Puget Sound Septic System Management Programs

Best Management Practices Reference Manual

Washington State Department of Health

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Preface

On-site sewage systems treat wastewater on or near the property where the wastewater is generated. The flexible nature of on-site sewage infrastructure—also called decentralized wastewater infrastructure—allows the technologies to support development in a variety of settings.

The systems have advanced from simple technologies and temporary infrastructure to now serve as essential sewage infrastructure. However, many systems still in use have surpassed their effective lifespan. The systems are commonly known as septic systems and that term is used throughout this manual.

Regardless of the type or scale of system, all wastewater systems need proper use and care in order to work effectively. Unlike municipal sewage treatment works where operation and maintenance are closely regulated, septic systems are privately owned and have historically been lightly regulated. That paradigm has been gradually shifting in recent decades both nationally and in Washington State, drawing more attention to the management needs of septic systems. With its prized and sensitive water resources and unending population growth, the need and push for management oversight of septic systems has been more pronounced in the Puget Sound region.

This manual serves as a primer on the many issues, elements, and activities that form the septic system management programs carried out by the 12 local health jurisdictions around Puget Sound. These programs are anchored in local plans adopted under state law on Marine Recovery Areas (chapter 70.118A RCW) and on-site sewage systems (chapter 246-272A WAC).

The purpose of these local plans and programs is to educate and engage people on the proper use and care of septic systems to ensure good, ongoing sewage treatment and protection of water quality and public health. The region's dispersed network of septic systems is estimated at more than 600,000 systems and about 940,000 systems statewide.

The local management programs are complex and costly to administer. They operate under common authority, yet are all uniquely designed and implemented providing an uneven patchwork of oversight. Local program funding is spotty and uneven, further contributing to region's fragmented management framework.

Work improving and harmonizing the local programs is unending and requires input and participation by a suite of stakeholders. This manual is written in simple terms to help educate and support the work of citizens, realtors, industry service providers, environmentalists, builders, elected officials, professional staff and others who help develop, update, and carry out these programs.

For ease of use as a technical and educational document, the manual has been posted as a single document and as individual chapters. The manual covers:

- Introduction to Puget Sound's on-site sewage infrastructure and the role of management.
- Background on the historical use of septic systems and implications for public health and water quality.
- Regulatory framework of septic system management.

- Benefits of septic systems and management programs.
- Fundamentals and key ingredients of management programs.
- Challenges and barriers to management programs.
- Comparative discussion of Puget Sound's local management programs.
- Perspective on Puget Sound's management programs by the on-site sewage industry.
- Summary of program tools and best practices, and summary findings.

The manual is the product of collaborative work by Lynn Schneider and Stuart Glasoe of the Washington State Department of Health, Corinne Story of Skagit County Health, Linda Hofstad of BH Consulting, and John Thomas of the Washington On-Site Sewage Association who provided the chapter on industry perspective.

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Introduction

On-site sewage systems are commonly referred to as septic systems. The term "septic system" is a bit of a misnomer when used to describe the diverse and advanced treatment of today's on-site sewage systems. For the purpose of this document, it's the "plain talk" term of choice and we use it throughout the document when describing the systems and the related management programs.

Septic systems treat domestic sewage from individual homes or small developments and infiltrate the treated water on or near the property where it is generated. This wastewater infrastructure—sometimes referred to as "decentralized" due to its dispersed nature—consists of an estimated 600,000 systems in the Puget Sound region (WDOH 2014a). Developing an accurate inventory and record of all the systems is a priority need of the region's local septic system management programs.

One reason local records are incomplete is that many systems were installed prior to current design and permit requirements. Many systems were installed as temporary infrastructure until centralized sewer systems could be expanded or built to accommodate all of the region's urban and suburban development. Such work will never be feasible.

Figure 1. Puget Sound counties have about 600,000 septic systems.

With advances in on-site treatment technology and other knowledge, septic systems are no longer viewed as a temporary treatment option but are now viewed as the best means of sewage treatment for a large portion of the population in the 12 counties surrounding Puget Sound (Figure 1). Statewide, this decentralized wastewater infrastructure consists of an estimated 940,000 systems (WDOH 2014d).

In the past century, Puget Sound cities, towns, and counties have grown at a high rate. Since 1960 alone, the region's population has swelled from about 1.8 million to nearly 4.8 million today (WOFM 2015, 2010). The result is more densely populated communities and housing developments that lie outside the service areas of municipal sewage treatment plants. Septic systems have become a significant part of the region's wastewater infrastructure. Puget Sound is vulnerable to pollution from a variety of sources including failing or malfunctioning septic systems. For this reason, permitting requirements and operation and maintenance (O&M) requirements for septic systems are stricter in the Puget Sound region than in other parts of the state. The health of Puget Sound relies, in part, on properly functioning septic systems.

Though septic systems are generally out of sight, they can no longer be out of mind. The systems now being installed are often very different from the simple tank and gravity drainfield of the 1970s, and

even more so the cesspools and seepage pits of previous decades. No longer is the norm only to keep the sewage underground and out of sight. As technologies have advanced to work on marginal properties and effectively treat contaminants, the new norm is that systems must function properly. Systems must treat wastewater to a standard that protects public health and ground and surface water.

Puget Sound counties have established management frameworks to help ensure systems work properly and health and water resources are protected. These local management frameworks include a range of program elements and activities, from permitting new systems to ensuring proper O&M and repair of failed systems.

The complexity of a framework managing septic systems can be considerable. Foremost, there are regulations: federal, state and local. Each plays a role in the regulatory framework. However, the primary regulatory work happens at the local level where decisions are made about how to interpret and implement the state regulations. Though local health jurisdictions have essentially the same authority, they vary in how they use that authority to design and implement their local septic system management programs. Among other factors, these local decisions are based on:

- Actions and approaches with public health goals.
- Legal interpretation of code requirements by county prosecuting attorneys, local boards of health, and health program managers and staff.
- Evaluation of water quality problems and the risks posed to public health.
- Program resources/capacity and access to stable funding.
- Political support and community buy-in.

In addition, as technology continues to advance there are complexities of the system itself and how to meet regulatory inspection and maintenance requirements. Add to that the challenges presented when summer cabins become larger, full-time residences or when reserve areas in housing developments have already been used for repairs and space for a second repair is limited. And there are the thousands of septic systems in housing developments that were planned and installed as temporary that are now old infrastructure supporting permanent development. Community systems (large on-site sewage systems) are also used throughout the region. They can be problematic and also require considerable oversight.

Identifying elements that are foundational to septic system management programs can help local health jurisdictions achieve their public health goals. This document provides information on many basic program elements and describes how counties are implementing them in different ways to achieve desired outcomes or to build more robust programs. Currently, all 12 Puget Sound counties have basic elements in place that range from permitting to O&M oversight of those systems. Some counties have bigger, more robust programs due in part to starting their programs more than 20 years ago, or having a stable funding source, or having strong community and political support. Other counties struggle to maintain basic programs in light of limited budgets and staff.

This document discusses many issues and challenges associated with the local management programs and compares optional approaches used across the Puget Sound region. Given the program complexities and history of the region's communities and counties, it is no surprise that these programs differ significantly. To illustrate, the number of septic systems in the 12 counties ranges from estimates of 155,000 in King County to 9,000 in San Juan County (WDOH 2014a). See Appendix A for a summary table

of the county programs. Even within a county, design and implementation of a program can vary, often due to risk factors. For example, a largely rural county may have pockets of urbanization that require a different approach than the less densely populated rural areas. The concentration and types of systems, soils, geography and topography, professional availability (such as designers and installers), political and public support, legal authority, and more, vary widely among Puget Sound counties.

A management framework must be purposeful and well designed, and must take into consideration a number of complexities. Good intentions don't result in adequately maintained septic systems. Management programs are needed to fulfill stewardship responsibilities protecting Puget Sound, public health, and homeowner investment in their septic systems. Management programs are built in stages. They need to be stable and enduring because septic systems are the long-term, permanent method of wastewater treatment for a large portion of Puget Sound's properties. Septic system management is not a one-time effort, nor is it a static program. Management approaches need periodic review and flexibility to adapt to emerging issues, new technology, and a growing population. Because the counties have unique needs and characteristics, a one-size-fits-all approach is not fully workable. The following chapters further explain the need for these programs and some of the methods and elements that are being put to use across the Puget Sound region to ensure proper use and care of septic systems.

Background

Historical Use and Management of Septic Systems

This chapter takes a look at how septic systems have evolved in terms of use, prevalence, management, and regulation. This look back gives some perspective on how views and practices have changed and helps explain the continued need to transform public understanding of on-site sewage treatment in the 21st century.

Septic systems became a common method of sewage treatment in the late 1800s and were relatively unregulated in Washington until the 1970s. Early guidance from Washington Department of Health (1942) on "residential sewage disposal plants" said the systems "are out of sight; they cause no odor; they last indefinitely and require comparatively little maintenance or attention." That was the common understanding in the first half of the last century and sums up the basic understanding that some homeowners, decision makers, and others still have today.

Out of Sight, Out of Mind

"It has hitherto been—and in fact it still is—the practice of the world to consider its wastes satisfactorily disposed of when they are hidden from sight. In spite of an almost universal outcry about sewer-gas, filth diseases and infective germs, the great mass, even of those who join in the cry, pay little heed to defects in the conditions under which they are living so long as they are not reminded by their eyes or their noses that their offscourings are still lurking near them."

– George Waring, Sanitary Engineer, 1894

Until the latter half of the last century, a septic system had a relatively simple design: cesspool, seepage pit, or septic tank (constructed of a variety of materials) which most often flowed via gravity into a drainfield (also called a leach field). Other than knowing not to site the drainfield near a drinking water well, there were few guidelines or criteria on where to locate a system. After the septic system was in the ground, it was commonly understood that not much else was needed, at least not until it failed and had to be repaired or replaced. To this day it's not uncommon to hear a well-meaning person tell a new neighbor, "Nah, just leave it be. You don't need to pump it ever."

With the return of soldiers at end of World War II and the surge in home building in Washington, septic systems were the easiest, most expedient method of wastewater treatment (Tyler 1943). Municipalities and developers didn't have time to wait until a municipal sewage treatment plant could be built to serve the wastewater needs of the community. As Tyler (1943) described the situation, "The influx of large numbers of war workers with their families has overtaxed the sanitary facilities of many communities and necessitated the construction of additional sewers and disposal plants." Most septic systems were designed based on a "perc test" that measured the time it takes for water to percolate through a soil test hole. Septic systems were installed as temporary treatment until a sewage treatment plant could be built. This concept of temporary wastewater treatment continued into the 70s and beyond, allowing developers to meet housing demands to accommodate population growth in Puget Sound counties. Figure 2 is a local permit issued in 1974 noting, "The septic system is an approved, temporary method of sewage disposal until sanitary sewers are available."

In 1972, President Nixon signed into law the federal Clean Water Act. The goal of the act was to restore the quality of the nation's water resources—lakes, streams, rivers, wetlands, and coastal waters—which had become seriously polluted. The act included provisions to provide funding for publicly owned sewage treatment works. In ensuing years, cities and towns across the nation and Puget Sound chose to apply for funding to build, expand, or upgrade municipal sewage treatment plants. This infrastructure is known as centralized wastewater treatment.

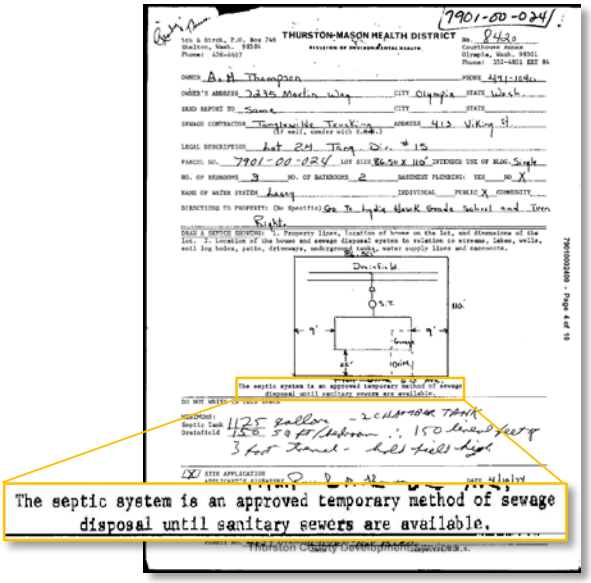

Figure 2. Permits issued on into the 1970s approved on-site septic systems until sewage treatment plants were available.

