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Guidance for Implementing a Point-of-Use or Point-of-Entry Treatment Strategy for Compliance with the Safe Drinking Water Act

– Revised Final Draft –

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Guidance on Implementing a Centrally Managed Point-of-Use or Point-of-Entry Treatment Strategy for Compliance

The challenges facing small drinking water systems were a major focus of the 1996 Amendments to the Safe Drinking Water Act (SDWA). One way Congress sought to help systems meet these challenges was by explicitly allowing systems to install point-of-use (POU) and point-of-entry (POE) treatment devices to achieve compliance with the National Primary Drinking Water Regulations (NPDWRs).

POU and POE treatment devices rely on many of the same treatment technologies that have been used in central treatment plants. However, while central treatment plants treat all water distributed to consumers to the same level, POU and POE treatment devices are designed to treat only a portion of the total flow. POU devices treat only the water intended for direct consumption, typically at a single tap, while POE treatment devices are typically installed to treat all water used within a single home. The cost savings achieved through selective treatment may enable some systems to provide more protection to their consumers than they might otherwise be able to afford.

Centrally managed POU and POE treatment strategies have proven especially useful in rural areas and small communities where constructing, upgrading, or expanding a central treatment plant would be too expensive or would require a degree of technical expertise not readily available. Given the improving effectiveness and decreasing costs of POU and POE treatment equipment, small systems should consider the adoption of a POU or POE treatment strategy to achieve compliance with the NPDWRs.

What is the purpose of this guidance?

This guidance outlines the technical and managerial issues involved in implementing a successful POU or POE treatment strategy. It describes the types of water quality problems that can and cannot be treated with POU and POE devices and offers recommendations on how to select, install, maintain, and monitor this equipment. With careful attention to source water characteristics, federal, State, and local requirements, and public relations, centrally managed POU or POE treatment can offer a practical alternative to central treatment.

Why should I consider implementing a POU or POE treatment strategy? What are the potential benefits?

- The United States Environmental Protection Agency (EPA) has approved centrally managed POU and POE treatment devices as a means to achieve compliance with maximum contaminant levels (MCLs) established in the NPDWRs.[1]

- Numerous small communities have already successfully used POU and POE treatment devices to address water quality problems (see Appendix A).

- Implementing a POU or POE treatment strategy may be substantially less expensive than building, expanding, or upgrading a central treatment plant since only a portion of water

[1] POU units may *not* be used to achieve compliance with the MCL for microbial contaminants or indicators for microbial contaminants.

used in the household is treated to a higher level. For example, the implementation of a POU treatment strategy for arsenic was found to be less expensive than central treatment for communities of fewer than 40 households.[2] In addition, many vendors offer POU and POE unit rentals for less than $25 per month per household, eliminating up-front capital costs for the utility and the associated financing issues.

- Some forms of POU and POE treatment may provide your customers with equal or better protection from certain contaminants than central treatment at a lower cost. For example, total trihalomethanes (TTHMs) may be reduced to a lower level with POU treatment than is economically feasible with central treatment.[3]

What are the potential drawbacks of implementing a POU or POE treatment strategy?

Prior to implementing a POU or POE treatment strategy, three potential disadvantages should be considered:

- First, the successful implementation of such a strategy will require a system to address and meet the logistical challenges associated with obtaining regular access to treatment units which may be located within customer homes to perform necessary maintenance and sampling activities.

  To ensure regular access, you may need to convince your local government to pass an ordinance guaranteeing water system personnel access to service treatment units. To meet your legal responsibility to provide water in compliance with all NPDWRs, you may also have to pass an ordinance that requires your customers to use POU and POE treatment units, and that provides you with the authority to shut off a customer's water if the customer refuses to allow installation and maintenance of, tampers with, bypasses, or removes the treatment unit.

- Second, poor or widely varying water quality may preclude the safe operation of POU or POE treatment devices. Potentially problematic water quality issues should be identified during the pilot testing process.

- Third, the media or membranes used in POU and POE treatment devices may be susceptible to microbial colonization. Higher levels of bacteria have been found in the finished water produced by some POU and POE treatment devices, particularly those that incorporate an activated carbon element, than in the corresponding untreated water. Although no illnesses have been reported as a result of the use of these treatment devices, the health effects of these bacteria are still unknown. Therefore, additional monitoring and post-treatment disinfection may be required to ensure customer safety, increasing overall costs.

While these three disadvantages may preclude certain systems from pursuing the implementation of a POU or POE treatment strategy to achieve compliance, you should weigh them against the

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[2] U.S. EPA, *Cost Evaluation of Small System Compliance Options: Point-of-Use and Point-of-Entry Treatment Units*. September, 1998.

[3] National Sanitation Foundation Assessment Services, *Guidelines for Management of Point-of-Use Drinking Water Treatment Systems*.

advantages associated with such a strategy before concluding that POU or POE treatment is not an appropriate option for your system.

What restrictions have been placed on the use of a POU or POE treatment strategy to achieve compliance?

To ensure the protection of public health, §1412(b)(4)(E)(ii) of the SDWA regulates the design, management, and operation of POE and POU treatment units used to achieve compliance with an MCL. These restrictions are:

- **POU treatment units *may not* be used to achieve compliance with an MCL or treatment technique for a microbial contaminant or an indicator of a microbial contaminant.** Note that POE devices *may* be used to achieve compliance with an MCL for a microbial contaminant or an indicator of a microbial contaminant.

- **POU and POE units must be owned, controlled, and maintained by the public water system or by a contractor hired by the public water system to ensure proper operation and maintenance of the devices and compliance with MCLs.** The system must retain oversight of unit installation, maintenance, and sampling. While this provision does not require you or your staff to perform all maintenance or management functions — you are free to contract out these tasks — it does emphasize that *your system retains final responsibility* for the quality and quantity of the water provided to the service community and must closely monitor all contractors. Further, your system *may not* delegate its responsibility for the operation and maintenance of POU or POE devices installed as part of a compliance strategy to homeowners.

- **POU and POE units must have mechanical warnings to automatically notify customers of operational problems.** Each POU or POE treatment device installed as part of a compliance strategy must be equipped with a warning device (e.g. alarm, light, etc.) that will alert users when their unit is no longer adequately treating their water. Alternatively, units may be equipped with an automatic shut-off mechanism to meet this requirement. Several communities have implemented POU or POE treatment strategies using units equipped with water meters and automatic shut-off devices to disable the units after a pre-specified amount of water has been treated to prevent contaminant breakthrough (see Appendix A).

- **If the American National Standards Institute (ANSI) has issued product standards for a specific type of POU or POE treatment unit, then only those units that have been independently certified according to these standards may be used as part of a compliance strategy.** ANSI has adopted the standards for POU and POE devices developed by the National Sanitation Foundation (NSF). ANSI/NSF standards cover six types of POU and POE devices:

    - Standard 42: Drinking Water Treatment Units — Aesthetic Effects
    - Standard 44: Cation Exchange Water Softeners
    - Standard 53: Drinking Water Treatment Units — Health Effects
    - Standard 55: Ultraviolet Microbiological Water Treatment Systems
    - Standard 58: Reverse Osmosis Drinking Water Treatment Systems
    - Standard 62: Drinking Water Distillation Systems

. If you plan to install a treatment device covered by one of these six standards, you must make sure that the product you select has been independently certified according to NSF standards by an accredited laboratory. Lists of certified devices are available from NSF and two such laboratories, Underwriters Laboratories (UL) and the Water Quality Association (WQA) on the Internet at: *www.nsf.org/Certified/DWTU/*, *www.ul.com*, and *www.wqa.org*, respectively. In addition, NSF has established a toll-free hotline to answer questions regarding products certified by NSF laboratories (877.867.3435). The Water Quality Association may be contacted at (630.505.0169) and Underwriters Laboratories (UL) can be contacted at (888.547.8851). You may also email questions regarding certified products to info@nsf.org, info@mail.wqa.org, or info@us.ul.com. Appendix B describes NSF's standards-setting process and each established standard in detail**.**

Although not explicitly prohibited in SDWA, POU treatment devices *should not* be used to treat for radon or for most volatile organic contaminants (VOCs) since these devices do not provide adequate protection against inhalation or contact exposure to these contaminants at untreated taps (e.g., showerheads).

Summary of Restrictions on the Implementation of POU and POE Treatment Strategies to Achieve Compliance

- POU devices cannot be used to comply with MCLs for microbial contaminants.
- POU devices should not be used to treat for radon or for VOCs.
- The water system must maintain ultimate control over all POU and POE units.
- POU and POE devices must be designed to automatically notify customers of operational problems.
- POU and POE devices used to achieve compliance with an MCL must be certified according to ANSI/NSF standards if such certification is available**.**

What water quality problems have been addressed with POU or POE treatment?

Communities have installed POU and POE treatment devices to treat a wide variety of inorganic, organic, and biological contaminants (POE only). Appendix A summarizes the experiences of more than 20 communities in treating contaminants ranging from arsenic to radon and from aldicarb to trichloroethylene (TCE).

How do I choose between available POU and POE technologies?

Different POU and POE units have different performance characteristics. In fact, the same unit may perform significantly more or less effectively depending on raw water characteristics; a

treatment technology that is effective in treating a particular contaminant in one community may not necessarily be effective in another.

The EPA document, "POU and POE Treatment Units: *Evaluation of Contaminant-Technology Scenarios*" may assist you in narrowing the list of potential treatment technologies to consider. In addition, you should evaluate each of the following factors when considering which type of treatment to implement in your community:

- The contaminant of concern;
- Raw water characteristics such as pH, hardness, co-occurring contaminants, etc.;
- Desired quality of treated water;
- Operational requirements of the treatment technology (e.g., backwashing, pre-treatment, potential for microbial colonization, etc.);
- Technical skill required of operator;
- Disposal requirements; and
- Applicable local, State, and federal regulations.

The most important step in ensuring the success of a POU or POE treatment strategy is to conduct extensive pilot testing on each device that you are considering for use in your community. Devices should be thoroughly pilot-tested prior to installation to measure how well the devices perform under local conditions (i.e., temperature, humidity, raw water characteristics, etc.) that may vary on a seasonal basis. At a minimum, the need for pre- and/or post-treatment elements should be identified, and maintenance and sampling schedules should be established based on average and minimum run lengths and should incorporate a margin of safety.[4] Thorough pilot testing and the correct selection of one or more treatment technologies will ensure the protection of public health and prevent the need to make costly retrofits.

Several treatment technologies may need to be incorporated into a single POU or POE treatment system to address certain water quality problems. For example, to reduce the potential for microbial contamination of finished water, post-treatment disinfection (e.g., ultraviolet light) must be installed as part of any POE granular activated carbon system.

Other treatment technologies are much more effective when coupled with one or more additional technologies. For example, pre-filtration will greatly extend the life of reverse osmosis membranes, while a post-filtration activated carbon filter will improve the aesthetics of treated water, resulting in improved customer satisfaction.

Tables 1a, 1b, and 2 on the following pages can be used as preliminary screens to help identify potential treatment technologies for several common contaminants. Note, however, that your

[4] EPA used a 100 percent margin of safety when determining appropriate maintenance and replacement schedules for POU and POE treatment units and the associated costs. These safety allowances were designed to cover the variance that exists in annual household consumption and water use and potential variations in source water quality.

decisions should not be based on these tables alone. As previously discussed, it is essential to weigh the advantages and disadvantages of different treatment strategies and to conduct pilot testing before selecting a treatment technology for use in your community.

Table 1a: *Selection of POU Treatment Technologies for Various Water Quality Problems*

Treatment Technology	Contaminant of Concern										Considerations
	Arsenic	Copper/Lead	Fluoride	Nitrate	SOCs[1]	VOCs[2,3]	Radium	Uranium	Radon[3]	Microbial[4]	
Activated Alumina (AA)	✔		✔					✔			Raw water characteristics (e.g., pH and competing ions such as fluoride and sulfates) may reduce efficacy. Can be installed in series to improve run length.
Aeration: Diffuse Bubble or Packed Tower											Not feasible to install at the POU.
Distillation	✔	✔		?	✔		✔	✔		(✔)	Very high electrical costs. Treated water produced in batches, rather than continuously; storage tank required. High TDS or hardness can lead to scaling, increased costs, and decreased efficacy. POU distillation is not listed as a compliance strategy for Nitrate due to potential for acute health effects (hemoglobinemia or blue baby syndrome) for certain vulnerable segments of the population
Granular Activated Carbon (GAC)					✔						NOM and co-occurring SOCs can reduce efficacy. Some potential for microbial (HPC) colonization of units. Likely to improve aesthetics (taste, odor, color) of finished water. Therefore, often incorporated as element within other POU treatment systems.
Ion Exchange (IX)											Competing ions (particularly sulfates and barium) can greatly reduce efficacy. For example, run lengths for AX systems decrease dramatically in the presence of high levels of sulfates. If these units are not replaced on a regular basis, chromatographic peaking – the rapid desorption of arsenic from the resin – may occur, leading to higher levels of arsenic in finished water than in untreated water. Due to the risks posed by chromatographic peaking and the limited margin of safety provided by POU devices, POU AX is not listed as a compliance strategy for arsenic. Also, POU AX is not listed as a compliance strategy for Nitrate due to the potential for acute health effects (hemoglobinemia or blue baby syndrome) for certain vulnerable segments of the population
Anion Exchange (AX)	(✔)		✔	?				✔			
Cation Exchange (CX)		✔					✔				
Ozonation											Not feasible to install at the POU.
Reverse Osmosis (RO)	✔	✔	✔	?	✔		✔	✔		(✔)	Some membranes are chlorine-sensitive. High hardness reduces efficacy. Likely to improve aesthetics significantly (color, clarity). Storage typically required due to low production rate. POU RO is not listed as a compliance strategy for Nitrate.
Specialty Medias (SM)	✔	✔		?			✔				These medias preferentially remove specific contaminant(s). Examples include granular ferric hydroxide (GFH) to remove arsenic and specialty anionic and cationic resins for nitrate and radium removal, respectively. Not as sensitive to competing contaminants as standard medias, enabling longer run lengths. However, generally more expensive than standard medias. Technologies are still developing. POU SM is not listed as a compliance strategy for Nitrate
Ultraviolet Light (UV)										(✔)	High electrical costs. High levels of turbidity limit effectiveness of UV treatment.

2. Synthetic organic contaminants (SOCs) include many pesticides, herbicides, and insecticides (e.g., alachlor, aldrin, atrazine, lindane, etc.).
3. Volatile organic contaminants (VOCs) include organic chemicals and solvents that vaporize at relatively low temperatures (e.g., TCE).
4. POU devices are not acceptable for treatment of radon or VOCs since they do not protect against dermal and inhalation exposure to these contaminants.
5. Microbial contaminants include bacteria, viruses, and protozoa. While POU devices may improve the microbial quality of finished water (indicated by a check-mark in parentheses), these devices may *not* be used to meet the MCL for microbial contaminants.

Table 1b: *Selection of POE Treatment Technologies for Various Water Quality Problems*

Treatment Technology	Contaminant of Concern										Considerations
	Arsenic	Copper/Lead	Fluoride	Nitrate	SOCs[1]	VOCs[2]	Radium	Uranium	Radon	Microbial[3]	
Activated Alumina (AA)[4]	✔		✔					✔			Raw water characteristics (e.g., pH and competing ions such as fluoride and sulfates) may reduce efficacy.
Aeration: Diffuse Bubble or Packed Tower						✔			✔		High electrical costs. Requires post-treatment disinfection and repressurization. May not meet local, State, or federal air quality requirements. Oxidizes many metallic contaminants, improving treatment efficacy of other elements of the treatment train.
Distillation	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	May not be appropriate for use at the POE due to constraints on total daily production. Very high electrical costs. Produces treated water in batches, rather than on a continuous basis; storage tank required. High TDS or hardness can lead to scaling, increased costs, and decreased efficacy.
Granular Activated Carbon (GAC)					✔	✔			✔		POE units require post-treatment disinfection due to potential for bacterial (HPC) colonization of media. NOM and co-occurring SOCs & VOCs can reduce efficacy. Likely to improve aesthetics (taste, odor, color) of finished water.
Ion Exchange (IX)											Have been prohibited in some communities. May be inappropriate for homeowners with high blood pressure. Competing ions (particularly sulfates and barium) can greatly reduce efficacy. As observed for POU AX systems, the efficacy of POE AX systems used to treat for arsenic decreases dramatically in the presence of high levels of sulfates. If the resin is not regenerated or replaced frequently enough, chromatographic peaking may occur.
Anion Exchange (AX)	✔		✔	✔				✔			
Cation Exchange (CX)		✔					✔				
Ozonation										✔	High electrical costs.
Reverse Osmosis (RO)	✔	✔	✔	✔	✔		✔	✔		✔	Some membranes are chlorine-sensitive. High hardness reduces efficacy. May be nappropriate for arid regions due to low recovery rates. May require post-treatment pH control and re-pressurization. In addition, the disposal of waste brines may be closely regulated. Likely to improve aesthetics significantly (color, clarity). Storage typically required.
Specialty Medias	✔	✔		✔			✔				These medias preferentially remove specific contaminant(s). Not as sensitive to competing contaminants as standard medias, enabling longer run lengths. However, generally more expensive than standard medias and may require disposal as hazardous waste due to high contaminant concentrations. Technologies are still developing.
Ultraviolet Light (UV)										✔	High electrical costs. High levels of turbidity limit effectiveness of UV treatment.

1. As outlined in Table 1a, SOCs include many pesticides, herbicides, and insecticides (e.g., alachlor, aldrin, atrazine, lindane, etc.).
2. As outlined in Table 1a, VOCs include organic chemicals and solvents that vaporize at relatively low temperatures (e.g., TCE).
3. Microbial contaminants include bacteria, viruses, and protozoa. Although POE treatment devices may be used to achieve compliance with the MCL for biological contaminants, they should never be used to treat water of unknown biological quality.
4. The regeneration process for AA requires the use of strong caustics and acids. Therefore, POE AA should only be considered for use on a throw-away basis.

Table 2: *Operation and Maintenance Requirements for Various POU and POE Treatment Devices*

Treatment Technology	Operation and Maintenance Requirements[1]
Activated Alumina (AA)[2]	POU: Replacement of spent cartridges and particulate pre-filters (if used). POE: Periodic backwashing. Replacement of spent media and particulate pre-filters (if used). Maintenance and cleaning of storage tank (if used).
Aeration: Diffuse Bubble or Packed Tower	Only appropriate for POE Replacement of particulate pre-filters. Replacement of air filters for fan intake and for exhaust. Maintenance of fan, motors, and repressurization pumps. Replacement of post-treatment GAC polishing filters. Maintenance and cleaning of storage tank. If UV is used for post-treatment disinfection, replacement of UV bulb and cleaning bulb housing. If ozonation is used for post-treatment disinfection, maintenance of ozonation element.
Distillation	POU and POE: Regular (frequent) cleaning of boiling chamber. Replacement of particulate pre-filters (if used). Replacement of post-treatment GAC polishing filters. Maintenance and cleaning of storage tank.
Granular Activated Carbon (GAC)	POU: Replacement of spent cartridges and particulate pre-filters (if used). POE: Periodic backwashing. Replacement of spent media and particulate pre-filters (if used). Maintenance and cleaning of storage tank (if used). If UV is used for post-treatment disinfection, replacement of bulb and cleaning bulb housing. If ozonation is used for post-treatment disinfection, maintenance of ozonation element.
Ion Exchange (IX) Anion Exchange (AX) Cation Exchange (CX)	POU: Replacement of spent resin cartridges and particulate pre-filters (if used). POE: Regular regeneration and periodic backwashing. Replacement of salt used for resin regeneration. Replacement of lost or spent resin and replacement of particulate pre-filters. Maintenance and cleaning of storage tank (if used).
Ozonation	Only appropriate for POE Replacement of pre-filters (if used). Cleaning and maintenance of ozone generator, treatment tank, and storage tank. Maintenance of repressurization pumps (if necessary).
Reverse Osmosis (RO)	POU and POE: Replacement of exhausted membranes, particulate pre-filters, and post- treatment GAC polishing filters. Maintenance and cleaning of storage tank. Maintenance of (re)pressurization pumps (if used).
Specialty Medias[3]	POU: Replacement of spent media and particulate pre-filters (if used). POE: Periodic backwashing. Replacement of spent media and particulate pre-filters (if used). Maintenance and cleaning of storage tank (if used).
Ultraviolet Light (UV)	POU and POE: Replacement of UV bulbs. Cleaning bulb housing.

1. Systems that elect to implement any POU or POE treatment strategy will need to conduct monitoring at each household according to a monitoring schedule approved by the appropriate regulatory agency (discussed in greater detail later in this document) to ensure proper unit operation.
2. The regeneration process for AA is complex and requires the use of strong caustics and acids. Therefore, to avoid potential health risks associated with the storage of these chemicals in residences, POE AA should only be considered for use on a throw-away basis.
3. Regeneration of specialty medias is generally not effective due to the high affinity of the media for the contaminant(s) of concern and is typically a complex operation. Therefore, specialty medias installed at the POU or POE should only be considered for use on a throw-away basis.

What should I consider when selecting a specific treatment device?

