Guide Book:
Planning and Implementation of
"Point of Entry" and "Point of Use"
Water Treatment Systems
in British Columbia

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Note

This document and the information it contains are 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. The information presented in this document was compiled for the purposes stated in this document, and with the understanding that each user accepts full responsibility for the use and application of the document and the information it contains.

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INTRODUCTION

This publication provides a concise guide to the planning and procurement of Point of Entry and Point of Use water treatment systems by small water suppliers in British Columbia. It is intended primarily for use by the owners and operators of small water supply systems (WSS) throughout BC. In this document the abbreviation POE / POU has been used for Point of Entry / Point of Use systems.

Use of POE / POU

A POE / POU installation consists of various items of equipment, for example filters and disinfection units, which when assembled together treat the water to a desired standard. These devices are typically installed at the home or facility of the consumer. Point of Entry equipment is generally installed at the point where the water supply enters the building, and treats all the water used within the building. A Point of Use device typically treats water only at the point at which it is installed, typically at the kitchen sink.

POE/ POU technology has been in limited use for many years, primarily in individual homes and commercial facilities. However recent changes to the legislation in British Columbia may lead to increased use of POE /POU. The legislation now permits the use under certain circumstances of this technology by small community water supply systems. This Guidebook is intended for use by community water supply systems interested in the application of POE /POU technology.

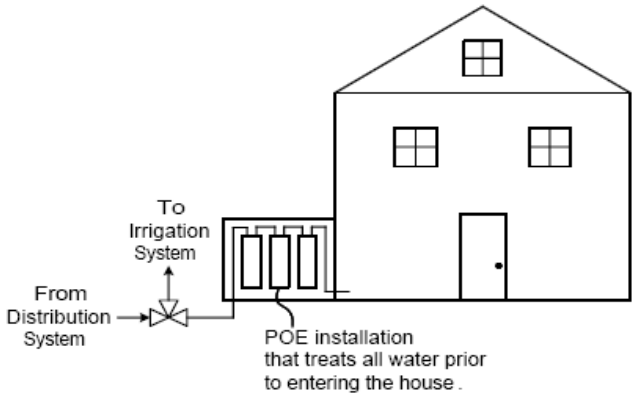
The use of POE / POU technology is seen by some as a means by which smaller community water suppliers can provide safe drinking water in an affordable manner. In some cases these suppliers believe they cannot afford centralized treatment; in other cases they are reluctant to manage the complexities associated with procuring and operating a central treatment plant. In a typical POE /POU application, the community water supply system may provide untreated water to the property of each customer and a POE / POU device installed on the premises of the customer would treat the water to a potable standard.

When POE / POU technology is used by a community water supplier in BC the equipment should be purchased, owned and maintained by the water supplier. Generally the costs are passed on to the consumer in the form of increased water charges. Interest in the use of POE/ POU technology by small community water suppliers is typically based on the supposition that it will be a less expensive option than centralized treatment. POE / POU treatment devices rely on many of the same treatment technologies that are used in

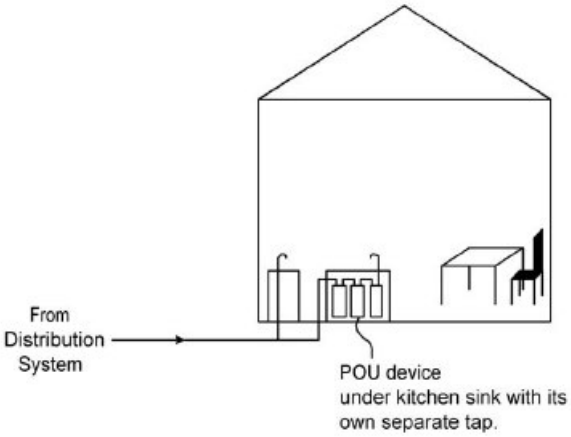
central treatment plants. While central treatment plants treat all water distributed to the consumer to the same level, POE / POU devices may be designed to treat only a portion of the total flow delivered by the water supply system.

The following definitions are used for the purposes of this Guidebook:

Point of Entry (POE): A Point of Entry device is one which is located at the point where the water supply enters the premises and treats all water entering the premises to a potable standard.



Point of Use (POU): A Point of Use device is one that is typically (but not necessarily) installed within the premises and located immediately before the point at which water is drawn for consumption, such as a kitchen tap, and which treats only water drawn at that point to potable standard.



About the Guidebook

In order to keep this Guidebook "user friendly" a great deal of detailed information, other wise necessary to obtain a complete picture of POE /POU, has been omitted. This information can be found in the documents referenced in this Guidebook. In many cases, background information, and information that does not directly apply to the steps described in this document, has been placed in the appendices.

The Seven Step Process

In this Guidebook the planning, design and installation of a typical POE /POU installation has been presented as a seven-step process[1]. This reflects a logical series of activities that can be followed by a typical small community water system when installing a POE /POU system. The seven steps are:

1. Identify Needs
2. Examine Options
3. Plan the Project
4. Assemble the Team
5. Design in Detail
6. Supply and Install
7. Commission & Operate

The extent of work involved in a given step is dependent on the nature of the water system, the availability of existing information and the experience of those involved in the process. Some steps may involve more work than do others. Although activities are presented as discrete steps, in practice, elements of one step may merge with another. An iterative process may also be followed: that is, certain steps are largely completed, parts of subsequent steps are started, and then a return is made to complete previous steps

The WorkSheets

This Guidebook is supplemented by a collection of WorkSheets. These WorkSheets are intended for use by water supply systems (WSS) when considering the use of Point of Entry or Point of Use (POE/POU) water treatment equipment. The WorkSheets help to identify water treatment needs, and to examine options for meeting those needs. The worksheets also help with subsequent steps of the process. These include planning of the project, assembling the necessary team, and procuring, installing and commissioning the treatment system. The Worksheets are generally completed by selecting from multiple choices or entering concise information. The worksheets are divided into seven sections corresponding to the Seven Step Process.

[1] Under license from PLANthenBUY™

Long-Term Planning

Before you embark on a POE / POU treatment project, or upon any other project involving you water system, it is important to have a long-term or strategic plan in place. To help create a strategic plan you should develop a vision of your water system over the long term. With that vision in place, you can develop major objectives to help progress towards the vision. Those objectives may cover topics of major importance, for example your source of water, the ways you will assure continuing financial viability, and the needs for overall system upgrading.

Within the context of your strategic plan, you can review in more detail such issues as your needs for improved water treatment, both in the near term and long term. As a result of this process you may conclude that POE / POU water treatment appears to be a viable option for your system. If so, you can examine POE/ POU further with the help of this Guidebook.

Other Issues

As you read through this Guidebook it will become apparent that procuring a new treatment system involves a range of skills. You may want to appoint several people from your water system to make up an interim project team. For example, you may appoint one person as initial project manager, one person for community liaison, one person to overview financial aspects, and one person to learn about technical aspects. It is helpful if all these people look through this Guidebook.

This Guidebook will be supplemented by new sections in the web site of the Sustainable Infrastructure Society. The web site will facilitate access to context-specific information concerning POE / POU. It will also include electronic versions of the Worksheets described above. These will help you with project planning, and technical, financial and operational assessments.

In parallel with circulation of the first edition of this Guidebook, POE / POU pilot projects will be carried out in various communities in BC. The results of these pilot projects will be incorporated in subsequent editions of this Guidebook.

