your long-term forecasting and budgeting consider full cost accounting and asset management?
- Are you aware of any international trade agreements that may include procurement-related obligations which must be met?
- Does your organization have the capacity to see this project through based on the necessities described above?

**\*For more information about capital project planning and procurement, refer to the AGLG Perspective Series booklet "Oversight of Capital Project Planning & Procurement".**



## HOW DOES WORKFORCE COMPOSITION IMPACT WATER SYSTEMS?

Currently, more than one-third of B.C.'s water system operations workforce is close to retirement.<sup>21</sup>

This significant shift in the workforce raises serious concerns over potential knowledge loss and the risk of inadequate succession planning. Local governments need to ensure important knowledge is captured and record-keeping systems are in place. Succession planning, including training, mentoring and job shadowing, should also be considered. There is a growing shortage of qualified and experienced workers in B.C.'s water and wastewater sector.

The BC Water and Waste Association and the Environmental Operators Certification Program have projected that, over the next decade, more than 50 per cent of the water and wastewater workforce—3,300 people—will need to be replaced due to retirements, attrition and job growth.<sup>22</sup> Recruitment and retention of staff is a growing challenge for public water and wastewater facilities, particularly retaining workers at intermediate or higher levels because younger workers or workers new to the industry often lack appropriate skills and experience to replace those who are leaving.

<sup>21</sup> Source: B.C. Water & Wastewater Sector Workforce Profile 2015

<sup>22</sup> Source: Workforce Strategy, B.C. Water and Wastewater Association and Environmental Operators Certification Program (2017)



## 18 WHY IS IT CRITICAL TO PROVIDE SUPPORT AND TRAINING TO DRINKING WATER OPERATORS?

The Drinking Water Protection Act requires that water suppliers serving more than 500 customers must have certified drinking water operators. While water systems that serve fewer than 500 customers are not required to have certified operators, provincial health authorities (through drinking water officers) have the right to require smaller system operators to certify depending on the water system’s complexity and classification.

As technology advances and water infrastructure changes, it becomes increasingly important that water operators keep up to date on the knowledge necessary to manage water systems properly.

Without a requirement for certified operators, smaller communities may have untrained or under trained water operators. Operators may not know how to properly use equipment and if

they are responsible for training new staff, improper knowledge transfer may occur. To compound these issues, if the community only has one operator or limited resources, operator training might be viewed as a non-essential luxury rather than a necessity, resulting in it falling to the wayside.

Utility managers often must contend with labour shortages as a result of challenges in attracting and retaining trained and certified operators. Additionally, they must prepare for knowledge loss due to large numbers of operators retiring. Smaller and remote communities may lose talent to larger municipalities that offer greater career growth or compensation. To deal with these challenges, local governments should ensure that there are supports and incentives for operators to pursue training, especially volunteer operators who do not receive monetary compensation for maintaining such critical services to acceptable standards.

### WHAT’S DRIVING THE FOCUS ON INCLUSION AND DIVERSITY?



An inclusive and diverse work environment can help a local government better respond to industry challenges such as labour shortage, customer expectations, climate change and technological capabilities.

Inclusion and diversity contribute to greater innovation, robust decision-making, and better business performance. Actively widening talent pools in all areas and departments shows the commitment to address historic challenges of an ageing, male-dominated field workforce. An inclusive work environment and diverse workplace shows a local government is trying to sustainably respond to industry challenges.

Globally, the International Water Association has called attention to the importance of gender-diverse workforces and gender-sensitive products and services to external customers in its 2016 report ‘The Untapped Resource: Gender and Diversity in the Water Workforce’.”

As of 2015, B.C.’s water sector workforce was made up predominantly of men (87 per cent): Operator and supervisor positions are mostly held by men and managerial employees tend to be older than staff in other positions.

Local governments could review their strategies and processes for attracting, recruiting, training and retaining employees from under-represented groups to ensure an inclusive work environment that supports a diversified staff.

Source: *Tapping the Power of Diversity and Inclusion in Urban Water*, Water Services Association of Australia (2015)

Source: *BC Water and Wastewater Sector Workforce Profile 2015*

## WHAT COULD HAPPEN WITH INADEQUATE TRAINING?

Ultimately, a lack of operator training can lead to many undesirable and sometimes deadly consequences. For example, in 2000, Walkerton, Ontario, had an outbreak of waterborne gastroenteritis from contaminated water that led to more than 2000 sick people and seven deaths.<sup>23</sup> It was discovered that the two water operators had been issued certifications to operate their systems based on a grandfathering program but had less than the required minimum hours of training and were inadequately informed about water safety.

In these types of cases, liability for under trained staff falls to the water provider and employer.

To reduce liability and maximize community health, local governments must aim to provide sufficient support, financially and otherwise, to enable water operator training and encourage staff to keep their training up to date and relevant to the water systems they oversee.

Local governments can consider employees' professional development needs and set aside sufficient training budgets and related resources to ensure that workers can maintain their skills and certifications and advance in the workforce. Examples may include training in leadership, communication, and computer skills.

To help attract and retain qualified employees, local governments could invest in employee wellbeing by providing work environments that recognize a diverse range of needs and flexibility through work hours, benefits and varied incentives.

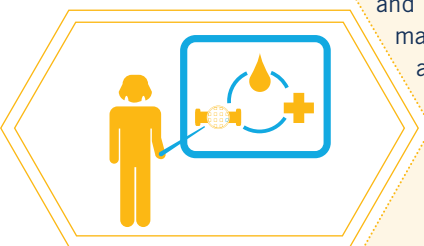
Drinking water is a critical service that must be provided on a continuous basis through disruptions.

Emergency management training and exercises are essential to ensure that these services are delivered.

Emergency management training should be in addition to other operator certification. New employees should be trained when first hired, when transferred or promoted and when new equipment or materials are introduced that affect emergency response procedures.

For more information on emergency management and business continuity training, see the AGLG audit reports and Perspectives Series booklets.

**EMERGENCY MANAGEMENT TRAINING AND EXERCISES**

An illustration within a hexagonal frame. On the left, a yellow silhouette of a person stands with their right arm pointing towards a central diagram. The diagram consists of a blue square containing a water cycle: a blue water drop at the top, a blue circular arrow in the middle, and a yellow cross at the bottom right. To the left of the square is a yellow globe icon. The entire illustration is set against a light yellow background.

<sup>23</sup> Source: *Inside Walkerton: Canada's worst-ever E-coli contamination*—[www.cbc.ca](http://www.cbc.ca)

## ENVIRONMENTAL OPERATORS CERTIFICATION PROGRAM (EOCP) AND RESOURCE-SHARING OPPORTUNITIES

In B.C. the Environmental Operators Certification Program<sup>24</sup> is the only certification body for water operators. To maintain valid certification, smaller system operators must complete 12 hours of continuing education while larger system operators (certified at levels I, II, III and IV) must complete at least 24 hours (2.4 CEUs) every two years and pay their membership dues annually. Though training is critical to ensuring the safety of drinking water for consumers and certification is required for system operators with more than 500 customers, there are many additional benefits to ensuring water operators are appropriately certified.<sup>25</sup>

Studies have shown that communities with certified water operators tend to have work plans focused on improving, repairing or replacing existing municipal water systems. Research has shown that certified water operators are more likely to report they had complete maps of pipe infrastructure and are also more likely to maintain drinking water system information. Certified water operators were also more likely to have a treatment or plant operations maintenance plan. Finally, chlorine level checks were more frequent in places where certified water operators worked—a crucial factor in ensuring that bacteria are removed regularly.<sup>26</sup>

In the long run, certified water operators who maintain their relevant education can help local governments and water providers meet regulatory requirements and feel confident that their drinking water is effectively treated for quality and safety. Management can support staff in maintaining and making necessary system improvements while extending the life of infrastructure and reducing costs to the community.

B.C. water facilities are generally classified (Class I-IV) indicating the size and level of complexity of the water system and factors such as flow, analytical laboratory controls and more. Facility classification also highlights the type of certification the facility's water operator needs to hold and the degree of knowledge and training required.

**IS YOUR WATER OPERATOR CERTIFIED TO THE CLASSIFICATION OF YOUR WATER SYSTEM?**

As water providers, local governments are responsible for ensuring operators have the necessary level of certification to match their operating system.

Source: *How Drinking Water is Protected in B.C.* Government of British Columbia



<sup>24</sup> EOCP's objective is to protect human health, the environment, and the investment in facilities through increased knowledge, skill and proficiency of the members of the Program in all matters relating to water treatment and distribution and wastewater collection, treatment, and disposal.

<sup>25</sup> Source: Continuing Education Requirements for Operators, EOCP [www.eocp.ca](http://www.eocp.ca)

<sup>26</sup> Source: Minnes, S. & Vodden, K. Dr. (2014). *Exploring Solutions for Sustainable Rural Drinking Water Systems: A Study of Rural Newfoundland & Labrador Drinking Water Systems (Rep.)*. The Harris Centre Memorial University.

Operators with less access to resources or concerns about travel requirements can keep training current by taking correspondence courses or accredited online courses<sup>27</sup> provided by many institutions. Another alternative is resource-sharing—building capacity for operations by gathering several operators of nearby water providers and hiring a trainer to provide the required training for this group.

The Environmental Operators Certification Program can provide mobile onsite examinations for several operators at a time when arrangements are made in advance and has begun an Operator Peer Network, which is a mentoring program that matches mentors and mentees based on skills available and skills needed in order to capture and retain valuable information in water operations.

**\*For more information on workforce strategies,** see Appendix 3: Water Management Resources and Strategies

**DO YOU KNOW YOUR DRINKING WATER OFFICER?**



Drinking water officers are provincial government representatives that have some discretion in making decisions on certain requirements (such as how water is treated) for individual systems. Provincial policies guide these decisions in order to promote effective, consistent and transparent decision-making across the province.

Guidance policies can be found in the Drinking Water Officers Guide—a supportive document that contains all provincial health policy related to drinking water.

The circuit-rider system develops a cohort of skilled operators who travel on a scheduled basis to visit individual water treatment plants (including remote facilities) to provide hands-on training and operator support. First developed in Saskatchewan for First Nations water operators, this system has been adopted by many First Nations administrative regions in Canada.