During the 1970s, people recognized that decentralized wastewater systems needed more attention. Amendments to the Clean Water Act in 1977 required consideration of alternatives to conventional sewage treatment works because not all wastewater treatments needs could be met with conventional, centralized treatment. As noted in the U.S. Environmental Protection Agency's (USEPA 1978) guide to the amendments, "a number of the 1977 amendments reflect a strong Congressional desire to encourage deployment of new waste treatment technology—in part because it may in some cases cost less than conventional technology, and in part because it offers substantial environmental benefits." Centralized facilities received most of the attention and billions in capital construction. However, the Innovative and Alternative Technology and Small Community set-aside of the Construction Grants program resulted in the construction of hundreds of small community systems using a combination of centralized and decentralized technologies (USEPA 1997).

New terms were introduced during the era. In addition to septic systems, decentralized technologies were called on-site sewage systems (OSS), on-site wastewater treatment (OWT), and on-site sewage disposal systems (OSDS). New laws were adopted at state and local levels to establish authority, permitting requirements, and roles and responsibilities of health officers, industry service providers, and system owners. More sophisticated design and installation standards emerged, replacing perc tests with more accurate evaluation methods based on scientific understanding of how soils treat sewage.

Awareness was growing that better design and installation of septic systems tailored to site conditions was critical to performance. Emphasis was placed on development of alternative systems and those options grew in number (USEPA 2005). Research focused on how to design systems that would provide enhanced treatment to address pollutants, in essence making septic systems "mini" sewage treatment plants. EPA funded research and development of highly sophisticated systems, as well as public domain products that provide treatment in difficult or remote site locations. In addition, private companies developed and marketed alternative system designs as a profitable industry. Septic systems had become a viable, permanent wastewater option and an integral part of the infrastructure.

The decades of the 1970s and 1980s brought an understanding that regular operation and maintenance (O&M) is a critical factor to effective treatment that protects public health, water resources, and

homeowner investment. And many advanced technologies required even more oversight and specialized technical service.

Failing septic systems were causing water quality problems, including beach closures, drinking water problems, and shellfish bed closures nationwide and in Puget Sound. Public perception was shifting to understand that systems need maintenance and related management programs to achieve sustained results. While not common knowledge, as early as the 1920s, proper use and care were seen as essential to protecting the integrity and performance of septic systems. As noted in a U.S. Department of Agriculture bulletin (Warren 1922) on home sewerage works, "Care in operating is absolutely necessary. No installation will run itself. Continued neglect ends in failure of even the best designed, best built plants. If the householder is to build and neglect, he might as well save expense and continue the earlier practice." Even though the Department of Health's early guidance (WDOH 1942) stated that "the tank should be inspected and the amount of sludge determined two years after installation and each year thereafter," this piece of owner maintenance was not enforced and was not common knowledge. The commonly held view was that septic systems were maintenance free.

Advances in On-Site Systems

"Newer technologies that include components such as controls, pumps, and filters have further undermined any assumption that, once installed, a system will continue to operate as designed. If that assumption is not valid for conventional systems, which depend on gravity and have no moving parts, it is even less valid for more complex systems. To ensure that onsite systems continue to operate as designed requires that they be maintained in a manner consistent with what they are: mini wastewater treatment plants."

– Halvorsen and Gorman, 2006

The current state on-site sewage code, chapter 246-272A WAC, which was adopted in 2005, lays out a management approach with shared responsibilities for septic system owners and local health jurisdictions. As a practical matter the vast scale and privately owned nature of decentralized infrastructure requires such an approach to try to ensure good, ongoing maintenance. Among other expectations, the state regulation requires system owners to evaluate gravity systems at least every three years and advanced systems at least annually (WAC 246-272A-270). Complementing this, the state code requires local health jurisdictions to develop and implement management plans to engage with system owners to help support this work and ensure proper use and care. Septic system classes, videos to train homeowners how to do their own inspections, certification of O&M specialists, financial incentives, and more are all designed to help system owners achieve this goal.

Such work is costly and complicated. And changing behaviors is challenging. A small percentage of system owners will do inspections and maintenance and will also practice household habits that don't stress a septic system. Education, though an excellent tool for raising basic knowledge, does not always change behavior even if the benefits are understood (Silverman 2005). Local health jurisdictions have found that when notices are sent, people wait for the next notice before scheduling their inspection. Incentives such as rebates work for a time but can become familiar and eventually go unnoticed. People's lives are busy. Their intentions are good but follow-through is often inconsistent. Consequently,

maintenance is not assured. Puget Sound counties report that education and incentive programs are most effective when accompanied by inspection requirements that are enforced (WDOH 2014g).

For many wastewater treatment professionals and regulators, there has been a gradual shift in recent decades from discounting the devices as "just a septic system" to understanding their value as a wastewater treatment facility with a range of technology from simple to complex, all of which need proper operation and maintenance. However, that paradigm shift is not yet complete for all in the public arena: homeowners, decision makers, agency personnel, realtors, and others. As the Water Environment Research Foundation (undated) has noted, all septic systems need some form of management framework, but "it takes time to accept new ideas." In its updated program strategy on decentralized wastewater treatment system, EPA (2005) concluded that septic systems can protect public health and the environment and have certain advantages over centralized system. However, they face many barriers and "until significant progress toward eliminating these major barriers is made, it is likely that decentralized systems will continue to cause health and environmental problems, and will not be recognized as a key component of the long-term wastewater infrastructure."

We are not alone in wrestling with these challenges. This is a national issue. In many respects Washington is a leader figuring out how to educate system owners and implement better programs. Washington's local health jurisdictions estimate that there are over 600,000 systems in the Puget Sound region and about 940,000 systems statewide (WDOH 2014a and 2014d). These systems serve just over a third of our population regionally and statewide (WDOH 2015). Nationally there are about 26 million septic systems, serving more than one in five homes (EPA 2012). A recent survey of state regulators estimated about 27 percent of the nation's population, roughly 86 million people, are now served by decentralize on-site wastewater infrastructure (SORA 2015).

There are many estimates of septic system performance and the percentage of failed or underperforming systems. EPA has estimated that between 10 and 20 percent of all systems nationally are not adequately treating wastewater, but acknowledges that actual failure percentages are unknown (EPA 2005).

Around Puget Sound, areas where there's been little fieldwork evaluating systems or where significant time has passed since investigations were conducted would have higher failure rates than areas where fieldwork has been conducted and management has followed. Data from Kitsap and Thurston counties tracking regular inspections show declining percentages of problem systems even with the use of sophisticated dye tests to help identify subtle shoreline seeps and other problems. The results are meaningful and help illustrate the value of regular inspections. However, two related concerns are the large number of systems in the region that have never been inspected or inspected regularly, and the large number of systems that are more than 30 years old—perhaps half the infrastructure (EPA 2005)—and are close to or past their life expectancy. The longer systems and geographic areas go uninspected, the more problems and failures that will be identified when inspections ultimately occur.

Assuming 225 gallons per day per system, the estimated 600,000 systems in the counties bordering Puget Sound generate about 135 million gallons of sewage each day. Nationally, EPA (2012) puts this estimated volume at over four billion gallons each day. Though the proper design, installation, and ongoing maintenance of the systems that treat this amount of sewage are largely invisible parts of the wastewater treatment infrastructure, they are critical to achieving the goals of preventing human illness and assuring good water quality. These desired outcomes can be achieved only by effective septic system management programs.

Health and Environmental Implications of Septic Systems

As described by Gainey and Lord (1952) and other textbooks on the microbiology of water and sewage, "Long before concrete evidence of the existence of microorganisms was available, man was suspicious of undesirable or 'bad' waters as a source of sickness." Hynes (1960) characterized the sanitary state of cities and towns in England during the 1700s as "disgusting" with excrement and garbage piled in streets, and by the early 1800s the condition of its rivers was getting out of hand with outbreaks of cholera in London and the disappearance of salmon from the Thames. In 1855, British physician John Snow documented the transmission of cholera from a drinking water well contaminated by sewage from a cesspool at a nearby house as the cause of hundreds of deaths in London (Edmonds 1978). This marked the beginning of our modern understanding of the connection between disease-causing organisms (pathogens), water, and sewage.

Over time our understanding of the issues has expanded greatly, yet basic problems and risks persist. This is the backdrop of our longstanding efforts to properly treat wastewater and protect water quality. Examples of waters polluted by failing septic systems still occur today in Puget Sound and include occasional examples of disease transmission.

Of key concern are the bivalve shellfish grown and harvested in Puget Sound, iconic symbols and foods of the Pacific Northwest. Clams, oysters, geoduck, and mussels are filter feeders that siphon marine water in search of food. In the process, they can accumulate potentially harmful microorganisms that can cause illness when the shellfish are consumed. Septic systems that are not properly operated and maintained can impact shoreline areas where shellfish are grown and harvested. This has been documented in numerous studies of the state's shoreline waters by state and local health. Washington is the nation's leading producer of farmed bivalve shellfish, generating revenues of nearly $150 and total economic benefit of shellfish aquaculture (farmed and wild harvest) approaching $200 million (WSI 2016a, 2016b). To protect the state's valuable shellfish industry and other valued uses of these prized waters, it's critical that septic systems are maintained so they function properly and do not discharge untreated or partially treated sewage.

An incident in 2014 involving a single failed septic system helps illustrate these risks. In November 2014, several people who ate raw oysters harvested from Puget Sound became ill with norovirus-like symptoms. The Department of Health used its shellfish tracking system—which tags all commercially harvested shellfish with harvest locations and dates—to backtrack the incident to shellfish harvested on a portion of Hammersley Inlet in Mason County. Further investigation of shoreline conditions by health staff in the growing area led to a failed septic system adjacent to the waters where the shellfish were harvested. The analysis even successfully identified the same strain of Norovirus in the tank of the failed system, in the contaminated shellfish, and in the people who became ill eating the contaminated product. From this one outbreak, 22 people became ill (norovirus confirmed in 6 cases) and 12,000 dozen oysters and 8,000 pounds of clams were recalled from numerous states and countries (WDOH 2014e, 2014f).

Years earlier, a single failed system in Thurston County contaminated a shellfish growing area when untreated sewage flowed down a roadside ditch into a storm drainage system that discharged onto a beach. The affected growing area was restricted from harvesting shellfish until the failed system was repaired more than a year later. The home was located more than 1,000 feet from the shoreline, which demonstrates that contamination from a failed or malfunctioning system can impact water resource and properties that are separated by roads, empty lots, and ravines.

The isolated examples are simply intended to illustrate the connections and significant implications of septic system performance and water quality. The region has 600,000 systems. Proper use and care of these systems matters greatly on all scales—property, neighborhood, community, watershed, and region.

Regulatory Framework of Septic System Management

The regulatory framework for on-site sewage systems, commonly known as septic systems, involves two sets of overlapping drivers:

- Programs and laws protecting the environment and water quality. Examples of this include the federal Clean Water Act implemented by the U.S. Environmental Protection Agency (EPA) and the Washington Department of Ecology, and the Puget Sound Action Agenda coordinated by the Puget Sound Partnership.
- Programs and laws directly regulating the design, installation, use and care of septic systems. This mainly takes the form of state and local septic system regulations and programs administered by the Washington Department of Health and local health jurisdictions.

Protection of Water Quality

Enacted in 1970, EPA was set up as the key regulatory agency to protect and restore the nation's environment, including protection of surface water through the 1972 Clean Water Act. The longstanding goal of the act has been to protect and restore the quality of the nation's water resources—lakes, streams, rivers, wetlands, and coastal waters.