The preparation this Guidebook was sponsored by the BC Ministry of Health as part of the initiatives under the Action Plan for Safe Drinking Water in British Columbia.

STEP 1: IDENTIFY NEEDS

Point of Entry and Point of Use (POE /POU) water treatment systems are of primary interest to small water systems; those generally having less than about 100 connections. These systems are often interested in POE / POU because they need to provide improved water treatment system at an affordable cost, and they believe that POE / POU will meet requirements.

This Guidebook describes a seven step process that can be followed by community water supply organizations, who need improved treatment, and who wish to procure, install and operate a POE/POU system. Step 1 of the process is about clear articulation of the need for improved water treatment.

As a small water system owner or operator you may be interested in POE /POU technology because water quality problems are occurring and you hope this technology will provide an affordable solution to the problem. In Step 1 it is important to clearly articulate the nature of your water treatment needs, and to avoid jumping to conclusions about the most suitable solution at this stage.

The processes to be undertaken in Step 1 will help you to gather information and to articulate your needs. A range of information is required in order to effectively assess your needs, to fully describe your system, and to assist development of an effective solution to the needs. Certain information gathered in Step 1 will be used, as the process proceeds through subsequent steps, by suppliers, regulators, customers and others.

1.1 Information Collection

A thorough collection of information in Step 1 is a prerequisite to effective implementation of the seven-step process. The WorkSheets which complement this Guidebook should be used to their full extent. Not only is this a useful way for you to document your system, but you can also send certain worksheets to suppliers or other specialists (see Step 2) to assist them in providing you with technical assistance. They will be able to work most efficiently if they receive complete information in a standard format.

1.2 Clarify Needs

It is important for you to be clear about why you are considering improved water treatment. Your reasons for initiating the project may include:

1. **The need to comply with legislation and regulations**

   The BC Drinking Water Protection Act and Regulation creates the regulatory context within which drinking water systems are regulated. A brief summary of elements of the legislation is given in the appendices. The permits issued to you under the Act and Regulation will govern the nature of the water treatment you should provide.

2. **The desire to employ best practices**

   As the owner or operator of a water supply system you have a duty of care to your customers. You are expected to operate diligently and to do all that is reasonably expected to ensure your consumers do not consume water that is unsafe. You should demonstrate that you are following good practices in the operation of your system.

3. **Addressing liability concerns**

   Even though you do your best to follow good practice, problems with your system may occur. To protect against this possibility most water supply systems carry liability insurance. Many insurers will provide a discount to the premium payable to water suppliers who demonstrate good practices, such as improved water treatment.

   For more information about liability insurance for community water systems see: www.SustainIS.Org

You should identify the needs you wish to satisfy with your new treatment system. There are several reasons why a community water supply organization may wish to improve the quality of water provided to customers. At the start of a project the reasons for the project may be clear to the initiators. As the project progresses, however, more people become involved, the project becomes more complex and the original reasons for beginning the work may no longer be clear to many of the people involved.

A formal statement made at an early stage about why the project is being undertaken will add clarity for both the initial team members and others who may become involved with the project later on. The statement will also be helpful to many others who may be involved with the project but do not have the detailed knowledge of those responsible for project initiation. For example, the technology suppliers, consultants and regulators you may encounter during this process, as well as your customers, will want to see a clear

statement of your objectives. The WorkSheets will help you clarify the objectives you want to achieve.

STEP 2: EXAMINE OPTIONS

In the previous step you assembled information about your system. You also outlined the needs you would like to address in response to your water quality problems. In this step you will review the options for meeting those needs, for example centralized treatment or POE treatment.

2.1 Initial Activities

Before you consider in detail the options for meeting your needs, you should undertake certain initial activities.

- Think about the resources you will use in carrying out the project; and,
- Begin a dialogue with your local Drinking Water Officer.

Resources to be Used

The selection, installation and operation of a POE / POU system will involve a variety of technical, financial and managerial issues. This can be a challenging task. As a result you should carefully choose the resources you will employ. These resources may include:

1. Using in-house expertise.
2. Working with experienced suppliers.
3. Engaging an experienced consultant.
4. Using a combination of the options above.

Information is provided in the appendices which will help you choose which approach to use. Use of the WorkSheets in conjunction with Appendix 2A will help you make this decision. You should make a decision about the resources you will use before you make firm commitments.

Contact with the Drinking Water Officer

An operating permit issued by your local Drinking Water Officer (DWO) is required for your water system. (See http://www.health.gov.bc.ca/protect/pdf/dw_ha_contacts.pdf)

Amendment to the Regulation

The amended BC Drinking Water Protection regulation (DWPR s. 3.1) states that a small system is exempt from section 6 of the Drinking Water Protection Act if each recipient of the water from the system has a point of entry or point of use treatment system that makes the water potable. By being exempt from section 6 of the Act in this way, the water purveyor is no longer required to provide water that is potable before it reaches the consumer's home.

The Drinking Water Officer is a member of staff of your Regional Health Authority and has an essential role to play in the protection of drinking water. You should contact the DWO responsible for your area at an early stage in the planning of a POE / POU system. After initial discussion the DWO may ask you to provide initial information about your system and your plans. This information may include the following:

1. An analysis of certain parameters within the source water
2. A description of the water source, including type and location.
3. Location and layout plan of the water system.
4. Initial description of proposed POE / POU installation.
5. Proposals for field testing and /or engineering review (if applicable).
6. Preliminary implementation timetable.
7. A covering letter which summarizes your preliminary plans and refers to the items listed above.

Field testing

Field testing is a term used to describe the installation of a limited number of treatment units on site under actual field conditions. In this way the effective operation of the treatment units can be verified under the conditions actually encountered within your water system, and prior to full installation of treatment equipment.

After working through the elements of Step 2, you should be in a position to provide the information described above. Additional information may also be requested by the DWO. Any new information that you acquire during the process of evaluating options should be forwarded to your DWO.

2.2 Examining Your Options

Once you have confirmed that you have a need to respond to water quality problems in an affordable manner, you should examine your options. Options may fall into several categories, including:

1. Advising all residents to boil water or take other individual precautions necessary under the circumstances.
2. Changing your water source.
3. Installing a centralized water treatment system
4. Installing a POE or POU treatment system.
5. Installing a system that combines features of 2) and 3) above.

Each of these options is outlined briefly in the following sections. The Worksheets will help you make a preliminary assessment of each of these options. As you work through

the process you will be able to refine your assessment as more information becomes available.

Option 1: Advise customers to take individual action

Some water suppliers who have water quality problems have chosen to rely solely on advising customers to boil their water. In general this is not a good long-term strategy. You may be advised to consider some form of collective action to enhance the quality of your drinking water, and to consider the other options outlined below.

Option 2: Change the water source

If you are confident that your water quality problems originate at your existing intake or well, you may consider obtaining water from another source. This may be a convenient solution. Typically however, this involves the construction of new wells or intake works and possibly the relocation of water mains and other parts of the system.

Option 3: Install a centralized water treatment system

Most water quality problems can be solved by the installation of appropriate technology. The drawback for many small systems however may be the cost and complexity of the technology involved in a centralized treatment plant.