**HOW LOCAL GOVERNMENTS CAN SHARE RESOURCES AND COSTS FOR TRAINING**



Source: Hrudehy, S.E., *Safe drinking water policy for Canada—Turning Hindsight into Foresight* (2011), pg. 12

<sup>27</sup> EOCP provides a list of accredited online courses offered through various institutions that water operators can take to meet their continued education unit requirements





## HOW CAN BYLAWS AND POLICIES HELP SUPPORT WATER MANAGEMENT OBJECTIVES?

Local governments can utilize bylaws and policies such as zoning, financial and development plans and water use fees to support water management objectives. A cohesive and strategic approach can bring together areas such as source protection, demand management, emergency management and business continuity as well as help identify gaps and overlaps.

Local governments should ensure that their bylaws, policies and plans are up to date, relevant and include actions that are implemented and modified as necessary based on new information and insights learned through stakeholder engagement and system monitoring.

### BYLAWS AND POLICIES

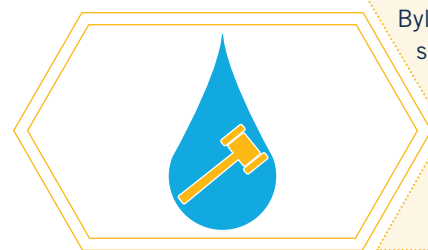
The bylaws, policies and procedures that a local government adopts may impact the use, conservation and quality of drinking water. Water bylaws establish the water system, fees for consumption and measures that can be taken to conserve drinking water. Irrigation and landscaping bylaws can help in conservation efforts. Stormwater and sanitary sewer bylaws ensure that wastewater is gathered and treated appropriately, and also set fees. Policies can establish performance standards and measures for water systems. Staff should always act in the best interests of the public and be able to rely on codes of ethics, conflict of interest, whistle-blower and harassment policies to support ‘doing the right thing’.

It is important to have up-to-date bylaws and policies as outdated bylaws risk no longer complying with legal requirements or may be difficult to enforce. Bylaws and policies should be reviewed and updated regularly and as necessary to include processes to maximize bylaw compliance.

There are many types of water-related bylaws which can help protect water supplies and quality. A few examples include:

- Watering restrictions
- Cross connection control
- Connection charges
- Runoff control
- Watercourse protection
- Sewer rates
- Water rates
- Water service and water regulations
- Landscaping

### WATER-RELATED BYLAWS



Bylaws can also be used for sub-division servicing and zoning purposes or to control pesticide use.

For more information on bylaws, see Appendix 3: Water Management Resources and Strategies



## WHAT IS BUSINESS CONTINUITY PLANNING AND WHY IS IT IMPORTANT?

Business continuity plans are strategic plans focused on ensuring a local government's critical services continue through potential disruptions. They also address productivity loss and physical damage that may result from disruptions while normal services and operations are being restored.

Local governments should prepare business continuity plans to ensure that emergency operations and critical services continue despite the loss of staff, resources, power, facilities, information technology infrastructure and/or communication systems. Backup power and alternative water supplies need to be ready to be brought online quickly.

By creating and maintaining a business continuity plan, a local government can help ensure it has the resources and information it needs to deal with an emergency and sustain long-term recovery. Business continuity plans, like other planning documents, should be informed by risk-based assessments such as business impact analysis and updated regularly.



## WHY IS PERFORMANCE MEASUREMENT AND CONTINUOUS IMPROVEMENT IMPORTANT?

### PERFORMANCE MEASUREMENT

A robust monitoring and reporting system can provide regular updates on the status of a local government’s drinking water system.

Performance measurement is an essential element of effective utility management that provides opportunities for a local government to improve water system management and operations. It is the foundation for continuous improvement and sound strategic planning. More detailed information on this topic will be provided in a forthcoming Sustainable Financing AGLG Perspectives Series booklet.

Performance targets or benchmarks help a local government set standards for the performance it wishes to achieve.

By advocating and supporting performance management in relation to water services, a local government can learn where to focus its priorities and resources, facilitate decision-making, clarify expectations for staff and the public and demonstrate accountability by communicating these measures internally and externally. It also facilitates education around the value of water and the activities a local government must conduct to make this vital service available to its community.

### CONTINUOUS IMPROVEMENT

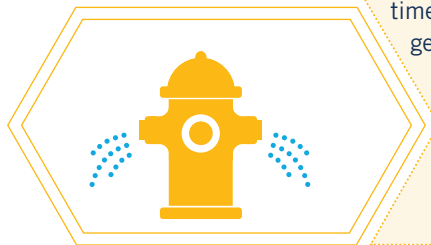
Continuous improvement occurs when lessons learned through performance measurement processes are used to adjust and make improvements with the intention of meeting or exceeding performance targets.

Continuous improvement should be a cycle—an evaluative loop where performance measurement is used with reporting, testing, analysis and improvement activities.

When a local government integrates such a system into its everyday approach to management and operations, it can reinforce and demonstrate the work it does to bring value to its community on a continual basis. This process can also be used to improve and adapt policies and practices in response to changing conditions.

For example, a local government can set objectives for water consumption over a few years and monitor water loss and prevent unnecessary costs by implementing leak detection programs. Leak detection can also protect water quality by identifying points of contamination so repair and maintenance can occur in a timely manner.

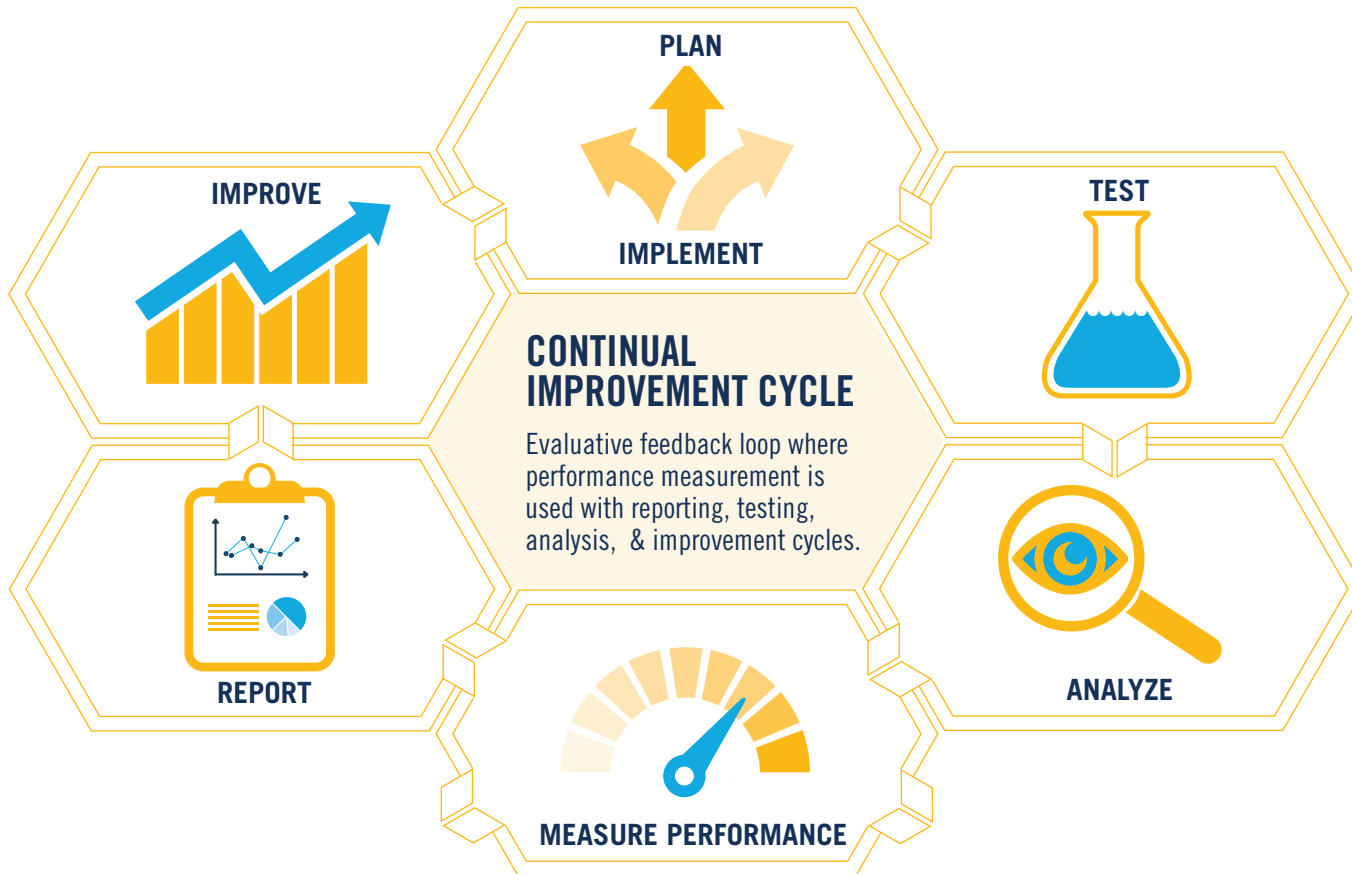
### LEAK MONITORING CAN SAVE MONEY



At the City of Vancouver, more than 100 of over 6,000 fire hydrants were thought to be leaking at any given time. In 2013, Vancouver began a twice-yearly hydrant leak survey program, which is estimated to have generated savings of 200 million litres of water and up to \$200,000 a year.

Although cost-savings had not been confirmed at the time of issuing the report, an AGLG audit found that the Regional District of Okanagan-Similkameen had an informal leak detection process that tracked the quantity of pumped water, reviewed water use and pressure at various times of the day.

*Source: What we are doing to protect and conserve our water, City of Vancouver  
Local Government's Role in Ensuring Clean Drinking Water: Regional District of Okanagan-Similkameen*



- WATER USAGE (PER CAPITA, PER HOUSEHOLD, SEASONAL, USE)
- WATER SERVICE DISRUPTION
- SUPPLY DISRUPTION
- OPERATING AND MAINTENANCE COST PER WATER VOLUME TREATED OR DELIVERED
- NUMBER OF WATER LEAKS REPAIRED
- WATER NOT ACCOUNTED FOR

- EFFICIENCY SAVINGS
- LOCAL SUPPLY VS DEMAND
- BILLING ERRORS PER NUMBER OF ACCOUNTS
- RATIO OF PLANNED MAINTENANCE TO TOTAL MAINTENANCE
- EMPLOYEE TRAINING MEASURES
- COMMUNITY ENGAGEMENT DAYS
- CUSTOMER COMPLAINTS



**WORKING  
EFFECTIVELY  
WITH OTHERS**

## DO YOU KNOW THE OTHER LEVELS OF GOVERNMENT AND STAKEHOLDERS INVOLVED IN DRINKING WATER?

While a local government holds responsibility for its own drinking water system, there are other groups with a vested interest in the provision of drinking water. It is important for a local government to identify these interested parties and consider their concerns when making decisions about drinking water.