It is essential to conduct extensive pilot testing of all potential treatment units *prior* to installation to ensure their effectiveness in reducing contaminant concentrations to the MCL under local conditions. The need for pilot testing is strongly supported by the experience of other systems that have installed POU and POE treatment devices as part of a compliance strategy. Several systems found that the treatment devices that they had initially planned to install did not operate properly (i.e., did not adequately reduce the concentration of the contaminant of concern in finished water) due to the combination of contaminants present in local waters. As a result, these systems installed appropriate units, avoiding unnecessary costs, and were able to achieve better rates of contaminant removal (see Appendix A).

If possible, pilot testing should be conducted for an entire year to enable analysis of treatment efficacy in light of seasonal variations in water quality. However, if an extended testing period is not feasible, units should be tested for a period of at least two months to ensure consistent removal of the contaminant of concern.[5] Clearly, if a treatment device does not produce finished water that consistently meets the MCL, it should not be selected for use. In addition, you should consider the following factors when selecting a POU or POE treatment device for compliance:

- **Appropriate certification and minimal unit requirements.** As previously noted under "What requirements must be met?", if an ANSI/NSF product standard has been established for a treatment technology, any unit that relies on that technology must be certified to that standard if it is installed as part of a POU or POE compliance strategy.

  If no standard has been established by ANSI for a particular treatment device, you may wish to select a product certified under the Water Quality Association's (WQA's) "Gold Seal" program, since these products have been subjected to independent, third part testing and have met the standards established by the WQA. The WQA is an international trade association representing the household, commercial, and industrial water quality improvement industry. Under the "Gold Seal" program, WQA has established additional standards for water softeners (cation exchange systems), filters, reverse osmosis systems, and distillation units.

  - WQA S-100: Household and Commercial Water Softeners
  - WQA S-200: Household and Commercial Water Filters (in-line)
  - WQA S-300: Point-of-Use Reverse Osmosis Drinking Water Systems
  - WQA S-400: Point-of-Use Distillation Drinking Water Systems

  Products that meet the industry standards for contaminant reduction, durability, and materials safety may display the WQA Gold Seal. The Association also ensures that product advertising, labeling, and installation instructions for certified products are consistent with its code of ethics.

  Again, it is important to emphasize that if you are considering the use of a technology or treatment device for which a standard has been developed by ANSI/NSF to achieve

[5] Note that POU and POE vendors and manufacturers that participated in several of the demonstration studies presented in Appendix A paid for all necessary pilot testing. In general, vendors want their customers to be satisfied and may consider the cost associated with pilot testing as a cost of doing business (cost-of-sale). Therefore, you should attempt to negotiate with your vendor to pay for pilot testing.

compliance with an MCL, you may only use a product that has been independently certified by an accredited laboratory to that standard. Accreditation under the "Gold Seal" program *cannot* substitute for accreditation under the appropriate ANSI/NSF standard required under the SDWA.

- **State and local regulations.** State regulations may restrict your ability to implement a centrally managed POU or POE compliance strategy. Currently, most States do not allow the use of POU units for compliance. However, at least 10 States do allow their use as a condition for obtaining a variance or an exemption to a NPDWR. In contrast, only two States (Iowa and Ohio) was found to forbid the use of POE treatment devices to achieve compliance or as a condition for obtaining a variance or an exemption. You should contact your State regulatory agency to confirm the stance of your State on the use of POU or POE treatment devices to achieve compliance with an MCL.

  Local regulations may also pose a challenge to the implementation of a POU or POE compliance strategy. For example, water system staff may not have the legal authority to enter private dwellings. As a result, you may need to convince your local government to pass an ordinance ensuring your staff access to POU and POE treatment units to conduct maintenance and sampling activities. One system addressed this challenge in a different manner by requiring all homeowners in the service community to sign agreements explicitly providing water system staff with access to their homes for the purpose of conducting necessary maintenance and sampling activities.

  Your system will also need to comply with all local plumbing, electrical, and/or building codes. As a result, you may need to consult with local health or licensing authorities during the development of your management plan to ensure approval of your installation, maintenance, and monitoring strategies. Further, local codes may require that personnel involved in the installation, repair, and/or maintenance of POU and POE treatment units be certified as licensed plumbers and/or electricians. Such a requirement could significantly increase the cost of a POU or POE compliance strategy. Since equipment vendors are generally well versed in the manner in which local regulations impact the operation of POU and POE treatment devices, you should discuss potential difficulties prior to purchasing treatment equipment.

- **Initial cost (taking volume discounts into account).** The quality and reliability of POU and POE treatment devices have improved rapidly over the past 5 years. Over this same time period, the cost of these units has decreased substantially, making POU and POE treatment strategies even more cost effective. It is still important to shop around, however, since prices may vary markedly. Many communities have been able to leverage their buying power to negotiate volume discounts with manufacturers and/or retailers. In addition, systems may elect to contract with a vendor to rent POU or POE treatment devices. This option eliminates up-front capital costs and ensures the availability of trained maintenance personnel.

  Cost Evaluation of Small System Compliance Options: Point-of-Use and Point-of-Entry Treatment Units, a document published by EPA,[6] provides detailed cost comparisons between POU, POE, and central treatment options for a variety of contaminants and may

[6] U.S. EPA, *Cost Evaluation of Small System Treatment Options: Point-of-Use and Point-of Entry Treatment Units*. September 1998. An updated version of this document will be released in March 2002.

prove helpful in making initial determinations regarding the relative costs of potential POU and POE treatment options (including device rental).

Note that many sources of funding are available to small systems attempting to achieve compliance with the NPDWRs. Please refer to Appendix D for an in-depth discussion of many of these sources.

- **Manufacturer or retailer.** The lowest bid will not necessarily be the cheapest option for your community in the long run. You should contact several vendors when seeking to purchase POU or POE units and request references from each. Many communities have successfully used POU and POE treatment to address water quality problems. The experiences of more than 20 such communities are detailed in Appendix A. Past performance can give you insight into the level of service that you can expect, and it may alert you to potential problems before you have signed a binding contract. In addition, don't forget to ask about product warranties and the availability of replacement parts.

- **Ease of operation, maintenance, and sampling.** Operation and maintenance account for most of the cost of a centrally managed POU or POE treatment strategy. Therefore, it is important to select treatment units that will be easy to service and to sample. You may also want to ask about training programs provided by the vendor for maintenance staff.

- **Waste residuals.** Spent cartridges, media, membranes, bulbs, and filters must all be disposed of at the end of their useful life. In addition, waste brines from the use of POU and POE reverse osmosis systems and POE ion exchange systems, and backwash water from POE activated alumina and granular activated carbon systems must also be disposed of. Therefore, prior to selecting a treatment technology, you should consider potential difficulties associated with the disposal of these wastes (including local regulations, costs, etc.). EPA has developed a document entitled, *Waste Disposal Costs for Point-of-Use and Point-of-Entry Treatment Strategies*[7] to assist in the characterization of the waste streams generated as a result of the use of different technologies to treat for common contaminants.

How do I install the equipment once I have decided to implement a POU or POE strategy?

Unit installation can be a complicated and time consuming process, particularly for POE devices. Improper installation can lead to unit malfunction, a decrease in the unit's effective life, property damage, and difficulties with maintenance and sampling. Therefore, it is important to develop a standardized installation protocol to reduce the chance of inter-household variability in unit performance. In addition to testing a variety of system configurations, you should consider the following factors when developing your installation protocol.

- **Location of installation.** Your staff will need regular access to all treatment devices after installation to provide maintenance and conduct routine sampling. To minimize the need for coordination with homeowners, therefore, it is preferable to install POE units

[7] U.S. EPA, *Waste Disposal Costs for Point-of-Use and Point-of-Entry Treatment Strategies*. October 2000. An updated description of waste disposal strategies and costs will be provided in the revised 1998 report, *Cost Evaluation of Small System Treatment Options: Point-of-Use and Point-of Entry Treatment Units*, scheduled for release in March 2002.

outdoors whenever possible. However, in colder regions, where temperatures drop below freezing even for part of the year, it will be necessary to install the POE unit inside to prevent damage. Therefore, in most regions of the United States, the best available site for unit installation will be either a garage or basement.

POU units typically are installed under the kitchen sink to ensure treatment of all water used for drinking and cooking, and to protect the unit from damage and tampering. Basement installation of POU units may be possible in some areas depending on household layout.

Please refer to Appendix F for diagrams of typical household POU and POE installations.

- **Unit accessibility.** It is important to install the unit in a manner that will permit you to service and monitor it quickly and easily. In warmer regions of the nation, you may be able to install the unit outside of the home (e.g., small shed). Garage or basement installations, particularly for POE devices may also improve your ability to access the unit without disrupting your customers' schedules. Installing a unit-bypass will greatly ease the process of replacing the treatment media or the unit itself when necessary. Sampling taps installed before and after the treatment unit will allow you and your staff to obtain samples quickly and easily and isolate individual units as necessary. Remember, however, to consult with the manufacturer to ensure that your installation plan will not hamper unit operation. For example, for most efficient operation, UV disinfection elements must be plumbed such that they are preceded and followed by straight lengths of pipe (i.e., no bends) measuring approximately 6 pipe-diameters and at least 4 pipe-diameters, respectively (e.g., a system plumbed into a quarter-inch line would require 1.5 inches of straight piping prior to the UV lamp and 1 inch of straight piping after the lamp for optimal operation).

- **Installer qualifications.** State or local laws may require treatment units to be installed by a certified installer, a licensed plumber, or even a professional engineer. An electrician may be required to supervise the installation of units that require large amounts of power (e.g., aeration and distillation units).

How do I maintain POU and POE treatment units once they have been installed?

POU and POE treatment units require regular maintenance to ensure ongoing effective operation. A review of available case study data reveals a clear connection between inadequate maintenance and deteriorating unit performance.

Effective unit capacity (i.e., total gallons treated below the MCL) should be determined during pilot testing. You can then use this information as the basis for your maintenance schedule. To ensure the safety of your customers, you should build a substantial safety factor into the maintenance schedule. An aggressive maintenance schedule will also help you and your staff head off small problems (e.g., leaks), before they become large ones (e.g., damaged floors or burst pipes) and will build up customer confidence. Note that an example schedule detailing necessary maintenance activities over the course of a year is provided in Appendix G.

The following factors should be considered when developing a maintenance plan for POU and POE units:

- **Location of unit.** As noted above under "How do I install the equipment?", a unit's location will affect how easy it is to service. A unit that is difficult to reach or examine will take longer to inspect and service than one in a relatively open area. Spending time to consider maintenance requirements prior to installation will save time, reduce frustration, and will lead to lower costs in the long run.

- **Coordination with sampling.** If possible, you and your staff should plan to conduct sampling after completing routine maintenance (on the same visit). Reducing the number of house visits will reduce administrative costs and will reduce travel time, resulting in substantial cost savings while ensuring ongoing protection of public health. This practice will also reduce the disruption to residents.

- **System experience.** Adjust maintenance schedule based on system experience. For example, some households served by the system may have relatively higher sediment loads, necessitating more frequent pre-filter replacement.

How do I conduct sampling as part of a POU or POE compliance strategy?

It is important to monitor both the quality of water being distributed to the community and the quality of the finished water produced by the POU or POE treatment units. In addition to your current sampling activities at your well or central treatment plant, post-unit samples should be taken from *each* household within the community when a POU or POE treatment strategy is first implemented. This strategy will ensure complete coverage and will quickly identify any units that are not providing an adequate level of protection to your customers.

Assuming that the treatment units that you have installed have reduced the concentration of the contaminant of concern below the MCL, the frequency of sampling may be reduced to once every three years. In this case, one-third (33 percent) of all units should be sampled each year for chronic contaminants on a rotating basis. For acute contaminants such as nitrate, each unit should be sampled more frequently. This will allow you to continue to monitor the effectiveness of your treatment strategy, ensuring the continuing protection of public health, while keeping costs low. Under reduced monitoring schedules, POU and POE performance data may be augmented through the use of commercially available field testing kits, electrical conductivity meters (only appropriate for evaluation of RO operation), and water hardness testing (to evaluate the effectiveness of CX in removing radium and barium), which can be used to quickly and cheaply spot-check water quality on-site during routine maintenance visits.

Recommended Monitoring Practices for Systems Using POU or POE Treatment for Compliance

- Systems must continue to conduct all previously required sampling at wellhead or central point of distribution.
- Systems should sample the finished water produced by each household at least one time during the year in which the POU or POE treatment devices are initially installed.
- Assuming that the devices are found to successfully reduce contaminant concentrations below the MCL, systems should sample finished water from one-quarter of all households in each subsequent year.

The following factors should be considered when sampling POU and POE units:

- **Location of unit.** As noted above under "How do I install the equipment?", a unit's location will affect how easy it is to conduct appropriate sampling. The installation of sampling taps will accelerate the sampling process, particularly for POE units. Time spent considering sampling requirements prior to installation will save time, reduce frustration, and will lead to lower costs in the long run.

- **Coordination with maintenance.** To minimize the burden associated with gaining access to individual residences, POU and POE sampling should be coordinated with routine maintenance and previously required on-site sampling such as monthly coliform sampling and annual sampling for copper and lead. Reducing the number of house visits will reduce administrative costs and travel time, resulting in substantial cost savings as well as reducing the disruption to the residents.

What type of certification or training is required to manage a POU or POE strategy?

Adequate training for you and your staff is essential to the success of a POU or POE treatment strategy. Many vendors offer training in the proper operation and maintenance of their equipment as part of their sales package. Some systems managing POU or POE treatment programs have arranged for the equipment vendor to install and maintain the devices, in which case they did not have to invest in additional training. Other systems relied on the vendor to maintain the units for a period following their initial installation while system personnel were being trained.

Note that some States may require water system operators and other system personnel to participate in structured training programs or obtain additional certification. Regardless of State requirements, however, you will be better able to address potential problems as they arise if you and your staff participate in training programs designed by States or other organizations specifically for the operation, maintenance, and administration of a POU and POE treatment strategy on a regular basis.

As the use of POU and POE treatment devices becomes more prevalent, State and local technical assistance providers have begun to offer more training programs specifically targeted towards those individuals who install, maintain, and operate these devices. In addition, non-governmental groups such as NSF and the Water Quality Association (an international industry association for POU and POE distributors and retailers) offer training programs in the use and operation of POU and POE treatment units. Equipment manufacturers frequently offer training programs to vendors. It may be possible to negotiate with the manufacturer and your vendor to attend these trainings.

How do I fulfill my responsibility to ensure that every customer is provided with water that meets SDWA requirements if not every tap is treated and/or a recalcitrant homeowner refuses to allow unit installation or allow access for maintenance and monitoring?

While POE units treat all water used in a household, POU treatment devices only treat the water at a single tap. As a result, these devices are not appropriate for treating contaminants that represent an acute threat to human health (e.g., nitrate) or for treating contaminants that may have a negative impact on health as a result of inhalation or dermal contact. However, since all water intended for consumption (drinking or cooking) is treated if a POU is installed at the

kitchen tap, EPA believes that POU devices meet the requirements of the SDWA as long as they reduce the concentration of the contaminant of concern below the MCL.

Systems should attempt to educate the public prior to implementing a POU or POE compliance strategy. This education may include public hearings, water bill inserts, posters, or notices in print or on radio or TV (public education strategies are discussed in more detail in Appendix H). When presented with the facts, most people will happily provide the water system with access to install POU or POE treatment units, and to conduct the necessary maintenance and monitoring to ensure their ongoing effectiveness. To address the possibility that an individual or a group of individuals may refuse to provide system personnel with the necessary access, it is recommended that your system or local government draft an ordinance requiring homeowners to provide such access or risk having service stopped. A sample access agreement and a sample ordinance are provided in Appendices I and J.

What problems may arise if I decide to implement a centrally managed POU or POE treatment strategy, and how can I avoid them?

Public Relations

One of the greatest challenges facing water systems is public relations — keeping the community aware of current and future activities that will impact service, responding to customer complaints, and ensuring customer satisfaction. Good public relations are even more important for systems that implement a centrally managed POU or POE treatment strategy. Because these units are installed and maintained on customer property, this type of treatment requires frequent interaction with homeowners. Below are some tips for achieving homeowner cooperation and satisfaction.

- **Educate your customers.** You should explain to your customers why you have elected to install POU or POE devices (e.g., greater protection at lower cost), the level of performance customers should expect, when and how customers should contact you, and their responsibilities (e.g., protecting their unit from damage or tampering).

  This information can be communicated to customers in several ways. Examples include house visits, telephone calls, a town meeting, announcements in the local newspaper, and informational pamphlets (perhaps included with the water bill). Appendix H provides more information on tools that may be employed to enhance public education efforts.

  To avoid problems, perform pilot testing.

  The best way to avoid problems associated with implementing a POU or POE treatment strategy is to run extensive pilot tests *prior* to the selection and installation of treatment devices. Performance of even the highest quality treatment units will vary depending on source water characteristics.

- **Provide a customer complaint line.** Even with regular maintenance and replacement of certified, reliable units, there are likely to be unanticipated problems, particularly when the devices are first installed. Since water availability is so important, repair staff should

be on call at all times. Quick response will ensure the customer's safety and comfort while helping to prevent more costly repairs in the future.

- **Be professional.** As you know, it is important to show your customers that you and your employees are knowledgeable and trustworthy. Customer confidence is especially important when managing a POU or POE strategy, where treatment takes place in customers' homes. Therefore, staff should show up promptly for appointments, remain courteous at all times, answer customer questions, and clean up after performing sampling or maintenance.

Logistics and Administration

The administrative tasks required to manage a successful POU or POE treatment strategy, including customer outreach, scheduling, and record keeping, can be time-consuming. Several of the systems identified in Table A-1 in Appendix A reported that it was beneficial to hire a part-time employee to develop schedules for installation, maintenance, and sampling, and to set up and confirm all appointments. This person could also be responsible for keeping up-to-date records of visits and sample results.

Below are some suggestions on how to ensure that your POU/POE treatment program runs as smoothly as your other operations. In addition, please refer to Appendices I and J to review a sample access agreement and ordinance to provide you with the legal right to conduct necessary maintenance and sampling activities. Both of these documents may be modified to reflect the needs of your system and service community.

- **Schedule visits to homes near each other for the same day.** When coupled with the coordination of maintenance and sampling visits, this will minimize travel time and maximize productivity.

- **Communicate with your customers.** Sending a card like those used by dentist offices that reminds customers of the date, time, and purpose of your visit will help reduce the number of missed appointments. Confirmation calls are also very important. These procedures will save you money by minimizing extra trips and will build consumer confidence. Providing homeowners with a record of your visit, such as a receipt, will also help maintain positive customer relations.

- **Keep your appointments.** To maintain the trust and respect of your customers, it is essential for you to ensure that all appointments are kept, or to notify the homeowner in a timely manner if they must be rescheduled. To avoid scheduling and access problems, some systems have arranged for customers to provide system employees with keys to their houses or have installed treatment units (particularly POE units) in garages or basements.

- **Keep records.** To confirm that you are following sampling and maintenance schedules as planned and that the treatment units are performing as expected, it is helpful to keep track of all your sampling and maintenance visits, work performed, and lab analyses in a log book or simple database.

Liability

Under the SDWA, you are responsible for maintaining the safety of the water provided by your system. In addition, you are directly responsible for the operation and maintenance of all POU and POE treatment devices installed as part of your compliance strategy. Therefore, you will be liable in the event of device malfunction or failure. Furthermore, you are obligated to test and maintain these devices and to educate consumers about their responsibility to contact you if a problem arises.

Although the liability issue may at first seem overwhelming, it is important to understand that it is unlikely that your system will face extraordinary liability costs as long as you conduct proper maintenance and monitoring and your staff approach their duties in a professional manner. Further, several options are available to you to reduce your liability and risk.

First, you may be able to negotiate certain contract provisions with the vendor who sells you the treatment equipment or with a subcontractor that you hire to conduct sampling and/or maintenance to insulate yourself (at least in part) from the consequences of device failure. For example, in one of the case studies reviewed in Appendix A, the equipment vendor agreed to cover all expenses (approximately $200) resulting from the leakage of a POU treatment device. In another case, a vendor agreed to cover any damages incurred during the installation of up to two units, with the system covering the cost of any additional damage.

Indeed, it is recommended that you negotiate with the vendor or installer for them to retain responsibility for all units for a specified period after installation to allow for minor adjustments, leak repair, and a follow-up inspection.

Second, you may purchase additional insurance (e.g., comprehensive general liability insurance) from an outside provider (e.g., State Farm).[8] Several systems that have installed POU and POE treatment devices have acquired liability insurance to cover homeowner damages resulting from malfunctioning units. Contract and insurance law are extremely complex. Therefore, it is highly recommended that you obtain legal assistance when deciding which option makes the most sense for your system.

Equipment

To be prepared for equipment failure, you should stock replacement units and parts. Ongoing parts availability should be considered when selecting an equipment supplier. To minimize storage costs, some systems have negotiated deals with equipment vendors who promise to provide all replacement parts on demand at or below retail cost.

As with all equipment purchases and service contracts, you should confirm that your potential supplier is reliable and trustworthy. A good vendor should be easy to contact and should provide technical assistance in the event a problem occurs.

[8] Note that mention of a particular product or service in this document does not imply EPA endorsement.