Option 4: Install a POE/ POU system

A POE / POU water treatment system is designed to treat specific water quality problems, and is installed on the property of individual customers. The POE / POU installations may only be required in parts of the system in which potable water is required, such as individual homes. Water used for other purposes such as farm irrigation may not need treatment; the installation of a POE /POU system may mean you would avoid the cost of treating this water.

Option 5: Install a combined system

In some circumstances a combined system may be appropriate. In this type of system certain contaminants are removed by centralized treatment and others are removed near the point of consumption by a POE / POU installation. For example some water systems may have an interest in removing the by-products of chlorination before water is consumed. In this case chlorination might be provided at a centralized treatment facility, and by-products removed in individual homes using Point of Use treatment equipment.

After completing the Worksheet concerned with the initial screening of options, you will have identified the options that should be considered further. If you have identified

Options 4 or 5 for further consideration, then you should continue to use this Guidebook. If not, then you should refer to other sources of guidance in meeting your needs.

2.2 Comparison of Remaining Options

If Option 4 or Option 5 are included in the options you have selected for further consideration then you should continue with this Guidebook. These two options involve the use of POE / POU technology.

Your task is to make a selection between your remaining options. To do that, you require further information about each of these remaining options. The information you should consider falls into several categories, as shown in text box #1.

As you see, some of the information you require to compare options requires specialist knowledge. Much of the data about equipment and systems originates with the manufacturers and suppliers. Providing they have details about your system and the needs you have, they can provide a lot of useful information. Specialist consultants may also be able to assist.

TB1. Comparing the options

When making comparison of options consider these characteristics:

- **Need**
- **Costs**
- **Financing**
- **Performance**
- **Physical characteristics**
- **Installation and commissioning**
- **Operation and Maintenance**
- **Customer acceptance**
- **Approvals.**

(As you work through the remainder of Step 2 you may come to see that options other than POE / POU technology may be appropriate. In this case you are advised to refer to other information sources as well as the material referenced in this Guidebook).

The Worksheets will help you to obtain information from suppliers of POE/POU systems, which you can use to compare the remaining options. Before you use the Worksheets you should review the sections below. These sections provide more information about each of the characteristics listed in the textbox above. When completing the Worksheets, be sure to be as thorough as possible as you may be providing information to people who have no previous knowledge of your specific system. The better the information provided, the more useful the information you will receive in return. Suppliers need a range of information about your system before they can provide you with an outline of equipment, budget costs, and other details.

Life Cycle Cost:

Note that comparing the capital and operating costs of each option is not necessarily a straightforward process. Options may vary greatly in characteristics and performance. Some will have a higher capital cost but a lower operating cost than will others. Options may also have varying life expectancies. You should compare the life cycle costs of each option. This is typically done using a life cycle cost analysis. The WorkSheets will help you to undertake this analysis once information is received from suppliers. You can also use web based tools.

Characteristics of Each Option

In making comparisons between options, you should consider thoroughly the following characteristics of each option. Use the worksheets to help with this process.

- **Need**: How capable is the option of meeting the need you identified in Step 1. How well will the option treat the contaminants of concern?

- **Costs**: You need an estimate of the capital and operating costs of each option. You should ask suppliers for this information, and you use it in building a budget for your project. The information provided by suppliers may be modified at a later stage in the project, perhaps because requirements are altered or costs change.

- **Financing:** How easy will it be for you to finance each option? Where and how will you obtain financing? What kind of process and time-frame is involved? Is collateral required for the loan? Can you pay for capital costs with existing reserves? Your financing costs will be influenced by the capital cost of the option and its useful life, and the amortization characteristics. Certain kinds of funding assistance may require you to work with your regional district. Their views may influence your selection of treatment options.

- **Performance:** How capable is each option of reliably providing the performance you require? You might for example require the option to be capable of removing a certain percentage of a contaminant, or to reduce the contaminant level to less than a stated concentration. Is the option capable of providing this performance? What guarantees of performance should be established with the supplier?

There are several technical and financial issues to consider when examining POE / POU systems. The appendices help outlines these issues. Appendix 2C is one of the larger appendices to this Guidebook, and will appeal to readers with an interest in technical issues.

- **Physical characteristics:** what is the size of the equipment, does it make a noise, what power requirements does it have? You will want visualize the appearance of the system, know the important dimensions of the equipment, ensure you can provide appropriate power requirements and anticipate the environmental impacts such as noise or odour that may result from the operation of the system.

- **Installation and commissioning:** what is involved in the installation and commissioning of each of the options? Is installation easy and quick, or complicated and lengthy? How will it impact your customers? How will you know the system is working as it should, once installation is complete?

- **Operation and Maintenance:** what are the operating and maintenance requirements of each option? Does the system require frequent operator attendance? Can it be remotely operated? Will the homeowner be involved in any aspect of operation? What maintenance tasks are necessary and how frequently

are they required? Does the equipment include fail-safe mechanisms and can it trip an alarm when problems occur.

- **Customer acceptance:** how will your customers respond to each of the options? In systems with a centralized treatment plant, most customers are quite unaware of the nature or complexity of treatment plant operation. A POE/ POU system on the other hand, is located on the premises of customers and they will need knowledge of its location and function.

- **Approvals:** You will need to obtain the approval of your local drinking water officer for any treatment system you install. You may also find that there are other regulatory approvals required, whether you use centralized or POE/ POU treatment. You should consult with approving agencies and your drinking water officer well before you make a firm selection of treatment approach. Regulators who have been informed of plans, and whose opinions are taken into account, are likely to be more cooperative than those who are only told of proposals when planning is well underway.

2.4 Working with Suppliers

You can obtain information about available technology by contacting several suppliers. They should have information about their product and services in various forms, which may include brochures, catalogues, and on web sites. They can also provide you with information about technical operation, a "budget quotation" covering the capital costs of the equipment, estimated operating costs, and other details in response to specific enquiries from you. You will exchange information with suppliers most efficiently if an organized and systematic approach is used. The Worksheets will assist you in providing information to suppliers; they will help you to organize the information in an understandable and comprehensive fashion, minimizing the chance of omitting important details.

You may wish to ask the supplier for supplemental information such as replacement part costs and references from previous customers. You may also ask for estimates of operating and maintenance costs so that a life cycle cost comparisons can be made between options. An estimate of the complete life cycle cost of each option is important in determining the most viable option for your given situation. Life cycle costs are explained further in other sections of this Guidebook.

It is important to note that in Step 2 you are simply obtaining information from suppliers and not requesting a formal tender or proposal for supply of equipment or services. The

tender process or a formal request for proposal comes at a later step, once you have made decisions about which options are suitable for you, and after you have prepared formal contract documents.

If you obtain information from suppliers in Step 2 you are not precluded from using the services of an experienced consultant in later stages of the process. It is advisable however to make decision about the use of consultants at an early stage in the process. (See Appendices) .You may choose to inform suppliers about your plans to engage a consultant because this may influence the way they respond to your request for information.

Using the Design Build Approach

You may choose to use the Design build approach for your project. Design-Build is a method of project delivery in which one organization (the design-builder) enters into a single contract with the Owner (in this case your water supply organization) to provide for engineering design services, equipment supply and installation services. If you choose to use the Design Build approach you may want to employ the Design Build framework outlined in this Guidebook. The greater part of Step 4 of this Guidebook is based on use of the Design Build approach to the procurement of POE / POU systems, and Design Build is explained further in Step 4.