Among other key efforts and milestones helping to improve centralized and decentralized wastewater treatment, 1987 amendments to the act added section 320 establishing the National Estuary Program (NEP). In 1988, EPA designated Puget Sound an Estuary of National Significance and in 1991 approved the Puget Sound Water Quality Management Plan as the region's Comprehensive Conservation and Management Plan (PSWQA 1991). The state management structure and plan have evolved ever since and function today as the Puget Sound Partnership and Puget Sound Action Agenda. Since its inception in the 1980s, the Puget Sound plan has advanced a number of strategies to strengthen septic system management in the region. The Action Agenda has added select program measures and targets in recent years to help gauge progress, focusing mainly on management activities in Marine Recovery Areas (MRAs) and other sensitive areas.

In 2010, EPA significantly ramped up its involvement and funding under NEP investing more than $100 million in Puget Sound's recovery to help implement the Action Agenda and meet requirements of the Clean Water Act. The Washington Department of Health administers a portion of this funding to Puget Sound counties to prevent and reduce pathogen pollution and protect shoreline waters for safe shellfish harvesting. In the funding program's initial six years, the Department of Health invested nearly $7 million in the region's local septic system management programs and a similar amount in local pollution identification and correction (PIC) programs. Altogether the agency has administered roughly $20 million in NEP funds for projects and programs to combat pathogen pollution. Plans are underway to extend NEP funding for Puget Sound recovery for several more years.

Along with many other delegated responsibilities under the Clean Water Act, the Department of Ecology has been tasked with conducting total maximum daily load studies of Puget Sound streams and rivers to assess and lower pollutant loads to meet water quality standards. Ecology works with tribes, agencies, and other stakeholders to figure out how to implement the cleanup plans and remedy these pollution problems. The water quality data and cleanup strategies put added emphasis on proper management of septic systems and often connect directly with shellfish harvesting in the Sound.

State and Local Regulation of On-site Sewage Systems

State and local codes form the primary regulatory framework for septic system management. In Washington, the State Board of Health adopts the state on-site sewage system regulation, chapter 246-272A WAC. It was last updated in 2005.

Initially adopted in 1976, the regulation governs small septic systems with flows below 3,500 gallons per day. The Washington Department of Health develops and oversees the regulation. Local boards of health adopt the regulation into their local codes as minimum standards. They may add more stringent standards, requirements, and definitions to meet their local priorities and situations. Except for a few functions carried out directly by the Department of Health, local health jurisdictions implement the regulation and permit septic systems statewide. The regulation governs all aspects of siting, design, installation, repair, and operation and maintenance to help ensure effective treatment and protection of water quality.

Requirements for local septic system management plans are outlined in the regulation and in a companion statute on MRAs, chapter 70.118A RCW. State law gives Puget Sound local health jurisdictions optional authority to impose and collect rates or charges under RCW 70.05.19 to implement the local management programs. However the laws do not provide dedicated, sustained funding and do not define specific performance standards for the management programs.

Early guidance issue by the Department of Health (1942) advised the following regarding the use and care of septic systems:

> Every private home not accessible to a sewer should have running water and a residential sewage disposal plant. . . . Such plants are easy to build. They are out of sight; they cause no odor; they last indefinitely and require comparatively little maintenance or attention. . . . These plants consist essentially of a septic tank and a nitrification bed or filter trench. . . A septic tank does not purify the sewage, it merely prepares it for final disposal. . . . The tank should be inspected and the amount of sludge determined two years after installation, and each year thereafter. When the tank becomes half full of sludge and scum, this material should be removed and buried. A little sludge should always be left in the tank to keep it working.

Thirty-two years later in 1974, the state adopted its septic system regulation, codified as chapter 248-96 WAC. It regulated the siting, design, installation, repair and replacement of septic systems. There was no mention of long-term operation and maintenance (O&M).

In 1989, chapter 246-272 WAC supplanted chapter 248-96 WAC. This chapter, which has been periodically updated ever since, remains the governing regulation**.** The 1994 version of the regulation outlined and assigned O&M responsibilities to system owners and local health officers.

The 2005 version of the regulation, codified as chapter 246-272A WAC, required local health jurisdictions to develop management plans to help ensure more comprehensive management of septic systems. The plans must address the following:

- Progressively inventory all septic systems.
- Identify high-risk areas and designate MRAs and sensitive areas.

- Develop and tailor O&M requirements to these areas.
- Facilitate education of system owners on their O&M responsibilities for all types of systems.
- Remind and encourage system owners to inspect their systems.
- Maintain records of O&M activities.
- Find failing systems and enforce system owner requirements.
- Assure coordination with local comprehensive plans.
- Describe the capacity of the local health jurisdiction to adequately fund the management plan.

Following adoption of the state regulation, in 2006 the state passed legislation codified as chapter 70.118A RCW requiring Puget Sound counties to designate and protect MRAs in their sewage system management plans. MRAs are defined in the law as areas where "additional requirements for existing on-site sewage disposal systems may be necessary to reduce potential failing systems or minimize negative impacts of on-site sewage disposal systems."

Using guidance produced by the Washington Department of Health in 2006 and 2007, the Puget Sound local health jurisdictions adopted management plans in 2007-08 and subsequently designated many MRAs and other sensitive areas where they engage with homeowners to ensure the systems are inventoried, inspected, and properly maintained. The plans share many common program elements. However, they are all uniquely designed and implemented, are all complicated and costly to implement, and are unevenly funded. Differences in the rigor, design, and funding of these local programs reflect a variety of social, economic, and political factors in the 12 Puget Sound counties.

Key provisions of state regulation to help people take care of their systems:

- Operate and maintain the systems as directed by local health.
- Obtain approval before repairing, altering, or expanding the system.
- Renew required maintenance contracts.
- Renew required operational certificates.
- Inspect gravity systems every three years and all other systems annually.
- Pump tanks when necessary.
- Complete maintenance and needed repairs.
- Provide system maintenance records at time of property transfer.

To help jump-start the Puget Sound septic system management programs, the state legislature has allocated over $7 million for planning and implementation since 2005. The Department of Health administers this state funding alongside the federal NEP funds. However, the state funding was not intended to cover full program costs and was not intended to serve as a dedicated funding source or long-term financing mechanism for these programs. This pass-through state funding has diminished since the 2007-2009 biennium, and has been significantly augmented since 2010 by the NEP funds.

Benefits of Septic Systems and Management Programs

Decentralized Wastewater Infrastructure

There are many benefits associated with the use of on-site sewage systems. These systems are commonly called septic systems and are collectively referred to as decentralized wastewater infrastructure. Over a third of the population statewide and in Puget Sound is served by decentralized on-site sewage systems (WDOH 2015).

A large portion of this infrastructure is now viewed as the long-term treatment solution for domestic sewage. Proper use and care of the systems are essential and unending. It's like having one car for all your transportation needs. Obviously, it would need lots of care: oil changes on a prescribed schedule, routine maintenance by a reputable garage, and repairs when needed. Good driving habits would extend the life of your car. You'd also need a license to drive it, a license plate to register it, and emissions testing if you live in a sensitive area. Unless you have an incredible memory, you'd need to keep some records of when you did what to the car to keep it in running. If the car broke down due to careless maintenance or was totaled, you'd end up paying big bucks for a new car.

Actually, a septic system isn't much different. That's why practicing household habits that enable system operation, periodic inspections, routine maintenance to find minor problems before they become major problems, and good record keeping are all critically important to extend the life of a system. A permit was needed to install it though an owner's manual may never have been provided. Minor repairs are needed periodically and are usually not costly, but buying a new system is expensive.

Inspections Can Prevent Costly Problems

While a little dated, extensive field work in Mason County in the 1990s yielded useful data and insight into the value of regular inspections and the nature of septic system problems.

Across three large watersheds the county inspected about 4,500 systems, approximately 12 percent of which were considered failing. In two watersheds the county closely tracked the cause of the problems. Of the initial 268 corrections, fully two-thirds of the failures or 181 systems involved relatively simple component problems such as connecting a greywater discharge, drainfield or tank repair, plumbing correction, or other maintenance work. The remaining 87 failures were more significant and required the installation of new systems.

As summarized by Glasoe and Tompkins (1996),"Follow-up work to correct the failed systems clearly shows that the majority of failures are relatively easy and inexpensive to repair. This finding underscores the value of regular inspections and maintenance for detecting and correcting problems that are likely to escalate over time. As the advertisement says, 'You can pay now or pay later.'"

There are many benefits associated with decentralized wastewater infrastructure. These include the following:

- Protection of public health and the environment when systems are properly sited, designed, installed, operated, and maintained. All aspects of the work must be done well.
- Initial installation and ongoing maintenance costs are typically lower than connection and ongoing service costs associated with centralized municipal sewage treatment plants.

- With advances in technology a system can be designed for isolated properties or difficult site conditions where sewer is not available or where connection costs are excessive. Use of on-site technology must take into account suitability of a site and local development regulations.
- Enhanced treatment by alternative systems to meet required performance standards in the state on-site sewage system regulation to protect public health and water quality.
- The dispersed infrastructure mimics watershed hydrology and recycles water within the watershed preserving natural systems and making nutrients in the effluent available to plants and soil. The returning water helps recharge streams and aquifers supplementing stream flow and supporting other uses rather than being transported to a sewage treatment plant where it may be discharged to nearby rivers, Puget Sound, or another watershed.

Advocates of decentralized wastewater infrastructure offer strong arguments and perspectives on these and other benefits. Bishop (2011) goes so far as to say, "When looking back at the history of wastewater treatment in the US, it's entirely possible and beneficial for us to return to more decentralized, onsite wastewater treatment and water reuse systems. It has the potential to save families and save the country as water becomes a more precious resource and energy prices continue to rise." Every advocate of decentralized infrastructure underscores the essential role of management and proper operation and maintenance in order to realize the full benefits of on-site treatment and safeguard public health and water quality.

Management Framework

There are many benefits when a local health jurisdiction has a solid septic system management framework in place. These benefits should naturally line up with the strategies and goals outlined in local management plans. Among other outcomes, there are public relation benefits when management plans are implemented fairly and equitably and the programs achieve positive results. And when the roles and responsibilities of the participants are clearly outlined and communicated, the work is more likely to be performed in a routine, consistent, and timely manner. When an effective management framework is in place, the following benefits can be achieved:

- **Clear expectations** for all participants—septic system owners, service providers, regulators, manufacturers, local health staff—that are written and adopted by the local health jurisdictions and available to all.
- **Protection of the owner's investment** in what is often the most expensive appliance on a property—the septic system. Proper care prevents decreased property value due to preventable failures, such as finding and fixing component problems or "pre-failures" that are far less expensive than replacing a septic system. Good care can also avoid costly impacts to neighboring properties. Owners can save money by pumping the tanks only as needed. Keeping track of the tank's scum and sludge levels helps determine when a tank needs pumping, which is defined in code or department policies. A carefully used septic system may not need to be pumped as frequently.
- **Oversight of service professionals** by local health staff helps promote quality services. Conducting quality control site visits of work done by professionals helps monitor service delivery and enables comparison of work quality of low bidders versus high bidders. Work completed for a specific task must be of comparable quality to ensure that maintenance protocols and standards are not set by the lowest bidder. Similarly, oversight of O&M specialists

helps assure that inspections are being conducted according to the standards set by the local health jurisdiction. Follow-up after an inspection assures these standards are met.

- **Consumer protection** through education and consistent, routine inspection of all septic systems. New, old, conventional, complex—all system types can fail. Identify problems early and reduce the risk of failure.
- **Public health protected** because there are fewer failures and surfacing sewage. Periodic inspections find systems that have failed or are experiencing problems and help assure they are repaired.
- **Water resources protected** because contaminants aren't entering ground and surface waters. Maintaining good water quality avoids decommissioning drinking water wells or downgrading marine waters for shellfish harvesting due to contamination as well as the expensive and challenging processes required to address such pollution problems (such as forming shellfish protection districts or carrying out water cleanup plans).
- **A stable, clearly defined program** anticipates problems. Fewer crises occur thus allowing environmental health staff to focus on quality, consistent service delivery and on priority management program issues.
- **Routine program reviews** look at the quality of inspections and other program services to help ensure that practices and procedures are consistent and efficient. Adaptive management facilitates continual process improvement in the program and its services.

