

# How to Plan for Effective Water Treatment



This booklet is prepared by the Sustainable Infrastructure Society (SIS) for owners, managers and operators of community water supply systems in British Columbia. It will help you to deliver safe, secure and

sustainable water to your customers. This booklet is brief; further information can be found on the web site of the Sustainable Infrastructure Society.

To operate successfully, a community water supply system must be properly designed, capably managed, competently operated and financially secure. The operation of even a small water system can be a complex business. In fact it is easy for folks involved in running a system to become overwhelmed,

and to lose sight of the most important issues, one of which is to ensure that customers consume water that is safe to drink. This booklet is intended to help you to make rapid progress towards the provision of safe water. We have set out to ensure this booklet is concisely focussed on the topic. Other aspects of community water systems operation will be covered by further booklets in this series.

The steps outlined in this booklet help you to explore water treatment options that may be suitable for your system, their costs, and the way

you can borrow the money to pay for them. Many water systems are deterred from making progress towards safe water because of perceptions about the costs and complexity involved. The seven-step process in this booklet is designed to be straightforward to follow; it will help you access clear information, including estimates of cost, on the basis of which you can make informed decisions about water treatment. You may not need to spend much money or make significant commitments until you reach Step 7.

Some water systems face challenges in reaching agreement between owners and customers. You may be able to overcome these challenges by directly following the seven steps below. In so doing you will encourage cooperation, and show that with a clear plan to follow your water system can achieve valuable results.

## The Supply of Safe Water

All community water systems must ensure that their customers consume water which is safe to drink. For many small water systems in BC there are several options to achieve safe water:

1. Purchase drinking water from a regional water treatment plant and either build a pipeline or truck the water to customers.
2. Supply water from a groundwater source which is free of contamination, and distribute to customers through an effective distribution system.
3. Treat water from source through a centralized treatment facility and distribute to customers through an effective distribution system.
4. Deliver non-potable water to the property of each customer and provide a Point of Entry (POE) water treatment unit which is installed on the premises of each customer.

The approach best suited to a particular water system will depend on the circumstances of that system. The supply of water directly from a safe groundwater source will be covered in later publications. This booklet is concerned with Options 3 and 4 above.

## The Seven Steps

The Seven Steps to Effective Water Treatment are shown below. Work may be started on certain steps prior to completion of previous steps.

1. **Objectives:** Confirm your objectives, assemble information about your water system and provide water samples for analysis.
2. **Communications:** Talk with your Drinking Water Officer, share your plans, and engage your customers in early stage discussion.
3. **Budgeting:** Send information about your system to treatment equipment suppliers, review the cost information you receive from suppliers. Assemble cost estimates for any other capital expenditures you need to make.
4. **Feasibility:** Assess financial feasibility of the project; prepare projections of capital expenditure, operating and maintenance costs and your water pricing structure.
5. **Financing:** Apply for a loan covering the amount you need to install water treatment; provide financial information including income and expenditures and your water pricing.
6. **Approvals:** Apply for a construction permit, and any other approvals such as a tariff adjustment you may need prior to procurement of the water treatment system.
7. **Installation:** Finalize design and financing. Procure and install the water treatment equipment. Start up, commission and move into routine monitoring and sampling.

Each of these steps is outlined below.

### Step 1: Objectives

Your water system may have many objectives concerned with managerial, financial and operational issues. It pays to focus only on a limited number of objectives at any one time. Your objective statement in this case may be: *We will ensure our customers consume water that is safe to drink by the end of December 2012.* You may achieve this objective by providing centralized treatment and distributing water through an effective distribution system, or, if you are a small water system, you may achieve this objective by providing Point of Entry water treatment equipment. At this early stage you should also be aware of the regulatory requirements you must meet.

In providing safe water you will enjoy many secondary benefits. For example the value of property in your community may increase and you may become eligible for liability insurance coverage that was previously denied.

The kind of water treatment that is suitable for your system is very much dependent on the characteristics of your source water. For example water from a creek on steep terrain may contain much more sediment than water from a spring; water from a groundwater sources may have a much higher mineral content than water from an upland surface source. The suppliers of treatment equipment need to know the characteristics of your source water to determine the objectives of treatment and the kind of equipment to provide. An early step is to take water samples, following a sampling protocol, and send them to an approved testing laboratory for analysis.