One of the initial stages in the Design Build approach is to contact suppliers and ask them for an expression of interest in working on you project. You send them information about your project. You also ask them for an outline of the ways in which they can help to meet you needs, and for certain specific information about their products and services. This initial package of information that you send to suppliers, together with an invitation to them to respond with specific details, is termed a Request for Submissions (RFS) in this Guidebook. It is your request to them to provide you with certain information about their products and services, and to confirm their interest in your project. You ask for information that will help you to choose between the options being considered in Step 2. In issuing the RFS you also include a request for the budget quotation that was mentioned in earlier sections of Step 2. The budget quotation may be used by you in Step 3, when you plan your project in detail.

A framework for the preparation of a Request for Submissions is provided in Appendix A2.3. The Worksheets will help you to prepare an RFS based on this framework. The next stages in using the Design Build approach, in which you prepare a full Request for Proposals (RFP) prior to selecting a supplier, are described in Step 4.

2.5 Applicability of POE / POU Technologies

In Step 2 you are concerned with making a choice between several options for meeting your needs. These options may include POE / POU technology. You will not need to examine the technical aspects of POE / POU technology in great detail until you have decided that a POE / POU system is your preferred option. In this Guidebook we have provided information that enables you to make a preliminary review of technical aspects of POE / POU technology.

In the appendices you will find tables that show the contaminants that may be treated by various forms of POE / POU technology. These tables will help you gauge the way in which POE / POU systems may help you solve the problems you articulated in Step 1. You should be aware that the presence of certain contaminants in your source water or distribution network can interfere with the operation of certain POE /POU treatment technologies. For example the presence of copper, if you are using ion exchange technology, may cause fouling of treatment equipment components. A table in the appendices provides more information on the effects of certain contaminants on the commonly used POE /POU technologies.

In the appendices you will also find an overview of the costs and impacts of various POE /POU technologies. This table shows generalized characteristics only of the technologies listed.

The information in the appendices may help narrow your list of acceptable POE /POU technologies. You can examine the preferred technologies in more detail at a later stage. The information provided may save you from contacting a large number of suppliers covering a wide range of technologies. Remember that the information in the appendices is generalized. If you are uncertain about the applicability of a particular technology, then you should seek experienced advice.

Consider these things:

- Provincial and Local regulations
- Need for continuing field testing
- Number of taps to treat
- Response of consumers
- Disinfection and HPC monitoring
- Warning and shut-off devices
- Equipment certification
- Access to the equipment
- Disposal of waste streams
- Monitoring and maintenance
- Reporting, record keeping and compliance
- Operator training and certification issues
- Local plumbing and electrical codes.

2.6 Implementation Considerations

The implementation aspects of POE / POU systems should be considered before final selection of the treatment approach is made. These implementation considerations are matters that are typically examined in detail once the decision has been made to proceed with POE / POU. On occasion however, some of these considerations may have significant influence on the success or failure of the POE /

POU installation. It is important to undertake an initial review of these considerations in Step 2. If you think one or more of the considerations may present problems, examine it in detail before going further in the selection process. You can see from the considerations listed opposite that there are many aspects to think about. Many water suppliers seek specialist assistance in addressing these topics.

More detailed information about these implementation considerations is given in the appendices.

2.6 Choosing Between Options

Use of the Worksheets may help you to discount certain options and to select a preferred option. Other worksheets will help you in obtaining information from suppliers about certain treatment technologies. You may also collect information and comments from other organizations and individuals. Your final task in Step 2 is to review all information, and use it to help select your preferred option. The WorkSheets will help you through this process.

Remember that in this step, you are not making a choice between individual suppliers. Rather, you are making a choice between several broad options. For example you may now be at the point where you have discarded *"Option 1: Advise all residents to boil water …"* and *"Option 2: Change the water source"*. You may be left with a choice between *"Option 3: Install a centralized water treatment system"*, "*Option 4: Install a POE or POU treatment system"*, and *"Option 5: Install a combined system"*.

Employing Specialists

You may find that despite the work you have done you still are not able to make a clear choice between options. If this is the case it may be the time to employ specialists to help you make further progress. If you employ specialists at this stage, the work you have done so far will be of great help to them. It should mean that you have a clear articulation of your needs. It means also that the specialists will not need to assemble the range of information you have already gathered. This may save them time and your bill for services should be lower.

Continue with this Guidebook?

If you have completed the worksheets for Step 1 and Step 2, you may now have a sense of which option is appropriate for your system. If *Option 3: Install a POE /POU system*, or *Option 4: Install a combined system*, are your selected options you should continue to work through this Guidebook. If you have selected Option 1 or Option 2, you should seek guidance from sources other than this Guidebook.

STEP 3: PLAN THE PROJECT

In Step 1 you identified the water treatment needs of your water supply system. In Step 2 you identified the options available for meeting those needs, and made a selection of the preferred options. The work undertaken in Step 1 and Step 2 will help you to identify the main elements of a project to install a POE /POU water treatment system. If the results of Step 1 and Step 2 are positive you are now ready to start planning the project in some detail, and to produce a written project plan.

When you plan the project you should consider the scope of the works, the budget, the financing, the schedule, the people involved, the need for communications, and the end products. All these aspects should be discussed by the planning group and the results used to create a written project plan. The project plan does not have to be lengthy or elaborate. It must however cover the important elements of the project. The worksheets will help you in preparing the project plan.

The project plan is a document which you will refer to as the project proceeds. It is a document that will also be referenced by others. For example, it may be used by a consultant engaged for system design, the lending institutions you approach for funding, the customers you serve, and the regulatory agencies you must deal with to gain approval for your proposals

Planning the project
Planning the project is not the same as designing the treatment installation. Designing the treatment plant installation is an engineering activity that involves the preparation of plans and specification, and should be undertaken by individuals experienced in engineering design. On the other hand, the project planning involves thought and discussion about the bigger picture. It leads to a document, the project plan, which is much broader in scope than the technical documents, and which communicates the big picture to a broad audience.

3.1 Elements of the Project Plan

The elements of a typical project plan are as follows:

- Purpose & objectives
- Project sponsor and project team
- Scope
- Schedule
- Budget
- Deliverables
- Public communications
- Financing.

Each of these elements is outlined in the following sections.

Importance of the Project Plan

Preparing the project plan is a very important part of your project, but one that is often neglected. A project plan provides added structure to help you complete your project on time, on budget and within scope. It also facilitates the receipt of support from customers and regulators. The project planning process begins by assembling your interim project team and reading through this Guidebook.

You may want to undertake project planning in two phases. The first phase is less formal and encompasses Step 1 and Step 2 in this Guidebook: you may want to assemble your interim project team for these steps. At the end of Step 2 you will have a clear sense of the direction of your project. At that point, if your project is to proceed, you should formally confirm the membership of your project team, and prepare the written project plan as described in this Guidebook. Discuss your project thoroughly within your project team, and continue completing the worksheets provided with this Guidebook.

3.2 Purpose & Objectives of Project

At the beginning of the project plan document, you should clearly state the purpose of the project. An example could be, *"To procure, install operate and maintain a point of entry water treatment system that will enable us to comply with the water quality requirements of Western Health Authority"*.

You should also include the objectives in your plan that support the purpose of the project. If possible make them quantifiable. Examples include:

- *"To install our POE system and to have it fully functional by 1st March 2008"*.
- *"To select a system that will have an annual cost to our residential customers of no more than $xxxx"*.