Data Analysis and Data Monitoring

To assess whether the management program is delivering the desired benefits and making progress on the desired goals, data analysis and water quality monitoring are essential. Without these tools, any conclusions or interpretations are purely anecdotal. Anecdotal observations can be interesting and actually can become the basis for questions to "ask of the data." Anecdotal is not certain. Though it can be correct, it can also misrepresent what is actually happening in the field.

Most counties have systems for electronic submittal of inspection reports but must hand-enter homeowner inspection reports. Most counties are working toward attaching the inspection report to the septic system permit document so that both can be viewed on the county website.

In order to measure success, hard data helps determine the following:

- Whether the program goals are being met?
- What parts of the program need to be adjusted?
- What new issues are emerging?
- What information supports the need to maintain the program on a permanent basis?
- How to move toward a more robust program to meet future needs of septic systems and public health?

Data analysis and water quality monitoring can provide the following benefits:

- When presenting periodic updates to decision makers, data provides solid information that can be used to show that the program is doing what it claims or aims to do, that the program is successful and needs their public, political support.

- Provides information that can be passed on to septic system owners and other stakeholders on how well the program is doing. Provides data and points-of-interest for public meetings, regular professional meetings with realtors and service providers, newsletters, websites, and all forms of media communication. Provides an opportunity to acknowledge the efforts of all interests making the program work.
- Monitoring and data analysis improve the ability to track performance of various septic system types. For example, which system types exhibit particular problems? Which components are failing more frequently? How does system age affect performance? Such information can then be shared with industry professionals and the Department of Health. This type of analysis serves to identify and resolve recurring problems, notify the department of products that may need more review, and provide sanitarians and professionals with documented information.
- Provides information to local health staff for adaptive management of program elements, such as code language, policies and protocols, O&M requirements, reporting and tracking, public education, professional certification, and data management systems. Data can help tease out what program adjustments might be needed.
- Draws attention to areas where pollutant levels are increasing or septic system failures are occurring. Provides information when considering whether to connect properties served by septic systems to municipal sewers.

Indicators that counties have used to assess effectiveness or progress achieving goals are as follows:

- Increasing percentage of final inspections of septic system installations completed by local health sanitarians.
- Increasing percentage of failures that have completed repairs.
- Increasing number and percentage of systems documented and recorded in the database.
- Decreasing number of failures identified in high risk areas due to previous efforts identifying and fixing problem systems.
- Increasing number of septic systems routinely inspected and maintained resulting in fewer failures.
- Increasing percentage of up-to-date inspections.
- Increasing availability and use of incentives and financial assistance by septic system owners.
- Increasing interest and attendance by septic system owners in training classes and educational workshops to learn how systems function and what household habits they can adopt.
- Improving water quality (stream, shoreline, or aquifer).
- Reopening or upgrading the classification of shellfish beds.
- Improving quality and automated updating of maintenance data and septic system inventory.
- Improving level of dedicated, sustainable revenue for the program.

In summary, there are significant benefits when local health jurisdictions employ a management framework to regulate septic systems. This framework provides essential structure to implement septic system management plans. When useful and measurable indicators are identified, program benefits can be documented and communicated. These indicators need to be measured consistently and tracked as easily as possible, such as using the program database to analyze data. Keeping the spectrum of program participants informed of successes has enormous benefits for continued support.

Fundamentals of a Septic System Management Program

Developing and managing a program for on-site sewage systems, commonly known as septic systems, is a complex task. The Washington Department of Health develops the state regulation governing on-site sewage systems, chapter 246-272A WAC, and the State Board of Health formally adopts the code. Local health jurisdictions adopt and implement the regulation and have front-line responsibility regulating and permitting septic systems statewide.

Local health jurisdictions have the following responsibilities:

- Protect public health and safety from disease and accidents by assuring proper siting, design, installation, operation and maintenance (O&M), repair, and abandonment of septic systems.
- Determine what specific public health and water quality risks the county has from septic systems and adopt local health code that addresses those risks.
- Communicate and coordinate with state agencies and local jurisdictions on wastewater issues that affect and impact the citizens of the county.
- Maintain a working relationship and meet regularly with septic professionals to clarify new requirements, listen to concerns, and resolve problems.
- Provide system owners (current and prospective) with information and education on how to properly operate and maintain their septic systems in order to meet their legal responsibilities, extend the life of the system, protect the health of the community, and protect their investment.
- Encourage septic system inspections at time of property transfer.
- Adapt to new information about septic systems, community wastewater and water quality issues, and coordination opportunities.
- Identify failing systems and ensure they are promptly repaired.
- Identify and implement a funding strategy that effectively supports a comprehensive septic system management program.

Sustainable Programs

During the financial crash of 2007-09—the very time local management plans were being adopted—local health services were badly affected and many jurisdictions did not have adequate staffing to implement and manage their O&M programs.

Some local boards of health were, and still are, reluctant to hire staff even with the support of state or federal grants because they know the funding is temporary and the positions come to an end.

In the 2014 survey of Puget Sound environmental health directors, one county reported that their board felt it would be embarrassing to hire staff during the downturn when people's budgets were so tight. (WDOH 2014g)

The work of the local management programs is complicated and unending. Sustainable funding is needed to develop and implement stable programs that deliver quality services through economic upturns and downturns.

Some of the challenges associated with this work include:

- Communicating with decision makers, system owners, and other stakeholders to build relationships and program support.

- Determining how best to meet regulatory inspection and maintenance requirements and keeping pace with advances in technology.
- Understanding continual changes in local demographics.
- Dealing with summer cabins converted to larger, full-time residences.
- Dealing with limited repair options when reserve areas have already been used for repairs.
- Finding solutions for large numbers of septic systems in housing developments that were originally planned and installed as temporary infrastructure.
- Lending a "local eye" and field support to large on-site sewage systems permitted by the Department of Health.
- Designing O&M program elements to fit and work efficiently together to meet the goals of the local management plan.
- Securing sustainable funding to carry out the program.

Program Basics

Septic System Permitting Sequence
Since the 1970s when all Washington counties adopted chapter 248-96 WAC, permits have been required for the installation of septic systems. The state code regulated siting, design, and installation as well as repair and replacement of septic systems. At that time, the majority of systems were relatively simple.

Siting
There is improved scientific understanding of how soils treat sewage. The introduction of more technically complex systems and the challenges of designing a septic system for difficult properties make proper siting increasingly important. Site conditions define the limitations of installing and operating septic systems. By the mid-1990s, state guidance (WDOH and PSWQA 1996) recognized this, saying "Appropriate siting is crucial for ensuring long-term performance of systems—the best operation and maintenance cannot overcome deficient land use planning and site evaluations."

Design
Design is dependent on what the site conditions can allow for treatment. Design approval has become more complicated with more complex septic systems and requires a higher degree of training and certification by local health staff. Design options and proprietary products are at the discretion of the designer, not the environmental health specialist who reviews the design. Local health's responsibility is to evaluate whether the design submitted will provide the treatment necessary to meet the code requirements. It is not their responsibility to provide the property owner with other product options that would meet the code requirements and perhaps be less costly or easier to maintain. Local health's role is to assure that the septic system is designed to meet state and local codes. It can sometimes appear to the public that the health department is requiring a specific unit when it is the designer who chooses that unit to assure it meets design requirements.

Installation
This is the last step in the permit process to get a new septic system, and it is critical. The system must be installed where and how it was designed by the septic system designer and approved by the local health jurisdiction. Therefore, inspections must be done in order to confirm that the installation was done properly. It is at this point that practices among Puget Sound local health jurisdictions begin to show differences. Though all Puget Sound counties want to do all final inspections, they are not able to

do so consistently. However, most Puget Sound counties are managing to conduct between 75 and 100 percent of final inspections (WDOH 2014g). Some counties conduct multiple inspections during various points of installation, particularly with more complex designs. Some counties allow the designer to sign off that the system was installed exactly how he or she designed it. Included in this phase of the process is a required "record drawing," formerly called an "as-built." This is a drawing to scale of the exact location of all system components. This drawing is needed by the septic system owner or service provider in order to conduct thorough inspections and perform any needed maintenance.

Use

At this point the system gets handed off to the user or system owner. Evidence indicates that careful use and maintenance of a septic system is the most critical factor determining how a system functions over time. However, the owner may not know even the basics of proper system use and care. The owner may be a first-time homeowner; an owner who has no prior experience using a septic system; an owner who receives misinformation from a neighbor or friend; or a well-intentioned owner who just never gets around to doing what needs to be done.

Clearly there's increasing awareness of the importance of ongoing maintenance. Routine septic system maintenance is as necessary and important as car maintenance or house maintenance. Lack of proper care can, and often does, result in problems. All septic systems need routine inspections and maintenance.

Before saying more on the local management programs, here's an important note to clarify basic O&M responsibilities in Washington. State code, chapter 246-272A WAC, puts responsibility on septic system owners for proper use and periodic inspection of septic systems. Relying heavily on an honor system that is in the system owner's best interest, the law requires system inspections at least every three years for conventional systems and at least annually for advanced systems. Complementing this, state code requires local health jurisdictions statewide to adopt management plans describing how they communicate and work with system owners to help accomplish this. As a large-scale sensitive area within the state, there are added requirements for these management plans in the twelve-county Puget Sound region and still higher expectations in Marine Recovery Areas (MRAs) and other sensitive areas.

There are significant differences in how Puget Sound counties conduct O&M oversight in their programs and engage with system owners to help track and facilitate inspections. Some counties require inspections only for advanced systems or for systems at the time of property transfers. Other counties require inspections of all systems in MRAs. At least one county requires inspections of all septic systems within the county. Over half the counties allow septic system owners to conduct their own inspections on specific system types, most allowing it only after some type of certification process.

Components for Success

The following is based mainly on work by Evans (2013). First and foremost, adequate resources are needed for a successful program. This pertains mainly to program financing. It also pertains to the resources homeowners need to properly use and care for their systems, most notably capital they may need to access in the form of loans to repair/replace broken systems.

In addition, whether a management program is basic or robust, its success depends on the following:

- Authority—Clear understanding of who requires what.

- Expectations—Clear understanding of roles and responsibilities.
- Accountability—Assurance that all do what they are responsible for.
- Enforcement—Clear understanding of who can hold whom accountable.

Authority
The program must clearly state and communicate to all stakeholders *who* is requiring the septic system management program and *who* has the authority to carry it out. State law, primarily chapter 246-272A WAC and chapter 70.118A RCW, requires and charges local health jurisdictions to develop and carry out a program. Likewise, it is important to state clearly *why*, from a public health perspective, such a program is necessary. Lastly, those with authority need to communicate *what* is required of whom.

Expectations
The septic system becomes the responsibility of the user who may or may not know the basics of proper operation and maintenance. Expectations of what each stakeholder is responsible for requires clear communication. These include expectations of how service providers will do their work; how local health will provide septic system education to assure system owners have the tools necessary to use and care for their systems; how regulators will equitably and reasonably enforce the rules; and how decision makers will help ensure protection of public health and safety and provide program funding.

Accountability
Discipline, a public health ethic, and good intentions can produce amazing results and can be the backbone for a management framework. However, the reality is that people in different roles don't always do their part. For accountability to be effective and equitable, all participants need a means by which they are held accountable. Procedures to monitor and maintain accountability must be built into the program.

Enforcement
Enforcement goes hand-in-hand with accountability. In order to be able to hold someone accountable for their work—whether it's making certain an inspection is done routinely or submitting accurate pump reports or following through on fixing a failing septic system—there needs to be consequences for inaction. If there is no ability or desire to enforce, accountability will be weak and the program will have difficulty meeting its goals.

When these four components are clearly outlined and adopted into code, policies, and procedures which can be referenced and revisited periodically, it is easier to maintain consistency and make needed changes over time. Clearly written documents provide consistent messages for use in communications, compliance, and enforcement. Table 1 summarizes these four components as they relate to four sample elements of a septic system management program.