Within the local government's jurisdiction there will be a range of governments, local community groups, businesses, as well as the public whose perspectives ought to be considered. For example:

- Environmental groups and water basin councils or boards will often bring forward issues impacting water to the attention of the local government
- The federal and provincial governments and other governmental agencies are concerned that local governments are meeting various requirements set by those levels of government
- First Nations may have rights and title related to water which should be considered from a constitutional and water licence holder point of view. In addition, First Nations may have concerns about water-specific issues<sup>28</sup>, the environment<sup>29</sup> and human use<sup>30</sup>
- Neighbouring local governments (municipalities, regional districts and improvement districts) may be impacted by a local government's decisions concerning drinking water, in particular if those neighbours are drawing from the same water source, as is often the case. For example, improvement districts are often responsible for the operation of drinking water systems. Sometimes these systems are within the boundaries of a municipality, or in communities located next to local government boundaries
- Industry and agriculture have vested interests in water. Water use can be central to their business activities and their discharge practices can affect the surrounding water quality
- Water sources may be shared and are sometimes managed by utilities such as BC Hydro
- The public needs to be engaged as they have a vested interest in safe drinking water<sup>31</sup>

<sup>28</sup> Such as poor water quality, increasing drought conditions, earlier peak stream flows, changing water temperatures, increased risk to water quantity due to low water levels, and increased risk to water quality due to coastal erosion and storm surges.

<sup>29</sup> Such as rapid glacier melting, widespread thawing of permafrost, and shifting marine ecosystems.

<sup>30</sup> Such as conflicts over water use and water allocation as result of increased agricultural, commercial and industrial demands, growing urbanization, increasing number of boil water advisories, increased flood damage to buildings, roads, bridges and rail lines; and increased air pollution and exposure to water and food borne pathogens; Source: Fraser Basin Council: *Rethinking our Water Ways*, (2011) p.10

<sup>31</sup> The Public often lacks understanding of water challenges and may not be motivated to change practices or habits. It is unrealistic to expect them to embrace water sustainability objectives without this understanding; Source: Brandes, O.M, Renzetti, S. and Stinchcombe, E. (2010) *Worth every penny: A primer on conservation-oriented water pricing*. POLIS project (UVic): Victoria, B.C. pg. 11

## WHY IS EXTERNAL ENGAGEMENT IMPORTANT?

There are many individuals and groups that share an interest in improving water management. By increasing engagement and cooperation, as well as information-sharing, local governments can expand perspectives and make better decisions with valuable input.

For example:

- Incorporating different viewpoints can build understanding among all parties and reduce conflict over competing issues
- Access to local expertise leads to better information, and improved decision-making. Those who live in a watershed may be better equipped to identify issues and solutions
- When users have a role in decision-making, they may gain a stronger interest in making decisions that reflect their interest
- Greater understanding of local government decisions and policies that support final decisions
- External engagement may increase transparency and help build credibility

Challenges to engagement may include:

- Longer timelines to produce the desired outcome
- Increased costs
- Unequal representation of stakeholders
- Emphasis on consensus and politically workable solutions at the expense of optimal solutions

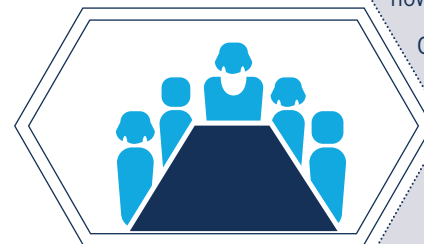
These factors will vary from local government to local government, so should be carefully weighed in each particular situation<sup>32</sup>.

Good governance is a means of facilitating improved decision-making; improving management efficiency in water use, and government responsiveness.

Good governance outcomes are impacted by various factors such as inclusiveness, participation, accountability and transparency.

Good governance can be measured by the degree to which decisions are inclusive, participatory, accountable, transparent and responsive. All involved parties must be part of the governance process if the drinking water system is to be sustainable now and in the future.

### WHAT IS GOOD WATER GOVERNANCE?



Good governance also includes the ability to adapt to varying situations, monitoring and assessing on a continuous basis and effective problem solving.

<sup>32</sup> Source: Nowlan, L. & Bakker, K. (2010) *Practicing shared water governance in Canada: A Primer*



## WHY IS INTER-AGENCY COORDINATION IMPORTANT IN WATERSHEDS?

Most B.C. local governments are located within multi-use watersheds, which means water resources are shared between a variety of users. Metro Vancouver and Greater Victoria, home to more than half of the province’s population, are the two most prominent examples of jurisdictions with protected watersheds.

It is common elsewhere in the province to have multiple users sharing a limited water resource and numerous activities that can inadvertently contaminate the water supply.

Local governments need to manage activities and land uses around municipal wells and/or drinking water treatment plant intakes to protect the quality and quantity of existing and future sources of drinking water. Neglecting source water protection can be costly and risky.<sup>33</sup>

However, local governments may encounter significant issues in watershed management. They may not have regulatory authority over activities outside their boundaries. They may also have limited involvement in activities regulated by federal or provincial governments.

In many instances, particularly where communities rely on surface water, the majority of the watershed is outside of the local government’s jurisdiction, so the only way to attain watershed protection is through partnerships with others.

For example, control and oversight over land use activities such as mining, forestry and manufacturing is usually at a provincial level and spread across multiple agencies, often including ministries responsible for the environment, energy, forests, lands and natural resources and health.

### SIMILKAMEEN VALLEY PLANNING SOCIETY:

An example of coordinated planning in the Okanagan is the Similkameen Valley Planning Society (SVPS). The SVPS is a not-for-profit organization with membership from eight governing bodies: Municipalities of Keremeos and Princeton, Regional District of Okanagan-Similkameen Electoral Areas of B, G, & H, and the Indian Bands of Lower Similkameen and Upper Similkameen.

Source: *Strategy for a Sustainable Similkameen Valley 2011-2020*, pg. 4

### THE COWICHAN WATERSHED BOARD:

Formed in 2010 to provide leadership for sustainable water management in the Cowichan watershed and adjoining areas.

The Board's 14 members are appointed by its government partners and include:

- ▶ three members from the Cowichan Valley Regional District (including one who serves as Chair)

- ▶ three members from among the chief and councillors of Cowichan Tribes
- ▶ three or four members-at large from the community to provide specific local watershed knowledge
- ▶ one or two members recommended by the federal government
- ▶ two members recommended by the provincial Ministry of Environment

Source: Cowichan Watershed Board web contents

<sup>33</sup> Removing contaminants from drinking water can be expensive. Source water quality also impacts the treatment that is required and certification level of the environmental operators needed to operate the system. The most reliable way to protect public health and the environment is to proactively address water use and minimize sources of pollution before they enter water sources.

Interagency cooperation is important when activities occurring within a watershed impact water quantity and quality and these impacts are a result of decisions made outside of the local government jurisdiction.

In the absence of a province-wide strategy to protect source waters, it's necessary for local governments to build partnerships fostered through relationships with other actors in the shared watershed to collaborate on source water protection.

Local governments would benefit from communicating and fostering relationships with other agencies that share a watershed and have a vested interest in drinking water and source protection:

- Identify critical issues
- Effectively exchange information
- Improve decision-making
- Coordinate responses to complex problems

#### **COQUITLAM RIVER WATERSHED ROUNDTABLE**

The Coquitlam River Watershed Round-table aims to improve collaboration and problem-solving among stakeholders in the watershed. Launched in 2011, the Roundtable coordinates and implements activities that promote Coquitlam River watershed's long-term sustainability based on a shared mission, vision and values for the watershed.

The Roundtable does not have decision-making authority but is supported by a Core Committee, representing many watershed sectors.

Source: Coquitlam River Watershed web contents

**\*For more information on roles and accountabilities of various agencies and government ministries, see Appendix 2: Cross-jurisdictional Responsibilities for Source Water Protection and Drinking Water Supply Systems**

#### **BRITISH COLUMBIA HYDRO AND POWER AUTHORITY (BC HYDRO) AND GREATER VANCOUVER WATER DISTRICT (GVWD) PROTOCOL AGREEMENT**

In 1987, BC Hydro and GVWD entered into a long-term agreement for water supply from the Coquitlam Reservoir, which includes management and operational considerations. Under Provincial licences, the Coquitlam Reservoir is allocated between BC Hydro and GVWD for the respective purposes of power generation and waterworks. This agreement provides the GVWD with the ability to withdraw additional volumes of water, above its own licensed allocation, per the terms and conditions stipulated within the agreement. This is facilitated through a 'nomination' process each year and BC Hydro is financially compensated by the GVWD for the loss of potential generating capacity.

BC Hydro is responsible for the operation and maintenance of the Coquitlam Dam and reservoir, which includes the provision of environmental flows to the lower Coquitlam River. The GVWD is responsible for the management of the water supply area lands under a 999-year lease with the Province. GVWD controls all access into the water supply area to ensure the protection of the drinking water supply and associated infrastructure. GVWD and BC Hydro meet on a regular basis in a collaborative manner, to ensure the needs and requirements of both parties are met under the terms of the agreement.

Source: Metro Vancouver Water Services



## WHY IS EFFECTIVE COORDINATION IMPORTANT FOR DRINKING WATER EMERGENCY MANAGEMENT?

Drinking water is a critical service and local governments are required to have both an emergency management plan (under the *Emergency Program Act*) and an emergency response and contingency plan (under the *Drinking Water Protection Act*).

An emergency can affect every aspect of a local government, from engineering and operations to information technology, communications and finance. Other levels of government, adjacent local governments, First Nations and agencies such as electricity, gas utilities, water-sewers, railways, roadway authorities, transit authorities, airport authorities, school boards, health services and hospitals may also be involved in an emergency.