## Step 2: Communications

It is very important to maintain regular contact with your Drinking Water Officer (DWO). This person is a staff member of your regional health authority; these are the folks responsible for administering the regulations covering the protection of drinking water. Explain your objectives and plans to the DWO. You should have an Operating Permit in place for your water supply system. Before you install water treatment equipment you must obtain a Construction Permit from the health authority.

To fulfill your objective you will have to spend money and ultimately your customers must pay for expenditures. It is important therefore to engage your customers at an early stage, although at this point in the process you will not be able to provide detailed information. Resources are being developed that may help you explain the true value of water to customers. Historically many water suppliers, both large and small, have undercharged for water. As a result they have insufficient money to maintain and upgrade their systems, and many suddenly find it necessary to apply substantial price increases. Avoid this trap; plan ahead and communicate the real cost of treated water!

## Step 3: Budgeting

Before you embark on changes to your water system you should know how much they will cost. This is important; the absence of cost information may often deter an organization from seriously considering important improvements. An early step in provision of safe water is to obtain treatment cost estimates from experienced suppliers. To provide an estimate a supplier must have information about your water system.

In some cases a water system may carry out other upgrading projects at the same time as water treatment is installed. In an ideal world a full water system assessment should be carried out to identify all upgrading needs before water treatment equipment is specified. For example: will your water storage reservoir meet peak demand and provide adequate chlorine contact time? A system assessment can be carried out by an experienced engineering consultant. However for some community water systems this may be too expensive. Alternatively, individuals with the water system may carry out a self-assessment. In some cases water treatment is clearly needed and should be provided even if a full assessment cannot be made at the time. Common sense will help; for example there is little point in providing centralized water treatment if water will be subsequently conveyed to consumers through a pipe network that is old and contaminated.



Point of Entry Equipment



Centralized Treatment

At this point you may need to make preliminary decisions about the kind of water treatment you will install: centralized treatment or Point of Entry (POE) treatment. If you are a small water system as defined in legislation, then you may be able to install POE. There are no hard and fast rules about which is best. Centralized treatment is typically the most economic approach when you have more than about 100 connections. In the range 50 to 100 connections the most economic approach should be determined by analysis. Below 40 connections POE may offer advantages particularly if your system has certain characteristics. It is very important to look at your water quality, and the characteristics of your system. You should seek informed advice.

**Step 4. Feasibility**

The costs of all improvements should be totalled to find out how much money your water system will need to spend. The difference

between planned expenditures and the balance of your renewal and reserve funds is the amount that may need to be borrowed.

How feasible are your planned improvements? The technical, operational and financial feasibility of water treatment improvements should be examined at this stage. Often the technical feasibility of water treatment is not in doubt; most contaminants can be removed at a reasonable cost. Is a certain form of treatment operationally feasible? The answer depends on factors such as the skills and training of your operator, the operating costs for items such as power consumption and filter replacement, and the frequency and complexity of maintenance required. Treatment equipment suppliers can advise on these issues.

The financial feasibility is typically the biggest challenge for community water supply systems. The costs of water treatment may be considered in two categories: the one-time capital costs to purchase and install the equipment, and the ongoing operation and maintenance (O&M) costs. Sometimes an approach which has a lower capital costs has a higher operational cost. To fully understand the costs of water treatment it is necessary to undertake a life-cycle cost analysis in which both capital and O&M costs are considered. This information in turn enables the water system to work out the charges for water that must be made to customers to recover the capital and O&M costs.

Like all elements of water infrastructure, at some point in the future the treatment equipment will need to be replaced. Long-term financial planning is an essential activity for all water systems, from the smallest to the largest. You will need to prepare a financial plan covering purchase of water treatment equipment, and this may provide the opportunity to also carry out asset management activities covering other infrastructure including reservoirs, pumps and pipes. You can

then prepare long-term financial plans. These in turn will help you to establish water rates and charges for today and tomorrow. A water system that does not have plans in place to fully renew its infrastructure at the appropriate time it is not operating sustainably.