Table 1. "Components for Success" Applied to Sample Elements of a Septic System Management Program

Septic System Management Program Elements	Authority … who requires	Expectations … what is expected of whom	Accountability … who is responsible to do the expected	Enforcement … who holds them accountable
Inventory	▪ Chapter 246-272A WAC ▪ Chapter 70.118A RCW	▪ Local health to make steady progress completing full inventory of all septic systems	▪ Local health	▪ Department of Health tracks inventory data for Puget Sound indicator
Inspections	▪ Chapter 246-272A WAC ▪ Chapter 70.118A RCW ▪ Local health codes	▪ Local health establishes inspection requirements ▪ Septic system owner submits inspection reports on established schedule ▪ Septic system professionals complete inspections per county requirements	▪ Local health ▪ Septic system owner ▪ Septic system professional	▪ Department of Health tracks inspection data for Puget Sound indicator ▪ Local health tracks data for local use ▪ Local health holds staff, septic system owners and professionals accountable for conducting and reviewing inspections
Compliance	▪ Chapter 70.118A RCW ▪ Chapter 246-272A WAC ▪ Local health codes	▪ Department of Health reviews management plans for completeness and consistency with state law ▪ Local health carries out compliance per health code, policies, and procedures	▪ Local health	▪ Department of Health for state septic system code ▪ Department of Licensing for septic system designers ▪ Local health for local health codes
Water Quality Monitoring	▪ Chapter 246-272A (optional element)	▪ Local health to find problem areas ▪ Department of Health shellfish program monitors marine water quality in shellfish growing areas ▪ Ecology has authority when water quality does not relate to septic systems	▪ Local health ▪ Department of Health ▪ Department of Ecology	

Key Ingredients of a Management Program

In reviewing the literature and results of the 2014 survey of Puget Sound environmental health directors (WDOH 2014g), nine ingredients emerged as key to the success of a septic system management program. Other survey findings comparing the local management programs are discussed in the "How do Puget Sound Programs Compare?" section.

Enabling Legislation
Clearly written code, policies, and procedures are essential for spelling out program expectations and business practices. Writing and adopting code takes valuable time and resources, but in the long run can save significant time and headaches. Internal procedures and protocols should be adopted by local health jurisdictions to further explain and help implement the code.

Thurston County wrote and adopted more than 30 procedures and protocols when it implemented the Henderson Inlet Watershed Protection Area program in 2006. These included everything from how to determine which properties were in the program (including those where the boundary line dissected the property) to when to authorize an extension to an inspection deadline. These written procedures and protocols promote consistency among staff and show the public the program is being run in a fair, consistent manner.

Such an approach may not seem necessary in jurisdictions with a small staff. However, with new or additional staff members, these documents provide clear direction and descriptions of how the work must be done and how decisions get made. Often program legal counsel will either require or strongly recommend this in order to more easily and efficiently pursue compliance.

Legal Support
Legal support is needed to clarify code and support public health actions to implement a strong management program. Such issues include property access, investigations, and compliance actions. Legal counsel will advise on strategy, tactics, and reasonable flexibility based on circumstances. Legal counsel needs to be available to assist with compliance and enforcement cases in a timely manner; typically within a window of ten days.

Information and Data
Managing data on the large number of septic systems in the Puget Sound region—which ranges from about 9,000 in San Juan County to 155,000 in King County (WDOH 2014a)—can only be done accurately and efficiently with electronic databases and software programs (such as MS Access) that can easily interface with each other. While databases are costly to design and administer, the alternative (paper files and sheer manpower) would be cost-prohibitive on such a scale. Available options range significantly in design and cost. They enable tracking of maintenance activities, septic system problems, trends, and overall septic system inventory. Citizens, realtors, and others who desire system information should be able to access it via the county website. Data is vital to O&M activities and ongoing performance monitoring and adaptive management of the program.

Linking inventory and maintenance data with other permitting and monitoring data adds a new dimension to serving customers, anticipating problems, and envisioning solutions. It's often helpful to know what other activities are going on with a site, as well as knowing if there are any other departments working on compliance issues. Coordination with other departments is preferable when multiple issues are present. The public views coordination as spending their tax dollars wisely. With a

comprehensive database, communication with stakeholders can be easier, less costly, and tailored to specific areas or audiences.

Communication
Communication with all stakeholders is important. Databases can provide addresses and septic system information to streamline communication to special groups or subsets such as MRAs and neighborhood associations.

A review of the literature confirms that regular communication is very important (Halvorsen and Gorman 2006). There are skills and approaches recommended by Covello (2008) and other communication experts that can be used to help keep people updated and improve transparency with ongoing program implementation.

It is important to personalize communications so that what's arriving in a system owner's email or mailbox doesn't look like junk mail. Branding can be helpful so system owners know when they see an icon that it signals information they need to pay attention to and immediately associate with this issue. It's important to keep in mind that different age groups respond to different and ever-changing modes of communication. Mobile technology, social media, and other emerging means of communication will play an increasingly important role in outreach and communication strategies. Programs will benefit as managers and staff learn to develop and apply these tools to improve messaging and service delivery on various fronts.

Tips and Tools for Communicating and Branding

Vincent Covello (2008) advocates the following cardinal rules for effective risk communication:

- Accept and involve the receiver as a legitimate partner.
- Plan and tailor communication strategies.
- Listen to and understand your audience.
- Be honest, frank, and open
- Coordinate with and use credible information sources.
- Plan for and understand how to use media influence.
- Speak clearly, simply, and with compassion.

The Department of Health hosts a site with material developed under multiple projects in the region that can be used in program outreach and branding. This includes flyer templates, logos, videos, links to external resources and more. To access it, go to the department's webpage on septic system social marketing tools.

Training and Education
The need for education and training is unending and applies to all roles and participants in a comprehensive program:

- State and local health staff.
- Septic system professionals.
- Realtors.
- Policy makers.
- System owners and users.

There are always new people in the picture who have had no introduction to septic systems. Regardless of their role, people need refreshers in this information-saturated culture. Rule changes happen periodically and may require some additional training and clarification. Time spent in training will save time spent in disagreements and misunderstandings. A side benefit of training is that it offers an opportunity to invite and hear feedback. No one has the corner on the best way to do something.

Education is a core element of a management program. As a stand-alone approach, it is unlikely to result in a significant, consistent increase in inspections or other desired actions. Unless an inspection is required and the requirement is enforced, at most about 20 percent of system owners will follow through on inspections or maintenance (most often pumping the septic tank). In reality, the percentage of people taking action is usually less than 10 percent.

New forms of communication should be tested and used to reach desired audiences to help improve system use and care and compliance. As noted previously, social media can be used to reach a younger and fast-growing audience. Small focus-group education—say groups of 20 to 30 people—can help improve inspection rates but are cost prohibitive unless supported by sustainable program funding.

Many local health jurisdictions have developed web-based training videos in lieu of Septics 101 classes and for use in homeowner inspection training. Thurston County found that the web-based training video developed by a group of local health jurisdictions and now hosted by the Department of Health served as a useful refresher course for system owners who had taken an in-class course. However, the county concluded that without hands-on training the video is not sufficient to teach septic system owners who are doing their first inspection. The septic system examples in the video were different from what people saw in their yards, making it difficult to recognize system components. Training also needs to be provided in other languages, and even close-captioned on videos. Agencies and other partners should collaborate to develop outreach material and programs designed to reach audiences where English is not the first language.

Public Support

A program functions more smoothly with public support. Public support is fostered by good customer service, frequent communication, clear expectations, and flexibility in responding to personal situations. It's also important to express appreciation for the achievements of the program and show how people's efforts are making a difference. Public support is built from the ground up. Local health expressing gratitude for responsible ownership and stewardship is one way of fostering this support. Complementing this, it is equally important to be skilled at dealing with well organized opposition that attempts to erode public support.

Project	Fund Source	FTE	Notes
Nisqually Watershed Protection Program	Fees and Grant	2.00	Ongoing - includes $30K grant for 2015
Henderson Watershed Protection Program	Fees	1.50	Ongoing
O&M - OSS	Fees	1.50	Ongoing
PIC Task 1-5	Grant	1.00	Ends 12/15
OSS Round 3 (Con Con)	Grant	0.25	Ends 12/15
Groundwater	General Fund	0.40	Ongoing
Aquifer Well Monitoring	Interfund	0.10	Ongoing
Ambient Monitoring	Interfund	0.35	Ongoing
IDDE	Interfund	0.05	As needed
Shellfish Protection District program	Grant	0.05	Ends 7/17
Safe Water	Grant	0.25	Ends 7/17
On-Site Management Plan Implementation	Grant	0.35	Ends 7/16 (anticipate renewal)
Totals		**7.80**	

Figure 3. Fund sources and approximate allocation of Thurston County's 2015 budget for its septic system management program illustrating piecemeal funding.

Sustainable Funding

Stable, dedicated funding is essential to developing and sustaining an effective local septic

system management program. With stable funding, time and attention no longer have to be spent on a constant search for grants and fees to keep a program running. Such sources are generally piecemeal, unpredictable, and temporary. Implementation efforts aren't derailed by always wondering how to fund another year's work—what can be added or has to be taken away. A secure and adequate funding source transforms a program from a tentative effort to a reliable, permanent program. That type of program provides a platform upon which a more robust program can be built to address additional and future needs.

When program rate structures and billing systems are developed, they should be set up and administered to be as efficient, equitable, and low cost as possible. Local health jurisdictions should aim to efficiently invest program revenue in priority services and avoid costly billing systems. The simpler, the better. And the fee structures and systems must be clearly communicated to those paying the bills.

State Agency Support

Support from the Department of Health is key to providing information on the reliability of technology, legal assistance, and financial resources. State support also extends to technical and financial assistance from the Department of Ecology and Puget Sound Partnership on key environmental and financial matters, and support from other agencies on select issues. State support includes the following:

- Technology—technical guidance documents known as Recommended Standards and Guidance (RS&Gs) for septic systems.
- Legal—Assistant Attorney General advice and opinions on code language and policy matters.
- Financial—state and federal grant funding, technical support and funds for septic loan programs, and advice on local finance mechanisms.
- Regulatory—rule and policy support interpreting and implementing codes and programs for public health and environmental protection.
- Advocacy—sharing accomplishments and helping partners and policy makers understand issues and need for the management programs.
- Data management and analysis—evaluating program results and accomplishments; working with state and local policy makers to understand the programs and challenges and make improvements as needed to achieve public health goals.

Evaluation

Successful management programs build in evaluation to determine how well various elements of the program are doing. This plan-do-check-act loop demands flexibility as staff adapt to emerging needs and issues. Adaptive management can be used to look at such things as:

- How work is being performed.
- How program goals and objectives are being achieved.
- How efficiencies can be improved.
- How problems can be identified.
- What patterns and trends are emerging.
- What actions need consideration.
- Whether the program structure is changing or needs to change.
- Whether program fees are commensurate with program costs and services.

Quality assurance/quality control (QA/QC) is a useful tool and should be integral and ongoing in program evaluation. The results provide information that can be reported to stakeholders, can help identify problem areas and actions needed, and can help fine-tune program structure and procedures.

Program Structure and Implementation

Septic system management programs are built incrementally. Though all 12 of the region's local health jurisdictions have adopted management plans and the companion programs share many common elements, they all have unique structures and are at very different stages of development. The unique nature of the local programs is due to many factors, including state regulatory philosophy that empowers local rule and does not apply a rigid top-down structure.

Based in part on the 2014 survey of Puget Sound environmental health directors (WDOH 2014g), Table 2 lists many elements of the local management programs, organized roughly around (1) permitting functions that facilitate the design and installation of systems, and (2) oversight functions that follow and help facilitate proper operation and maintenance. The table also attempts to briefly describe activities and approaches for each element ranging from basic to robust, moving from left to right on the table. The actual structures of the 12 local programs around Puget Sound are a mix of these elements and activities, reflecting the different approaches and stages of program development.