Active and effective inter-agency relationships are important in emergency response planning and are imperative when dealing with a crisis event. The quality of relationships can determine the quality of the response in a crisis. Emergency response plans need to be updated regularly (particularly contact information). They also need to be exercised with both table top and simulated live exercises. This validates the effectiveness of emergency plans and allows all parties to become familiar with working together and to understand their roles when an emergency occurs.

Previous experience has shown that the severity of some major drinking-water incidents in the past may have been aggravated by the absence of constructive (and communicative) inter-agency relationships. Local governments cannot afford for their relationships with others to be transient. Instead, they need to be nurtured and ready to be activated in the event of an incident.

Internally, management can aim to have its water utility department coordinate with its emergency management team when developing or exercising emergency response plans. If a community's water utility is separate from the local government, the local government can strive to be involved in the creation of the water utility's emergency plan.

Ideally, other departments and agencies with a role in emergency response may also be involved in creating plans.

**\*For more information on emergency management,** refer to the AGLG Perspectives Series booklet on emergency management listed in the reference and resource section at the back of this booklet.

## WHY IS IT IMPORTANT FOR LOCAL GOVERNMENTS TO BUILD RELATIONSHIPS WITH FIRST NATIONS?

In 2015, the Truth and Reconciliation Commission called on governments among others, to take action on 94 Calls to Action to redress the legacy of residential schools and to advance reconciliation. These calls to action were for all levels of government to recognize Indigenous rights over land and resources.

Positive engagement between local governments and First Nations can facilitate stronger relationships, open dialogue, and improve understanding between communities to promote reconciliation and build a foundation for future relations.

Water use decisions in First Nations in B.C. are governed by local First Nations authorities and the federal government, however, water source supply and quality impacts local communities, including municipalities and First Nations. Local governments should recognize that their decision-making, particularly around natural resources like water, may have an impact on First Nations. It is imperative that local governments make an effort to include First Nations early in all planning processes.

A four-phased provincial consultation process (preparation, engagement, accommodation and decision and follow-up) can help provide a comprehensive approach, which local governments can adapt to ensure fulsome consultations.<sup>34</sup>

### GUIDELINES FOR WORKING WITH FIRST NATIONS:

**Sustainability:** Achieve a vision where social well-being is supported by a vibrant economy and healthy environment

**Respect and Equity:** Respect diverse values, cultures, interests and knowledge of all communities and regions; understand that water often has a spiritual side and may be considered a relation; commit to supporting equitable opportunities for achieving sustainability

**Inclusive Decision Making:** Acknowledge First Nations governments as an order of Canadian government and aim to support coordinated and collaborative efforts among all government and non-government interests

**Meaningful Engagement:** Support opportunities for meaningful First Nations involvement in all activities aimed at achieving sustainability in the region, develop a common understanding of and shared expectations for meaningful involvement, engage in shared decision-making where appropriate and identify and address capacity challenges and opportunities associated with involvement

**Intellectual Property:** Acknowledge the value, significance, and Indigenous ownership of traditional and local knowledge and respect the link between traditional knowledge and First Nations' rights:

- recognize that incorporation of traditional and local knowledge is integral to ensuring sustainable management

- promote wider application of interpretation of traditional and local knowledge with consent and involvement of knowledge holders while also honouring confidentiality and conditions of information release (information should remain the property of knowledge holders)

**Communication:** Foster frequent and open communication, information exchange, and inclusive, meaningful dialogue to develop shared solutions to sustainability challenges. Build effective relations with First Nations by engaging early (e.g. exchange information about the proposed project/work in a respectful and meaningful manner)

Source: Adapted from *Rethinking Our Water Ways: A Guide to Water and Watershed Planning for BC Communities in The Face of Climate Change and Other Challenges*, Fraser Basin Council, 2011

<sup>34</sup> Source: *Collaborative Consent and Water in British Columbia—Towards Watershed Co-Governance*, The Centre for Indigenous Environmental Resources and POLIS Project on Ecological Governance, Pg. 14 and 20



## WHEN SHOULD LOCAL GOVERNMENTS CONSULT AND ENGAGE WITH INTERESTED PARTIES?

In order to take into account the needs and views of others, a local government should determine in advance the level of consultation and engagement it wishes to undertake depending on the type of decisions, who is affected and the immediacy of the issue.

The type of consultation a local government uses to develop its official community plan can guide how it will engage with others on water-related matters. At the very least, a local government needs to provide adequate details about the plan and be open and receptive to input throughout the various stages of its development. The key is to involve relevant perspectives in the planning and development stages to create a well-informed plan and refrain from only engaging with interested parties after the fact.

“Consultation in its least technical definition is the talking together for mutual understanding.”

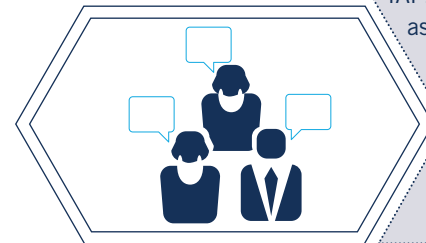
SOURCE: *Updated Procedures: For Meeting Legal Obligations When Consulting First Nations*, Province of British Columbia (2010), Pg. 7

As interested parties may vary depending on location and jurisdictions, and complex relationships impact decision-making, local governments may find challenges related to existing regulations, licensing arrangements, potential compensation issues and historical aboriginal grievances.

These guidelines help to create a climate for inclusive drinking water engagement:<sup>35</sup>

- Map all parties who have an interest in the outcome or that are likely to be affected, as well as their responsibilities, core motivations and interactions
- Define the ultimate line of decision-making, the objectives of engagement and the expected use of inputs
- Allocate proper financial and human resources and share needed information for result-oriented engagement
- Regularly assess the process and outcomes of engagement to learn, adjust and improve accordingly
- Embed engagement processes in clear legal and policy frameworks, organizational structures, organizational principles, and responsible authorities
- Customize the type and level of engagement to the identified needs and keep the process flexible for changing circumstances.

#### INTERNATIONAL ASSOCIATION FOR PUBLIC PARTICIPATION (IAP2)



IAP2 is an international association of members who seek to promote and improve the practice of public participation / public engagement in relation to individuals, governments, institutions, and other entities that affect the public interest in nations throughout the world.

IAP2 has resources available to assist organizations, decision makers, policy makers and practitioners to improve the quality of the public participation work.

Source: International Association for Public Participation web contents

<sup>35</sup> Source: Organization for Economic Co-operation and Development *Stakeholder Engagement for Inclusive Water Governance* pg. 13

## WHAT WE CAN LEARN FROM HULLCAR (CLCAHL) VALLEY



Since 2014, Hullcar Valley residents have been under Water Quality Advisories for nitrates in their drinking water.

An independent report provided 90 short and long-term recommendations focused on nine themes to help improve soil nitrate balance and restore the aquifer to acceptable nitrate levels as well as improve mechanisms to prevent similar situations from occurring in other drinking water aquifers in B.C.

Part of the collaborative government-to-government process to address these recommendations included:

- ▶ An Inter-Agency working group made up of various agencies, ministries and Splat-sin (members of the Secwepemc Nation)
- ▶ Memorandum of Understanding
- ▶ A Steering Committee comprised of Splat-sin and Ministry of Environment staff

Recommended mitigation included but was not limited to:

- ▶ Provision of Alternative Drinking Water – The Province and Fraser Basin Council provided funds to help find alternative water sources,

treat water and support sustainable, environmentally appropriate farming in the valley as well as studies to undertake small infrastructure works to connect to local government water systems or to shift to a new source

- ▶ A technical working group with members from Splat-sin, the First Nations Health Authority, Interior Health and various ministries meet regularly to discuss environmental technical aspects and share information
- ▶ Communications with the public through an information webpage, newsletters, in-person meetings with Splat-sin, Township of Spallumcheen, Steele Springs Water District, and Save Hullcar Aquifer Team; general meetings with agriculture producers; community meetings and open houses as well as bi-weekly conference calls with staff.

A Memorandum of Understanding was created in 2013 between the Township of Spallumcheen and City of Armstrong to establish a framework to develop mutually beneficial agreements to consolidate, integrate and enhance existing water district service provision and to explore the feasibility of extending service to other water districts.

Source: *Hullcar (Clcahl) Aquifer Response Plan Report (2018)*, pg. 1-11





## HOW CAN LOCAL GOVERNMENTS FORMALIZE RELATIONSHIPS WITH PARTNERS?

Consultation may occur between the local government and interested parties on an occasional basis. However, infrequent discussions are not necessarily the best approach to deal with drinking water issues over the long term.

A local government can ‘formalize’ its relationships with those who will be most directly impacted by decisions.

As a starting point, staff can meet with potential partners to discuss each party’s intentions, the results that they would like to see and possible next steps to formalize the relationship. This relationship can be achieved through either a protocol agreement or terms of reference (see the next two questions).

Advisory committees can serve an important function if made part of their mandate. Advisory committees may be considered at multiple levels, ranging from technical to senior administrative. Establishing clear terms of reference is important.

Meetings may need to occur at a policy level as well as at a technical level. The local government should anticipate that all partners will need to meet several times to develop a common framework for discussion and decision-making.

## WHAT SHOULD BE INCLUDED IN THE PROTOCOL AGREEMENT OR TERMS OF REFERENCE?

Ideally, any protocol or similar agreement would include the following items at a minimum:

- Statement of mandate or purpose
- Principles under which the partners will operate
- Description of goals and objectives to be achieved by the agreement
- Description of the approach or activities to be undertaken
- Terms of the agreement and whether there will be any reviews during the term or renewals at the end of the agreement
- How changes may be made to the agreement during its term
- What is not covered by the arrangement
- Code of conduct, if necessary

Drinking water-related agreements could include the following topics and processes:

- Communications terms, such as how the parties will communicate or how public statements will be issued, communications between meetings and giving notifications
- Number of representatives for each party, designation of official spokespersons for each party, naming of staff liaisons, apportionment of any expenses and liabilities, delineation of roles and responsibilities and establishment of any financial commitments
- What types of information, technology and resources are shared and how
- Frequency and locations of meetings, the type of decisions to be made and the decision mechanism to be used (voting or consensus)
- Decision implementation processes such as reporting, audits, and evaluations
- Manner in which disputes are resolved, the mechanisms to be used (for example, negotiation, mediation, conciliation) and what remedies may be required

### WHAT TO CONSIDER IN SERVICE AGREEMENTS



Municipal councils and regional district boards can choose to enter into partnering agreements to provide services for a variety of reasons. For example, agreements can be made to help to capture economies of scale and provide the potential to save money. This is especially relevant in the case of services requiring significant capital investment or when it is more beneficial for two or more local governments to combine resources such as expertise and materials to provide the same specialized service.