With a clear statement of purpose and quantifiable objectives you will find it easier to maintain focus and to communicate your intention to customers and others. The WorkSheets will help you to articulate your purpose and objectives.

3.3 Project Sponsor & Project Team

The project sponsor and the project team should be identified at an early stage in the project. These are the key individuals who will move the project forward to successful completion. The Worksheets will help you to identify and describe these key individuals.

Sponsor: This is the individual or group that sponsors the project by providing the authority and the money for the project. The sponsor may be a board of

trustees, Board of Directors, a group of residents, or the individual or corporate owner of the water system.

Your project team is made up of the individuals who will play important roles in your project. These include:

Project Manager: This is the individual who manages the project. This person will report to the sponsor, and is responsible for securing the agreement of the sponsor to the main elements of the project including scope, budget, and schedule. The project manager should ensure adequate communications about the project occur with all interested parties, including the drinking water officer. He or she has the responsibility for managing the project resources including personnel and finances, to ensure a successful outcome, and has the authority to guide the other members of the team to get the job done.

Technical Advisor: This person is responsible for providing the technical advice, on the basis of which the treatment option is selected, and drawings and specification are prepared. This person also typically reviews the installation, commissioning and start-up of the system. This person may be a member of the community (provided this individual has the appropriate qualifications), an experienced supplier working under the terms of a well-drafted contract, or a specialist consultant employed for the project.

Community Representative: You may want to include a community representative as part of your project team. This person should support the purpose and objectives of your project. He or she should also be someone who is regarded by the majority of consumers as a fair and informed representative of the community. The community representative has a particularly important role to play. He or she should confirm the information that the community will require about the project, facilitate the communication with the community and propose the frequency and manner in which that information will be provided to the community.

3.4 Project Scope

As part of the project planning you need to define the scope of the project. You should identify the elements that are included in the project, and the things that are not. For example, if you are installing a point of entry system, you may also with to think about upgrading your water intake at the same time. Will you combine the point of entry installation with the intake upgrading all in one project, or will you regard them as separate projects, perhaps using different project managers, and financing them in different ways? Both approaches are valid. It is, however, important to decide at an early stage whether these activities are to be separate, or both are to be part of one project.

This Guidebook identifies seven steps involved in the installation of a water treatment system. You may define your project scope as including all the work involved in moving from Step 1 through to Step 7. On the other hand, you could decide to undertake a project involving only Step 1 and Step 2. You might say that these first two steps will be undertaken as a distinct project in the current budget year, and the remaining steps deferred until the following budget year, as part of a second project, separate from the first. This also is a valid approach.

You can see that there is a lot of flexibility in the way in which you define a project. Your project scope can encompass a wide range of activities, or a narrow range. It can include all steps to implement a strategy for improved treatment, or it might encompass only a few. The important point is that you are clear on what is within the project scope, and what is beyond the scope. The project sponsors and the project manager must have a clear meeting of the minds on this point. The project plan should include a written project scope and will greatly assist communication on this important point.

3.5 Project Schedule

The project schedule outlines when you can expect important elements of the project to be begin and to be completed. In its simplest form it may simply list the principal tasks, together with start and end dates for each. In practice most complicated projects, including engineering projects involving planning, financing, design, installation and commissioning, require a more comprehensive schedule which may be broken down and linked into sub-schedules for each of the aspects mentioned.

Preparing a schedule is not difficult if you have the right tools and access to information. You can use a spreadsheet program such as Excel to document you project schedule. You may break your project into the main steps, and certain steps in turn into several tasks.

Installing a treatment system is a relatively complicated project. You may want to define the steps of the project as being the Seven Steps outlined in this Guidebook. Each step in turn may be broken into several tasks. You will need to refer to specialists and other individuals to obtain certain information to complete your schedule. For example you should contact suppliers to find out how long after confirmation of order it would take to have a water treatment system delivered to site, and how long you should allow for installation.

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3.6 Project Budget

The project budget is one of the most important elements of the project plan. Many projects go astray because an accurate budget was not prepared, or because the accumulated costs of the project were not regularly compared against the budget. Preparing the project budget can be challenging, and is a task avoided by many people who feel they do not have the knowledge or experience to do the job properly. With the right tools and access to resources, the preparation of a budget can be a straightforward task. This Guidebook and the associated tools, reduce the task of budget preparation to a series of easily understood and systematic steps.

A project budget is derived from an estimate of the costs of the project. You first estimate the costs of each component of the project. You then add these components to get the total estimated cost. This total estimated cost is presented to the project sponsor. The project sponsor may then accept this estimate and authorize the project to proceed based on the estimated costs. You now have the project budget. As the project proceeds you may find that actual expenditures are greater or lesser than the budgeted amounts. You should have an agreement in place with the project sponsor, so that the sponsor is informed of significant departures of actual expenditures from budgeted expenditures, and can authorize departures from the approved project budget if required.

Budget Quotations

Equipment suppliers are generally experienced in supplying "budget quotations" to prospective purchasers. A budget quotation is a quotation covering supply of equipment or possibly both supply and installation of equipment. The supplier provides the quotation to you so that you have information required to prepare a budget. The budget quotation is not a formal tender for supply of the equipment. You may find that for various reasons the amount shown in a formal tender differs from the amount of the budget quotation provided earlier by the same supplier. This sometimes happens because circumstances change between provision of the budget quotation and the formal tender.

To prepare a project budget, first think through the steps you will follow and then identify the individual task involved in each step. To a large extent you will already have done this in preparing the project schedule. In fact in some organizations, the same worksheet is used to depict both the project schedule and the project budget, because the same breakdown of task is used for both purposes. Typical task might include: *"Prepare drawings and specifications"* or *"Develop and deliver public information program"*. One of the most difficult parts of the budget to estimate the costs to supply and install the equipment you need to meet your needs. The best sources of this information are equipment suppliers and consultants. You may also find that neighboring jurisdictions that have been through a similar process and have current cost information available which they can share with you.

Worksheets accompanying this Guidebook will help you prepare a project budget. The web based version of the Guidebook will also include Worksheets which are linked to SIS Industry Partners. These are suppliers who have agreed to provide current budget

quotations and comply with a code of practice which requires adherence to standards of business practice. This makes your budgeting easier to do.

3.7 Project Deliverables

Deliverables are the tangible end products of your project. If you are installing a new water treatment system the deliverables include all the equipment, the pipes, pumps, fitting and components that make up the system. Deliverables also include less obvious, things including documents such as the operating manuals, the operating permit from the regulators, and legal agreements with individual customers.

In planning a complex project it sometimes happens that those involved lose sight of the actual deliverables such as pipes and pumps, manuals and written agreements that remain in place long after the project discussions, the community meetings, the telephone conversation and email exchanges have disappeared. It helps to focus on the real purpose of the project if you create a list of deliverables at an early stage. What do you expect to end up with after the dust has settled? Once you have that list of deliverables, and the individuals who will deliver them, the people involved in the project, the suppliers, consultants, regulators, financiers and customers, all have a better picture of what the project is about and the part they are to play. The WorkSheets include a checklist which will help you to identify the project deliverables you expect at the end of the day.

It is important to keep well organized project records, including for example, notes on meetings at which important decisions are made. These records in themselves are part of the project deliverables.