Table 2. Elements and Activities of Septic System Management Programs

	Minimal → Robust		
Permitting			
Local health code	▪ Exact language of chapter 246-272A WAC	▪ Supplemental language for local circumstances that have required clarification	▪ Additional language to clearly define authority, requirements, and accountability.
Installation inspections	▪ Final inspections done by staff or professional designer or installer	▪ 100% final installation inspections by staff ▪ Require inspections for local development permits	▪ Additional inspections during installation of new/repaired septic systems ▪ 100% final installation inspections by staff ▪ Require septic systems to have easy access for component maintenance ▪ Follow-up inspection after property is fully developed to assure system wasn't compromised
Record drawings	▪ Submitted	• Submitted within 30 days of septic system installation or prior to building occupancy	▪ Submitted electronically within 30 days of septic system installation
Repair requirements	▪ Maximum extent of the site	▪ Tracked from identification to installation. ▪ Up to a Table IX	▪ Table IX
Failure enforcement criteria	▪ Repairs only to correct surfacing sewage	▪ Identify risk ▪ Look at data ▪ Use tools to evaluate ▪ Identify reason for failure	▪ Repairs to correct all problems found
Structure improvements	▪ No relationship with building permits	▪ EH review of all building permits	▪ Reserve area protected ▪ Repair to standards of current code
System owner loan/grant options	None	▪ State revolving fund	▪ State revolving fund ▪ Funds available for all OSS owners, even those that pose high risk due to credit history, income, etc.
Installer, pumper, monitoring specialist providers	▪ Meet as needed	▪ Meet annually to discuss rule changes, procedures, and listen to problems	▪ Meet more frequently, use newsletters, social media to communicate.
Require inspections at time of property transfer	▪ May	▪ Required	▪ Repair all problems found ▪ Encourage realtors to provide accurate information to prospective buyers
Require inspections at time of building permit	▪ May	▪ May	▪ Mechanism in place to coordinate with building department

	Minimal →		Robust
Operation and Maintenance			
Funding	▪ Heavily dependent on grants	▪ Combination of program charges, fees and grants	▪ Stable and long-term ▪ Efficiently collected via property tax statement
Inventory	▪ Paper files ▪ Passive effort to document systems	▪ Continually update with maintenance activity ▪ Opportunistic effort to document systems	▪ Link to permitting activity from other county departments ▪ Committed systematic effort to document all systems
Database(s)	▪ Stand alone	▪ Electronic database via spreadsheet or other manually populated database	▪ Relational data management to identify and anticipate issues ▪ Electronic entry of inspections by O/M providers
O&M requirements	▪ Dependent on risk	▪ Dependent on system type and site ▪ Establish O&M inspection requirements in MRAs and other high risk areas	▪ Countywide ▪ All advanced systems ▪ Adequate staff to support the robust program
Notice to septic system owner	▪ No notices sent	▪ Send inspection notices in bulk mailings	▪ Send inspection notices on established schedule ▪ Inspection notice includes information or requirements for that particular system
Septic system inspections	▪ None required	▪ Track with database ▪ Ensure quality of inspections with QA/QC ▪ Optional homeowner inspections after training	▪ Initial O&M inspection done by licensed professional
Inspection reports	▪ Required for failing septic systems	▪ Review inspection reports	▪ In-depth report form ▪ QA/QC process
Water quality monitoring	▪ None	▪ Conduct WQ monitoring to proactively find problem areas	▪ Expanded monitoring ▪ Pollution identification and correction program (PIC)
Enforcement	▪ Surfacing sewage	▪ Enforce repair and replacement	▪ Enforce compliance of O&M requirements ▪ Follow up on deficiencies found during inspections ▪ Sustained funding for deficiency follow up and enforcement

	Minimal		Robust
Free Technical Assistance to septic system owner	▪ None	▪ Help Line to answer questions ▪ Information provided via web page	▪ Provide technical assistance to owners for minor repairs
Oversight of Service Providers	▪ None	▪ Certification	▪ Track consistency of inspections and reports by O&M providers ▪ QA/QC follow-up inspections for both O&M providers and homeowners who do their own inspections
Owner education options	▪ Printed materials available	▪ Workshops available	▪ More education options and outreach ▪ Realtor training – these professionals have the most interaction with new septic system owners
Incentives	▪ None	▪ Occasional use; special projects	▪ Regular use; systematic approach

Barriers to Carrying Out a Septic System Management Program

There is an ongoing and gradual shift in perspective understanding the use and role of on-site sewage systems as permanent wastewater infrastructure. Commonly known as septic systems, these increasingly complex technologies need careful use and care in order to function properly and safeguard public health and water quality. It takes time to advance new ideas and to develop and implement local management programs that provide efficient and adequate oversight of Puget Sound's 600,000 septic systems (WDOH 2014a).

There are a number of barriers and roadblocks to putting these programs in place. The following discussion is a compilation of findings from local, state, and federal publications as well as input from the 2014 survey of Puget Sound environmental health directors (WDOH 2014g).

The discussion begins with challenges local health faces when developing and adopting the management programs and when moving beyond basic services to more robust programs. The chapter then addresses some of the challenges system owners deal with operating and maintaining their septic systems, handling inspections, and fixing identified problems. It then ends with an overview of challenges associated with ongoing implementation of comprehensive management programs.

Challenges to Adopting a Septic System Management Program

Perception that Septic Systems Need Little Attention
Unfortunately, the notion or belief that septic systems don't need much attention can be all too common even today. Echoing old state guidance (WDOH 1942), many people still believe septic systems "are out of sight; they cause no odor; they last indefinitely and require comparatively little maintenance or attention." When the Department of Health issued that guidance, the primary aim was to get the sewage underground and keep it there. There was only rudimentary understanding of how sewage treatment occurred and there were few options: cesspools, seepage pits, and gravity drainfields that focused on disposal.

Today there are numerous options for system types and levels of treatment. The objective now is for all systems to provide effective treatment and to meet the necessary standards that will protect public health and ground and surface water. Bottom line, all systems need ongoing attention.

Though sewage is generated on personal property, when it moves through the on-site system the effluent can eventually move off-site and impact neighboring properties or public resources. This movement can be above ground or sub-surface. A properly functioning system treats the effluent before it moves on so that pathogens and germs are bound to the soil particles or killed. To be fully functional at disabling the disease-causing organisms, all systems need to be kept in good working order.

Political Leadership and Community Support
Though decision makers want to believe that people will always do what's best and septic system owners may have the best intentions to routinely inspect and maintain their septic systems, the reality is that the percentage of owners who fulfill their legal requirements is very low. The reality, also, is that a management framework is needed to provide the needed support and services to system owners to assist them in complying with their regulatory requirements.

Awareness of O&M Responsibilities and Benefits

System owners are often unaware of the benefits and services a management framework can provide. To keep anything in good working order, good use and care are essential, and septic systems are no different. Anecdotal data from Kitsap and Thurston counties show that without regulatory oversight only about 20 percent of system owners will do annual maintenance (inspections, making minor repairs, pumping tanks). The actual percentage is likely lower because some of this maintenance is required in association with selling a property or refinancing a mortgage.

Knowledge of Septic Systems

The perception is still widespread that septic systems are simple, function forever, and don't need much maintenance. In fact, pumpers find that their clients are shocked and alarmed when they learn their septic tank is FULL! This shows a lack of basic understanding of how a system works: one gallon in, one gallon out. Though gravity and pump-to-gravity systems can still be installed in most counties, these simple systems are a shrinking percentage of the region's septic systems. The ones in existence are getting older. Newer systems are more complex, many to the extent that a contract with a monitoring specialist is required. Good household habits, reasonable water usage, regular system inspections, routine pumping of the tank are all needed in order to get the maximum life out of any septic system. Understanding how the septic system functions is important to understanding how household habits and water usage impact the system.

It's equally important to understand that how well a system performs is directly related to how well public health and water quality are protected. Raw or partially treated sewage isn't any cleaner than it's ever been. It can still cause disease outbreaks, decommission drinking water wells, and close beaches and shellfish beds.

Need for Structured Management

On-site sewage systems are often referred to as decentralized wastewater infrastructure. This infrastructure is used by over a quarter of the nation's population (SORA 2015) and over a third of Washington's population (WDOH 2015). Some form of management or oversight is essential. In its report to Congress on decentralized wastewater systems, the U.S. Environmental Protection Agency (1997) noted that "adequately managed decentralized wastewater systems are a cost-effective and long-term option for meeting public health and water quality goals, particularly in less densely populated areas." In summing this and numerous other EPA technical reports on septic systems, Job (2010) goes on to add that, "adequately managed septic systems promote groundwater protection, public health, and community economics." The central tenet in all these reports is "management." No municipality would ever entertain the idea of not managing a sewage treatment plant. The same should be true for decentralized wastewater infrastructure. There must be ongoing oversight and investment in the infrastructure and in the related programs and services.

Legal Counsel Writing Code and Interpreting Law

Local health code adopts the state regulation for septic systems, chapter 246-272A WAC. These regulations lay out minimum requirements. It is the responsibility of each local health jurisdiction to codify how septic systems will specifically be regulated from initial permitting to installation to operation and maintenance to repairing or replacing a system. Barriers are removed when the local health code clearly defines roles and responsibilities, as well as expectations, requirements, and consequences for not meeting those requirements. Clear and concise regulations provide a foundation to implement the program consistently and equitably resulting in less ambiguity.

Legal counsel also helps determine how other laws related to public health, water quality, and program

financing will be interpreted by decision makers and county prosecuting attorneys. Problems can occur if legal counsel is not readily available for regulatory interpretation and code writing as well as assisting with compliance and enforcement situations. Supportive legal counsel can remove barriers, facilitate a responsive program, and help keep the program on a successful track.

Legal Challenges and Fear of Liability
The fear of liability and legal challenge can be a barrier to doing anything (Etnier et al. 2005). This can include access to property, inspection requirements, enforcement of failing systems and required repairs, and program rate structures. However, the flip side is that not having requirements to ensure proper use and care of system and to protect public health, water quality, and homeowner investment also entails risk and can result in legal challenges. Among the 12 Puget Sound counties there are examples of lawsuits and other legal challenges to local management of septics, some cases even decided by the Washington State Supreme Court.

Consultation between county prosecuting attorneys may provide a platform for dialogue on what works, what causes more work, and how to pursue creative approaches. Sharing well written code language can also help avoid reinventing the wheel.

Stable Program Financing
Securing stable funding is arguably the biggest and most common barrier in the region. It overlaps with virtually all other challenges. Stable funding is the key to establishing a predictable program that views septic systems as permanent infrastructure and public health and water resources as core values. Without stable, dedicated funding a program remains precarious and valuable time and resources are continually syphoned off searching for and patching together an assortment of federal and state grants, and local revenues and fees that "nickel and dime" system owners at every turn. It's inefficient and can create ill-will with system owners, service providers, and other stakeholders.

In short, like any other utility-style program, it's difficult to efficiently plan, implement, and sustain a septic system management program that effectively meets customer and community needs without a dedicated local revenue stream.

Strategic Planning and Long-term Vision
Management programs cannot be built overnight nor are they static. Some of the region's best local management programs are also the oldest. To avoid getting stuck in day-to-day details, it is important to develop the capacity to anticipate next steps and future needs in overall program development. Continuing to ask questions about what works, what's missing, what could make the program more efficient are vital to implementing and expanding a quality program. Such thinking can be applied continually and formally in a plan-do-check-act (PDCA) adaptive management cycle and should contribute directly to periodic updates of each county's septic system management plan.

Education, Regulation, and Behavior Change
Education is very important. However, if used as the only approach to getting septic system owners to do their inspections, practice good household habits, and properly maintain their septic systems, it is not enough. Unfortunately, the least expensive intervention when used on its own is not fully effective at changing behaviors even when the benefits are understood (Silverman 2005). Mohamed (2009) reinforces this finding, saying, "as the primary policy response, education has had limited impact" yet it remains the preferred policy choice for promoting maintenance. To successfully change behavior, education must be complemented by other program tools and elements. When septic system operation

and maintenance is required, septic system owners have an incentive to be educated. In several Puget Sound counties, septic system owners can take local training and be certified to do their own system inspection. This is a real incentive to save money. Saving money may be what initially incentivizes an owner, but the broader benefit is learning what a septic system is all about. Responsible ownership is the result.