### Step 5: Financing

Many community water systems will need to borrow money to install water treatment. The process of borrowing is likely to be more straightforward if the steps described above have been carefully followed and are clearly documented. In seeking a loan, a water system will need to provide information to the lending institution about its assets and liabilities, and its revenues and expenses. Other information about the water system will also be required, such as the number of connections and the characteristics of the customer base: for example, what is the ratio of year-round homeowners to vacation property users.

Some lending institutions in British Columbia are not familiar with community water supply systems and may not be sure how to proceed with negotiations. For example, when lending institutions loan money to an individual to purchase a house, they have the house as security in the event of a default. However water supply systems generally cannot offer security against a loan in the same form. Water systems do however have positive characteristics which should be emphasized: for example they have a secure revenue base and provide an essential service.

Water systems seeking a loan for capital improvements can make use of the *Access to Financing* program developed by SIS. The preliminary application form can be used to provide the basic information required by the lending institution.

### Step 6: Approvals

Certain types of water supply system must obtain approvals from government agencies in connection with financial matters. For example Improvement Districts must obtain authorization to spend money from the capital reserve fund, and water utilities must have tariff adjustments approved by government. Before installation of water treatment facilities, a construction permit from the regional health authority must be obtained. These approvals may take time to obtain, so you should start the process as part of Step 2.

At this stage also it is important to ensure that your customers have been reminded of the plans for water treatment, and provided with details. If you are using a Point of Entry treatment, then equipment will be installed on the premises of each customer. Customers must know about the equipment; for example you will need agreements in place with each customer which provide for access for purposes of maintenance and monitoring.

You may also need amendments to your Operating Permit as issued by the health authority, which may specify requirements for topics such as monitoring frequency and operator training requirements in connection with treatment.

## Step 7: Installation

The final step in the process is to specify, order and install the water treatment equipment.

The specification is a document that defines in writing the requirements that the treatment equipment must meet. The specification will describe the performance required of the treatment equipment. It should also cover details such as recognized standards with which the equipment must comply, and it may even describe the materials to be used in manufacture. The specification is one of the set of contract documents covering procurement of the equipment. The contract documents should also cover topics such as price, warranties, delivery, installation, start-up and commissioning activities. Many of these topics may have been covered in earlier steps, for example as part of the budget quotations received from experienced suppliers.

Supervision of installation should be undertaken by an experienced individual. You may require the equipment supplier to also take responsibility for installation. Alternatively a contractor with appropriate experience may undertake installation, start-up and commissioning. Ensure that your operator has received training in operation of the equipment, and where possible is involved

with the installation process. The operator should receive hands-on training from the supplier or installer at the time of start-up and commissioning.

If you are working with an engineering consultant, the consultant will typically manage the process of design and specification, and will overview procurement and commissioning. If you are working directly with an experienced supplier, the supplier may be able to provide much of the advice and services required.

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## About the Sustainable Infrastructure Society

The Sustainable Infrastructure Society (SIS) is a not-for-profit organization incorporated in British Columbia in 2005. Our mission is to deliver programs and resources to community infrastructure organizations to help them operate sustainably. We work extensively with community water supply systems (WSS), with experienced individuals in the water industry, and with government agencies. We set out to understand the needs of WSS, and to help to satisfy those needs through links with Industry Partners. These are organizations who have specialist experience in areas such as insurance, finance and water treatment. Together we customize products and services to meet the needs of WSS and to achieve economies of scale. The end results are products and services that are affordable, convenient and flexible, and which help water suppliers to deliver safe, secure and sustainable water supplies to customers.

[www.WaterBC.ca](http://www.WaterBC.ca)

Acknowledgements:  
HomePlus Products Inc.  
BI Pure Water (Canada) Inc.  
Vancity Credit Union



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### Please Note

The information presented in this document was compiled with the understanding that each user accepts full responsibility for the use and application of the document and the information it contains. This document is intended only as a general guide. It is not intended to replace the services of experienced specialists where these services are warranted by specific circumstances.

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