It is best to consider the following when determining partnering agreements:

- Identify a servicing opportunity or need that the local government feels it should address
- Assess the advantages and disadvantages of the various service provision methods available to them
- Identify and approach any prospective partners

To learn more about partnering agreements and statutory requirements, see Appendix 3: Water Management Resources and Strategies.

Source: *Local Government Partnering Agreements for Service Delivery*



# COMMUNICATIONS AND PUBLIC AWARENESS

## WHY IS COMMUNICATION SO IMPORTANT?

Communication is often taken for granted particularly when drinking water management becomes a daily operational routine and is offered as an ongoing service. However, communication is crucial for many reasons:

- Informs people of an emergency or hazard (threat to public health and safety, boil water advisory)
- Educates the community and raises awareness about the value of drinking water and the cost of providing this critical resource
- Motivates people to take action (such as reducing water consumption during a drought or boiling water when there is a drinking water advisory)
- Propels people to reach agreements over controversial issues (from large infrastructure investments to understanding the need to chlorinate drinking water)
- Generates support for full cost recovery financing options (e.g. rate changes, bonds)
- Keeps people updated on infrastructure and construction projects that may impact services or access

Different communication strategies can be applied to meet these objectives.

Because drinking water (e.g. treated water in reservoirs or wells) and infrastructure like pipes are often invisible to the public eye, the public is often unaware of the condition of drinking water sources, quality, quantity and the complexity required to bring water to the community.

By improving communication and public outreach and knowledge-sharing, local governments can benefit greatly:

- Build transparency and improve the accountability of institutions responsible for drinking water management
- Facilitate participation and social change
- Increase society's understanding of invisible water resources

### INVISIBILITY AND THE DE-VALUING OF WATER



Source: Adapted from *Managing the Invisible: Understanding and Improving Groundwater Governance 2012*, Pg. 57 & 88

## HOW DOES 'KNOWING YOUR AUDIENCE' IMPACT COMMUNICATION EFFECTIVENESS?

Knowing your audience can definitely change how the public receives, understands and responds to information. Many factors influence the effectiveness of local government communication. These include the nature and scale of an issue, audience age, education, language, access to information, functional needs, the content of the message (accuracy, clarity and specificity), timeliness of the message and trust in the source.

An effective communication strategy requires a deep understanding of the community, because different community members will have different needs. Factors that local governments should consider include:

- **Community location:** Rural residents may have more difficulty accessing or receiving information than those living in more densely populated areas
- **Age:** Older adults and children may receive and respond to information differently or may require additional assistance
- **Language:** Non-English-speakers may not understand information that is provided only in English. Information (such as alerts and notifications) should be provided in the primary language(s) of the population as well as English, especially if a community has a high percentage of non-English-speakers
- **Length of residency:** Transients, tourists and newcomers to the area will likely lack knowledge of local issues (such as summer drought conditions and watering restrictions) that impact drinking water, so they may react differently from other audiences
- **Access to information:** Communication tools include door-to-door, internet, print, broadcast, and social media. Each has advantages and limitations depending on your communication objective (such as general education or emergency notification) and the intended audience. It is important to consider what is appropriate to the community and the reliability of the tools. For example, in emergencies, alternative alert and warning methods are needed for individuals with access and functional needs such as those with visual or hearing limitations. In such cases, both audio and equivalent text messages should be provided, if possible, in all languages widely used in the area
- **Vulnerable groups:** Susceptible individuals include the elderly, infants, and those who are immune compromised. Critical services such as hospitals and certain industries (such as those at increased risk of fire hazards in heat or drought) should be identified
- **Urgency:** Determine how quickly people need the information and develop your communication strategy accordingly

## WHAT TYPE OF COMMUNICATION STRATEGIES SHOULD BE EMPLOYED AND UNDER WHAT CIRCUMSTANCES?

Without a communications plan, communication may be ineffective. Knowing the purpose of communication will help a local government determine what type of communication strategy to use. There are four general purposes that apply to drinking water communications: general education, inquiries, requests for service and complaints, and warnings and advisories.

### GENERAL EDUCATION

General education provides fundamental knowledge about drinking water and raises community awareness about drinking water issues. For example, many people are unaware of what is involved in bringing safe drinking water into their homes. Local governments should initiate such conversations.

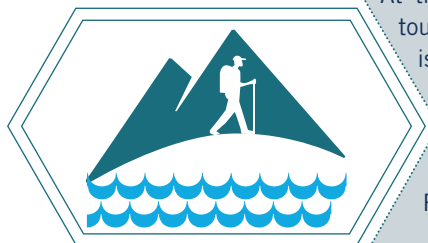
General education about drinking water can share the steps required to deliver drinking water and the importance of drinking water conservation. Here, the local government can provide information to raise awareness of the value of water, the importance of monitoring and re-evaluating water use to prevent the need for expensive infrastructure additions to meet high peak demand.

Because general education communications are aimed at a broad audience, local governments can use a variety of communication media over a long time frame to present the message. This could include a series of education campaigns throughout the year. For example, a local government may wish to advocate water-conserving landscaping at the start of spring, as people prepare to head into their gardens. Similarly, a campaign about summer water conservation could take place around the May long weekend.

Local governments can develop educational materials for children on topics such as drinking water supply, water quality, source protection and conservation. They could offer to have staff members go into the schools to talk about issues affecting the local community, such as water conservation. By educating children, who then bring the message home to their parents, local governments are educating both the current generation and the next generation on ways to help protect their local environment and natural resources.<sup>36</sup>

The District of Nanaimo has combined conservation strategies with public education by implementing a rainwater harvesting rebate program.

### UTILITY AND WATERSHED TOURS



Local governments can adopt some practices that increase community awareness.

At the local level, staff can conduct public tours of their water utilities, so the public is able to better understand how they get drinking water and know what costs are involved in meeting peak water demand.

Some local governments such as Capital Regional District that have control over their watersheds, have stewarded annual watershed tours to help the public learn more about their natural landscapes, water supply reservoirs, and the treatment processes required to bring water to their homes.

Metro Vancouver combines its watershed tours with recreational activities such as snow-shoeing. This local government also runs a comprehensive, curriculum-connected school program out of their watersheds and the Lower Seymour Conservation Reserve.

Sources: Capital Regional District and Metro Vancouver web contents

<sup>36</sup> The American Water Works Association has developed a public communications toolkit which contains information about various activities that can be used for communicating about drinking water with children and young people.



## ENQUIRIES

As with other critical local government services, the public may have many questions related to drinking water. To help people become more aware and appreciative of their local government and its services, front-line staff should be trained to know more about drinking water and related services so they can either answer the question or know where to direct enquiries. Where possible, general education materials should include a telephone number, which the public can use to get more information if required. Ideally, the person responding to these calls should be knowledgeable about drinking water and what is involved with its provision.

Local governments can reduce the staff time and other resources devoted to answering phone calls by dedicating a portion of their websites to drinking water information. A website can provide detailed answers to common enquiries and links to related materials and documents. A local government should ensure that its website and social media are kept current and relevant. Local government staff with knowledge of drinking water should review web content regularly to maintain currency and relevancy.

## REQUESTS FOR SERVICE AND COMPLAINTS

There are times when the public needs to contact the local government to make either a request for service or a complaint. Given that the local government will need ready access to information in order to respond effectively and in a timely way, it should have a well-designed, formal process in place to deal with such enquiries. Information gathering systems should be easy to use so the public can submit requests or concerns in various ways. These might include—mobile applications, email, on-line forms and by telephone. The local government's process should track each request or complaint from the time it is submitted until it is concluded. Continuous information updates can also help reduce confusion, the number of complaints and response times. Tracking requests for service and complaints also helps a local government monitor its performance and focus resources where they are most needed.

Complaints and inquiries can be taken as constructive opportunities for the local government to learn more about how well they are performing and meeting customer needs and can help identify areas for improvement. For example, a decrease in complaints received could indicate higher satisfaction with services, while an increase in closed complaint tickets could highlight an efficiently-run system that addresses public concerns in a timely way.

### EXAMPLE OF EFFECTIVE WEBSITES



The City of Wetaskiwin, Alberta maintains an active on-line Facebook presence and is able to respond to criticisms or controversy in a timely way by providing facts and background information to citizens

The City of Calgary's website lists educational partners and youth programs that help provide water education opportunities for schools and youth organizations.

Metro Vancouver's website describes the community's water sources and supply, water quality testing regimes, water conservation and watering regulations, as well as construction projects and operational and maintenance updates that may affect the public.



## COMMUNICATION IN EMERGENCY SITUATIONS

During emergencies and crisis situations it can be stressful and challenging for a local government to craft effective messages. A well-prepared local government should have an established communication system, strategy or process in place well before the need to activate the warning. By making preparations in advance, a local government can take steps to ensure it does not miss notifying the people who need to know.

Emergency communication with the community is especially critical. Well-conceived and effectively delivered emergency messages can help ensure public safety, protect property, facilitate response efforts, elicit cooperation and instill public confidence.

Emergency communications should be clear, contain specific and adequate information and align with other information being disseminated. As emergencies generally have a widespread impact on community health and safety, this form of communication should be accessible to the whole community.

Often, smaller water systems lack resources to address communications in a crisis. See Appendix 3 for resource materials to assist in managing and communicating during an emergency or crisis, which smaller water systems can use.

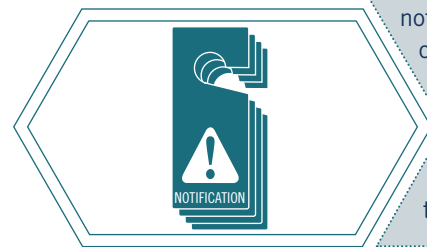
## WARNINGS AND ADVISORIES (EMERGENCIES)

Local governments are legally required by the *Drinking Water Protection Act* to have a notification procedure to alert the public and others of an emergency. Communication practices differ depending on the type of emergency and the audience.