Waste Disposal

Just as a central treatment facility generates waste residuals as a result of the treatment processes that it employs, systems that implement a POU or POE treatment strategy must dispose of the wastes generated by these units. A system that employs POU or POE treatment devices must dispose of spent media, cartridges, membranes, and filters several times a year. In addition, reverse osmosis POU and POE units produce a waste brine which is characterized by high contaminant concentrations. Backwashing and regeneration, required for proper operation of most POE treatment devices, will also result in the generation of liquid waste. Note, however, that the wastes generated by POE treatment units are typically less concentrated and have a smaller volume than those generated as a byproduct of central treatment and that those generated by POU treatment units are even less concentrated and of even smaller volume.

Non-hazardous solid waste produced by these treatment systems often can be disposed of like normal household waste, delivered to a local landfill or regenerated and recycled. Non-hazardous liquid waste may usually be discharged to publicly-owned treatment works (POTWs), on-site septic systems, or dry wells. In these cases, the disposal costs associated with the POU or POE treatment strategy are likely to be negligible compared to the cost of equipment, installation, and ongoing operation and maintenance. Many systems have implemented POU and POE treatment strategies without waste disposal problems.

However, waste that contains high concentrations of certain contaminants may require costly special handling and disposal. The media used in POE devices used to treat for radionuclides such as radon, radium, or uranium may require treatment (disposal) as radioactive waste when replaced. Similarly, wastes that fail the toxicity characteristic leaching procedure (TCLP) test may require treatment (disposal) as hazardous waste.[9]

Because the solid residuals generated by POU and POE units are collected from individual households, these wastes *may* be exempt from federal regulation as hazardous wastes, regardless of their toxicity. However, State regulations and each State's implementation of federal regulations can vary. In the case of liquid wastes, local wastewater treatment plants may issue their own limits for the disposal of certain contaminants, such as copper and TDS. The use of POU devices do not generally lead to waste disposal problems. However, to avoid issues with the disposal of wastes from POE devices, it is essential that you consult with your local wastewater treatment plant as well as State regulatory authorities to clarify the interpretation of hazardous waste regulations before deciding to implement a POE treatment strategy.

The EPA report entitled, *Waste Disposal Costs for Point-of-Use and Point-of-Entry Treatment Strategies*,[10] addresses the issue of hazardous waste disposal in detail.

For examples of how real systems have successfully addressed some of the problems associated with managing POU and POE treatment strategies, please refer to the case studies presented in Appendix A.

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[9] A list of contaminants that may potentially be regulated as hazardous under the Resources Conservation and Recovery Act (RCRA) on the basis of the TCLP is provided in Appendix E.

[10] U.S. EPA, *Waste Disposal Costs for Point-of-Use and Point-of-Entry Treatment Strategies*. October 2000.

Appendix A: *Case Studies*

This appendix summarizes several field studies and demonstration projects in which POU and POE technologies were applied in small communities. Table A-1 identifies, when available:

1. *Community Information*: Location, population, and other characteristics of the community in which the POU or POE technology was installed.

2. *Contaminant and Concentration*: The contaminant of primary concern and its concentration in untreated water. Other source water characteristics that may affect device performance, such as pH, total dissolved solids (TDS), and co-occurring contaminants, are indicated in italics.

3. *Treatment Type:* Specific type of POU or POE technology installed in the community.

4. *Number of Units*: The number of POU or POE units that were studied or installed in the community.

5. *Performance:* Information on unit capacity, removal rates, and contaminant concentration in treated water. Where available, the duration of the study is also indicated.

6. *Other Findings:* Additional information about the community's experience with a POU or POE treatment strategy.

> **NOTE:** A system should not select one of the devices described in a case study simply because the device was used successfully and economically to treat the identified water quality problem. Before selecting a treatment device, you should subject it to extensive testing to determine its capacity to treat the contaminant of concern under local conditions.

This appendix also reviews the management of the POU and POE projects implemented in communities for which relevant information was available, including:

1. Selection of treatment type
2. Installation
3. Sampling and monitoring
4. Maintenance and replacement
5. System administration and management

While each system considering the implementation of a centrally managed POU or POE treatment strategy to achieve compliance must devise a course of action appropriate to the characteristics of its source water and service area, the following case studies offer real-life examples of the potential advantages and disadvantages of such strategies.

Table A-1: *Community Experience with Centrally Managed POU and POE Treatment*

Community Information[1]	Contaminant and Concentration (mg/L)		Treatment Type		# of Units	Performance	Other Findings
Fairbanks, AK & Eugene, OR: 1983 4 households	Arsenic *Iron* *Sulfate* *pH* *Calcium* *Magnesium* *Turbidity*	0.22-1.16 *Low* *Low* *7.4* *8.9* *9.3* *0.32 NTU.*	POU	AA	9	3 units successfully treated more than 10,000 gallons. 3 other units treated more than 6,000 gallons successfully. 3 units failed to operate as expected due to inadequate device preparation.	Estimated capacity of AA for arsenic: 1.0 mg arsenic/g AA
			POU	AX	9	4 units successfully reduced the As concentration below 0.05mg/L (3 for 10,000+ gallons). 2 units demonstrated erratic As removal. 3 units performed poorly due to inadequate regeneration.	Estimated capacity of AX for arsenic: 0.86 mg arsenic/g resin
			POU	RO	9	Units initially removed 60-80% of As, but performance rapidly deteriorated (50% removal over life). Lowered TDS. Adding booster pumps to the RO units to increase water pressure improved performance but raised electricity costs. Under high-pressure, RO units successfully maintained arsenic below the MCL for 330 days.	Needed to be replaced 2 times a year to be effective given raw water quality. Limited production capability: < 3.0 gallons/day
San Ysidro, NM: 1986* Population: 200	Arsenic Fluoride *TDS*	0.22 5.2 *up to 1000*	POU	RO	74	Successfully reduced As below 0.05 mg/Land F below 2.0 mg/L.	Removal rates were 10% less than manufacturer's estimate due to water quality. A follow-up study (1992-1993) found that the POU devices could reliably meet treatment goals if proper O&M conducted, but that performance of some units had deteriorated over time due to inadequate maintenance.
Lewisburg, OH: 1997*	Arsenic *Barium* *Lead* *Cadmium*	0.050-0.864 *2.1-4.6* *0.030-0.368* *0.008*	POE & POU	POE: CX; CX & AA; CX & AX; CX, Oxidizing Media &AX POU: RO	17	Reduced As by 35-100% (lower levels of reduction primarily due to high concentration of As (III). POE unit containing CX, oxidizing media, and AX was found to provide the greatest As reductions (95-100%). High levels of iron were found to improve or degrade overall system performance depending on the type of treatment technology employed.	Arsenic speciation is essential for proper system selection and design. Oxidizing media can be effectively integrated into an As POE treatment system.
Fallon Naval Air Station, NV: 2001*	Arsenic	0.100	POE & POU	RO	11 & 360	Original installation due to exceedance of As MCL. Fallon also found to be site of a childhood leukemia cluster. Units reduced As concentrations by > 90% to less than 1 ppb. One of POE units had a bad seal and failed. This seal was replaced by the vendor at no charge. No other operational problems were reported. Outside vendor currently provides all maintenance. Sampling is conducted by Environmental Office at Fallon.	Access to units assured through Navy mechanisms enabling house inspections. Installation required approx. 1 hour. 76 additional units (similar to water coolers) installed in office spaces and other non-residential areas. POU RO devices expected to be installed in all area schools in near future.

Community Information[1]	Contaminant and Concentration (mg/L)		Treatment Type		# of Units	Performance	Other Findings
Island System, WA: 2000*	Arsenic *Cyanide*	0.27 0.25	POE	AX	16	Have reduced As below 0.01 mg/L (90%) and cyanide below 0.02 mg/L (92%) for more than 4 years.	Prior to installation, conducted a 6-month pilot test. All deeds for households served by these units must indicate that As and cyanide levels exceed MCLs unless treated. Implementation involved coordination between many parties. Follow-up with homeowners was essential to success.
Monadnock Area Cooperative School, NH: 2000	Arsenic		POE	AA	1	To date, no problems have been reported with this unit and it has successfully reduced arsenic levels.	Unit is easily maintained.
Parkersburg, IL: 1985*	Fluoride *Alkalinity* *TDS*	6.6 *1,000* *High*	POU	AA	10	Reduced F below 1.8 mg/L for 400 gallons.	High alkalinity reduced unit performance (compare w/Bureau Junction study).
Bureau Junction, IL: 1985*	Fluoride *Alkalinity* *TDS*	6.0 *540* *High*	POU	AA	40	Reduced F below 1.8 mg/L for 1,300 gallons.	
Kings Point, Suffolk, VA: 1995*	Fluoride *TDS*	5.62 *474*	POU	RO	39-80	Reduced F below 0.35 mg/L in 35 month study. Success led to expansion to 80 homes. Elevated heterotrophic plate counts (HPCs) were found in treated water. Regular use of the unit reduced HPCs. Removal of GAC post-filters eliminated problem.	High temperature, bacteria, and high pH all shortened useful life of device. Switched to city water in 1996 in part to reduce workload of system staff associated with sampling (very labor intensive since each household slightly different).
Sites in Arizona: 1985 Thunderbird Farms	Fluoride *Alkalinity*	2.6 *200*	POU	AA	8	Reduced F below local MCL for 1,540+ gallons.	Devices abandoned after 6 months when EPA raised MCL (no longer necessary to meet requirements).
Papago Butte	Fluoride *Alkalinity*	2.6 *200*	POU	AA	1	Reduced F below local MCL for 9,500 gallons.	
Ruth Fisher Elementary School	Fluoride *Alkalinity*	4.4 *80*	POU	AA	1	Reduced F below local MCL for 1,000 gallons.	
You and I Trailer Park	Fluoride *Alkalinity*	15.7 *40*	POU	AA	1	Reduced F below local MCL for 2,500 gallons.	
Emington, IL: 1985*	Fluoride *TDS*	4.5 *2,620*	POU	RO	47	Reduced F below 0.6 mg/L and TDS below 520 mg/L for 8 months.	Limited production capacity: 3.0 gallons/day

Community Information[1]	Contaminant and Concentration (mg/L)		Treatment Type		# of Units	Performance	Other Findings
Montana: 2000*	Fluoride	15	POE	RO	5	Units installed to treat drinking water for remote lodges. All 5 units successfully reduced fluoride levels and TDS. Units demonstrated a 75% recovery rate.	Disposal of waste brines was not found to be problematic (discharged to on-site sewage treatment system). Vendor provides routine maintenance and periodic disinfection of units.
Boynton Middle School, NH: 2001*	Fluoride	5.5	POE	RO, AA & UV	1	Reduces F well below MCL for 600 children and staff and has been virtually problem free although pre-filter has clogged on several occasions. Unit provides a 50% recovery rate.	Spent AA not considered hazardous.
Montana: 1999	Copper	2.6	POU	CX	2	Reduced Cu levels by 98% over course of study. Run lengths of 130 and 170 gallons (approximately 2 months) was observed for these two units. HPC level of effluent was found to exceed that of influent for one of the units	Units were determined not to be cost effective due to high O&M costs. UV element may be necessary to ensure the microbiological safety of treated water due to potential for microbial colonization of treatment unit.
Montana: 2000	Copper Lead	1.78 0.01	POU	RO	16	Cu reductions of ~90% and Pb reductions of ~70% have been observed since installation.	
Suffolk County, NY: 1985*	Nitrate	0.4-12.1	POE & POU	GAC, IX, RO, and Aeration	18	All units demonstrated ability to remove contaminants of concern to necessary levels.	
Maple Grove Elementary School, WI: 1996	Nitrate *Corrosion*		POE	AX	1	Extremely successful in reduction of nitrate levels. Some problems observed with corrosion control element.	
Fort Collins, CO: 2000	Nitrate *TDS* *Na, Mg, Cl, Ca, Fe, and alkalinity*	11.2-17.2 *1,200-1,500*	POU	RO	3	Units provided ~80% removal of nitrate and > 90% removal of TDS during 2 month pilot study.	Pilot study complete. System waiting to make final decision based on costs of other options (including development of new sources).
Covenant Christian School, WA: 2001	Nitrate		POU	RO	1	Unit performing well, effectively reducing nitrate levels.	
Bellevue, WI: 1989* 1,238 residential, 11 commercial, and 2 municipal customers	Radium 226 Radium 228 *pH* *TDS*	15.0 pCi/L 3.9 pCi/L *7.8* *614*	POE	CX		Performance data was not provided. The study only covered existing softeners.	Common maintenance problems included brine tank overflow, malfunctioning timer mechanism, and inaccessibility of treatment units.
Colorado & New Mexico: 1983	Uranium	104 g total U/L		AX	12	9 units reduced U below 1 g total U/L for 2 yrs.	
Various States: 1989	Radon	2576 pCi/L to 1 million pCi/L	POE	GAC 1.0 ft^3 GAC 1.7 ft^3 GAC 3.0 ft^3		Removal rate: 90.7% 92.5% 98.6%	

Community Information[1]	Contaminant and Concentration (mg/L)		Treatment Type		# of Units	Performance	Other Findings
Suffolk County, NY: 1985*	Aldicarb	87 g/L	POE	GAC	> 100	> 93% of devices operated satisfactorily. Premature breakthrough occurred primarily as result of improper installation, inadequate backwashing cycle, and homeowner negligence.	Devices successfully reduced aldicarb concentrations for 37% to 158% of advertised lifetime.
			POU	GAC	2	Reduced aldicarb below 7 g/L for <1,000 gallons.	Units still in place after 21 years in homes not connected to city water.
Fresno, CA: 1990 Low population density; intensely farmed area.	DBCP		POE	GAC	10	Over 2 year study period, units were extremely effective in removing DBCP.	Performance of units could change markedly over time, necessitating a high level of monitoring.
Florida: 1987	EDB Aldicarb Hydrocarbons		POE	GAC	842	Effective (detailed information not available).	
Byron, IL Very rural	TCE Cyanide IOCs		POE	GAC	N/A	Breakthrough had not occurred one year after installation.	
Elkhart, IN: 1989* Population: 65,000	TCE CCl_4 $CHCl_3$	0.533 g/L 1,165.2 g/L 25 g/L	POE	GAC	54	Devices treated 25,000 to over 300,000 gallons before breakthrough in 16-25 month study. Methylene chloride concentrations of 115 g/L were consistently lowered below detection levels.	Possible causes for CCL_4 breakthrough included competitive effects of other contaminants and bacterial colonization.
Rockaway Township, NJ: 1985* Population: 20,000	TCE Trichloroethane *Total Organic Carbon (TOC)*	0.125 0.092 *low*	POU	GAC	12	Reduced both contaminants below 0.001 g/L. Removal rates were over 99%. VOCs were undetectable at all 8 sites sampled during 24 month period.	
Silverdale, PA: 1985* Population: 500	TCE Trichloroethane	80.5 g/L 1.1 g/L	POU	GAC	49	Reduced TCE and 1,1,1-trichloroethane below 1.0 µg/L in 95% and 97.7% of samples, respectively.	Other VOCs were detected in only 61 of 715 post-device analysis (8.5%) during the study.
Putnam County, NY: 1987* Residences located in hills surrounding Lake Carmel.	TCE, TCA, PCE, Benzene, Toluene, Xylene, & CCl_4	All at high concentrations.	POE	GAC	67	Satisfactory. In no case was a contaminant found to exceed 5 g/L after treatment.	
Honeywell Site, PA: 1995*	TCE	1-10 g/L	POE	GAC	20	Units have reduced TCE levels below detection since installation around 1995.	Systems consist of 2 3' tall carbon units in series. Access has not been an issue; homeowners have been quite helpful, they want their units maintained. Disposal of spent media is included in fee paid to vendor (no problem with hazardous waste).
Crown Industry Site, PA: 1996*	PCE *TCE*	1-10 g/L	POE	GAC	7	Units have reduced PCE levels below detection since installation in 1996. The system did not report any problems with bacterial contamination.	Systems consist of 2 3' tall carbon units in series. Installation and maintenance contracted out to vendor.

Community Information[1]	Contaminant and Concentration (mg/L)		Treatment Type		# of Units	Performance	Other Findings
Hudson, WI: 2001*	TCE *TCA* *PCE, DCE*	> 11 g/L *> 15 g/L*	POE	GAC	~350	Excellent performance; over the past 6-7 years only one (unconfirmed) incidence of TCE breakthrough was reported (filters changed out). Some customers have submitted complaints about drops at the tap.	Steadily declining contaminant concentrations in raw water have led to reduced sampling schedule. Spent GAC removed by vendor and disposed of at a regeneration facility.
High Quality Plating Site, PA: 2001*	TCE	30-60 g/L	POE	GAC	2	State has conducted quarterly sampling for TCE and bacteria and has not yet detected either.	Systems consist of 2 5' tall carbon units (1' diameter) in series. Homeowners required to sign an access agreement to enable installation and sampling.
Kettle Creek State Park, PA: 1996*	Microbials		POE	UV	1	UV unit performed extremely well (and at low cost) throughout the 15-year period that it was installed at park. Very low maintenance requirements.	Park now uses standard package treatment plant.
Grand Junction, CO: 2000*	Microbials		POE	UV	20	Inconsistent and relatively poor results due to seasonal variability of raw water (turbidity overwhelms sediment pre-filters in spring).	System wants to replace POE units with a central treatment facility. Access and scheduling have not been a problem since personnel that provide O&M live in the community and know the residents.
No Name Water System, CO: 2001*	Microbials		POE	NF		Pleased with device performance. System reports no problems with bacterial growth/colonization.	System is transitioning to central bag-filtration
Lyman Run State Park, PA: 2001*	Microbials		POE	UV	4	Units were installed in 1985 and have been operating for approximately 15 years without incident. Both park manager and users are pleased with units' performances.	Park plans to install sediment scrubbers to make devices even more effective.
Ole Bull State Park, PA: 2001*	Microbials		POE	UV	1	Unit initially installed to replace smaller POE UV device previously installed (1976). New device has operated flawlessly since 1990.	

1. Some of the case studies included in this summary table were conducted more like technology performance evaluations than evaluations of a centrally-managed POU or POE treatment strategy. Those studies that fall into the latter category may have more relevance to your decision regarding the implementation of a centrally-managed POU or POE treatment strategy. Therefore, these studies are indicated by a '*'.

Community Experience with Centrally Managed POU and POE Treatment Strategies

Device Selection and Installation

Pilot testing or field testing is conducted prior to the installation of a particular treatment device. This process ensures that the device operates as advertised and that treated water will meet the MCL on an ongoing basis. System experience with pilot testing has demonstrated the value of this practice. Substantial cost savings were realized by one system that elected to change the technology that it was going to install on the basis of the results of pilot testing. Based on their experiences, two other systems strongly recommended that other systems planning to install POU or POE treatment devices as part of a compliance strategy should conduct pilot testing to verify unit efficacy, determine an appropriate maintenance schedule, and identify potential operational problems.

Once a water system selects a particular treatment technology to resolve a contamination problem, it must then address the task of installing a device in each household within its service area. In about one-third of the case studies in which device installation was mentioned, EPA personnel took responsibility for installation. In most of the other cases, equipment vendors either arranged and paid for device installation by licensed plumbing contractors, or installed the equipment themselves. In a study of radon treatment in various states, 60 percent of POE granular activated carbon (GAC) units were installed by homeowners themselves, without outside assistance.

Very limited information was provided on the amount of time needed for installation. However, installation of individual POE GAC units for TCE removal required between 45 and 90 minutes in Silverdale, PA.

Sampling and Monitoring

The structure of a monitoring program depends on the number of POU or POE devices installed in the community, the type of contaminant being removed, the treatment method, and the geography of the service area. In the cases reviewed, sampling generally was performed by state or local officials. In some cases, such as San Ysidro, NM, equipment vendors trained local personnel who then collected all necessary samples. The National Sanitation Foundation (NSF) trained sample collectors for the projects it managed in Silverdale, PA and Rockaway County, NJ. In these communities, sampling was paid for by the local health department and conducted according to prescribed EPA methods. In Suffolk, VA, where POU reverse osmosis (RO) devices were used to remove fluoride, a city official collected samples from each unit on a monthly basis for 2 years. Subsequently, the manufacturer took over the responsibility for scheduling and sample collection. After the first 2 years of successful fluoride reduction, each treatment unit was sampled on a quarterly rather than a monthly basis.

As would be expected, sampling schedules varied among communities and treatment types. In EPA's 1983 study in Fairbanks, AK and Eugene, OR, POU activated alumina (AA) units initially were sampled every 2 weeks. In this case, sampling required 15 minutes per unit per visit. When more households were included in this study, sampling frequency was decreased to once every 1 or 2 months for each treatment unit. In EPA's 1989 radon study, initial sampling and analysis was undertaken about three weeks after operation began in order to ensure proper installation; samples were then collected from each unit once every 6 months.

Not all studies employed sampling regimes that ensured 100 percent coverage. For instance, in Suffolk, VA, two residents in each region volunteered their homes as sampling sites. Some communities sampled treatment units on a rotating basis. In Putnam County, 10 percent of units were sampled each year. Meters designed to measure total dissolved solids (TDS) were installed with POU RO units in San Ysidro, NM to warn consumers of contaminant breakthrough, reducing monitoring needs. The sampling schedule for this community was published in customer's water bills and ensured that a unit would be monitored at least once every 3 years. Sample collection in San Ysidro required 15 minutes per household.

The frequency of sampling may be dictated by lab fees, which vary by the nature of the required analysis. In Silverdale, PA, GAC filter cartridges were replaced frequently, precluding the need for expensive volatile organic chemical (VOC) analyses, while ensuring safe performance. This strategy was found to be as safe and more cost-effective than less frequent filter replacement and more frequent sampling.