3.8 Public Communications

Your water treatment project might have been initiated for several reasons, one of the most important of which is to provide safe wholesome water to your customers. You are providing an essential service to people in your community. Clearly they will have an interest in the ways and means by which the project will be undertaken, and how it will affect them as individuals.

An organized program of public involvement and communications is an essential part of your project. This is particularly the case when a project involves equipment which is installed on the premises of individual customers. It is very important to communicate to customers the nature of the installation, the way it will operate, its appearance, the responsibilities they will have, its cost and reliability, and several other important issues.

The WorkSheets will help you identify of items that should be covered in your public communications program.

The community representative(s) on your project team have important roles to play. They are able to represent the community during the project planning process and can ensure that concerns of community members are fully addressed. If you do not receive a high degree of support and cooperation from your community members your project is unlikely to succeed. The Drinking Water Officer will expect to see agreements in place with all your customers, under which they all agree to the installation of a POE / POU treatment on their premises. The agreements should also confirm that each individual POE / POU treatment system is owned and maintained by you as the water supplier, and that you have rights of access to the POE/ POU system.

3.9 Project Financing

One of the most important elements of your project is the financing arrangement that you use for the Point of Entry / Point of Use treatment system. In previous steps you obtained budget quotations for supply and installation of the system from suppliers. You also have estimates of the cost of other elements of the project such as the use of specialist consultants. All costs are added together to give the total project budget. You now have the information that will allow you to approach the organizations that may be able to help in financing your purchase.

Certain forms of water supply organization, for example improvement districts, are subject to limitations on the way in which they may raise funds. You should check with your legal and financial advisors at an early stage to determine whether there are any constraints to consider in investigating your financing options.

Access to Loans

At the time of writing the SIS is negotiating with lending institutions to improve access to loans for community water suppliers. To obtain current information please go to www.SustainIS.org

Adjusting Your Water Rates

In order to raise sufficient funds you may have to increase revenues, and therefore review the rates and taxes charged to customers. The cost of water in British Columbia is typically lower than in other parts of Canada. In general the cost of water in Canada is much lower than in many other parts of the world. You may have room therefore to adjust your rates and to build the necessary revenues to pay for the treatment system. Adjusting rates and taxes can be a challenging process. You may require experienced assistance. The appendices provide information about resources that are available to help.

Further Information

In the Appendices you will find information on the following financing options:

- Purchasing using your existing funds
- Using a loan or through issue of equity
- Obtaining a grant from government
- Leasing the equipment.

3.10 Next Steps

As you proceed through preparation of the project plan in Step 3 and subsequent steps you will gather more and more information about many aspects of the project. This information will allow you to confirm the feasibility of the project and assemble the necessary resources to complete the project.

STEP 4: ASSEMBLE THE TEAM

In previous steps you assembled your in-house project management group. In this step you complete the full team by appointing a contractor to supply and install your water treatment system. There are several methods commonly used for the selection and appointment of a contractor and the full delivery of engineering and building projects. These may be summarized as:

- Design, Bid, Build
- Construction Management
- Design Build.

The method that is most appropriate for a given project is influenced by the characteristics of the project and any organizational constraints that may apply to the procurement process. For example in certain public sector organizations the competitive Design, Bid Build may be the only method permissible.

Certain characteristics of POE /POU projects make appropriate the use of the Design Build approach in many circumstances. When appropriately used, this method provides the opportunity for an effective project at an affordable price. The greater part of Step 4 of this Guidebook is based on use of the Design Build approach to the procurement of POE / POU systems.

4.1 Introduction to Design Build

Design-Build is a method of project delivery in which one organization (the design-builder) enters into a single contract with the Owner to provide for engineering design services, equipment supply and installation services. This contrasts with the "traditional" design-bid-build approach, in which the Owner commissions an engineer to prepare drawings and specifications under a design contract, and subsequently selects a construction contractor by competitive bidding or negotiation to build the facility under a construction contract. Several factors have led to an increasing interest in the design build approach, one of which is interest in saving time and money by using a

Conventional Design-Build

A conventional design-build project includes the following stages:

1. Strategic facility planning
2. Program definition.
3. Request for Qualifications (RFQ)
4. Qualifications statements
5. Request for Proposals (RFP)
6. Proposal submission and evaluation
7. Contract award
8. Documents and construction

process in which constructability is a key concern from the outset.

You may choose to use a design-build approach for your water treatment project. This means that the supplier of the treatment equipment also undertakes the detailed design. The design-build approach is suited to projects which include substantial use of off-the shelf equipment. In these cases the design used in one location can often be readily reproduced in another location where similar needs exist. The drawing, specification and other aspects of the project may require limited modifications before being transferred from one project to the next.

Use of Design Build

According to recent industry publications, Design-build is the project delivery system of choice on more than 50 percent of the non-residential construction projects in the European Community and is used on more than 70 percent of the non-residential projects in Japan. In North America the private sector's use of design-build has been increasing in frequency and application during the past thirty years. Design-build is used in a wide array of commercial and institutional applications including hospitals, educational facilities, office buildings, retail centers and hotels. Design-build has also been used for decades in the industrial and power sectors.

Design Build Adapted for POE / POU

The Design Build method has been adapted in this Guidebook for application to POE / POU projects in British Columbia. The following table shows how the stages in the conventional Design Build project fit within the Seven Step process used in this Guidebook.

	Stage of Conventional Design Build Project		Corresponding Step in 7 Step POE / POU Process
1	Strategic Facility Planning		*0 Occurs prior to use of 7 Step Process*
2	Program Definition		1. Identify needs
3	Request for Qualifications (RFQ)		2. Examine options
4	Qualifications Statements		2. Examine options
5	Request for Proposals (RFP)		4. Assemble team
6	Proposal Submission and Evaluation		4. Assemble team
7	Contract Award		4. Assemble team
8	Documents & Design		5. Design
9	Construction		6. Supply & Install

The WorkSheets provided to assist you with Step 4 are based on application of the Design Build approach, as adapted to the Seven Step process. The following section outlines considerations in the use of the Design Build approach, and provides background to the use of the WorkSheets for your POE/ POU project.

4.2 Considerations in Use of Design Build

Several considerations in relation to the Design Build approach are discussed in following sections. These are:

- Issuing the Request for Proposals
- Selecting a Design Build Contractor
- Completing the Team.

Issuing the Request for Proposals

In Step 2 you had the opportunity to issue a Request for Submissions (RFS), inviting selected POE/ POU suppliers to make a submission expressing their interest in your project and providing initial technical and financial information. You may have used this information in creating your project plan in Step 3.

In Step 4 you prepare and issue a Request for Proposals to qualified suppliers. Typically these are the people who responded to your RFS in Step 2. The request for proposals (RFP) is a document that fully describes the procurement process you will use, forms the basis for proposals by suppliers, and ultimately becomes an element in the contract between you and the contractor. An RFP typically is based on a framework such as the one outlined in the appendices.

Once you have received the Proposals from qualified suppliers you review them to ensure they all comply with the general requirements in your RFP. Those that comply are then reviewed in more detail, and your Design Build contractor is selected. The selection process is described in the following section.