Data Management
Databases and data management can present significant challenges. Not only can a data management system cost a lot of money, maintaining it can too. Proficient information technology (IT) personnel can often earn considerably more elsewhere so staff turnover can be a problem. It's also a challenge keeping data systems up-to-date and efficiently interfacing with data systems in other departments.

A well-designed database is foremost a data source for how many, how old, and what kind of systems are in the county. It can improve efficiency by making information readily available. It can provide transparency and fairness when all septic systems are documented in the database. An effective database can track system inspections, maintenance, repairs, and compliance, helping local health to better analyze trends to determine if the program is meeting its goals and objectives.

Data requirements for a successful management program are numerous and can include the following functions:

- Locate and document all septic systems.
- Link parcel information with other permitting departments to achieve a comprehensive picture of parcel activity, past and present.
- Develop an electronic permit application system.
- Track maintenance and compliance activity.
- Provide owners and service providers with system information, including record drawing, so inspections and maintenance can be done.
- Send notices/reminders to septic system owners.
- Map management program data to identify problem areas, trends, and relationships.

Challenges for Septic System Owners

Properly operating and maintaining a septic system is neither innate nor intuitive. It has to be learned, and learned accurately. There is much misinformation and there are widely marketed products that aren't needed to properly maintain a septic system. Key challenges and barriers include the following.

Knowledge of Proper Operation and Maintenance
Many owners have never had any experience living on property served by a septic system. Many people assume it's the same as living on a sewer system. What they do know may have been gained from television commercials for products to flush down the toilet so you don't have to do anything or folklore from well-meaning friends and neighbors. People sometimes choose to believe anecdotal information rather than a department sanitarian. System owners may not follow basic recommendations on proper use and care which can affect performance, damage the system, and shorten the system's lifespan. For this reason, the most technical septic systems typically require servicing contracts that are tracked by local health jurisdictions.

High Cost to Fix a Failure
Some folks feel it's better to not look because it might be bad news. However, if you don't look it's more likely that it will eventually or quickly be bad news. Many problems with septic systems require only minor repairs. Sometimes septic tanks need to be replaced due to cracks, or in some cases there's never been a bottom in the tank. Tank replacement does require a permit, but the cost is significantly less than replacing a system. However, total system replacement is sometimes necessary and can be costly. Most counties have excellent loan and grant programs that offer financial assistance. Some counties even offer assistance for minor repairs if the owner meets the grant criteria. A regional septic loan program is also in the works to further help homeowners in the state's 14 marine counties repair or replace failing or malfunctioning systems.

Unaware of Cost to Replace a System
The previous barrier is basically the fear of looking because it may cost a lot if there's a problem. This barrier is different in that it's inaction due to ignorance about the high cost of fixing a failed system. Knowing what it costs to replace a complete septic system can be strong incentive to do routine maintenance, practice good household habits, and fix small problems to prevent bigger problems.

Cost of Inspections and Maintenance
This barrier deals with the actual cost of inspections and maintenance. Yes it does cost, but it's wise and modest compared to dealing with a failing septic system.

Inaction after Inspection Training
A small percentage of people in homeowner inspection classes do not follow through after certification and actually inspect their systems. Even though they know what to do and how to do it, and know it would save them money, they don't get around to it. This is a situation where accountability becomes a factor.

Knowledge of System Problems
System owners often lack expertise to identify deficiencies or signs of failure. County field staff can recount many instances during wet-season work when sewage has ponded at the root level of grass and the property owner will claim no awareness or knowledge of it. Simple ponding at the foot of a mound may be perceived as "just a puddle." The system owner may not know what they are looking at or smelling or may hope that it will resolve itself. Other signs of trouble may be less obvious and often require the trained eye of a professional service provider. This is why state and local code require routine inspections as a foundational O&M practice.

Knowledge of O&M Requirements
System owners may not know there are requirements for operating and maintaining a septic system. Chief among these is the statewide requirement to inspect gravity systems at least every three years and advanced systems at least annually. Unless the system is located in a Marine Recovery Area (MRA) or other sensitive area where O&M requirements are tracked, or the specific system type has certain requirements, system owners may be completely unaware of basic expectations for system use and care.

Unknown System Location
Not knowing where the system components are located or having no record drawing presents a real barrier to proper O&M. This includes direct servicing of system components and if people know nothing

about the nature and location of a system they may pave or build over the system, drainfield, or reserve area further compromising the system and future repair options.

Habit
When inspections are not a habit, they get done only when there's a problem. Routine inspections make for habits. Habits remove barriers and become common practice.

Inconvenience
True. But routine, proper O&M can help avoid greater cost and inconvenience later.

Knowledge of Health and Safety Risks
Our society has become somewhat "sanitized" to the personal and public health risks associated with sewage. Unless experienced personally, many lack an understanding that sewage can have serious health consequences to those exposed directly, or indirectly. Despite our best efforts and modern safeguards, we still experience instances where shellfish beds, drinking water wells, or swimming beaches are impacted by failing or malfunctioning septic systems. Coupled with this people may be unaware of the safety risks associated the septic system, especially exposed risers and lids that if loose or cracked can present serious safety risks on a property.

Oops… Forgot
Our busy lives are an obstacle to routine inspection practices. In priority sensitive areas, LHJs engage with homeowners to try to reduce or eliminate such factors to help ensure inspections are done regularly and there's follow through on any required work.

The "Ick" Factor
This is definitely a barrier for some owners. The simple answer is to find a reputable service provider and routinely enlist their services.

Challenges to Implementing a Septic System Management Program

Lastly, there are the challenges that surface and need to be addressed when carrying out a septic system management program. They include a few program functions that may need to be regularly maintained and other challenges that may surface in some form during implementation. All program needs compete for limited resources, and some of these may be set aside when more pressing or interesting situations arise. However, left unattended, certain functions or data needs may ultimately end up demanding more time and resources.

Documenting Unknown Systems
Having a complete inventory of all septic systems in each county and the region is a priority. All those systems where there is no record—you know they are out there. How to identify them, develop a record, and count them is the challenge. This is an instance where clear documentation is needed to explain the methods used to establish the inventory. This is also a task where shared ideas on model approaches can help all local health jurisdictions tackle the work as smartly as possible.

Failure Definition
One of the primary objectives of a management program is to find failures and get them fixed. How local health jurisdictions interpret state code and define failure influences the structure and implementation of a local program. For instance, if a local program defines component problems and system deficiencies as failures that need to be closely tracked and corrected, this will drive activities and costs that differ

significantly from a program that focuses mainly on gross system failures. Appendix B includes information on failure definitions and repair requirements in the Puget Sound region. The matter deserves further attention to determine if definitions and requirements can be improved or reconciled. Regardless of local differences interpreting and applying the term and state code, local health jurisdictions need good tracking and follow through to ensure failed systems get fixed as quickly as possible.

System Deficiency

In keeping with the previous point, local health jurisdictions need to develop code and policies defining how a deficiency differs from a failure and apply the approach consistently. Does a deficiency need to be repaired? If so, when? Who may do the repair? Do you want documentation of work completed? How should this be tracked in a database? Clarification will help consistency and compliance.

Figure 4. Highway banner used by Mason County during their annual septic blitz reminding people that "All septic systems require maintenance."

Communication

Keeping in touch with all program participants keeps lines of communication open and builds trust and knowledge. Whom do you communicate with? How frequently? Are different methods and media formats used? How do you finance it? Mason County uses street banners as one tool in its annual septic blitz (Figure 4).

Feedback on Management Program

It's important to develop methods and skills to invite and listen to criticism and feedback, and to respond appropriately. Such input helps to successfully navigate public process when adopting or amending a local program. It's also central to ongoing adaptive management of the program. All stakeholders, even regulators and service providers, will have different views on how best to design, implement, and improve the management program. Listen to and seek out feedback.

Program Charges—Late Payment, Non-payment, and Reduced Rates

Collecting late charges is costly and inefficient. Whichever funding mechanism(s) is used to implement the program, written procedures describing how to handle late payments and non-payment are needed to ensure consistency and fairness. Likewise, written procedures help ensure fairness if reduced rates are offered for certain groups, such as seniors, veterans, or disabled people.

Staff Skills, Workforce Development

Build staff skills and competency and maintain consistency in procedures carrying out the work. It's easy to develop personal techniques for doing work. This often leads to improved efficiencies. Ongoing collaboration and annual review of staff techniques can help translate smart ideas into program best practices. Updated procedures can help institutionalize those practices and confirm that work is being done consistently across the program.

Staying Current with Regulations and Best Practices
It is important that all participants, not just environmental health staff working with septic permits, are made aware of changes to current practices and regulations.

Maintaining Support of Decision Makers
Decision makers need to stay informed and elections can bring new players who may need tutoring. Consider how to routinely update decision makers with interesting program results. Focus on positive progress and important matters needing attention and leadership. A septic system failure typically doesn't cause a crisis or spur major action. As such it's important to effectively and continually communicate the value and need for a permanent, proactive program in the absence of an urgent crisis.

Allocating Time to Evaluate and Adapt the Program
This may be one of the biggest challenges of managing a septic system management program—intentionally setting aside structured time to review aspects of the entire program. Built-in reports from the database can provide things such as monthly or periodic tracking of new septic system permits, septic system repairs, failures identified, and inspections completed. Other reports can be designed to compile monitoring data to identify emerging problem areas. Annual group debriefings of septic system staff can identify what's working well and where changes are needed. Brainstorming can produce suggestions of how to make work more efficient as well as what new issues are on the horizon. Local health jurisdictions can also build in advisory committees and other means to gather ongoing feedback from customers and program stakeholders.

How Puget Sound Septic System Management Programs Compare

A few Puget Sound septic system management programs have roots dating back to the 1970s and ’80s (PSWQA 1994). However, most are younger and have received serious attention only since plans were adopted in 2007-08 under requirements of the current state on-site sewage system regulation, chapter 246-272A WAC, adopted in 2005. The code and management programs regulate domestic sewage from small on-site sewage systems that serve homes, restaurants, and other dispersed development across the region. On-site sewage systems are commonly known as septic systems and that’s the “plain talk” term of choice in this document.

In 2014 the project team surveyed environmental health directors in the 12 Puget Sound counties on select elements and issues of the local septic system management programs (WDOH 2014g). The survey contained questions on system design and installation, repair of failing systems, professional certification, operation and maintenance (O&M) programs, incentives, data management, and enforcement. This chapter is based mainly on that survey. It compares different approaches and tries to explain how those differences influence the design and outcomes of local management programs.

The Puget Sound local septic system management programs represent 12 unique situations. The programs are shaped and prioritized under direction of the local health officer, decisions of local elected officials, and budgetary realities of the local governments. This ongoing process, which never involves a hard-and-fast formula, determines the structure and staffing levels (the number of environmental public health specialists) of the region’s local program. Figure 5 sums approximate staffing levels for the local programs and the approximate number of septic systems in the 12 counties as of 2014.

County	Number of Septic Systems	Number of Public Health Staff
San Juan	8,000	-
Jefferson	13,500	2.7
Skagit	15,000	2.5
Clallam	20,000	2.5
Mason	25,800	-
Whatcom	29,000	4
Island	32,000	-
Thurston	53,000	8
Kitsap	58,000	8.5
Snohomish	75,000	4
Pierce	84,000	8
King	155,000	9

Figure 5. Puget Sound septic systems by county and local health jurisdiction staff involved in their program.

Septic System Management Program Elements

Data and Data Management

This element is first in the chapter because it is a key component and integral to all aspects of the local management programs. Virtually all elements are linked with and benefit from a solid foundation of data management. It's one thing to collect data, and an entirely different matter to collect it in a manner that allows analysis to inform program decisions. Inventory data on location, type, and current status of all septic systems is needed in order to effectively manage a program.