Maintenance

Maintenance of household treatment units is the legal responsibility of the water system that installs them as part of a compliance strategy. The system may contract maintenance services, but it retains ultimate responsibility for the safety of drinking water delivered by the installed units. In addition to regular activities such as replacing cartridges and cleaning ultraviolet bulb housings, maintenance staff were often required to make special service calls to repair plumbing leaks or other problems in the reviewed cases.

POU and POE treatment strategies require that operation and maintenance staff have regular access to individual residences. A number of systems described in the case studies sought homeowner cooperation through written agreements. Customers in San Ysidro, NM signed a permission form allowing village officials to enter their homes to install, test, and maintain POU RO units. Participants in the Suffolk, VA and Rockaway Township, NJ studies signed similar access agreements. In Suffolk, the agreement also relieved the city of liability for damages resulting from the use of POU units.

While samples can be taken by relatively inexperienced personnel, maintenance requires a degree of expertise. In the reviewed studies, maintenance was usually provided by the vendor of the treatment unit, or subcontracted to a local water company. For example, the vendor maintained the POU RO units in San Ysidro, NM for a monthly fee of $8.60 per unit until a village maintenance specialist was sufficiently trained to take over the vendor's duties. San Ysidro required customers to pay for maintenance procedures necessitated by their own negligence.

Program coordinators in Silverdale, PA concluded that for POU treatment to be successful homeowners must be made aware of how and when to request maintenance and monitoring. In this case, homeowners failed to report operational problems immediately and, as a result, leaking units damaged two homes. The manufacturer's liability insurance covered the damage, but reimbursement took several months.

To ensure that such problems did not arise in their community, the San Ysidro Village Council outlined the responsibilities of water users and the water utility (the village). The village's responsibilities included unit maintenance, periodic monitoring, and liability insurance. Users were required to allow access to their units, protect their units from damage, assume liability for damage to their units, refrain from tampering with or disconnecting their units, allow periodic

inspections of their units, and report any problems with their units to the water utility in a timely fashion.

A follow-up study conducted in San Ysidro found that the performance of POU RO devices installed in the village 7 years earlier had deteriorated significantly due to inadequate maintenance. As a result, the authors of the study made four specific recommendations to ensure proper operation and maintenance (O&M) (and optimal performance) of the treatment devices in the future:

- Establish a funding mechanism dedicated to support O&M activities;
- Develop and adhere to a reliable system for tracking O&M activities;
- Provide appropriate operator training and equipment for measuring device performance; and
- Provide appropriate operator training and equipment for maintaining treatment devices.

The adoption of these recommendations will improve system compliance, extend the effective life of treatment units, and enhance customer satisfaction.

Replacement

Proper maintenance of POU and POE devices includes timely replacement of media, cartridges, filters, and modules. The timing of these replacements depends on the properties of the community's water supply and the use patterns of water customers. Many of the case studies identified pilot tests as the preferred method to determine an appropriate replacement schedule. In Silverdale, PA, GAC cartridges were replaced every 2 to 5 years, and particulate pre-filters were replaced once a year to avoid the costs of frequent sampling and expensive VOC analysis fees. Putnam County, NY replaced the lead GAC cylinder of a two-cylinder POE treating for VOCs annually. Each year, the lag tank was moved to the lead position, and a fresh tank was placed in the lag position. In Florida, GAC filters treating VOC-contaminated water were replaced twice a year and UV bulbs replaced once a year. It was not uncommon for systems to change filters more frequently than pilot tests suggested was necessary. For instance, although the theoretical lifetime of each GAC tank in the Putnam County POE program was 18 months, the lead cylinder was replaced annually, providing a 75 percent margin of safety.

Some systems chose to replace unit parts on an as-needed basis, rather than following a predetermined replacement schedule. In Suffolk, VA, POU RO membranes were replaced when fluoride rejection rates dropped below 70 percent, as measured by post-device conductivity tests. Similarly, staff replaced AA filters in Parkersburg and Bureau Junction, IL when fluoride exceeded the local maximum contaminant limit (MCL) in samples. Byron, IL planned to replace carbon filters upon TCE breakthrough

> **NOTE:** POU and POE units must keep contaminant concentrations below the MCL at all times in treated water to be considered compliance technologies.

The disposal of spent media was mentioned in three cases. In Putnam County, NY, used carbon was disposed of in a nearby landfill. Suffolk County, NY shipped used carbon to an out-of-state carbon manufacturer, where it was regenerated via a high temperature process. The regenerated carbon was then recycled for use in industrial applications. Program coordinators in Fairbanks, AK and Eugene, OR noted that arsenic did not accumulate on RO units. Therefore, disposal was not a concern at these sites.

Administrative Strategy

Thoughtful development of local laws can aid systems in implementing POU or POE compliance strategies. The village council of San Ysidro, NM passed a number of measures to ensure the success of its POU program. The most significant was an ordinance making the use of village water contingent on the installation of a POU in a citizen's home.

Another interesting feature of the San Ysidro program was a special provision making commercial establishments, rather than the village water system responsible for providing safe drinking water to their customers. This provision allowed commercial users the flexibility to select the most economical method of treatment and relieved the village of the need to coordinate the lease, purchase, and maintenance of RO units of various sizes. Note that this transfer of responsibility and liability may not be legal in all localities.

Appendix B: *Standards for POU and POE Water Treatment Devices*
The American National Standards Institute and the National Sanitation Foundation

To meet the requirements of §1412(b)(4)(E)ii of the Safe Drinking Water Act (SDWA), POU and POE devices installed as part of a compliance strategy must be certified according to the American National Standards Institute (ANSI) standards, if a standard exists for that type of device. Section 1412(b)(4)(E)ii states:

> *If the American National Standards Institute has issued product standards applicable to a specific type of point-of-entry or point-of-use treatment unit, individual units of that type shall not be accepted for compliance with a maximum contaminant level or treatment technique requirement unless they are independently certified in accordance with such standards.*

What is the American National Standards Institute?

The American National Standards Institute (ANSI) is the administrator and coordinator of the United States private sector voluntary standardization system. It is a private, nonprofit organization with a diverse membership of companies, organizations, government agencies, and other institutions. ANSI does not develop national standards itself. Rather, it helps to establish consensus among qualified groups. These ANSI Accredited Standards Developers work to establish standards that are compatible with the trends of technological innovation, marketplace globalization, and regulatory reform.

What is the National Sanitation Foundation?

The National Sanitation Foundation (NSF) is an ANSI Accredited Standards Developer. An independent, not-for-profit organization, NSF is known for the development of standards, product testing, and certification services in the areas of public health and the environment. In 1968, State drinking water administrators asked NSF to develop certification standards for POU and POE Drinking Water Treatment Units (DWTU). These standards allow customers to verify the claims of manufacturers regarding the unit's ability to reduce contaminants in source water. In the years that followed, NSF involved a wide variety of stakeholders, such as EPA and the American Water Works Association (AWWA), in developing standards for new technologies and applications.

What is Underwriters Laboratories?

Underwriters Laboratories Inc. (UL) is an independent, not-for-profit product safety testing and certification organization. UL tests a wide range of products including drinking water treatment units. UL's Drinking Water Certification Program is accredited by ANSI as well as by individual States such as California, Iowa, Massachusetts, and Wisconsin. As a result, UL is authorized to test and certify POU and POE treatment devices to ANSI/NSF standards.

What is the Water Quality Association?

The Water Quality Association (WQA) is a non-profit international trade association that represents the household, commercial, industrial, and small community water treatment industry. WQA provides support and educational opportunities to members as well as the public and acts as a voice for the industry. In addition, WQA has been accredited by ANSI to evaluate the ability of drinking water treatment units to meet the standards established by ANSI/NSF. Further, WQA has developed several additional standards under its "Gold Seal" program. Therefore, WQA's laboratory is authorized to certify POU and POE treatment units under both the ANSI/NSF standards and its own "Gold Seal" program.

What does NSF Certification Mean?

NSF does not recommend, rate, or compare products. It tests and verifies that each certified product meets all the requirements of the relevant standards and that a manufacturer's claims about its products are true. NSF Certification programs include testing, retesting, and third-party inspections and audits. Testing procedures for drinking water treatment systems are designed to ensure that product meets five basic requirements of certification.

1. The manufacturer's contaminant reduction claims are true.

2. The system does not add anything harmful to the water.

3. The system is structurally sound.

4. The advertising, literature, and labeling are not misleading.

5. The materials and manufacturing processes used to produce the system are not changed.

NSF may accredit other independent laboratories (such as Underwriters Laboratories or the Water Quality Association) to certify drinking water treatment units under ANSI/NSF standards. Prior to providing this accreditation, NSF audits these laboratories to ensure that they meet its procedural and technical requirements.

What are the current ANSI/NSF standards?

There are six ANSI/NSF standards for drinking water treatment units (DWTUs). Each standard applies to a different type of product. It is these standards to which the SDWA refers in §1412(b)(4)(E)ii (see above). For instance, since Standard 44 applies to cation exchange water softeners, a system planning to implement a POU program using such devices would have to ensure that the product it selects is certified according to ANSI/NSF standards.

To gain certification, a product is tested against one or more of these standards to ensure that it complies with the five requirements listed above.

- Standard 42: Drinking Water Treatment Units — Aesthetic Effects
- Standard 44: Cation Exchange Water Softeners

- Standard 53: Drinking Water Treatment Units — Health Effects
- Standard 55: Ultraviolet Microbiological Water Treatment Systems
- Standard 58: Reverse Osmosis Drinking Water Treatment Systems
- Standard 62: Drinking Water Distillation Systems

Please refer to Table B-1 on the following page for a detailed description of each standard.

IMPORTANT NOTE REGARDING ANSI/NSF STANDARDS 42 AND 55

- Devices certified according to Standard 42 must only meet aesthetic objectives – they do not necessarily need to achieve health objectives. Therefore, certification to this standard alone should not be considered when identifying potential compliance technologies.
- The use of POU devices to treat for microbiological contaminants is explicitly forbidden in the SDWA. Therefore, although POU UV devices may be certified under Standard 55, they should not be considered when identifying potential compliance technologies.

Table B-1: *Existing ANSI/NSF Standards for POU and POE Devices*

ANSI/NSF Standard		Date First Adopted by NSF	Type of Unit Covered by Standard	Conditions
42	**Drinking Water Treatment Units - - Aesthetic Effects**	March, 1973	POU and POE units designed to : (1) reduce substances that may detract from drinking water's aesthetic quality (taste, odor, or appearance), or (2) add chemicals to control substances that cause hardness.	Water must be microbiologically safe and of known quality.
44	**Cation Exchange Water Softeners**	November, 1971	Residential CX units used to decrease hardness of drinking water with manual, auto-initiated, or demand-initiated regeneration.	Water must be microbiologically safe and of known quality.
53	**Drinking Water Treatment Units - -Health Effects**	December, 1981	POU/POE units designed to remove contaminants that are established or potential health hazards, including: chemical, microbiological, and particulate contaminants.	Water must be of known quality. **Activated carbon units covered by this standard should not be used where the water is microbiologically unsafe**.
55	**Ultraviolet Microbiological Water Treatment Systems**	May, 1991	Two classes of UV disinfection systems and components: *Class A* - POU and POE systems designed to disinfect and/or remove microorganisms including bacteria and viruses in contaminated water to a safe level. *Class B* - POU systems or components designed to reduce normally occurring nonpathogenic or nuisance microorganisms. These systems are designed for supplemental treatment of previously treated and disinfected public drinking water, or other drinking water that a state or local health agency has deemed acceptable for consumption.	*Class A:* Water must not be cloudy, colored, turbid or have an obvious source of contamination. Systems treating surface water must be installed downstream of a pre-filter certified for cyst reduction under Standard 53. Systems are not intended to convert wastewater to drinking water. *Class B:* Systems are not intended for the disinfection of microbiologically unsafe water.
58	**Reverse Osmosis Drinking Water Treatment Systems**	November, 1986	POU RO units designed to reduce specific substances that may be present in public or private drinking water supplies, such as TDS or nitrate.	Water must be of known quality and microbiologically safe.
62	**Drinking Water Distillation Systems**	May, 1989	POU and POE distillation units designed to remove specific chemical contaminants, such as arsenic, barium, copper, lead, etc, from public or private drinking water supplies.	Water must not be cloudy, colored, turbid or have an obvious source of contamination. Systems are not intended to convert wastewater to drinking water.

How are ANSI/NSF standards developed?

ANSI requires certified standards developers, such as NSF, to follow three guiding principles: consensus, due process, and openness. In accordance with these principles, NSF aims to achieve consensus among the companies or organizations that will be affected by its standards. The approval process also allows for public comment and appeals.

NSF's Joint Committee on DWTUs is responsible for developing and revising DWTU standards. The committee is composed of a diverse group of stakeholders, including DWTU manufacturers, consumer groups, regulators, public health associations, and academics. If NSF plans to develop a new standard or revise an existing standard, it must announce its plans through the appropriate media and ANSI's newsletter, *Standards Action*. This public announcement is designed to ensure that all interested parties have adequate opportunity to comment. Parties who participated in the development or revision of a standard are automatically notified of any proposals to further revise that standard. In a continuing effort to allow for public comment, NSF publishes revision status information in the quarterly newsletter, *Regulatory World*, available online at *www.nsf.org/newsletters*.

Central to the standards development process is the creation of rigorous and accurate testing procedures that can be used to certify compliance with a standard. Testing protocols include criteria concerning the design and construction, performance, materials, and testing of a product. NSF's testing protocol committee is composed of expert engineers, manufacturer representatives, regulators, and public health experts.

After the Joint Committee has approved a standard or a revision, the draft is reviewed by the Council of Public Health Consultants (CPHC). CPHC is a board of elected professional and regulatory officials who are experts in protecting public health. Members of the CPHC include representatives from U.S. EPA, AWWA, the Association of State Drinking Water Administrators (ASDWA), and the World Health Organization (WHO). After CPHC reviews and votes on all new standards and revisions of existing standards, these measures can be made official by NSF's Board of Trustees.

In 1998, NSF received Audited Designator status, allowing standards to be fully ANSI-approved without direct approval from ANSI's Board of Standards Review. Only standards developers that have demonstrated a "consistent record of successful voluntary standards development" are offered this status.

How can I find water treatment products certified to ANSI/NSF standards?

Lists of POU and POE treatment units certified to ANSI/NSF standards may be accessed through the websites of NSF, UL, or WQA. Directions for accessing this information is provided below. If you do not own a computer with an Internet connection, you may be able to use one at your local library. To obtain a list of DWTUs certified according to ANSI/NSF standards through the mail, or for other inquiries related to drinking water treatment products, contact NSF's Consumer Hotline at 877.8.NSF.HELP (877.867.3435), UL at 888.547.8851, or WQA at 630.505.0160.

National Sanitation Foundation (*www.nsf.org/Certified/DWTU/*)

From this website, you will be able to search by treatment claim, by ANSI/NSF standard (see Table B-1 above), by treatment technology, by manufacturer, or by specific model. To retrieve a list of certified units or to verify that a particular unit is certified under a particular standard for the contaminant of concern to you, all you must do is enter the appropriate information (e.g., the name of the manufacturer) or select the appropriate check boxes (e.g., "arsenic reduction"). If you are interested in reducing several contaminants, select all the functions that apply. While the database will return products that may be certified to reduce only one of the chosen contaminants, it also may list products certified to reduce all of them. For instance, if you select both arsenic and lead reduction, the database will return products only certified for arsenic reduction, products certified only for lead reduction, and products certified to reduce both lead and arsenic levels. You also have the option of entering a manufacturer name and a product function to narrow your search. Once you have specified a manufacturer and/or product function(s), click the "Search" button, and the database will return a list of products and manufacturer contact information.

Underwriters Laboratories (http://www.ul.com/eph/waterqry.htm)

UL provides a directory of the products that it has certified under its Drinking Water Certification Program. From this website, select "Drinking Water Treatment Units." This will take you to a list of companies whose products have been certified by UL to one or more of the ANSI/NSF standards. Click on the hyperlink in the "Link to File" column to access a list of the certifications for all units made by a particular manufacturer.

Water Quality Association (http://www.wqa.org)

From the main WQA website, click on the "Gold Seal" link from the menu on the left hand side of the screen. A new frame will open up on the website that lists each of the WQA standards as well as the ANSI/NSF standards. To access a list of all units certified by WQA to these standards, simply click on the link to the standard of interest to you. Units are organized by manufacturer, type, and daily production.

How can I purchase a product listed in one of the certification databases?

The NSF, UL, and WQA websites include information on the name and model number of the treatment device as well as the address, telephone number and web site of each product's manufacturer when available. To purchase or inquire about a product, contact the manufacturer directly.

Where can I find information about the testing procedures for certification to ANSI/NSF standards?

A general description of the testing procedures used to certify DWTUs to ANSI/NSF standards can be found on line at *www.nsf.org/dwtu/pgminfo.html*. Information concerning testing protocol development is available at *www.nsf.org/newsletters/soe97-4/proving.html*. You can also call NSF's Consumer Hotline at 877.8.NSF.HELP (877.867.3435), UL at 888.547.8851, or WQA at 630.505.0160 to request information.

Appendix C: *Factors Influencing the Cost of Implementing a Centrally Managed POU or POE Treatment Strategy*

Administrative Costs
Record Keeping — *community size; total number of units; maintenance schedule; monitoring strategy*
Scheduling Unit Installation — *community size; total number of units*
Scheduling Maintenance/Sampling Visits — *community size; total number of units; maintenance schedule; monitoring strategy*
Public Outreach and Education — *community size; community density*

Capital Costs
Total Number of Units — *volume discounts*
Unit Ownership — *purchase vs. rental*
Unit Cost — *treatment technology; contaminant(s) of concern; other constituents; vendor proximity (shipping and handling); local taxes*
Effective Unit Life
Amortization Rate
Extent of pilot testing

Installation Costs
Labor Cost — *availability; skilled vs. unskilled; full-time vs. part-time*
Installation Time — *purchase vs. rental; labor experience; unit complexity; extent of pre-fabrication; local plumbing codes; local weather; location of installation (property-line vs. garage vs. basement, etc.)*
Travel Time — *community density; local geography; local weather*

Maintenance Costs
Maintenance Schedule — *frequency of maintenance visits (effective part life)*
Quantity of Replacement Parts — *volume discounts*
Cost of Replacement Parts — *treatment technology; contaminant(s) of concern; other constituents; vendor proximity (shipping and handling); local taxes*
Disposal Costs — *treatment technology; contaminant(s) of concern; local weather; local laws (limit options); proximity to disposal site (transport costs)*
Labor Cost — *availability; skilled vs. unskilled; full-time vs. part-time*
Maintenance Time — *purchase vs. rental; labor experience; unit complexity; local plumbing codes; location of installation (property-line vs. garage vs. basement, etc.)*
Travel Time — *community density; local geography; local weather*
Emergency Response — *frequency and complexity of emergency request*
Insurance — *purchase vs. rental; unit quality; replacement schedule; liability laws*
Coordination with Sampling/Monitoring

Monitoring Costs
Monitoring Strategy — *100% vs. representative; sampling frequency*
Total Number of Samples — *volume discounts in analysis*
Cost of Sample Analysis — *contaminant(s) of concern; other constituents; lab proximity (shipping and handling); local taxes*
Labor Cost — *availability; skilled vs. unskilled; full-time vs. part-time*
Sampling Time — *purchase vs. rental; labor experience; contaminant of concern; location of installation (property-line vs. garage vs. basement, etc.)*
Travel Time — *community density; local geography; local weather*
Insurance — *purchase vs. rental; unit quality; replacement schedule; liability laws*
Coordination with Maintenance

Appendix D: *Potential Funding Sources for the Implementation of a Centrally Managed POU or POE Compliance Strategy*

Funding for system improvements such as the installation of POU and POE treatment devices for compliance with an MCL or treatment technique is generally obtained by issuing bonds, or by successfully applying for loans or grants. This appendix is designed to provide you with a basic understanding of these financial instruments and to describe the programs offered by several of the agencies and organizations that provide financial assistance to small water systems.

As explained in EPA's April 1999 "Guidebook of Financial Tools" (available on-line at *http://www.epa.gov/efinpage/guidbk98/index.htm*), a bond is a written promise to repay borrowed money on a definite schedule (usually at a fixed rate of interest) for the life of the bond. Community approval is frequently required before bonds may be issued bonds because the amount of money that communities may raise through bond issues is strictly limited by local and State laws and because the system or community must dedicate a stream of revenue towards the repayment of the bonds (e.g., user fees). Banks, credit unions, and other institutions may offer loans to systems with a good credit rating. Loans provide funds that must be repaid within a set amount of time, typically with interest. Grants are the provision of funds for a specific purpose that need not be repaid. However, grant programs frequently have relatively restrictive application requirements. In addition, systems may need to raise their own "matching" funds equal to 5 to 50 percent of any grants that they receive.

The major sources of federal funding for small community drinking water projects include:

- The U.S. Environmental Protection Agency;
- The U.S. Department of Agriculture, Rural Utilities Service;
- The U.S. Department of Housing and Urban Development;
- The U.S. Department of Commerce, Economic Development Administration;
- The National Bank for Cooperatives; and
- The Appalachian Regional Commission.