Selecting a Design Build Contractor

There are several methods of selecting a design build contractor. One of the more suitable for typical POE / POU applications by community water suppliers is using the Cost/ Design competition approach. In the typical form of this approach, design build contractors are short-listed on a qualifications basis and requested to submit a qualitative proposal and firm price. You, as the Owner, establish an evaluation system for qualitative features and for price. The technical proposals are received by the Owner with the price submitted simultaneously but separately. The Owner reviews each technical proposal, then price, and makes a selection based upon previously stated selection criteria.

The purpose of the selection and evaluation process should be to determine which proposal provides the greatest value to you. A variety of evaluation processes are

available. Each has been successfully used and each has its merits. No single process is appropriate for every situation.

The selection processes include the weighted criteria method, which is generally suitable for application to POE/ POU projects. This is described further in the appendices. The Worksheets which have been prepared to assist with Step 4 are based on use of the weighted criteria method.

Further information on the application of the Design Build process to POE / POU projects is given in the appendices. The appendices include a description of a modified form of Design Build; this has been developed for SIS in working with community water suppliers in BC.

Completing the Team

Once a contractor has been appointed, your project team is complete. The most effective approach to your POE / POU project is to regard all parties as working as a team to ensure successful completion of the project. You may choose to enter into a contract with the same organization for both supply and installation of the POE / POU equipment, and for regular maintenance. In this event you will want to build a cooperative and responsive long-term relationship with the contractor. A full expression of expectations at the start of the work is important, as is continuing clear and direct communication between the parties.

STEP 5: DESIGN IN DETAIL

In previous steps you have identified your needs, examined the options for meeting the needs, planned your project and arranged for financing. You may also have appointed, in Step 4, a Design Build contractor who is responsible for the technical design and installation of your treatment equipment.

In Step 5 the detailed technical design of the project is completed. The technical design of any engineering project involves several distinct stages. In this Guidebook we use the term technical design to include the preparation of drawings and specifications. The drawings and specifications are prepared in sufficient detail to clearly communicate the arrangement of the overall system, and the components that go into making the system. They should be clear, unambiguous and prepared by individuals with appropriate technical experience. The drawings and specifications are used by those responsible for the manufacturing and installation of the system. They may also be reviewed by regulators, and by lending and granting organizations if involved in financing the project.

Drawings and specifications are prepared at the end of a series of activities starting with the articulation of need and leading into identification and review of options for meeting the need, followed by analysis and calculation to determine the characteristics of the components and systems that will provide an appropriate solution. For more complicated engineering designs, the detailed design phase may be preceded by a preliminary design phase which in turn may be informed by feasibility reviews and conceptual engineering studies. Steps 1 to 4 as outlined in this Guidebook cover part of the work that might otherwise be regarded as part of these activities.

Compared to many other engineering projects, the actual design of POE / POU water treatment systems is not generally a lengthy process. It should, however, only be undertaken by experienced individuals. Inappropriate design and specification of a treatment system to provide potable water can have serious consequences.

5.1 Design by the Design Build Contractor

You may have chosen to use the Design Build approach. If so, in Step 5 the detailed design is undertaken by the Design Build contractor you appointed in Step 4. The Design Build contractor will have previous experience in the design of water treatment systems similar to your system. Even so, certain characteristics of your system, for example aspects of source water quality, will differ from those of others, and the design process

should take these differences into account. For example, it may be necessary to conduct field testing prior to finalizing design. This may involve the installation of a limited number of treatment units by the supplier to ensure that they operate satisfactorily under the actual conditions encountered in your system. The detailed design should also take account of the local climate conditions encountered in your system, the proposed location of the treatment units (For example, will they be on the outside wall of houses, or within garages?), and other factors unique to your situation.

Professional Certification

If you use the Design Build approach, you will prepare in Step 4, as described above, a Request for Proposals (RFP) document prior to selecting a Design Build Contractor. In the RFP you may have specified that the detailed design of the treatment system must be certified by a Professional Engineer (P.Eng) experienced in this technical area. If so the Design Build contractor may involve a Professional Engineer who is part of his Design Build organization, or may appoint a third party Professional Engineer to undertake review and certification.

5.2 Other Approaches to Design

If you do not use the Design Build approach, there are other options to use for detailed design of the treatment system. These include:

- Design using your own resources
- Design through the use of a consulting engineer.

These are discussed in further detail in the following sections.

Design using your own resources

Larger water supply organizations such as municipalities and regional districts typically employ technical staff members who have experience in water treatment plant design and operation. If you have experienced staff you may choose to undertake part of the design phase using your own resources, and to defer other parts to suppliers and specialists as required. In most cases however, smaller community water suppliers do not have in-house staff with the necessary expertise, and therefore choose to utilize one of the other options for technical design.

Design by a consulting engineer

The conventional approach to engineering projects typically involves the services of a consulting engineer. Larger and more complicated projects will involve the use of several consultants each with a different area of expertise. Each consultant may contract directly

with the owner, however a common approach is that the owner contracts directly with a prime consultant, and the prime consultant in turn employs sub-consultants. To illustrate, a project to construct a large centralized water treatment system may involve a civil engineer as the prime consultant, who in turn may employ mechanical and electrical specialists as sub consultants.

A consulting engineer will typically undertake the technical design of the project and will help with other aspects. The services of a consultant may include assistance in articulating the needs, identifying, analyzing and comparing option for meeting the need, project planning, technical design, tendering, review of tenders and advice on award, inspection of installation, and assistance with start-up and commissioning.

The consultant charges a fee for these services which may be determined in one of several ways. The consultant may charge a fixed unit rate for each hour or each day spent on the project. The unit rate charged will depend on the qualifications and experience of the individual involved. For some projects, the consulting fees are calculated as a fixed percentage of the cost of construction. In other cases the consultant will provide a written proposal to the owner at the start of the works which includes a fixed fee for the provision of the services described in the proposal. This last approach is commonly used in projects involving the design and installation of smaller water treatment systems, including those featuring POE / POU technology.

If you employ a consultant, there are measures you can take to help ensure a successful outcome. For example it is important to find a consultant experienced in the area of water treatment, and in POE/POU technologies. You may want to invite several consultants to provide a proposal for services. Further consideration in using the services of a consulting engineer are outlined in the appendices.

The Traditional Approach

Traditional engineering projects involve three parties: the owner, the consultant and the contractor. The owner is the person who owns the engineering works, and who employs a consultant to design the works and prepare the tender documents. The consultant may help tender the works, and makes recommendations concerning the awarding of the contract to construct the system. The consultant works directly for the owner and acts in the interests of the owner in dealing with the contractor. The contractor is the person appointed by the owner, on advice of the consultant, to construct the works. The contractor is required to build the works in compliance with the design drawings, specification and conditions of contract prepared by the consultant.

You may choose to employ the traditional approach, rather than Design Build. If so, you will not have selected a contractor in Step 4. Instead your consultant will prepare the detailed design in Step 5, and then assist you to tender the works.

Even when you use a Design Build approach you may choose to employ a consultant for certain parts of the project. For example, you may contract with a consultant to help you prepare the Request for Proposals which is part of the Design Build process, and to review the design provided by the supplier. This will help ensure that the technical design meets your needs. The consultant may also help with earlier stages of a project such as an initial review of the existing system, and initial feasibility investigations undertaken prior to confirming your needs.