For example, in the case of drinking water, a Water Quality Advisory, Boil Water Notice and Do Not Use Water Notice each have different implications. Under the *Drinking Water Protection Act*, the drinking water officer may request or order the local government to issue a public notice in a form the drinking water officer deems appropriate.

Local governments may benefit from preparing 'ready-made' notification templates in advance that can be easily customized during an event (for example, flyers, door hangers and electronic notices such as email).

During an emergency, there may not be sufficient time or resources to prepare these. Every notification document distributed will need to be time and date-stamped so that citizens know when the alert has been provided.



## DIFFERENT TYPES OF DRINKING WATER ADVISORIES AND CIRCUMSTANCES FOR ISSUANCE

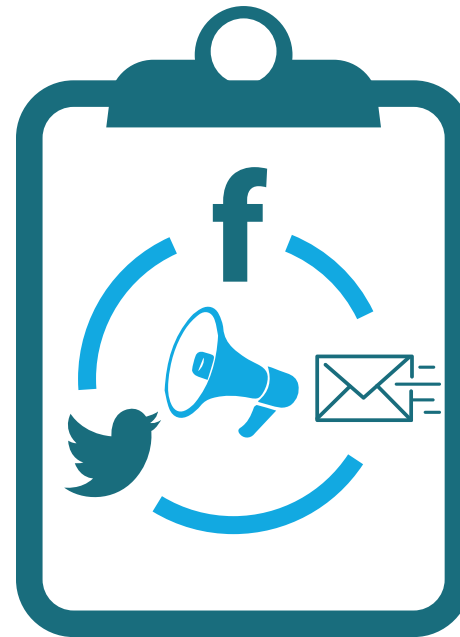
	<b>WATER QUALITY ADVISORIES</b> {INCLUDES DRINKING WATER ADVISORIES, WATER QUALITY OR DRINKING WATER NOTIFICATIONS}	<b>BOIL WATER NOTICES</b> {INCLUDES 'BOIL WATER' ADVISORIES (BWA) AND ORDERS}	<b>DO NOT DRINK ADVISORIES</b> {INCLUDES 'DO NOT USE' WATER NOTICES}
<b>Reasons to issue</b>	When there is some level of threat particularly affecting a subset of the general population (susceptible individuals) and not necessarily everyone; the threat is not significant enough to require a boil water advisory or do not drink advisory.	When there is a known or potential threat to drinking water that is microbiological (bacteria, virus or parasite) in nature.  The risk can be adequately addressed by boiling the water as a short-term form of treatment.  A boil water order is a legal written order and formalized version of a boil water advisory requiring the water supplier to operate under boil water conditions.	When there is a risk that cannot be adequately addressed by issuing a water quality advisory or by boiling the water (in some cases, boiling could worsen water quality); the water is not safe for domestic use.
<b>Common causes</b>	<ul style="list-style-type: none"> <li>➤ Chemical exceedances (such as high sodium or high iron levels, which may affect individuals on a sodium-restricted diet or infants, respectively)</li> <li>➤ Water is not aesthetically pleasing (colour, odour)</li> <li>➤ Medium-to-high turbidity</li> </ul>	<ul style="list-style-type: none"> <li>➤ Waterborne outbreak conditions</li> <li>➤ Bacteriological quality of water is below the accepted standard (presence of E. coli in water and/or repeated trends of total coli- form)</li> <li>➤ No treatment in place at water system</li> <li>➤ Water system treatment breakdown</li> <li>➤ Inadequate disinfection at water system</li> <li>➤ High turbidity</li> </ul>	<ul style="list-style-type: none"> <li>➤ Chemical contamination or exceedances (such as unacceptable levels of naturally occurring nitrates, lead or arsenic)</li> <li>➤ Accidents—such as chemical spills</li> <li>➤ Acts of vandalism, sabotage or bioterrorism that may affect the water supply</li> <li>➤ Natural disasters, such as earthquakes or mudslides</li> <li>➤ For precautionary purposes when there is some unknown threat that will require time to determine</li> </ul>

SOURCE: Gover, R. (2012) *Boil Water Advisory Protocol*. In, Dunn, G., (Ed.) Chapter 7, Water Security Guidance document. This document is a useful resource for local government as it includes checklists for water system risk assessments, creating a BWA message, ways to disseminate the BWA and how to remove a BWA.

## WHY SHOULD A LOCAL GOVERNMENT EVALUATE THE EFFECTIVENESS OF ITS COMMUNICATION STRATEGIES?

Evaluation is part of performance management and local governments can assess their communications effectiveness by monitoring and measuring message content, delivery and associated changes in behaviour.

Given that all local governments have limited human and financial resources, a communications evaluation can be valuable in helping a local government determine how specifically selected communication strategies can be adjusted for optimum effect or the benefits of investing in communication tools that help achieve desired results. For example, high-end technology may be useful in some communities where the use of text messages and social media are commonplace; however, in other communities, a more effective way of connecting with residents may be door-to-door signage or even large sign-boards posted in high traffic areas.



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## DEFINITIONS / GLOSSARY OF TERMS

**Aquifer:** A permeable rock that stores groundwater, which can flow readily into a borehole or supply well. Aquifers can be recharged (replenished) by rainfall or snowmelt, which infiltrates the ground. This process may be rapid or take thousands of years.

**Asset management:** Asset management is the process of managing a local government's capital assets cost effectively. It involves analyzing the lifecycle and capacity of each asset with detailed information about the condition of the asset (including its vulnerabilities), service levels, remaining service life, the timing of replacement and new asset needs. (See AGLG 2015 Perspectives booklet, Asset Management for Local Governments)

**Board** means the board of directors of a regional district or board of trustees of an improvement district

**Council** means the council of a municipality.

**Demand management:** Measures and techniques to reduce water demand. For example, pricing, metering, building codes, leakage control, education on efficient water use and water saving technologies such as water efficient devices.

**Ecosystem health:** A term used to describe the condition of a community of living organisms in conjunction with nonliving components of their environment.

**Full cost accounting:** Recording all the costs incurred to provide drinking water to customers, including operations and maintenance, administration, overhead, reserves, costs of compliance with regulations, financial costs such as depreciation, debt servicing, capital and environmental costs.

**Full cost pricing:** Covers all the costs of providing drinking water through user rates and charges, without depending on grants or general revenue from taxes.

**Full cost recovery:** Generates sufficient revenue through user rates, grants and taxes to cover the full costs of maintaining built infrastructure and providing drinking water.

**Governing body** means a council or a board, as the case may be.

**Greywater:** Refers to untreated wastewater from showers, baths and washing machines. Typically, it contains relatively few pathogens compared with 'black water', which comes from kitchen sinks and toilets. Greywater can be used for landscape irrigation and toilet flushing, which represents 30 to 40 per cent of indoor water use.

**Groundwater:** Can be found in permeable rocks known as aquifers.

**Local governments** (as defined by the *Auditor General for Local Government Act*) are municipalities, regional districts, greater boards, commissions, corporations or other organizations that are financially controlled by one or more municipalities, regional districts or greater boards and any other local body that may be prescribed by regulation at some point in the future.

**Multi-barrier approach:** Aims to reduce the risk of drinking water contamination to protect public health. Central to the multi-barrier approach is the assessment and management of risks to water safety that can be addressed at each stage in the water supply system (from the water source all the way through to the customer's tap). Barriers include source water protection, effective water treatment which can include filtration, a secure water distribution system, a pressurized water pumping system, water quality monitoring (at source, treatment plant and tap), operator training and emergency response procedures.

**Resilience:** Systems, including people, communities and ecosystems, that are prepared for and able to withstand natural and human-made catastrophic events in order to quickly respond, recover and adapt to a ‘new normal’.

**Risk assessment (for drinking water):** Identification of hazards and threats to water quality and quantity (existing and potential) throughout a local government’s services, facilities and assets. Threats can include sources of contamination, human error, technical failures and malicious acts. Local government estimates the likelihood of each threat occurring, how often it might occur and identifies possible response strategies (see risk management). Can be a formalized process (e.g., through Hazard Analysis and Critical Control Point (HACCP) or Water Safety Plan (see below) or informal conducted on an ad hoc basis.

**Risk management (for drinking water):** Decisions to identify and address the issues (control options to reduce or mitigate risk) identified in a risk assessment. Risks need to be balanced with available mitigation options that can be undertaken with available resources.

**Source to tap:** An approach in which the components of the water supply system from source protection to the treatment and distribution of drinking water to consumers are understood and managed as a whole.

**Sustainability:** Meeting current needs without compromising the ability of future generations to meet their own needs.

**Sustainable water management:** Protecting and conserving water resources and encouraging ways of living that neither deplete resources nor degrade environmental quality.

**Water abstraction:** Taking freshwater from ground or surface water sources, either permanently or temporarily and conveying it to the place of use.<sup>37</sup>

**Water conservation:** An absolute reduction in the amount of water taken from the environment.

**Water efficiency:** Using less water to accomplish a given task. Efficiency does not necessarily mean that less water is used overall. A low-flow shower head would use water more efficiently but if longer showers are taken, the same total amount of water could be used.

**Water management:** An operational approach used to inform decisions about water, which may include models, principles and information.

**Water safety plan:** A preventative risk-based approach to managing drinking water safety from catchment to consumer (source-to-tap). This approach is a formalized and routine process that identifies and plans for threats to the system, the capacity of the system to cope with threats, the ability to respond if barriers fail and measures to improve the system.