Other sources include:

- State Drinking Water Programs;
- The Rural Community Assistance Program; and
- The Rural Community Assistance Corporation.

What funding programs should I investigate, and how do I apply?

Several funding programs are available to help water systems – particularly small, rural systems – cover the initial costs of implementing a POU and POE compliance strategy.

Drinking Water State Revolving Fund (DWSRF) Program

EPA administers the DWSRF program. This program enables States to offer loans to community and nonprofit noncommunity water systems at interest rates below the prevailing market level. These loans are provided to help fund infrastructure projects needed to meet SDWA requirements and to protect public health (specific loan terms and conditions vary by

State). The funding of projects is determined based on a State-developed priority system which ranks projects based on three objectives mandated by the SDWA – threat to public health, need to ensure compliance with SDWA, and per household affordability. Funding is not guaranteed to all eligible projects. However, the requirement that 15 percent of each State's capitalization grant be designated for assistance to systems serving fewer than 10,000 people ensures that some small systems will receive funding each year. Furthermore, several States offer reduced interest rate loans (down to 0 percent), extended repayment terms, and, in some cases, principal forgiveness to economically disadvantaged communities. Most States provide extensive information about the DWSRF program, and in some cases application materials, on their website. Alternatively, you may contact your State DWSRF Program Manager for more information. If you are uncertain which office administers the DWSRF program in your State, a list of EPA Regional and State DWSRF Program Contacts is available on EPA's website at *http://www.epa.gov/safewater/dwsrf/contacts.html*.

Water and Waste Disposal Loan and Grant Program

The U.S. Department of Agriculture's Rural Utilities Service (RUS) oversees the Water and Waste Disposal Loan and Grant Program. Funding is provided for building, improving, or expanding water and wastewater facilities. Loans and grants are available to low-income, rural communities with fewer than 10,000 people. RUS defines low-income areas as those in which the per capita income is not more than 70 percent of the most recent national average per capita income, as determined by the U.S. Department of Commerce, and where the unemployment rate is not less than 125 percent of the most recent national average unemployment rate, as determined by the Bureau of Labor Statistics. As with the DWSRF program, eligibility does not guarantee funding; a rating system based on population, income, and health and sanitation criteria is used to ensure that projects with higher priority are funded first. Grants are awarded after loan funds are expended and only as needed to reduce user charges to a reasonable level. Up to 100 percent of a project's funding may be obtained through the program, but only 75 percent may be in the form of grants. Only those communities that are unable to obtain financing from other sources are considered for funding. Furthermore, RUS cannot provide funds to private, for-profit systems. Application procedures for the Water and Waste Disposal Loan and Grant Program are determined by State. Contact your State Rural Development Office for specific instructions. A list of State offices can be found under "Agriculture" / "Rural Development" in Appendix IV of the *Catalog of Federal Domestic Assistance.* The catalog is located online at *http://aspe.os.dhhs.gov/cfda/index.htm*.

Community Development Block Grants (CDBG) Program

The CDBG program is administered by the U.S. Department of Housing and Urban Development (HUD). The program enables States to provide grants for housing, economic development, and public facilities including water and wastewater to cities with fewer than 50,000 people and counties with fewer than 200,000 people.[11] Eligibility is limited to communities with an average income equal to or less than HUD's Section 8 low-income limit for metropolitan areas, or 80 percent of the State or county median household income for non-metropolitan areas. The size of grants available to eligible recipients varies from State to State; however, rarely will a CDBG grant suffice as the sole source of funding. CDBG grants are typically combined with grants and loans from other State and federal programs such as DWSRF loans and rural utility grants and loans. The office that implements the CDBG program in your

[11] Larger areas may be eligible to receive grants directly from HUD.

State can provide application materials and instructions. If you do not know which State office implements the program, you may contact your HUD Field Office (contact information is available under "Housing and Urban Development" in Appendix IV of the *Catalog of Federal Domestic Assistance*).

Public Works and Infrastructure Development Grants

The Economic Development Administration of the U.S. Department of Commerce provides grants to economically-distressed areas for public works projects – including water and wastewater – that promote long-term economic development, facilitate job creation, or benefit low-income families and the long-term unemployed/underemployed. Grants are limited to 50 percent of project costs. In special circumstances, however, a severely distressed community may receive supplementary grants bringing the total up to 80 percent. Contact your Regional Economic Development Administration Office for information on how to apply. A listing is provided under "Commerce" / "Economic Development Administration" in Appendix IV of the *Catalog of Federal Domestic Assistance*.

National Bank for Cooperatives Loan Program (CoBank)

CoBank is a regulated, federally-chartered bank that serves rural utility systems and agricultural cooperatives. Short- and long-term, interim, and refinancing loans are offered to creditworthy water and wastewater systems serving communities of fewer than 20,000 people. Terms may extend up to 35 years at competitive fixed or variable interest rates. A special streamlined application process is available for applicants seeking loans in the amount of $50,000 to $500,000. CoBank may be particularly helpful to investor-owned systems who are often ineligible for federal funding. Additional information is available online at *http://www.cobank.com/rutil/ru.htm* or by contacting CoBank directly at 1.800.542.8072.

Appalachian Area Development Grants

The Appalachian Regional Commission (ARC) is the federal agency that administers the Appalachian Regional Supplemental and Direct Grants Program. Under the program, grants are provided to qualifying communities in the 13 States that constitute the Appalachian region (AL, GA, KY, MD, MS, NY, NC, OH, PA, SC, TN, VA, and WV). Projects must either be related to economic or community development or must address residential needs in extremely poor communities. Additional funding limitations and matching requirements vary by project type. Financial assistance ranges from $2,000 to $1 million for a single project. Supplemental grants are also provided to help communities meet local matching requirements for other sources of federal funding. When sufficient federal funds are unavailable, funds may be provided entirely by the ARC. Contact the local development district serving your county for guidance on eligibility for funding and for assistance in preparing a grant application. A listing of State Program Managers is available at *http://www.arc.gov/grants/program/statmgrs.htm*.

The Rural Community Assistance Corporation (RCAC) Long- and Short-Term Loans

RCAC offers short- and long-term loan assistance to rural communities and disadvantaged populations in the western United States (AK, AZ, CA, CO, ID, HI, MT, NM, OR, UT, WA). The primary goal of the program is to assist low- and very low-income rural populations. Short-term loans are generally limited to a term of three years. Long-term loans are limited to

communities serving fewer than 20,000, but may have a term of up to 25 years. Additional information and applications are available online at *http://www.rcac.org/LoanFund.htm*.

The Southeast Rural Community Assistance Project (SE/R-CAP) Loan Fund

SE/R-CAP is one of six regional training and technical assistance resource centers affiliated with the National Rural Community Assistance Program (RCAP). Short- and long-term financing options are available to rural communities with a population of 10,000 or less that are located in one of the seven southeastern States served by SE/R-CAP (DE, FL, GA, MD, NC, SC, and VA). At least 30 percent of the population served by the proposed project must be of low income (at or below 80 percent of the median income for the area). Loans range in value from $1,000 to $250,000 for a single project and in terms ranging from 1 to 10 years. SE/R-CAP also provides assistance in identifying additional funding programs. Loan applications and additional information are available online at *http://www.sercap.org/loan.html*.

In addition, many States have their own funding programs, such as Maryland's Drinking Water State Grant Program and Oregon's Special Public Works Fund. You should contact the Drinking Water Program Coordinator in your State to learn about State-specific funding opportunities.

Is renting POU and POE equipment an option?

Yes. Renting water treatment technologies has grown in popularity in recent years, particularly among small communities that cannot afford large, lump-sum cash outlays. In addition, renting generally enables systems to obtain equipment quickly. Municipal lease agreements offer a tax-exempt, non-debt source of capital funding with the flexibility to upgrade equipment and extend financing terms, if necessary, without negotiating a new contract. In addition, vendors often include maintenance and monitoring services as part of a lease agreement.[12]

The most commonly rented POU and POE devices are the more expensive technologies such as POU reverse osmosis and POE cation exchange. However, virtually anything can be rented through independent leasing companies, certain banks, and often directly from the manufacturer or distributer. Before entering into an agreement, you should consider your budget and revenue stream, the expected life of the equipment, your desire for ownership, and the potential for the equipment to become out-dated.

How can I obtain additional information on funding options available to my system?

Your State Drinking Water Program Office is the best place to begin and may be able to help you evaluate the options to determine which one(s) is best for you. Some States, such as Oregon, offer one-stop financing where information is collected once and a financial package containing available State and federal funds is assembled by the State. (You'll want to find out which programs the State coordinates with for the one-stop option, however, to ensure that all of the options are evaluated.) Alternatively, many member-based organizations, such as the National Rural Water Association, often provide such services. EPA's Environmental Finance

[12] Service agreements vary significantly between vendors and across regions. Further, the system retains ultimate responsibility for the quality of the finished water. Therefore, you should investigate the reputation of the vendor and track the quality of the service provided should you choose to enter into such an agreement.

Centers, located at major universities in 7 of the 10 EPA Regions, provide finance training, educational, and analytical services designed around the "how to pay" issues of environmental compliance. In addition, the Environmental Finance Program website is continuously updated with environmental financing information and tools, such as "A Guidebook of Financial Tools," which provides detailed information on all of the federal funding programs described above (visit *http://www.epa.gov/efinpage/index.html*). For additional information about leasing or renting POU and POE devices you may start by contacting manufacturers or a local distributer directly. If they do not offer a leasing or rental program, they will likely be able to refer you to a company that does. A few of the companies that offer online information about municipal leasing include:

- First Fidelity (*http://www.fffs.com/municipal.html*);
- United Financial (*http://www.unitedfinancial-il.com/html/municipal.html*);
- American Capital Leasing (*http://www.americancapitalleasing.com/advantage.htm*); and
- The Municipal Funding Group (*http://www.sound.net/~mac47/mfg4.htm*).[13]

[13] Note that mention of a particular institution, product, or service in this document does not imply EPA endorsement.

Table D-1: *Sources of Funding*

Name of Program	Limitations	Contact Information
Drinking Water State Revolving Fund (DWSRF)	System must demonstrate adequate technical, financial, and managerial capacity System can not be in significant noncompliance, unless funding will ensure compliance Loans will not be provided for O&M expenses Lab fees for monitoring may not be financed with a DWSRF loan Standard loan term: 20 years (term may be extended to 30 years in some States for economically disadvantaged communities) Additional State-specific requirements	State website or State DWSRF Program Manager (for a list of EPA Regional and State DWSRF Program Contacts go to *http://www.epa.gov/safewater/dwsrf/contacts.html*)
Rural Utilities Service (RUS) Water and Waste Disposal Loan and Grant Program	Project may not service 10,000 people Private, for-profit systems not eligible Grants provided only to reduce user charges to reasonable level in communities where the service area MHI falls below poverty level or 80% of the State non-metropolitan MHI (whichever is higher) Grants limited to 70% of eligible costs	State Rural Development Office (A list of State offices is available online at *http://aspe.os.dhhs.gov/cfda/index.htm*. Click on "Agriculture" and then "Rural Development")
Community Development Block Grants (CDBG)	Average income of community may not exceed HUD's Section 8 low-income limit for metropolitan areas, or 80% of the State or county MHI for non-metropolitan areas	State CDBG Program Office (A list of State offices is available online at *http://aspe.os.dhhs.gov/cfda/index.htm*. Click on "Housing and Urban Development")
Public Works and Infrastructure Development Grants	Grants normally limited to 50% of eligible costs Under conditions of severe distress, grant funding may cover 80% of project costs	Regional Economic Development Administration Office (A listing of these offices is provided online at *http://aspe.os.dhhs.gov/cfda/index.htm*. Click on "Commerce" and then "Economic Development Administration")
National Bank for Cooperatives Loan Program (CoBank)	Project may not service 20,000 people Assistance limited to rural utilities Loan term may not exceed 35 years	CoBank: 1.800.542.8072 or visit them online at *http://www.cobank.com/rutil/ru.htm*
Appalachian Area Development Grants	Eligibility limited to communities in 13 "Appalachian States" Funding limitations and match requirements determined on a project-by-project basis	Local development district serving your county (A list of State Program Managers is available at *http://www.arc.gov/grants/program/statmgrs.htm*)
Rural Community Assistance Corporation (RCAC)	Eligibility limited to communities in 11 "western" States Project may not service 20,000 people Assistance limited to rural utilities Maximum loan term: 25 years	RCAC online at *http://www.rcac.org/LoanFund.htm*
Southeast Rural Community Assistance Project (SE/R-CAP)	Eligibility limited to communities in 7 "southeastern" States Project may not service 10,000 people Assistance limited to rural utilities 30% of population served must have an MHI 80% of the area MHI Maximum loan term: 10 years	SE/R-CAP online at *http://www.sercap.org/loan.html*

Appendix E: *Contaminants Regulated for Toxicity Under the Resources Conservation and Recovery Act*[1]

Contaminant	Regulated Level (mg/L)	Contaminant	Regulated Level (mg/L)
Arsenic	5.0	Hexachlorobenzene	0.13
Barium	100.0	Hexachlorobutadiene	0.5
Benzene	0.5	Hexachloroethane	3.0
Cadmium	1.0	Lead	5.0
Carbon tetrachloride	0.5	Lindane	0.4
Chlordane	0.03	Mercury	0.2
Chlorobenzene	100.0	Methoxychlor	10.0
Chloroform	6.0	Methyl ethyl ketone	200.0
Chromium	5.0	Nitrobenzene	2.0
Cresol (total)	200.0	Pentachlorophenol	100.0
m-Cresol	200.0	Pyridine	5.0
o-Cresol	200.0	Selenium	1.0
p-Cresol	200.0	Silver	5.0
2,4-D	10.0	Tetrachloroethylene	0.7
1,4-Dichlorobenzene	7.5	Toxaphene	0.5
1,2-Dichloroethane	0.5	Trichloroethylene	0.5
1,1-Dichloroethylene	0.7	2,4,5-Trichlorophenol	400.0
2,4-Dinitrotoluene	0.13	2,4,6-Trichlorophenol	2.0
Endrin	0.02	2,4,5-TP (Silvex)	1.0
Heptachlor	0.008	Vinyl chloride	0.2

1. 40 CFR 261.24. Table 1: Maximum Concentration of Contaminants for the Toxicity Characteristic.