5.3 Information for the Drinking Water Officer

In Step 2 you opened discussions with your Drinking Water Officer (DWO) and provided the DWO with preliminary information about your system and your plans for POE/ POU installations. Towards the end of Step 5 you will be in a position to provide detailed information to the DWO about your proposals for a POE /POU system. The information sent to the DWO in Stage 5 may include:

1. A complete analysis of the source water, and description of the water source.
2. The location and layout plan of the existing water system including a brief history of the system.
3. Description of the proposed POE / POU installation, including the plans and specifications.
4. Results of field testing, if applicable.
5. An installation plan and timetable covering issues including access and installation procedures.
6. An operating plan including:
    i. Monitoring, and alarm response considerations
    ii. Planned maintenance schedules
    iii. Record keeping procedures
    iv. Public information documents
    v. An outline of the right and responsibilities of the Community Water System and the customer
    vi. Ownership and access agreements
    vii. How any tendency for bacterial growth will be managed
    viii. Approach to non-compliance from individual customers
7. Covering letter signed by your duly authorized representative.

STEP 6: SUPPLY & INSTALL

If you have used the Design Build approach explained in earlier steps, you are now at the point at which the POE / POU systems are supplied and installed by the Design Build contractor.

6.1 Supply

Typically the POE / POU treatment units will be made up of several different components, each of which may come from a different manufacturer. Following your award of contract it may take the Design Build Contractor several weeks or months to order and receive the components, and to check they are as required. When the components arrive on site you should check prior to installation that they conform to the agreed specifications.

6.2 Install

The installation of POE /POU devices should be properly planned. An improperly installed device can lead to equipment malfunction, a decrease in the effective life of the unit, leaks, and difficulties with maintenance and sampling. It is important to install the unit in a way that will allow for quick and easy servicing and monitoring. Sampling taps installed before and after the treatment unit, for example, will allow you to obtain samples quickly and easily and allow for the identification of malfunctioning units.

POU Installation
In some instances, some extra carpentry or plumbing work may be required to place units under the kitchen sink. In other settings, the POU unit may need to be located in a crawl space due to physical limitations of the kitchen sink.

The Design Build contractor, if you use one, is responsible for effective installation. It is important that adequate inspection is carried out during the installation process. Certain errors and deficiencies in installation will only be noticeable at the time of installation. They are concealed once installation is complete. Installation should only be carried out by experienced and reliable individuals.

Before the actual installation of the units, all customers should receive approximately one month advance notification prior to any activity involving a system or system access occurring. Following up on this notice, you should arrange a mutually convenient time when each unit will be installed, ensuring that customers are advised that installation can take anywhere from one to four hours. Your customers should also be aware of where the unit will be located. For instance, for a POU unit at the kitchen tap, the treatment unit may be installed under the sink. You should ensure that customers know that you, the water supplier, will be responsible for all installation and maintenance costs.

To alleviate space concerns associated with POE units and to minimize the need for coordinating times with homeowners, it may be preferable to install POE units outdoors whenever possible. In colder regions, however, where temperatures drop below freezing even for part of the year, it may be necessary to install the POE unit inside to prevent damage to the unit. This could pose a problem for some customers who may not have adequate space in their homes or business for a POE device.

6.3 Using the Design, Tender, Build Approach

You may have chosen to use the Design Tender Build approach to your project delivery. If so, in Step 6 you will want to tender the supply and installation of the treatment systems. You tender your project by inviting qualified suppliers to submit to you an offer to supply and install the water treatment system. You or your consultant will provide to suppliers the contract documents, including drawings and specifications, together with a statement of the conditions under which you will enter into a contract with a supplier.

The contract documents are of major importance in your project. Outline information about certain of the contract documents used with the Design, Tender, Build approach is given in Appendix A6.1.

STEP 7: COMMISSION & OPERATE

In Step 7, you start-up, commission and operate your POE / POU the system. This is the final step in a process which included the identification of your water treatment needs, the examination of options, planning of the project, arranging financing, appointing a contractor, and designing and installing your system.

7.1 Start-Up & Commissioning

Once installation is complete, the treatment system should be taken though start-up procedures as recommended by the manufacturer. In this process, the unit is operated in place for the first time, and is checked by an individual experienced with the system to ensure all elements are working properly.

Commissioning is an extension of start-up, in which the unit is operated as far as possible under a range of conditions that may be encountered during its useful life. For example there may be significant variation from one time of year to the next in the concentration of a certain contaminant, or the turbidity of the water may be higher during spring melt. When possible, these variations in operating conditions are simulated during commissioning to ensure the unit will continue to function properly. If the unit has an automatic alarming and shut-off mechanism to address certain conditions, these conditions should be simulated to ensure that these mechanisms are operating properly. The manufacturer should advise on procedures for commissioning.

7.2 Operation

The administrative tasks required to manage a successful POU or POE treatment installation can be time-consuming. They include customer outreach, scheduling, and record keeping. You should first consider these tasks in Step 3 when planning your project, and so that you are ready to fully proceed with these activities in Step 7. Because POE / POU units are installed and maintained on customer property, this type of

treatment requires systematic interaction with homeowners. Clearly, maintaining good public relations is fundamental to your success.

Some suggestions about how to ensure that your POU/POE treatment program runs smoothly are as follows:

- **Schedule visits to homes that are near each other during the same day.** Coordinate maintenance and sampling visits to minimize travel time and maximize productivity.

- **Communicate with your customers.** Send a card like those used by dentist offices to remind your customers of the date, time, and purpose of the visit. Confirmation calls are also very important. These actions will save money by minimizing extra trips and will build consumer confidence.

- **Keep appointments and be flexible.** To maintain the trust and respect of customers, it is essential that you ensure that all appointments are kept. Remember to notify the homeowner in a timely manner if they must be rescheduled. To avoid scheduling and access problems, it is preferable to have POE treatment units installed on the exterior of the house, in garages or in basements, if conditions allow. You may need to accommodate the schedules of customers by planning maintenance and sampling for evenings or weekends.

- **Keep records.** You should confirm that sampling and maintenance schedules are followed and that the treatment units are performing as expected. This can be done by systematically tracking all sampling and maintenance visits, work performed, and laboratory analyses in a logbook or simple database. The appendices contain forms that can be used to track monitoring and maintenance activities.

- **Management of vendor/third party contracts.** You may have a contract established for installation and maintenance of the systems. If so, you should ensure that these tasks are performed in a satisfactory manner as stipulated by the contract.

- **Provide a customer contact line.** You may encounter unanticipated problems, particularly shortly after the devices are installed. Since water availability is so important, repair staff should be on call. Quick response will ensure the safety and comfort of your customers while helping to prevent more costly repairs in the future.

To prepare for possible equipment failure and the inevitable wearing of parts, you should stock replacement treatment units and parts. The continued availability of parts should be considered when selecting particular equipment – you may wish to obtain some assurance that the product and parts won't become rapidly obsolete. To minimize storage costs, you

may negotiate an arrangement in which the supplier undertakes to stock a range of replacement parts.

7.3 Monitoring & Testing

Monitoring and testing of your POE / POU units should be carried out in accordance with manufacturers directions, best practice and in compliance to the requirements of your local drinking water officer. Further information is available on the SIS web site at www.SustainIS.Org

7.4 Maintenance

All POU and POE devices require maintenance if they are to continue removing contaminants. The appendices include generalized summaries of the maintenance requirements for various POU and POE installations. Maintenance should observe the directions of the manufacturer.