**Water security:** The capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters and for preserving ecosystems in a climate of peace and political stability.<sup>38</sup>

<sup>37</sup> Source: OECD—[www.oecd.org](http://www.oecd.org)



# APPENDIX 1: Summary table comparing characteristics of different governing bodies

CHARACTERISTICS	MUNICIPALITY	REGIONAL DISTRICT	IMPROVEMENT DISTRICT
Principal Legislation	<i>Community Charter*</i>	<i>Local Government Act</i>	<i>Local Government Act – Part 17</i>
Status	Natural person powers	Corporate body	Corporate body
Governing Body	Council	Board of Directors	Board of Trustees
How Governing Body is established	Council members are elected	Municipal directors are appointed by their municipal council and electoral area directors are elected by electoral area residents	Board members are elected by improvement district residents
Terms of office	4 years	Municipal directors—at the pleasure of Council  Electoral area directors—4 years	3 years
Governance proceedings	Council meetings	Board Meetings	Annual general meeting with the residents; board meetings throughout the year
Ability to close a meeting	<i>Community Charter, §. 90</i>	<i>Local Government Act, §. 226</i> (See <i>Community Charter, §. 90</i> )	Minister has ability to pass regulations requiring these Boards to close meeting as if pursuant <i>Community Charter, §. 90</i> ;  no such regulations in effect
Reporting to the public	Council meetings and minutes  Public notices  Annual report	Board meetings and minutes  Public notices  Annual report	Board meetings and minutes  Annual General Meeting
Subject to Freedom of Information and Protection of Privacy Act	Yes	Yes	Yes
Powers exercised	By bylaw or by resolution, depending upon the provisions of the legislation	By bylaw or by resolution, depending upon the provisions of the legislation	By bylaw or resolution, depending upon the provisions of the legislation  Most powers such as financial powers, entering into contracts, regulating distribution and use of water regulating works and services by bylaw  Some bylaws must be registered with the Inspector of Municipalities

\* The City of Vancouver, including the Vancouver Park Board, is regulated under the *Vancouver Charter*, and grants the City different powers than other communities.  
Source: City of Vancouver web contents

CHARACTERISTICS	MUNICIPALITY	REGIONAL DISTRICT	IMPROVEMENT DISTRICT
Expropriation powers	Yes	Yes	Yes
Types of applicable bylaws involved in water provision	Official Community Plans Zoning Bylaw Subdivision Servicing Bylaw Water Bylaw	Regional Growth strategy Official Community Plans Zoning Bylaw Subdivision Servicing Bylaw Local Area Service Bylaws	Limited to the purpose of incorporation
Mandatory Staff Members	Corporate Officer Finance Officer	Corporate Officer Finance Officer	Corporate Officer Finance Officer
Other Staff Members	Chief Administrative Officer Other staff members as determined necessary	Chief Administrative Officer Other staff members as determined necessary	Chief Administrative Officer Other staff members as determined necessary
Services provided	Any deemed desirable by Council Can be extended outside of the boundaries in certain circumstances	Services provided only to those municipalities and electoral areas which agree to participate in that service	Limited only to those for which improvement district was established. Usually, provision of a single service (e.g. water, fire protection, etc.)
Forms of revenue available to finance water	Property taxes Parcel taxes Local service area taxes Development cost charges Fees and charges	Local service area taxes Development cost charges	Taxes on the basis of parcels, values, or areas User Rates (tolls) and charges Connection charges
Tax Sale to recover taxes	Yes	Yes	Yes

CHARACTERISTICS	MUNICIPALITY	REGIONAL DISTRICT	IMPROVEMENT DISTRICT
Financial Backing for Loans	Get support from rest of Regional District Goes through Municipal Finance Authority	Gets support from other municipalities within the Regional District Goes through Municipal Finance Authority	Generally on its own, but Cabinet may guarantee improvement district securities under certain conditions  Can access pooled leasing and short-term investment pool services from Municipal Finance Authority
Electoral approval required for long-term borrowing	Yes	Yes	No  (However, often required as a condition of approval by the Ministry)
Insurance	Through Municipal Insurance Association	Through Municipal Insurance Association	Not through Municipal Insurance Association
Access to grant programs	Yes	Yes	No

\*If the organization is supplying potable water, it is subject to the requirements of provincial legislation

# APPENDIX 2: Cross-jurisdictional Responsibilities for Source Water Protection and Drinking Water Supply Systems

## SOURCE WATER PROTECTION

MINISTRY/AGENCY	ACTIVITY	LEGISLATION
<b>Ministry of Environment and Climate Change Strategy</b>	<b>Source Water Quality/Quantity Protection</b> <ul style="list-style-type: none"> <li>➤ Management of industrial activities and permitted waste discharges to watershed:                             <ul style="list-style-type: none"> <li>- Agriculture waste, pesticides, municipal wastewater, organic matter recycling, biosolids, landfills, pulp and paper, contaminated soil treatment, gravel pits, oil and gas processing, mining, and metal processing</li> </ul> </li> <li>➤ Ambient water quality objectives for the protection of human health</li> <li>➤ Soil quality objectives for the protection of human health—contaminated sites</li> <li>➤ Area-based planning, regulations</li> <li>➤ Water policy (legislation, regulations, operational)</li> <li>➤ Groundwater well/aquifer protection</li> </ul>	<i>Environmental Management Act</i> Municipal Wastewater Regulation Organic Matter Recycling Regulation Agricultural Waste Control Regulation Contaminated Sites Regulation Hazardous Waste Regulation <i>Integrated Pest Management Act</i> <i>Water Sustainability Act</i> <i>Water Protection Act</i> <i>Park Act</i>
<b>Ministry of Forests, Lands, Natural Resource Operations and Rural Development</b>	<ul style="list-style-type: none"> <li>➤ Forestry and logging watershed protection—runoff, roads, deforestation, turbidity and pathogens</li> <li>➤ Designates “community watersheds”</li> <li>➤ Riparian (stream edge) protection</li> <li>➤ Sets objectives and monitors ambient surface water and groundwater quality (with ENV)</li> <li>➤ Approve the design, construction of new dikes, and change of existing dikes for flood control and water storage</li> <li>➤ Licenses non-domestic groundwater use</li> <li>➤ Supports community well head protection plans</li> <li>➤ Monitors the management of flood protection works by local diking authorities</li> <li>➤ Compliance programs to address critical dike safety issues</li> <li>➤ Cumulative effects policy</li> <li>➤ Land use planning</li> <li>➤ Bulk water removal and rights</li> <li>➤ Authorizing water use and making changes in and about a stream (operations)</li> <li>➤ Water program operations</li> </ul>	<i>Forest and Range Practices Act</i> and Government Actions Regulation  <i>Ditch and Dikes Act</i>  <i>Dike Maintenance Act</i>  <i>Water Protection Act</i>  <i>Water Sustainability Act</i>

SOURCE WATER PROTECTION—CONTINUED

MINISTRY/AGENCY	ACTIVITY	LEGISLATION
<b>Ministry of Agriculture</b>	<p><b>Advice and Education</b></p> <ul style="list-style-type: none"> <li>➤ Provide advice to producers on groundwater well and land management to protect water quality</li> <li>➤ Issues management related to water contamination or potential contamination (e.g., assisting in educating farms over the Abbotsford Sumas aquifer on practices to reduce potential impacts of nitrate and pathogen contamination)</li> <li>➤ If a spill was associated with agriculture operation or was to impact an agricultural operation, would be involved as a sister agency in the emergency response and recovery</li> </ul> <p><b>Regulatory</b></p> <ul style="list-style-type: none"> <li>➤ Disposition of provincial Crown Land through sale, lease, right of way, license or occupation—deals with activities that can impact watersheds</li> </ul>	<p><i>Land Act</i></p>
<p><b>Ministry of Health</b> (Policy role)</p> <p><b>Health Authorities</b> (Operations and Compliance)</p>	<p><b>Source Water Quality Protection</b></p> <ul style="list-style-type: none"> <li>➤ Onsite sewage design standards</li> <li>➤ Point source contamination setback from water wells</li> <li>➤ Standards for treating drinking water for pathogens in surface and groundwater</li> <li>➤ Guidelines for drinking water quality from chemical, physical or microbiological contamination</li> <li>➤ Issue warnings regarding beach water quality hazard to swimmers (municipalities also have a role)</li> </ul> <p><b>Compliance and Enforcement</b></p> <ul style="list-style-type: none"> <li>➤ Water supply system permits</li> <li>➤ Prohibition against contaminating a drinking water source</li> <li>➤ Boil Water Notices and Do Not Consume Advisories</li> <li>➤ Drinking Water Protection Plans</li> <li>➤ Landlords to provide tenants with potable water</li> </ul> <p><b>Monitoring</b></p> <ul style="list-style-type: none"> <li>➤ Water system monitored by water supplier (at intake and in distribution)</li> <li>➤ Property owner responsible if issues related to building plumbing system (e.g., lead pipe)</li> </ul>	<p><i>Public Health Act</i></p> <p>Health Hazards Regulation</p> <p>Sewerage System Regulation</p> <p><i>Drinking Water Protection Act</i></p>

SOURCE WATER PROTECTION—*CONTINUED*

MINISTRY/AGENCY	ACTIVITY	LEGISLATION
<b>Oil and Gas Commission</b> (operations role)  <b>Ministry of Energy, Mines and Petroleum Resources</b> (policy role)	<b>Source Water Quality/Quantity Protection, Compliance and Enforcement</b> <ul style="list-style-type: none"> <li>➤ Management of oil and gas drilling waste, drilling fluids and produced water</li> <li>➤ Production and disposal well casing requirements to protect drinking water aquifers</li> <li>➤ Setbacks from drinking water wells</li> <li>➤ Water withdrawals licensing</li> <li>➤ Handling of fracking chemicals</li> <li>➤ Remediation and restoration</li> </ul>	<i>The Oil and Gas Activities Act (OGAA)</i>  Oil and Gas Environmental Protection Regulation  Drilling and Production Regulation
<b>Ministry of Energy, Mines and Petroleum Resources (EMPR) and Federal Government</b>	<ul style="list-style-type: none"> <li>➤ Mining and managing runoff and effluent: chemical waste discharges; selenium, arsenic, etc.</li> </ul>	<i>Mines Act</i>  Health, Safety and Reclamation Code for Mines in British Columbia
<b>British Columbia Utilities Commission regulates BC Hydro</b> (BC Hydro reports to EMPR)	<ul style="list-style-type: none"> <li>➤ Hydro Dams, reservoirs, river levels, flooding—potential mercury contamination in fish as a result of land flood</li> </ul>	<i>Water Act</i>  <i>BC Energy Act</i>  <i>Hydro and Power Authority Act</i>  <i>Utilities Commission Act</i>
<b>Ministry of Transportation and Infrastructure</b>	<ul style="list-style-type: none"> <li>➤ Development/Housing: subdivision regulation in unincorporated areas, including water services and receiving environment for sewage</li> <li>➤ Transportation/Highways—road runoff, catch basins, drainage, erosion control</li> <li>➤ Response to transportation spills</li> </ul>	Subdivision Regulation  <i>Public Works Agreement Act</i>  <i>Transportation Act</i>  <i>Transport of Dangerous Goods Act</i>
<b>Ministry of Transportation and Infrastructure, and Ministry of Municipal Affairs and Housing</b>	<ul style="list-style-type: none"> <li>➤ Development/Housing: subdivision regulation in incorporated areas, water and sewage services.</li> </ul>	<i>Local Government Act</i>  <i>Community Charter</i>
<b>Environmental Assessment Office</b> (facilitation)  <b>Ministry of Environment and Climate Change Strategy</b> (regulatory decision)	<ul style="list-style-type: none"> <li>➤ Environmental assessments of large industrial projects—risk management proposals for managing impacts to human health from changes in water quality</li> </ul>	<i>Environmental Assessment Act</i>