Appendix F: *Diagrams of Typical POU and POE Installations*

Figure 1: *POU Activated Alumina*

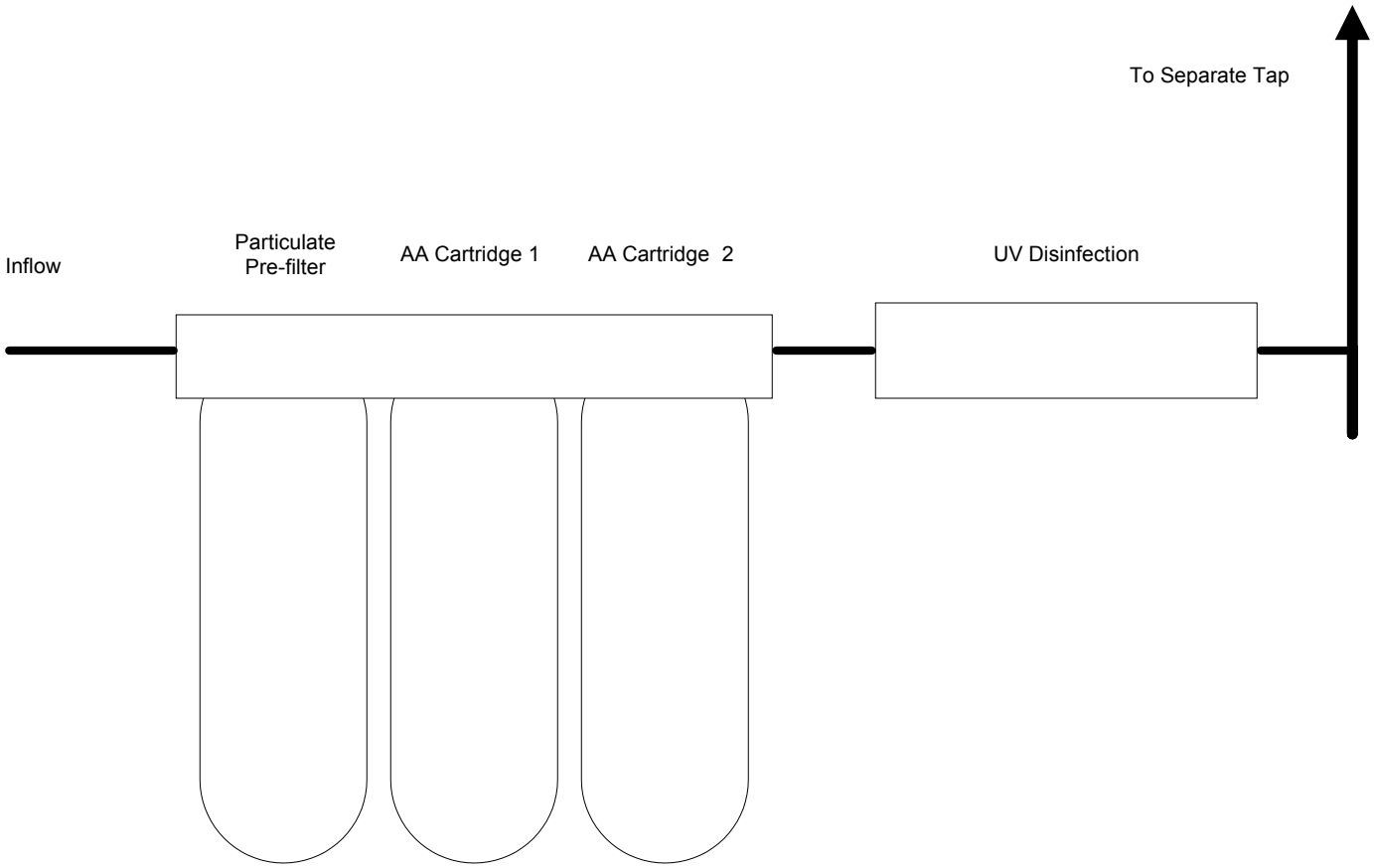


Figure 2: *POU Distillation*

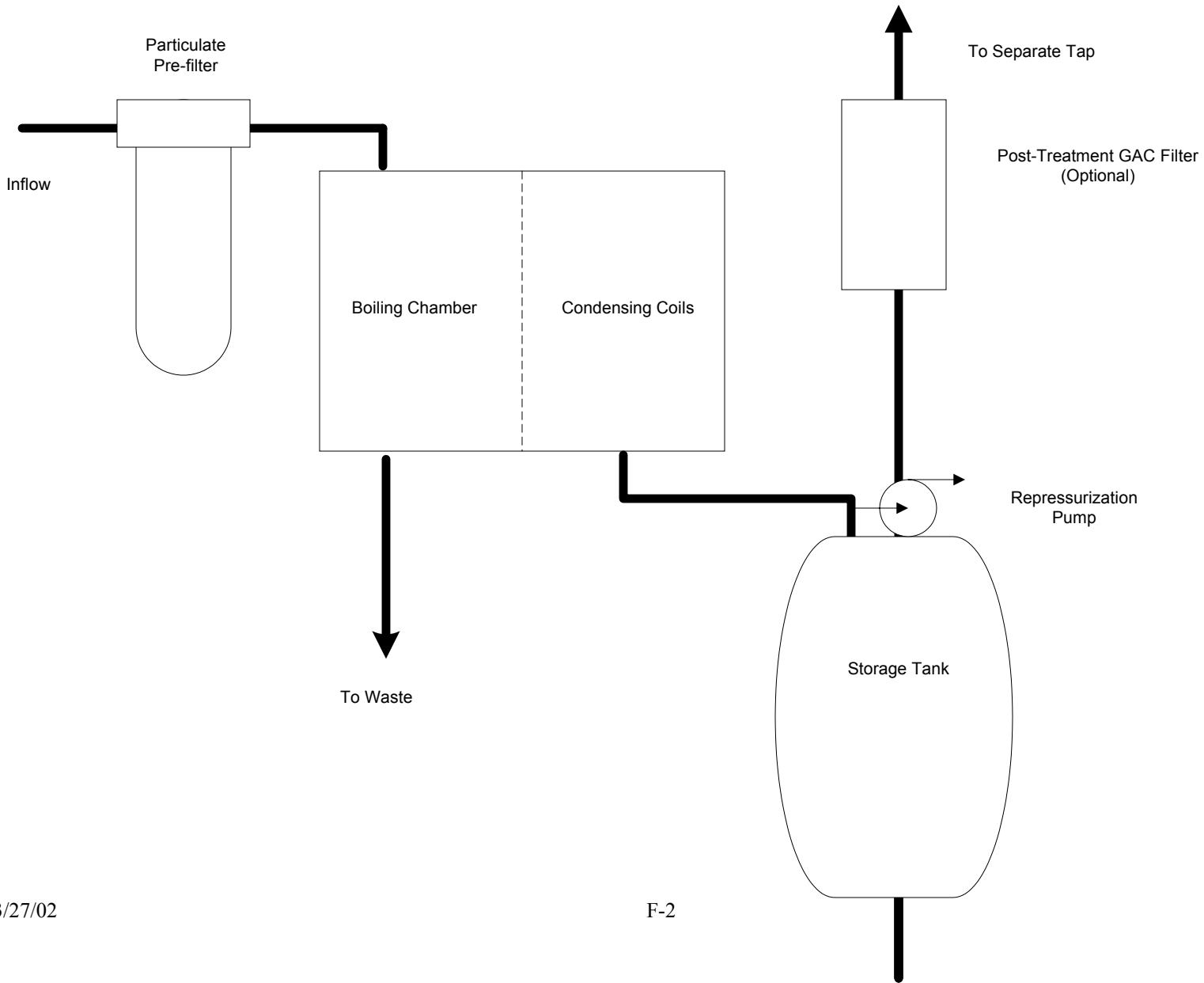


Figure 3: *POU Granular Activated Carbon*

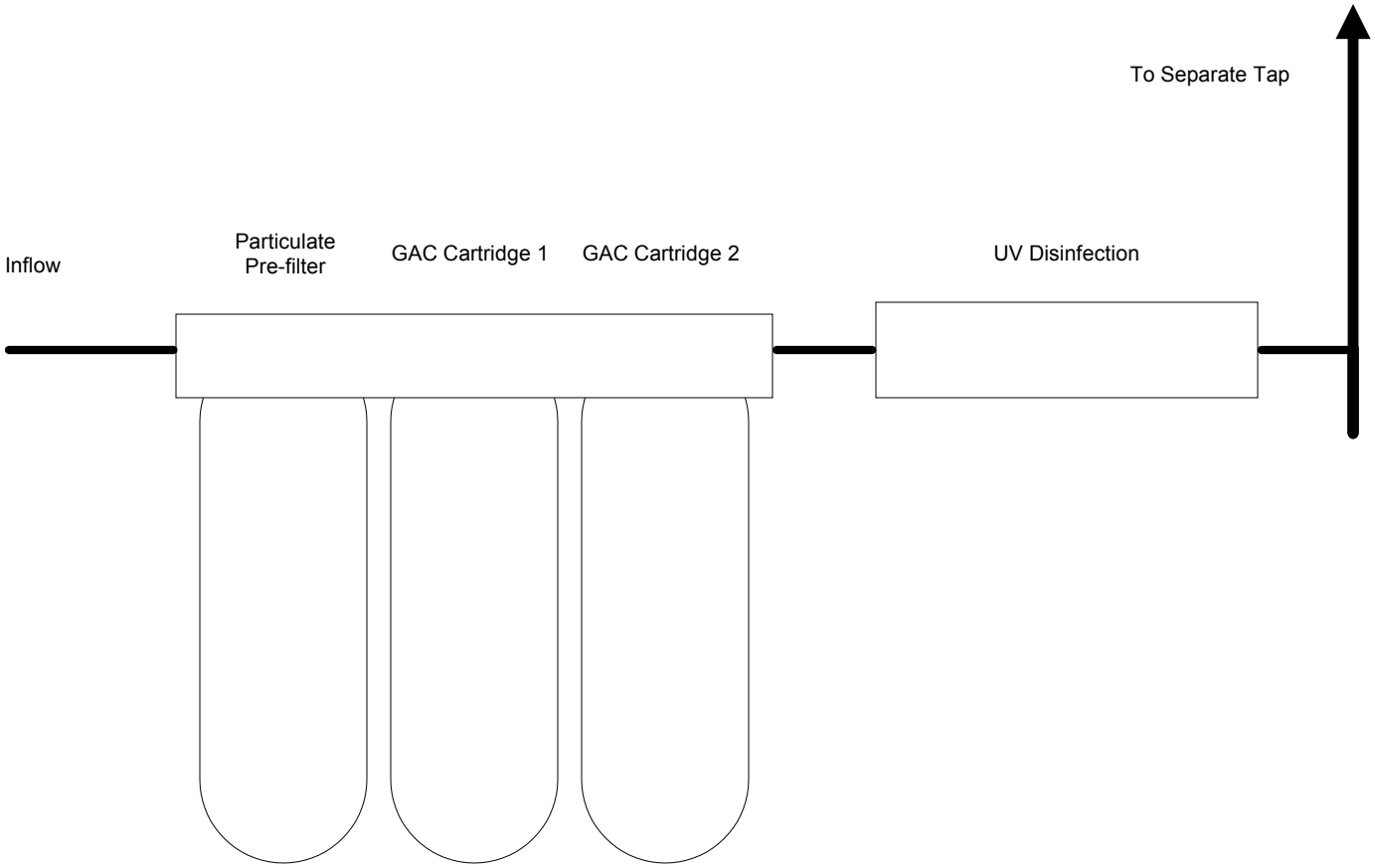


Figure 4: *POU Ion Exchange*

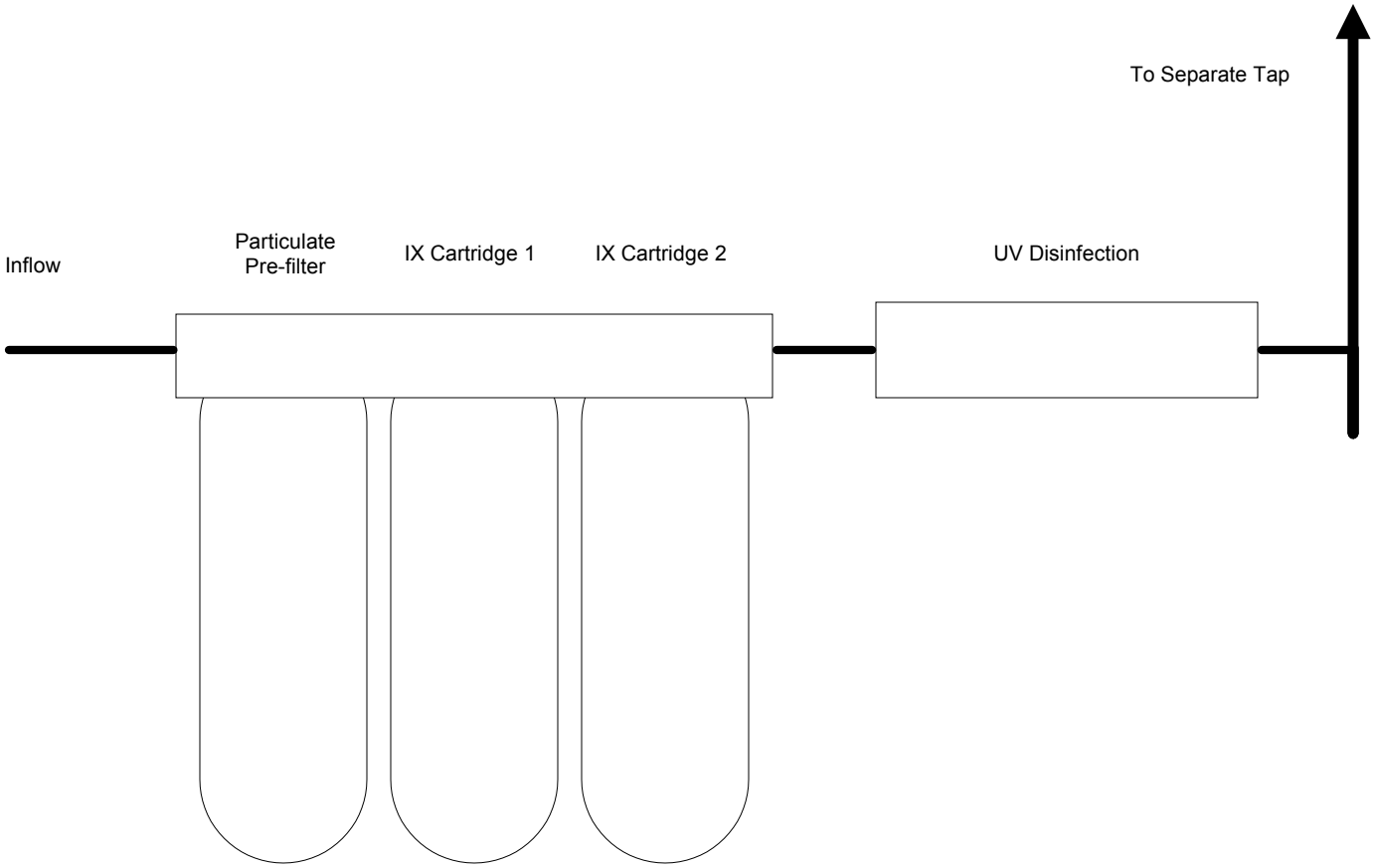


Figure 5: *POU Reverse Osmosis*

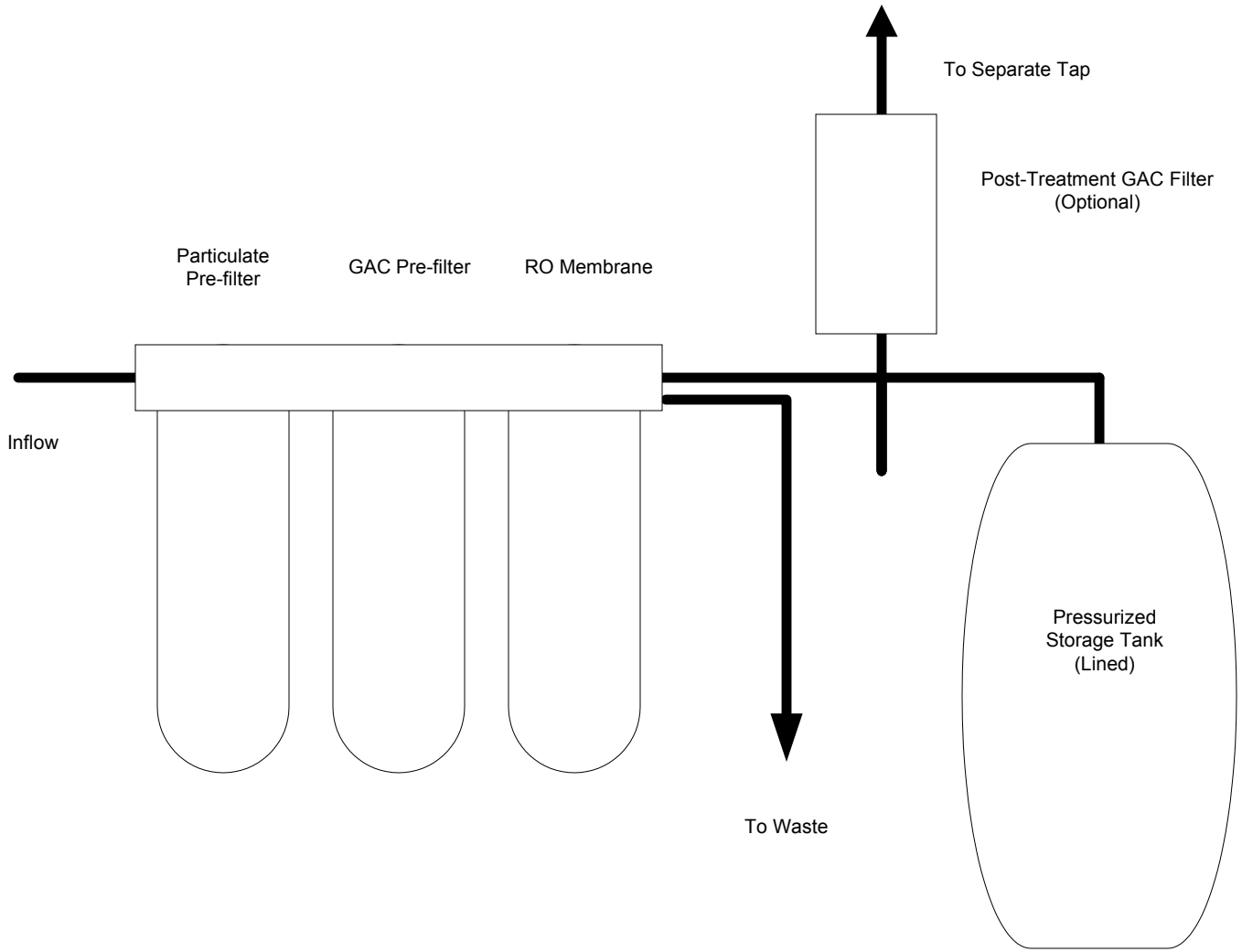
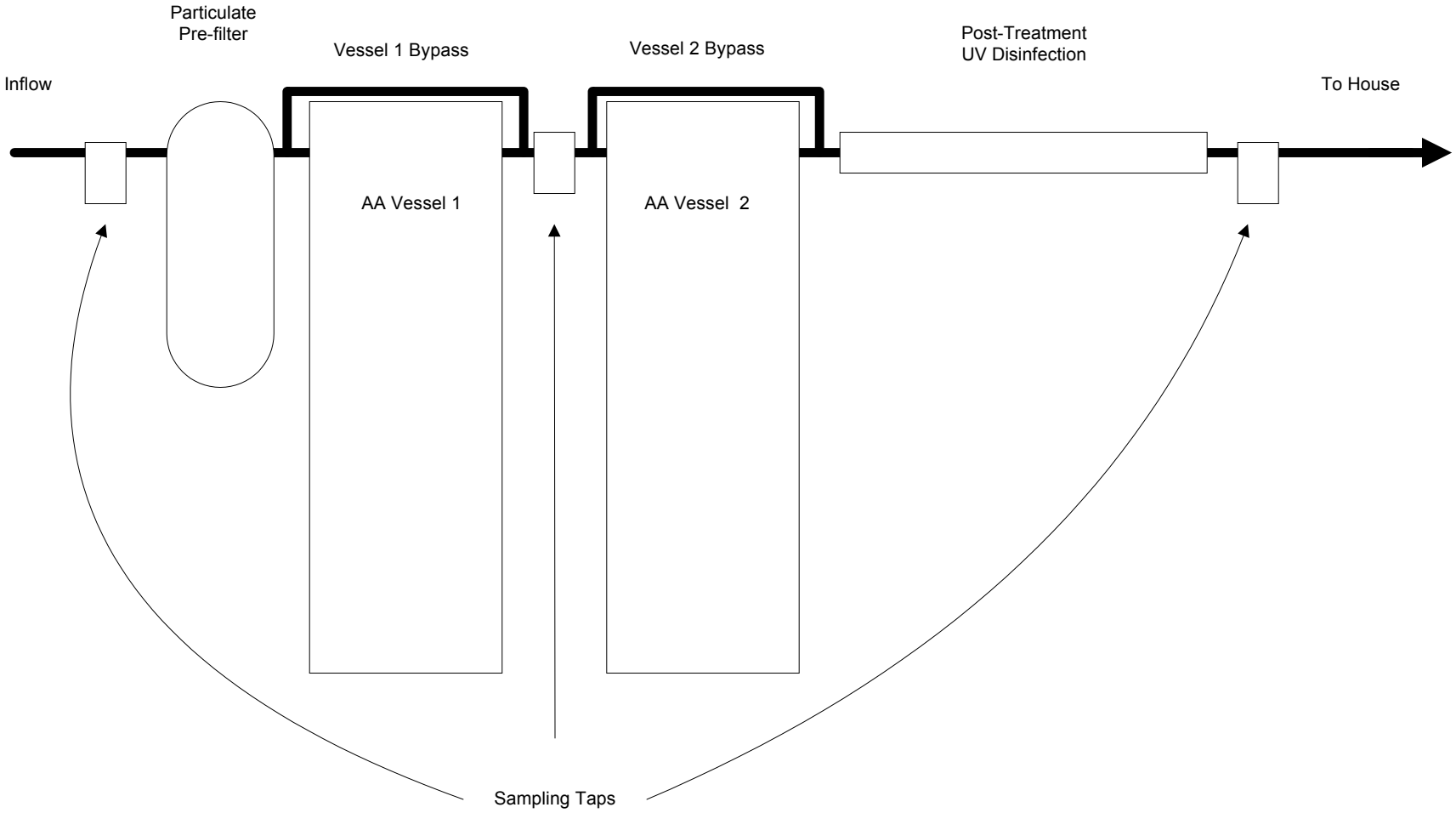