SOURCE WATER PROTECTION—CONTINUED

MINISTRY/AGENCY	ACTIVITY	LEGISLATION
<b>Ministry of Energy, Mines and Petroleum Resources</b>	<ul style="list-style-type: none"> <li>➤ Protects and reclaims the land and watercourses affected by mining</li> <li>➤ Monitors mining activity, aiming minimum environmental disturbance, taking into account sound engineering practice and prevailing economic conditions</li> </ul>	<p><i>Mines Act,</i></p> <p>Health, Safety and Reclamation Code for Mines in British Columbia</p>

DRINKING WATER SUPPLY SYSTEMS

MINISTRIES/AGENCIES/RELEVANT PARTIES	ROLE/ACCOUNTABILITIES
<b>Ministry of Health</b>	<p>Develops policy, legislation, and guidelines for public health risk management in collaboration with government partners, stakeholders, local government and the public. This includes:</p> <ul style="list-style-type: none"> <li>➤ <i>Drinking Water Protection Act</i></li> <li>➤ Drinking Water Protection Regulation</li> <li>➤ <i>Public Health Act</i></li> <li>➤ Sewerage System Regulation</li> <li>➤ Health Hazards Regulation</li> </ul>
<b>Provincial Health Officer (PHO)</b>	<p>Oversight and accountability role under the <i>Drinking Water Protection Act</i>. Can review decisions by Drinking Water Officers and prepares an annual report on the status of drinking water in B.C.</p>
<b>Ministry of Forests, Lands, Natural Resource Operations and Rural Development</b>	<p>Regulates privately operated water systems that service five or more persons or a corporation under the <i>Water Utility Act</i>. Operators are subject to the same duties, responsibilities and restraints that are imposed on a public utility under the <i>Utilities Commission Act</i>.</p> <p>Regulates authorizations under the <i>Water Sustainability Act</i>, including for waterworks water use purpose.</p>
<b>Ministry of Municipal Affairs and Housing</b>	<p>Oversees the local government financial and governance systems and supports local government infrastructure through the administration of capital funding programs.</p> <p>Responsible for the <i>Local Government Act</i> and the <i>Community Charter</i>.</p> <p>Responsible for subdivision regulation and land use “zoning”.</p>
<b>Health Authority</b>	<p>B.C.’s health authorities are responsible for administering the <i>Drinking Water Protection Act</i>.</p> <p>Drinking Water Officers have legislated authority to issue hazard abatement orders to protect drinking water sources if a potential health hazard is identified.</p>



DRINKING WATER SUPPLY SYSTEMS—CONTINUED

MINISTRIES/AGENCIES/RELEVANT PARTIES	ROLE/ACCOUNTABILITIES
<b>First Nations Health Authority (FNHA)</b>	<p>Supports access to safe drinking water by working in partnership with Indigenous communities.</p> <p>Environmental Health Officers work directly with communities to inspect drinking water systems, test drinking water to ensure it meets the Guidelines for Canadian Drinking Water Quality, interpretation and communication of drinking water quality results, provide guidance and recommendations about drinking water safety issues, such as drinking water advisories, review plans for improvements to systems, awareness and education on safe drinking water practices and risk prevention, and investigate waterborne illnesses.</p> <p>Also provides funding and technical support to communities for community-based drinking water monitoring programs.</p>
<b>Department of Indigenous Services Canada (DISC)</b>	<p>Provides regular operation and maintenance funding to communities yearly for their community systems and regular (every three years) inspections that are carried out to identify and fix system deficiencies.</p> <p>Also offers support through various avenues for Indigenous community drinking water systems (those with five homes or more connected to a single system), including:</p> <ul style="list-style-type: none"> <li>➤ Circuit Rider Training Program—where an experienced operator can go in to assist the First Nations operator in operating or maintaining their system, if the issue that caused the advisory is operational in nature</li> <li>➤ The Safe Water Operations Program, where we can make minor capital investments to fix a community system if small upgrades/installations are needed</li> <li>➤ The regular capital program where a larger investment may be needed to upgrade a community water system. This would then generally require feasibility and design work as the investments would be complex and would require a longer period of time to implement</li> </ul>
<b>Well Drillers and Pump Installers</b>	<p>Well drillers and pump installers must be qualified under the <i>Water Sustainability Act</i>. The Groundwater Protection Regulation outlines requirements for the safe installation and closure of a well prevention of groundwater contamination.</p>
<b>Water Supplier</b>	<p>Water suppliers are responsible for providing safe drinking water, meeting legislative requirements and notifying the public and health authorities about water quality problems or the potential for health risk.</p> <p>These operators may be local governments, private utilities, corporations, societies, co-operative associations and other forms of organization.</p>

DRINKING WATER SUPPLY SYSTEMS—CONTINUED

<b>Environmental Operators Certification Program</b>	Has established classification systems for water and waste water systems, as well as standards and processes for certifying system operators.
<b>Single-family Residences</b>	<p>A single-family residence on its own water supply system is exempt from most of the requirements of the Drinking Water Protection Act (e.g. construction and operating permits). It does, however, benefit from the parts of the act related to threats to drinking water and source water protection.</p> <p>Property owners are responsible for the safety of the water out of their taps, but are not empowered to protect their water sources unless they own the land or are responsible for activities on that land.</p>

Table Source: *Hullcar (Clcahl) Aquifer Response Plan Report (2018)*, pg 32-37

## APPENDIX 3: Water Management Resources and Strategies

Okanagan Basin Water Board (OBWB) has conducted a number of initiatives related to water conservation, drought management, sustainable water strategy, water quality improvement and public outreach

**Water Balance Model**—The City of Coquitlam provides a Water Balance Model Express online tool for homeowners to learn about options such as rain gardens, swales, cisterns and landscaping and can take an active role in supporting healthy creeks and watersheds.

### ASSET AND CAPITAL PROJECT MANAGEMENT

**Asset Management**—The Auditor General for Local Government produced an AGLG Perspectives Series booklet on Asset Management for Local Governments in 2015 to aid local governments in managing infrastructure assets.

**Leveraging Asset Management Data**—A 2018 national study from the Public Sector Digest, Canadian Water Network, Canadian Water and Wastewater Association of municipal asset management practices to identify and assess data collected by Canadian utilities on water, wastewater, and stormwater assets, and how information is used to inform operations and long-term planning decisions.

### EMERGENCY RESPONSE AND CONTINGENCY PLANNING

**Emergency response and contingency planning for small water systems**—Developed by the Health Protection Branch of the Ministry of Health in 2016, this step-by-step guide helps local governments create an emergency response and contingency plans for small water systems.

### SERVICE AGREEMENTS

**Public Private Partnership: A Guide for Local Government**—Developed by the Province of British Columbia, this resource is designed to assist local governments that are considering taking advantage of 1998 amendments to the *Municipal Act* that expanded opportunities for public private partnerships for the delivery of public facilities and services.

**Statutory Requirements for Partnering Agreements: A Municipal Guide**—Developed by the Province of British Columbia, this guide aims to assist municipal councils and staff to better understand partnering agreements by learning the principal statutory provisions governing agreements as well as various legal requirements for partnering agreements and available options.

### SOURCE WATER PROTECTION

**First Nations On-Reserve Source Water Protection Plan: Guide and Template**—a guide intended for use by community decision-makers that aims to assist First Nations in a process to manage drinking water sources and to locally take concrete actions to support human health and ensure a healthy environment for now and for future generations. This Guide recognizes the importance of taking a watershed-scale approach to protecting drinking water supplies and highlights how source water protection involves land use and other considerations that go beyond the authority of those involved in drinking water treatment and distribution.

**Resources for Water System Operators**—This government website provides a list of resources water operators can use to help develop a structured and consistent approach to evaluating drinking water risks in preparation to satisfy assessment requirements under Part 3 of the *Drinking Water Act*.

**Well Protection Toolkit**—The Province of British Columbia has developed a toolkit to help water providers develop well protection plans for community water sources and to promote good stewardship.

#### STORMWATER MANAGEMENT & RAINWATER HARVESTING

**Stormwater Planning: A Guidebook for British Columbia**—The Province of British Columbia, Ministry of Water, Land and Air Protection, developed this to provide a framework for effective stormwater management that is usable in all areas of the province and enables governments to move from planning to action.

**Stormwater Management Plan Example**—The District of Central Saanich (among others) has an integrated stormwater management plan for three important watersheds in its boundaries as well as surface water management plan bylaws.

**Homeowner’s Guide to Stormwater Management**—Metro Vancouver developed this tool to help local governments promote local efforts within their community.

**Rainwater Harvesting Rebate**—The Regional District of Nanaimo has a such a program and also offers a Rainwater Harvesting Best Practices Guidebook online.

#### WATER BYLAWS

**Groundwater Bylaws Toolkit: An Appendix to the Green Bylaws Toolkit**—This toolkit is designed to provide local governments with practical land use management tools to support the protection of groundwater resources.

#### WORKFORCE DEVELOPMENT

**Workforce Strategy**—A comprehensive strategy guided by BC Water and Wastewater Association and the Environmental Operators Certification Program over a two-year period that includes an implementation plan to address challenges outlined in the BC Water & Wastewater Sector Workforce Profile (December 2015) workforce report.

## AGLG contact information

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