Figure 6: *POE Activated Alumina*



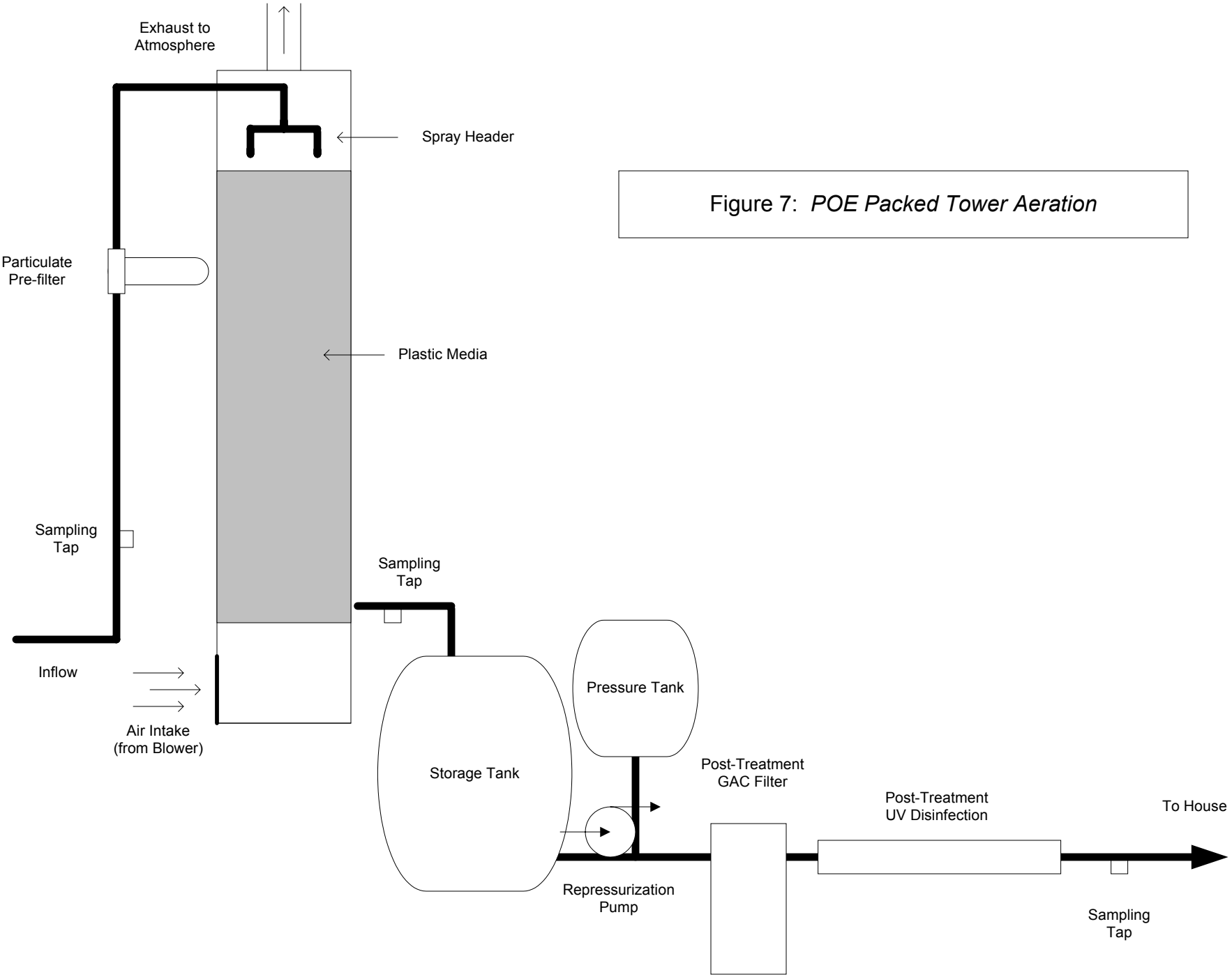


Figure 7: *POE Packed Tower Aeration*

Figure 8: *POE Granular Activated Carbon*

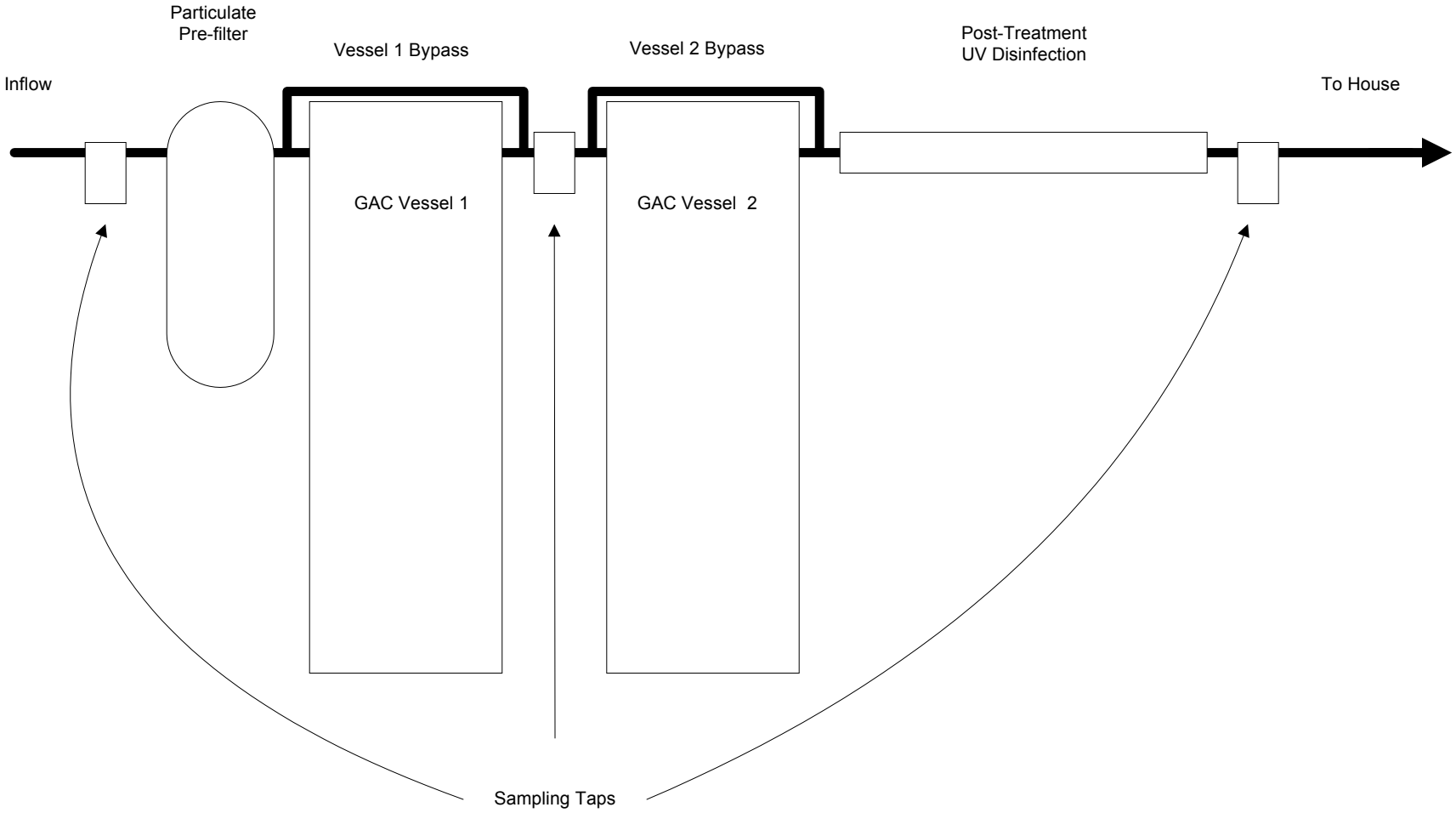


Figure 9: *POE Ion Exchange*

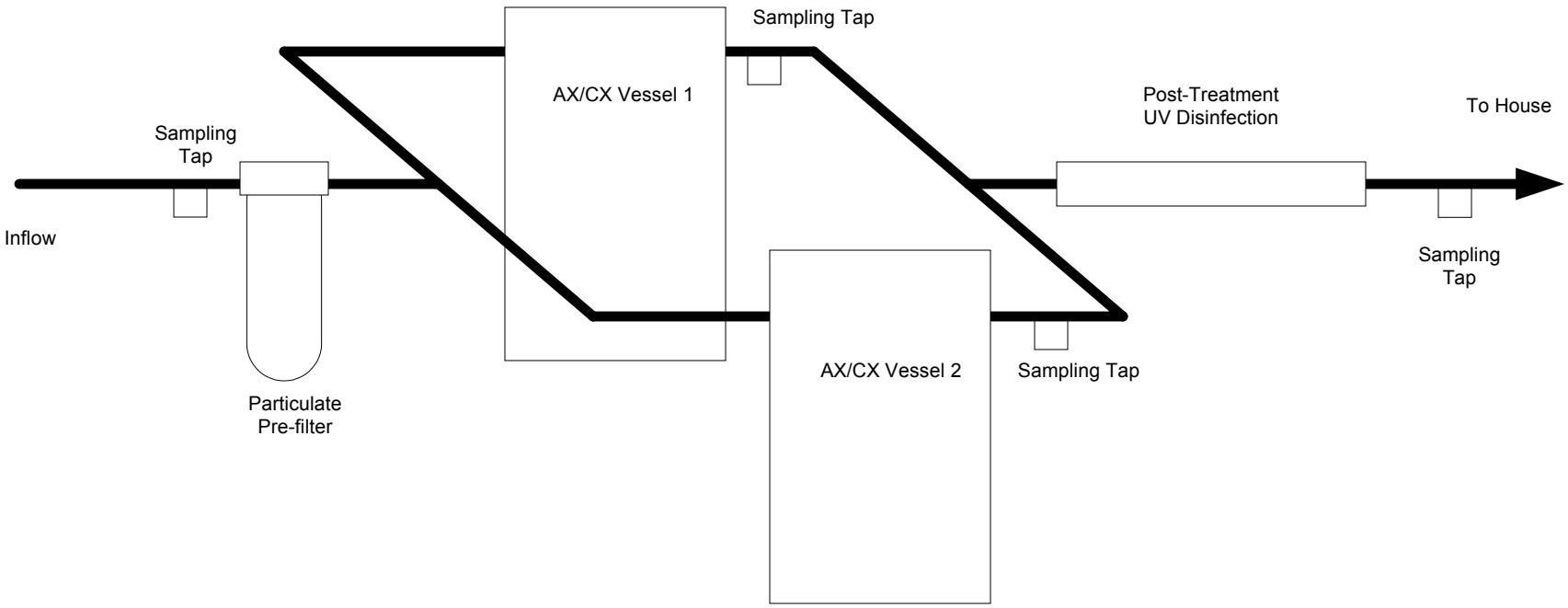
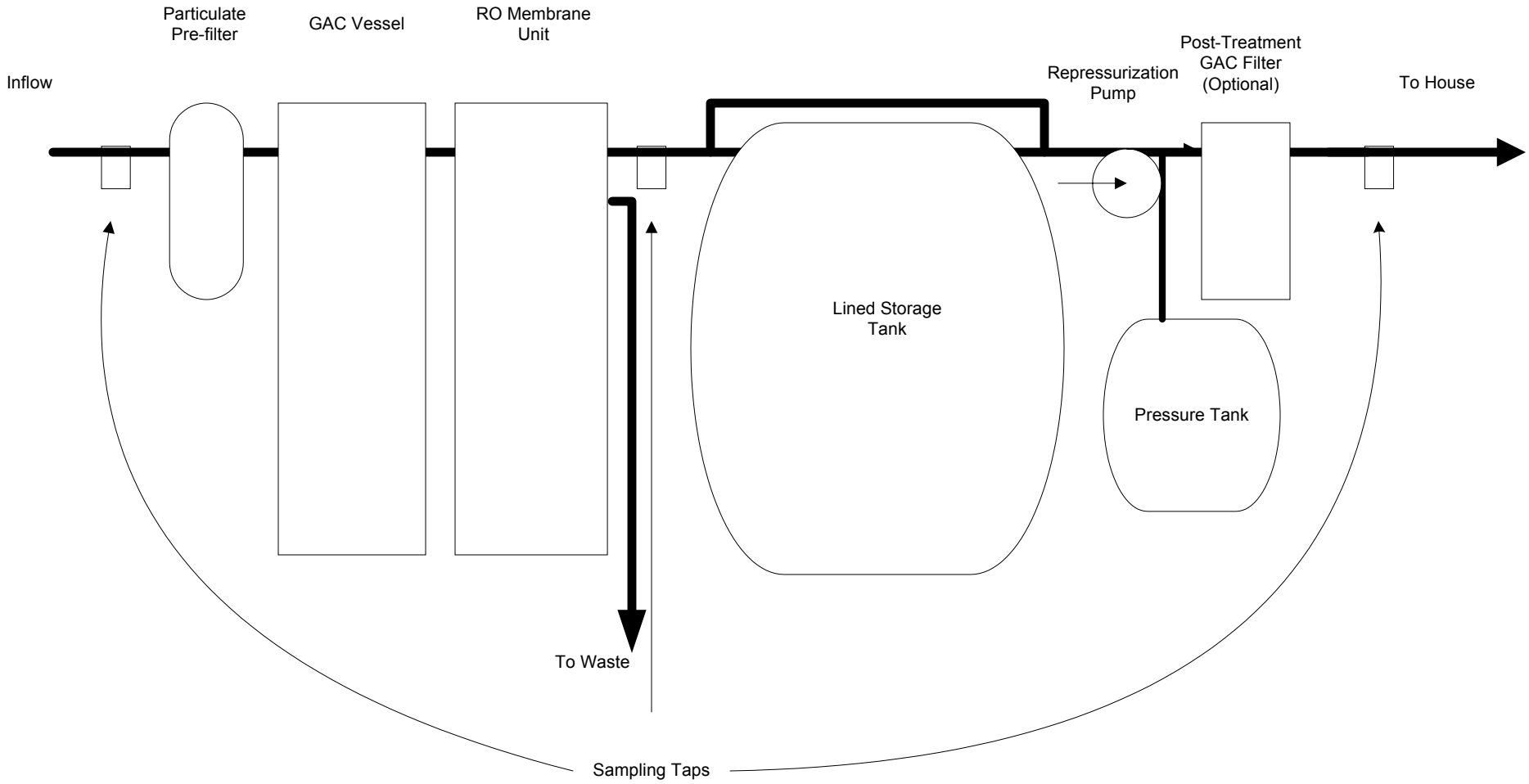


Figure 10: *POE Reverse Osmosis*



Appendix G: *Typical Calendar of Operation and Maintenance Activities for Water Systems that Implement a POU or POE Treatment Strategy*

Initial Start-Up

Test operation of system, manually initiate backwash cycle, check for leaks.
Demonstrate system and its operation to the homeowner.
Give homeowner owner's and operation manual. Install contact decal on system.
Establish responsibilities. For example when should customer call the water system?
Collect initial sample(s) for contaminant(s) of concern.
Collect initial bacteriological sample.

First Month

Adjust system based on results of initial samples accordingly.
Test operation of system, manually initiate backwash cycle, check for leaks.
Check level of salt or other backwash solution if present. Verify use rate.
Answer homeowner questions. Log details of visit and any questions or concerns.

Quarterly

Conduct screening analysis using field test kit (if available).
Collect sample(s) for analysis based on established schedule or field test results.
Visually inspect all joints, o-rings, and moving parts.
Test operation of system, manually initiate backwash cycle, check for leaks.
Replace POU media and pre-filters as scheduled.*
Answer homeowner questions. Log details of visit and any questions or concerns.

Annually

Collect sample(s) for analysis based on schedule.
Visually inspect all joints, o-rings, and moving parts.
Test operation of system, manually initiate backwash cycle, check for leaks.
Replace or clean screens and filters in POE units. Rebuild or replace piston valves and actuators as necessary and as recommended by manufacturer. Rebuild or replace float valves in backwash solution tanks.
Check overflow tubes on aeration and backwash equipment for clogging.
Examine POE media for clogging, fouling, or solidification.

Biannually

Examine POE media for clogging, fouling, or solidification. Replace as dictated by installation characteristics and by disposal considerations (e.g., hazardous waste issues).*

* The schedule for POU and POE media, filter, membrane, and unit replacement will vary with influent concentration, the type of media, and the presence of any confounding constituents.

Appendix H: *Tools for Public Education*

There are three major means of communicating with the members of your service community – through direct personal interaction, print media, or by means of radio or television. Each method has advantages and may reach different sectors of your customer base. Therefore, due to the critical importance of the information that a water system must convey to its users, particularly to users unfamiliar with POU or POE treatment, all three strategies must be considered when developing the public education effort necessary to support the successful implementation of a POU or POE compliance strategy. This appendix is designed to briefly describe several specific tools that systems may choose to incorporate into their public education strategy. Please note that the tools most appropriate for your system will depend on: (1) the size of your service community (more complex and expensive strategies may be necessary in larger communities), (2) the treatment technology selected for use, and (3) the contaminant of concern (contaminants that pose acute health risks will require you to take additional steps to ensure that all affected customers receive the necessary information). The costs associated with these tools are presented in the revised EPA document, "Small System Compliance Options: POU and POE Treatment Devices."

2. Direct Personal Interaction

Direct, face-to-face communication with the members of your service community is frequently the most effective way to convey necessary information and allay fears. In addition to ensuring that maintenance personnel have been trained to field most basic customer inquiries, two other avenues are open to you: home visits and public forums. While the former are relatively self-explanatory (system personnel make a special visit to all households in the community to provide information about your compliance strategy and to answer any other questions that they may have. In general, people will be more receptive if they know the individual visiting their home. Therefore, it is highly recommended that systems employ system or subcontractor personnel who are members of the community to perform these visits.

Public forums are a more formal communication strategy, consisting of a publicized meeting at which attendees are presented with specific information and are given an opportunity to ask questions and to provide feedback. This method of communicating information is particularly effective in small, tightly-knit communities. As with house visits, if the speaker presenting the information at the forum is known in the community, forums are even more effective at conveying the pertinent information in an understandable manner (e.g., using familiar terms, addressing individuals by name, etc.). While public forums provide systems with a powerful tool to communicate with the service community, they can require a significant amount of preparation. Indeed, for the smallest communities, the costs associated with this preparation may exceed affordability parameters. In general, water systems that serve larger communities can expect more attendees, however, they can also expect to reach a smaller percentage of their service community with public forums. Note that public forums also provide an excellent opportunity to distribute printed materials to the affected community (see description of brochures and notices, below).

3. Print Media

In addition to direct interaction, a water system may use various forms of print media to convey a public health message to its service community. These include: informational/warning notices

enclosed with each month's water bill; brochures that clearly explain the limitations of POU or POE treatment devices, safety precautions, and important "do's" and "don'ts"; posters that present important information, public forum dates, and contact numbers; and public service announcements (PSAs) in local newspapers or community newsletters.

2.1 Notices

Several water systems that have utilized POU or POE treatment strategies emphasized their reliance on informational notices to alert their customers to the potential health impacts of episodic contaminant exceedances (e.g., spikes of agricultural contaminants during the planting season) and to appropriate preventative measures. These systems often included informational notices with the water bill. Further, systems are already required to alert their customers in the event of treatment technique violations. Therefore, this method of information distribution is well understood and is an essential element of any serious public education campaign. Notices should also be posted in public areas such as the local post office.

It is anticipated that EPA will have, or will make available, standardized one-page informational notices that may be adapted by water systems for use in their community. These templates may be supplemented by additional information provided by the EPA Regional offices and by State regulatory and extension staff. Therefore, it is not anticipated that the development of these notices would require a large amount of effort on the part of your system. Furthermore, the costs associated with copying and distributing the notice are also very low. Note, however, that many people do not read the inserts enclosed with utility bills. Therefore, the use of notices alone would be insufficient to provide adequate protection of public health

2.2 Brochures

Brochures typically include more information than notices and present this information in a more attractive and engaging manner (e.g., color, graphics, etc.). A great deal of information has been developed on many of the contaminants of particular concern to small and rural communities (e.g., nitrate, agricultural chemicals, etc.). Additional informational pieces are currently available from AWWA, WQA, and EPA. Since WQA has a vested interest in increasing the use of POU devices, and since all three of these organizations strive to protect and improve the public health, it is expected that systems will be able to purchase pre-printed brochures on a wholesale basis, eliminating the need for you to develop your own materials from scratch.

Like notices, brochures may be distributed as part of the monthly water bill mailing. However, since brochures are typically more expensive to develop and purchase than notices, they should not be included in every month's bill. Distributing brochures to public buildings (e.g., schools, libraries, post offices, etc.) and making them available in locations frequented by vulnerable populations (e.g., doctor's offices) will maximize the efficacy of this communication strategy. If you choose to conduct public forums or send staff directly to individual households, brochures should be made available to ensure the consistency of your message and to provide a basis for discussion and questions.

2.3 Posters

Color posters may prove to be an invaluable part of a public education campaign since they provide yet another means by which you may alert members of the community to the potential dangers associated with drinking from untreated taps. Because standard copiers cannot produce posters of adequate quality, and because poster design is more complicated than notice or

brochure development, it is likely that most water systems will have to contract out this job. Further, while posters can provide a large amount of information quickly and easily, even to those who cannot read or speak well, the relatively high expense associated with this communication method makes it less appropriate for the smallest systems.

If you elect to incorporate posters into your public education campaign, locations such as pediatricians' offices, schools, and public offices/buildings (e.g., recreation centers, post offices, meeting halls, etc.) offer the best opportunity to alert parents, visitors, clients, etc. of the safety precautions that vulnerable members of the community must follow. These posters should also provide contact information and the dates of future public forums.

2.4 Public Service Announcement

Almost all communities have some sort of local newspaper or community newsletter. Therefore, you may take advantage of these publications by regularly placing public service announcements (PSAs) alerting the community to the dangers of the contaminant of concern, detailing the steps that your system has taken to address these concerns, and recommending appropriate safety precautions for the at-risk population. A water system could also provide contact numbers and advertise any public forums it sponsors in PSAs.

A PSA is a service to the community. Research has confirmed that newspapers will donate space for PSAs, particularly to help protect public health. Nonetheless, it requires significant effort to craft a readable, informative, and effective PSA. Therefore, while it is expected that EPA will design a sample PSA available to water systems that choose to implement a centrally-managed POU or POE strategy for certain contaminants with acute health effects such as nitrate, the development/adaptation of a newspaper PSA will still require a significant effort on the part of you or your colleagues.

4. Radio and Television

In recent years, the proportion of people who read the newspaper or other printed materials on a regular basis has decreased dramatically. Therefore, to ensure that you will be able to reach all members of your service community, it may be necessary to utilize radio and/or TV within your public education campaign, particularly in larger communities.

3.1 Radio

Not all communities will have access to a local radio station. Indeed, many of the smallest systems will not be able to use this tool because no station directly serves their community. As detailed above, a PSA is a service to the community. Therefore, those systems with access to a local radio station will likely be able to obtain free air-time at least once a month. Contacted radio stations supported this assumption. Nonetheless, it requires significant effort to craft a succinct yet informative and effective PSA. Although spots have not yet been developed, it is anticipated that a sample radio piece will be available to water systems that opt to implement a centrally-managed POU or POE treatment strategy from a national industry organization or a State or Federal agency. State and Regional staff may provide you with additional information regarding the feasibility/potential for this communication strategy.

3.2 Television

No community of 10,000 or fewer is likely to have access to even a small regional television station or community cable station. Therefore, it is unlikely that the water systems that would consider the implementation of a POU or POE treatment strategy will have the opportunity to take advantage of television in their public education campaigns. Nonetheless, since television is an extremely effective media that reaches a large percentage of the population, it should be considered if facilities are available in your community. As detailed above, a PSA is by definition a service to the community. Therefore, it is assumed that a television station will provide free air-time at least once a month to the local water system to help protect public health. Contacted television stations supported this assumption although several required verification of non-profit status (representing a potential hindrance to privately owned community water systems). Nonetheless, it requires significant effort to craft a succinct yet informative and effective television spot. The costs of the development of such a spot would likely be beyond the means of most small systems. While such advertisements have not yet been developed, it is anticipated that a sample TV spot will be available to water systems that opt to implement a centrally-managed POU or POE compliance strategy from a national industry organization or a State or Federal agency. Even with this assistance, personalizing the PSA will require a good deal of effort. In addition, as for newspaper and radio PSAs, the water system would be tasked with the responsibility of making initial and follow-up contact with the television station to ensure the receipt and proper airing of the PSA.

5. Summary

A great deal of community cooperation is required to successfully implement a POU or POE compliance strategy. Therefore, the development and implementation of a robust public education campaign is even more important for systems that elect this treatment option than those that rely on more traditional established compliance options such as central treatment. However, case studies have demonstrated that systems that take the time and make the effort to educate their customers will have fewer customer complaints and less difficulty in scheduling installation, maintenance, and sampling visits. In addition, customers who understand the system's plan tend to support necessary fee adjustments and make fewer complaints. As a result, it is recommended that systems employ several of the public education tools outlined in this section to ensure maximum penetration for your message and maximum effectiveness for your compliance strategy. Also, please note that State regulators and extension personnel may provide you with invaluable assistance in deciding on the type of public education program that would work best for your system and in developing the materials for your program. You should not hesitate to take advantage of these resources.

Appendix I: *Model Ordinance Language*[14] *for a POU or POE Compliance Strategy*

Section 1. Introduction

10. In accordance with the federal Safe Drinking Water Act and State drinking water regulations, *INSERT NAME OF WATER SUPPLIER* (Water Supplier) must minimize contamination in drinking water. It is the intent of the Water Supplier to accomplish this through the installation and operation of *INSERT TYPE OF TREATMENT UNIT THAT WILL BE INSTALLED* which *INSERT NAME OF BODY PASSING THE ORDINANCE* has decided is the most protective and cost efficient way to meet drinking water standards.

Section 2. Purpose and Intent

2.1 The *INSERT NAME OF TOWN/VILLAGE/MUNICIPALITY* is passing this ordinance in order to comply with the Safe Drinking Water Act, State drinking water regulations, and to protect the health of the consumers of water supplied by the Water Supplier.

2.2 The specific purposes of this Ordinance are:

2.2.1 To require the installation of *INSERT TYPE OF TREATMENT UNIT THAT WILL BE INSTALLED* to improve the quality of drinking water.

2.2.2 To minimize *INSERT TYPE OF CONTAMINATION THAT TREATMENT UNITS WILL REMOVE* in drinking water supplied by *INSERT NAME OF WATER SUPPLIER.*

2.2.3 To provide for an operation, maintenance, and monitoring program for *INSERT TYPE OF TREATMENT UNIT THAT WILL BE INSTALLED* installed as part of this Ordinance.

Section 3. Applicability

This ordinance applies to all customers connected to the Water Supplier and all customers who connect to the Water Supplier in the future.

Section 4. Authority and Effective Date

INSERT NAME OF BODY PASSING THE ORDINANCE is authorized under *INSERT BODY OF LAW PROVIDING JURISDICTION* to adopt this ordinance.

This ordinance becomes effective immediately upon adoption.

[14]This example ordinance was drafted to be overly inclusive in order to cover situations that could arise due to the implementation of a centrally-managed POU or POE treatment strategy. Some sections may not apply to your system because of your current service agreements; specific administrative or legal process requirements; or other geographic, political, or financial constraints. You should amend and adapt this model to meet your particular needs.

Section 5. Definitions

5.1 **Building** means a combination of any materials, whether portable or fixed, having a roof to form a structure for the shelter of persons, animals, or property.

5.2 **Consumer** means any person, corporation, or other entity using or receiving water from the Water Supplier.

5.3 **Customer** means any purchaser or buyer of water from the Water Supplier.

5.4 **Dwelling Unit** a house or other structure in which a person or persons live.

5.5 **Non-Residential User** is defined as a user of water provided by the Water Supplier for purposes other than personal consumption. Such purposes may include, but are not limited to, resale, as a component or ingredient in other products designed for resale or service to the public, or otherwise providing water directly or indirectly to a person for the purposes of consumption.

5.6 **Owner of the Premises** includes the legal owners, their agents, or authorized representatives.

5.7 **Person** means a human being, partnerships, associations, corporations, legal representatives, or trustees.

5.8 **Potable Water** means any water supply intended or used for human consumption or other domestic use.

5.9 **Premises** means any real property to which water is provided, including all improvements, buildings, dwelling units, mobile and other structures located on it.

5.10 **Residential User** is defined as any person occupying a dwelling unit receiving water from the Water Supplier for the purpose of personal consumption.

5.11 **Service Connection** is the point of delivery at which the Water Supplier connects to the private supply line.

5.12 **Structure** means anything constructed or erected, the use of which requires a fixed location on the ground or attached to something located on the ground.

5.13 **Tap** means any faucet, spigot, or fountain that supplies water for consumption by drinking or cooking (including ice).

5.14 **Treatment Unit** includes any device installed by the water supplier to treat water as well as any associated equipment or devices, including separate taps, storage tanks, and bypass valves.

5.15 **Water Supplier** means *INSERT NAME OF WATER SUPPLIER*, its employees, agents, and authorized representatives.

Section 6. Residential Users

6.1 Installation

6.1.1 The owner of the premises or residential users will allow the Water Supplier to install *INSERT TYPE OF TREATMENT UNIT* and all ancillary equipment needed for the proper operation of the treatment units.

6.1.2 A treatment unit will be installed on the primary tap used for drinking and cooking water.

6.1.3 Treatment units will be installed during normal business hours by a properly trained and certified person. All units will be installed in accordance with State and local codes, if any, and in accordance with the manufacturer's specifications.

6.1.4 Title to the treatment units remains with the Water Supplier. While in effect, this Ordinance shall run with the land and shall be enforceable on all parties having or acquiring any right, title, or interest in any dwelling unit.

6.2 Maintenance

6.2.1 The Water Supplier will maintain the treatment units. Maintenance may include, but is not limited to: any required repair to, or replacement of a treatment unit; any sampling of a treatment unit or the water a treatment unit is treating; or any action deemed necessary by the water supplier for the on-going proper operation of a treatment unit.

6.2.1.1 All maintenance will be conducted by a properly trained and certified person.

6.2.2 **Regular Maintenance**. The owner of the premises or residential users will provide the Water Supplier access to the treatment units on a regular basis so that the Water Supplier can maintain the treatment units.

6.2.2.1 The Water Supplier will periodically notify the owner of the premises or residential users of the intention to provide maintenance to a treatment unit. Notification will be provided in the monthly water bill.

6.2.2.2 Regular maintenance will be provided during normal business hours. Sampling will occur approximately every *INSERT TIME FRAME FOR SAMPLING IN ACCORDANCE WITH FEDERAL AND STATE REGULATIONS AND MANUFACTURERS SPECIFICATIONS.*

6.2.2.3 In the event that the owner of the premises or the residential users will not be able to provide access to a treatment unit on the date and time specified in the notification, the residential user will schedule an alternative time with the Water Supplier.

6.2.3 **Emergency Repairs or Replacement**. Residential users must provide access to the treatment units for emergency or unexpected repairs or replacements. Refusal to allow entry may result in termination of service in accordance with Section 8 of this Ordinance.

6.2.4 Residential users must visually inspect each treatment unit on a *INSERT TIME FRAME (i.e. on a weekly, monthly, bi-monthly)* basis.

6.2.4.1 In the event that a leak or other defect is detected, the residential user will: notify the Water Supplier at *INSERT TELEPHONE NUMBER* within 24 hours of noticing the leak or other defect and follow all directions given by the water supplier.

6.2.4.2 The Water Supplier shall arrange to repair the leak or other defect within *INSERT REPAIR TIME FRAME (i.e., two consecutive calendar days upon receipt of notice, four business days from receiving notice, etc.)*

6.2.5 The owner of the premises and residential users shall not adjust, modify, repair, replace, remove, disconnect, bypass, or otherwise tamper with a treatment unit.

6.2.5.1 Customers shall pay the Water Supplier for any costs incurred due to the owner of the premises or the residential user adjusting, modifying, by-passing, tampering with, or removing a treatment unit or any ancillary equipment.

6.2.6 *INSERT ANY MAINTENANCE CONDITION SPECIFIC TO THE TYPE OF TREATMENT UNIT INSTALLED. FOR EXAMPLE, "RESIDENTIAL USERS SHALL ENSURE THAT THE TREATMENT UNIT REMAINS PLUGGED INTO AN OPERATIONAL OUTLET."*

Section 7. Non-Residential Users

7.1 *Installation*

7.1.1 The owner of the premises or non-residential users will allow the Water Supplier to install *INSERT TYPE OF TREATMENT UNIT* and all ancillary equipment needed for the proper operation of the treatment units.

7.1.2 Treatment units will be installed on all taps.

7.1.3 Treatment units will be installed during normal business hours by a properly trained and certified person. All units will be installed in accordance with State and local codes, if any, and in accordance with the manufacturer's specifications.

7.1.4 Title to the treatment units remains with the Water Supplier. While in effect, this Ordinance shall run with the land and shall be enforceable on all parties having or acquiring any right, title, or interest in any premises.

7.2 Maintenance

7.2.1 The Water Supplier will maintain the treatment units. Maintenance may include, but is not limited to: any required repair to, or replacement of a treatment unit; any sampling of a treatment unit or the water a treatment unit is treating; or any action deemed necessary by the Water Supplier for the on-going proper operation of a treatment unit.

7.2.1.1 All maintenance will be conducted by a properly trained and certified person.

7.2.2 **Regular Maintenance**. The owner of the premises or non-residential users will provide the Water Supplier access to the treatment units on a regular basis so that the Water Supplier can maintain the treatment units.

7.2.2.1 The Water Supplier will periodically notify the owner of the premises, his agent, his authorized representative, or the non-residential users of the intention to provide maintenance to a treatment unit. Notification will be provided in the monthly water bill.

7.2.2.2 Regular maintenance will be provided during normal business hours. Sampling will occur approximately every *INSERT TIME FRAME FOR SAMPLING IN ACCORDANCE WITH FEDERAL AND STATE REGULATIONS AND MANUFACTURERS SPECIFICATIONS.*

7.2.2.3 In the event that the owner of the premises or non-residential users will not be able to provide access to a treatment unit on the date and time specified in the notification, the owner of the premises or the non-residential users will schedule an alternative time with the water supplier.

7.2.3 **Emergency Repairs or Replacement**. The non-residential users must provide access to the treatment units for emergency or unexpected repairs or replacements. Refusal to allow entry may result in termination of service in accordance with Section 8 of this Ordinance.

7.2.4 the non-residential user must visually inspect each treatment unit on a *INSERT TIME FRAME (i.e. on a weekly, monthly, bi-monthly)* basis.

7.2.4.1 In the event that a leak or other defect is detected, the non-residential user will: notify the Water Supplier at *INSERT TELEPHONE NUMBER* within 24 hours of noticing the leak or other defect and follow all directions given by the Water Supplier.

7.2.4.2 The Water Supplier shall arrange to repair the leak or other defect within *INSERT REPAIR TIME FRAME (i.e., two consecutive calendar days upon receipt of notice, four business days from receiving notice, etc.)*

7.2.5 The owner of the premises and the non-residential user shall not adjust, modify, repair, replace, remove, disconnect, bypass, or otherwise tamper with a treatment unit.

7.2.5.1 The Customer shall pay the Water Supplier for any costs incurred due to the adjusting, modifying, by-passing, tampering with, or removing a treatment unit or any ancillary equipment.

7.2.6 *INSERT ANY MAINTENANCE CONDITION SPECIFIC TO THE TYPE OF TREATMENT UNIT INSTALLED. FOR EXAMPLE, "NON-RESIDENTIAL USERS SHALL ENSURE THAT THE TREATMENT UNIT REMAINS PLUGGED INTO AN OPERATIONAL OUTLET."*

Section 8. Emergency Suspension of Utility Service

8.1 The water supplier may, without prior notice, suspend water service to any premises when such suspension is necessary to prevent or stop an actual or threatened imminent and substantial danger to the Water Supplier's public water supply.

8.2 The water supplier may, without prior notice, suspend water service to any premises when such suspension is necessary to prevent or stop an actual or threatened imminent and substantial danger to the environment or to the health or welfare of any person.

8.3 As soon as practicable after the emergency suspension of service, the Water Supplier will notify Customers of the suspension. Notice will be provided in person or by certified mail, return receipt requested.

8.4 The Water Supplier will not reinstate service until the actual or threatened danger has been eliminated and its cause determined and corrected.

8.4.1 The Customer shall pay the Water Supplier for any costs incurred for suspending service: responding to, eliminating, determining the cause of, and correcting actual or threatened dangers; and reinstating service, if the actual or threatened danger was caused by persons other than the Water Supplier.

Section 9. Non-Emergency Suspension of Utility Service

9.1 The Water Supplier may terminate, after notice and opportunity for a hearing, the water service of any Customer who:

- Fails or refuses to allow the installation of treatment units as required by this Ordinance.
- Fails or refuses to allow the Water Supplier access to the premises to conduct regular or emergency maintenance.
- Adjusts, modifies, repairs, replaces, removes, disconnects, bypasses, or otherwise tampers with a treatment unit without prior written permission from the Water Supplier.

9.2 Except in accordance with Section 8 of this Ordinance, the Water Supplier will notify the Customer of the proposed termination of water service at least 30 days before the proposed termination. Notice will be provided in person or by certified mail, return receipt requested.

9.2.1 The Customer may request a hearing on the proposed termination by filing a written request for a hearing with the Water Supplier, not more than 10 consecutive calendar days after receipt of notice of the proposed termination.

9.3 If water service is terminated, the Water Supplier will not reinstate water service until the Customer and owner of the premises allows for the installation of treatment units.

9.3.1 The Customer and the owner of the premises must enter into a written agreement to allow the Water Supplier access to the premises to conduct regular or emergency maintenance

9.4 The Customer shall pay all costs incurred by the Water Supplier to reinstate service.

Section 10. Installation and Maintenance Charges

10.1 Customers may be charged *INSERT COST OF INSTALLATION* for the installation of a treatment unit. Customers may be charged in equal increments every month for one year.

10.1.1 Customers may be charged for all costs incurred by the Water Supplier to make any required modifications to existing plumbing in order to install the treatment unit. Customers may be charged in equal increments every month for one year.

10.2 Customers may be charged a monthly maintenance charge of *INSERT MONTHLY MAINTENANCE CHARGE* for as long as the treatment unit remains installed on the premises.

10.3 Any installation and maintenance charges collected by the Water Supplier shall be deposited in the operating budget of the Water Supplier. Such funds shall be used for the purchase of new treatment units and to help defray the costs associated with purchasing, installing, maintaining, and removing the treatment units.

10.4 The *INSERT NAME OF MUNICIPALITY* reserves the right to increase or decrease the installation and maintenance charges as deemed appropriate through an amendment to this ordinance.

Section 11. Enforcement

11.1 All users of water supplied by the Water Supplier shall abide by the provisions of this Ordinance and any such rules, regulations, and ordinances promulgated for the improvement and maintenance of the quality of the water intended for human consumption supplied by the Water Supplier.

11.2 Failure to abide by the provision of this Ordinance may result in the termination of service as described in Section 8 or 9 or in the imposition of service charges.

11.2.1 The Water Supplier may charge the customer *INSERT AMOUNT OF SERVICE CHARGE FOR EACH FAILURE* for failure to allow access for the installation of the treatment unit.

11.2.2 The Water Supplier may charge the customer *INSERT AMOUNT OF SERVICE CHARGE FOR EACH FAILURE* for failure to allow access for the maintenance of the treatment unit.

11.2.3 In the event that the Customer, owner of the premises, residential user, or non-residential user fails to allow access to the premises for the purpose of removing the treatment unit, the Water Supplier may apply to the *INSERT COURT OF JURISDICTION (e.g., District Court, County Sheriff)* for an order permitting entry onto the premises and for the removal of the treatment unit.

11.3 Any service charges imposed and collected by the Water Supplier shall be deposited in the operating budget of the Water Supplier. Such funds shall be used for the purchase of new treatment units and to help defray the costs associated with purchasing, installing, maintaining, and removing the treatment units.

11.4 The *INSERT NAME OF MUNICIPALITY* reserves the right to increase or decrease the service charges as deemed appropriate through an amendment to this ordinance.

Section 12. Liability

12.1 The Customer, owner of the premises, residential user, and non-residential user shall indemnify and hold harmless the Water Supplier for any injury or damage which may occur as a result of:

1. The installation, maintenance, operation, sampling, monitoring, or removal of a treatment unit.

2. The adjusting, modifying, repairing, replacing, removing, disconnecting, bypassing, or otherwise tampering with a treatment unit.

3. The failure to inspect, detect, and report, in accordance with the Ordinance, any leaks or other defects which could have reasonably been detected by the required weekly inspection.

12.2 The Customer or the owner of the premises shall be liable for any damage to a treatment unit resulting from fire, theft, or impact.

Section 13 Severability

13.1 If any provision or provisions of this Ordinance is be held to be invalid, illegal, unenforceable or in conflict with the law of any jurisdiction, the validity, legality and enforceability of the remaining provisions shall not in any way be affected or impaired thereby.

Adopted this _____day of _____ by the *INSERT NAME OF BODY PASSING THE ORDINANCE*.

_____
Authorized Signatory

_____
Witness

Appendix J: *Sample Access and Maintenance Agreement*

_____[1] has decided to install _____[2] to treat for _____.[3]

We have chosen to use this treatment technology since it is the most effective means of removing this type of contamination from our drinking water in a cost efficient manner. Installation of this technology will help to ensure the deliver of safe water to your home.

The undersigned are the current legal owners of, and can provide access to, the following property: _____.[4]

The undersigned agree:

46. To allow the water supplier, its employees, authorized representatives, and others under agreement with the water supplier (the water supplier), to enter the aforementioned property to:

    a. Install, replace, maintain, or remove the treatment unit and any ancillary equipment.

    b. Maintain the treatment unit and any ancillary equipment. Maintenance may include periodic testing of the unit as well as the collection of samples. Any maintenance, testing, or sample collection will occur during normal business hours: _____.[5]

47. To not adjust, modify, tamper with, bypass, or remove the treatment unit or any ancillary equipment.

48. To, within a reasonable period of time, notify the water supplier of:

    a. Any problems, concerns, or questions concerning the treatment unit or any ancillary equipment.

    b. The rental, lease, sale, or other transfer of the aforementioned property.

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[1] Insert name of water system or municipality.

[2] Insert type of treatment system (e.g., Point-of-use reverse osmosis treatment units).

[3] Insert the type(s) of contamination the treatment unit is being installed to treat.

[4] Insert a description of the property here. This description should include the full address and, if known, the legal description provided in land records (e.g., Map 52, Parcel 40, Town X). Ensure that the undersigned owns the structure (e.g., house, business, office, other building) and not just the land that the structure is on.

[5] Insert a description of the frequency of sampling and maintenance activities (e.g., the first of each month, once per calendar quarter, twice a year, etc.)

53. To indemnify and hold harmless the water supplier for any injury or damage which may occur as a result of the installation, maintenance, operation, monitoring, or removal of the treatment unit or any ancillary equipment.

All equipment shall remain the property of the water supplier. The undersigned agree to reimburse the water supplier for any costs incurred because the undersigned adjusted, modified, bypassed, tampered with, or removed the treatment unit or any ancillary equipment.

This agreement remains in effect: _____.[6]

While in effect, this agreement shall run with the land and shall be binding on all parties having or acquiring any right, title, or interest in the property described herein.

This written permission is given by the undersigned voluntarily with knowledge of legal rights and without threat or promise of any kind.

Owners:		**Witnesses:**	
_____		_____	
Name	Date	Name	Date
_____		_____	
Name	Date	Name	Date

[6] Insert the length of time that the agreement is to remain in effect. For example, "for a period of one year from the date of installation; until the water supplier determines that the treatment system is no longer necessary, or until the treatment unit is removed from the property.

Appendix K: *Sample Maintenance Log for a POU or POE Compliance Strategy*[1]

System Name (PWSS ID): Franklin Run Water System (11234) Maintenance Supervisor: Richard Franks

Customer/Location	Date and Time of Call	Problem	Response Action	Date of Response	Initials
Doe, John 134 Main Street	4/6/2002 1:10 pm	Unit alarm triggered	Maintenance staff deployed; bottled water delivered; unit replacement scheduled for 4/8/02	Unit replaced 4/7/2002	KCS
Smith, Sue 1125 Central Drive	N/A	Routine maintenance visit	Maintenance staff deployed; unit serviced - pre-filters replaced, membrane replaced	4/15/2002	REK

System Name (PWSS ID): _____ Maintenance Supervisor: _____

[1] You should amend and adapt this sample maintenance log to meet your particular needs.

Customer/Location	Date and Time of Call	Problem	Response Action	Date of Response	Initials

Appendix L: *Sample Monitoring Logs for a POU or POE Compliance Strategy*[1]

In addition to continuing to conduct routine monitoring at the point of distribution, systems that elect to implement a POU or POE treatment strategy must also conduct sampling at individual units. Two different types of logs should be kept to ensure that necessary monitoring has been completed at each site. First, a log detailing the monitoring conducted at each individual residence. Second, a log detailing the daily activities of system staff (or contracted staff) involved in monitoring efforts.

Sample Monitoring Log 1: Site Monitoring History Log

Customer/Location: 1125 Central Drive System Operator/Monitoring Supervisor: Richard Franks

Semi-Annual Screening (Initial when completed)	Result (Pass/Fail)	Semi-Annual Screening (Initial when completed)	Result (Pass/Fail)	Full Sampling (Initial when completed)	Lab Results (g/L)
January 2002 (KCS)	Pass	January 2006		January 2002 (KCS)	3.0
July 2002		July 2006		January 2003	
January 2003		January 2007		Follow-up (if necessary)	
July 2003		July 2007		Follow-up (if necessary)	
January 2004		January 2008		Follow-up (if necessary)	
July 2004		July 2008		January 2007	
January 2005		January 2009		Follow-up (if necessary)	
July 2005		July 2009		Follow-up (if necessary)	

[1] You should amend and adapt this sample monitoring log to meet your particular needs.

Customer/Location: _____ System Operator/Monitoring Supervisor: _____

Semi-Annual Screening (Initial when completed)	Result (Pass/Fail)	Semi-Annual Screening (Initial when completed)	Result (Pass/Fail)	Full Sampling (Initial when completed)	Lab Results (g/L)
January 2002		January 2008		January 2002	
July 2002		July 2008		January 2003	
January 2003		January 2009		Follow-up (if necessary)	
July 2003		July 2009		Follow-up (if necessary)	
January 2004		January 2010		Follow-up (if necessary)	
July 2004		July 2010		January 2007	
January 2005		January 2011		Follow-up (if necessary)	
July 2005		July 2011		Follow-up (if necessary)	
January 2006		January 2012		Follow-up (if necessary)	
July 2006		July 2012		January 2011	
January 2007		January 2013		Follow-up (if necessary)	
July 2007		July 2013		Follow-up (if necessary)	

Sample Monitoring Log 2: Daily Activity Log

Name of Employee: Mark Sanderson System Operator/Monitoring Supervisor: Richard Franks

Employee Signature: _____ Supervisor Signature: _____

Date	Customer/Location	Sampling Location	Results (Pass/Fail or g/L)	Action Required
1/20/02	1125 Central Drive	Kitchen Tap	Pass	None
1/20/02	134 Main Street	Kitchen Tap	Pass	None
1/20/02	688 Tremont Lane	Kitchen Tap	Fail	Replace membrane; follow-up sampling
1/20/02	688 Tremont Lane	Kitchen Tap	Pass	None
1/24/02	492 Clarendon Street	Kitchen Tap	3.4	None

Name of Employee: _____ System Operator/Monitoring Supervisor: _____

Employee Signature: _____ Supervisor Signature: _____

Date	Customer/Location	Sampling Location	Results (Pass/Fail or g/L)	Action Required