Local health jurisdictions have a myriad of methods by which data is gathered and analyzed. Permitting new systems and repairs is done with the aid of permitting programs such as Permits Plus, Amanda, Tidemark, Envision, and Carmody. O&M inspection information may be handled in a different data management program. Property information is often managed by the local Assessor's office. Consequently, a full data management system may pull data from permitting, O&M, and property databases to create a complete picture of each septic system—where systems are located, how they were designed and installed, and how they have been maintained.

Eight Puget Sound local health jurisdictions use OnlineRME for data management of current system condition and status—Kitsap, Skagit, King, Island, Pierce, Thurston, Jefferson, and Clallam. OnlineRME allows pumpers and service providers to enter inspection information electronically. This data is then available to the local health jurisdictions. When filing an inspection report, septic professionals must answer a list of questions regarding the condition and performance of the septic system. Each jurisdiction using OnlineRME chooses the questions that must be answered by the inspectors or O&M specialists. Specific questions are chosen to identify deficiencies. High risk deficiencies are considered failures. Even with the myriad of data management programs, nearly every jurisdiction still does some manual entry of inspection data, particularly homeowner inspections.

Maintaining an effective data management system requires diligence to assure that the information and the links are updated and maintained. The robustness of data management is often dependent on available resources. The following survey responses from local health agencies offer insight on what their ideal data management system would look like.

What would your ideal data management system look like?	
Clallam	A permanent full time employee dedicated to data management.
Jefferson	Build reports of data we already collect and the ability to map it.
King	A fully integrated database with regular QA/QC.
Mason	Sustainable funding to enable us to do mailings, follow up on minor issues reported, education and database management.
Pierce	A system that collects the data we need and the personnel to collect and share the data.
Snohomish	Record drawings online, electronic filing of O&M reports, O&M reporting status online.
Thurston	A system that's nimble and easy to manage. Our current system does a lot but requires a professional data manager to fully access and update. We would like to allow system owners greater access to data, reports, reporting, etc.
Whatcom	O&M data would be integrated with all other complaint data so total failures wouldn't have to be pieced together.

Maps are an excellent tool to both acquire date and to present it. As the saying goes, “A picture is worth a thousand words.” Geographic information systems (GIS) and other mapping tools are extremely useful analyzing data, portraying findings, and determining where to focus program resources. Topography, building location, and soil type maps combined with aerial photography maps (available through Google and other mapping products) all help to identify where there is a high risk of fecal pollution. With several years of aerial photography now available, it is possible to view maps over a period of years. This ability to have a birds-eye view is very useful when determining if someone has built a shed over a drainfield, added an illegal residence or has somehow compromised the septic system. However, local health jurisdictions must be careful when using aerial photography to find problems. There may be legal ramifications associated with trespassing. Local health staff should consult with their prosecuting attorney or other legal counsel.

Permitting and Repairs

Local health’s historical responsibility permitting and inspecting new or repaired systems is well founded and well accepted today. Complaint response is also an expected function of a local program. The O&M functions are more recent additions to the foundational work of a local septic system management program.

New Septic System Permits

New system permits have been a local health mainstay for decades. Typically associated with a new building, the steps associated with approving a new septic system include site evaluation, design approval, installation, and final inspection followed by the designer submitting a record drawing to complete the process.

These responsibilities are clearly defined in state code but there are some differences in the number of inspections and who performs them. Local health jurisdictions can choose to either complete final inspection of system installations or delegate that responsibility to the septic system designer. Survey responses indicated that trust in local designers and installers may drive how many inspections are completed during the course of an installation. Only one Puget Sound local health jurisdiction defers the majority of final inspections to designers. Eight of twelve jurisdictions perform the majority of final installation inspections.

Repair Permits

Requiring a permit for a repair is variable among Puget Sound local health jurisdictions. The term “it depends” was used frequently in describing when a repair permit is required. Repair permits fall into two categories: major or minor repair.

Major Repair—Failing System

Sewage on the ground, flowing into a nearby waterway, or even backing up into a house is generally recognized as failures under WAC 246-272A-0280 and local code. It is up to the local health jurisdiction to determine if less obvious deficiencies are failures and to then take steps to enforce state and local code. Figure 6 illustrates a few differences defining failure in the region. See Appendix B for more detail.

WAC 246-272A-0280 prescribes what needs to occur when a repair takes place. State code defines a repair as “the relocation, replacement or reconstruction of a failed on-site sewage system.” Simple enough, but when it comes to repairing a failed system on a small lot with poor soils, completing a repair can be a logistical nightmare. Instead of a backhoe, hand excavating may be required, current setbacks may not be met, and finding a location for a replacement drainfield may even occur on a

neighboring property with an easement. Such challenges are all the more reason for people to take care of their systems and avoid these complex and costly repairs.

State code addresses these difficult situations by providing alternatives in Table IX of the code. Table IX repairs delineate the extent to which the sewage effluent must be treated prior to being discharged. Eleven of the twelve jurisdictions surveyed make a determination whether or not to use Table IX repairs based on the site conditions.

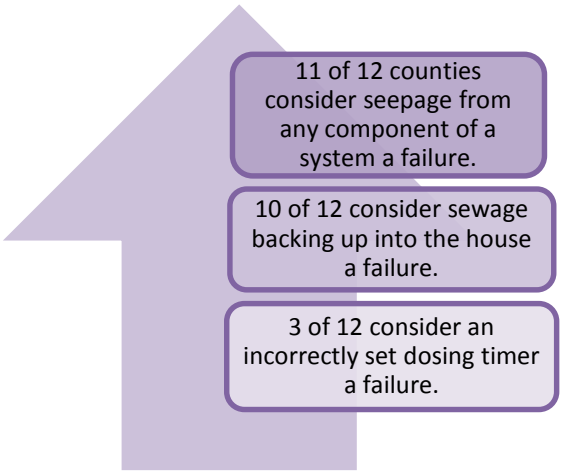

Figure 6. Examples of how the definition of a failing septic system varies in Puget Sound local health jurisdictions.

If a property owner refuses to complete a repair or does not complete it in a timely manner, local health must resort to enforcement. When a repair is ordered by the local health officer, system owners are given a period of time (varies from county to county) to hire a designer and get the system repaired. If the system owner refuses to do so or does not live up to their agreement with the compliance schedule for the repair, local health must use their enforcement authority. Kitsap Health District uses a ticketing procedure; other jurisdictions issue fines.

Minor Repair

Less obvious are deficiencies that may or may not be considered a failure but require some level of repair or maintenance. Terms such as "corrections needed" or "minor repair" are used to describe these situations.

These repairs are those that may not require a permit to be completed, but without a repair, the septic system is likely to fail earlier than it should. Examples include a crushed pipe or a pipe that has become slightly disconnected. Several comments in the survey indicated that local health wants to be notified when repairs are done that do not require a permit.

A significant matter that falls into this class of repair is to ensure that a riser lid is secured. A broken or unsecured lid can present a serious safety issue even if it does not present an immediate threat to the operation or performance of the system.

Permit Costs

The survey asked if repair permits cost less than new system permits, hypothesizing that less expensive repair permits might discourage illegal repairs and encourage better documentation of repairs. There was an even split on the responses—half the jurisdictions charge the same, the other half charge less. The two lines of thought are (1) charging less reduces a barrier to repairing a system and reporting the work, versus (2) charging the same because local health has to do the same amount of work for a repair as for a new system.

Complaint Response

Investigating and responding to complaints is a standard component of all programs. Local health jurisdictions are required to follow up on all complaints in order to determine whether a problem exists and, if so, to initiate some form of corrective action.

Operation and Maintenance
O&M functions are the relative newcomer to local health's suite of responsibilities managing septic systems. O&M functions and activities are so important that people sometime use the terms "O&M program" and "management program" interchangably. Proper use and care of systems is a smart and efficient way to improve treatment, avoid costly repairs, and extend the life of an on-site sewage system. Maintenance checkups and related work really tell the story of a system and are the key to long-term success.

Inspection Frequency and Compliance
State law requires inspection frequencies of at least every three years for gravity systems and at least annually for all other types of systems. This is a statewide requirement that is in the system owner's best interest. It broadly relies on "honor system" compliance with stricter requirements and tracking applied to advanced systems, systems located in Marine Recovery Area(s), and systems located in other sensitive areas. The reality of what's closely monitored by each Puget Sound jurisdiction depends on many factors. The jurisdictions prioritize oversight and compliance based on available resources, geography, system type, and other risk factors to determine where regular inspections and maintenance are most needed to safeguard system performance, public health, and water quality. These decisions are not made in a vacuum and are subject to local political and public process. As an example, Skagit County adopted close tracking of the three year/one year requirements for its Marine Recovery Areas but has resources to send inspection reminders or notifications only every two years or so. Without the notifications and staff follow up, rates of up-to-date inspections drop significantly.

The matter of inspection frequencies—along with other aspects of the system inspections—is fundamental to O&M and the overall design of the local management programs. Ideally system inspections will occur at appropriate intervals to ensure good, ongoing treatment and to detect and address problems as they occur. The matter deserves further attention by local health jurisdictions and the Department of Health to assess the effectiveness of different frequencies, to compare and harmonize locally monitored and enforced inspections, and to see if minimum state requirements can be improved.

Ghost Sewage Discharges
The quality of inspections is key to the overall success of a management program. But even the best inspector can miss a pipe leading out to a ditch 500 yards away or some other discrete or concealed problem. The septic tank may be functioning as it should, settling solids, and creating scum. The permitted drainfield may appear dry, with no signs of sewage seeping up. However, the drainfield may be short-circuiting into a curtain drain, or perhaps someone took action to fix a "slow-draining system" by attaching a pipe off the outlet pipe into the ditch.

Local programs aim to address and correct practices that were accepted decades ago. In rural areas, it was common to install a toilet and sink in the barn so mud wouldn't get tracked into the house at the end of the day. An O&M service provider needs to be diligent in trying to diagnose these situations. This can also be a difficult situation. The service provider is responsible for a full inspection of the septic system. However, the inspector can risk losing a client if they uncover a hidden problem in the course of fully evaluating a system and the property.

Local health jurisdictions play a role helping to identify these types of discharges. Using Pollution Identification and Correction (PIC) methods (described below) in concert with standard O&M

requirements is key to identifying poor water quality and methodically working upstream to find and correct such illicit discharges.

Homeowner Inspections

Ten local health jurisdictions make some provision for homeowners to do their own system inspections. The reasons for this are many and often boil down to community or political desire to involve and empower system owners. Conditions can be placed on homeowners who want to inspect their own systems, including:

- Requiring a professional inspection in addition to the homeowner inspection on a frequency determined by the local health jurisdiction.
- Requiring training, including field training where they can observe a septic system being inspected.
- Limiting homeowner inspections to certain types of systems and only in certain areas (e.g., not on shorelines).

While potential abuse of this provision may be obvious, there can be great benefits. When engaged this way homeowners take ownership and are actually proud of their septic systems and are happy to demonstrate their knowledge. Wow, that's quite a paradigm shift!

Skagit County's Experience

Notifications and reminders are sent to system owners in Marine Recovery Areas (MRAs). The process has proven effective although it's very resource intensive. System owners are sent a progressive series of letters—reminder, warning, and notice-of-violation—at intervals of 90, 30 and 10 days prior to the target date for completing an inspection. These notices go out with an escalating set of consequences. The first letter is a reminder; the second is a warning notifying the septic system owner they may receive a $75 per day fine; and the final letter gives them 10 days to complete the inspection or they will start receiving the fine. When the fine accumulates to $5,000, and it is verified that the septic system is not in failure, the account is sent to collections and the matter closed.

Skagit County has learned that without an end game, regular notices and warnings will start to go unheeded. Interestingly, after several years of this process, Skagit County now finds that people simply wait for the first notification from the county to do an inspection.

Other Types of Inspections

Reports of septic tank pumpouts are often included in data records. Kitsap Health District reviews pump records as a means of monitoring gravity systems that don't require O&M inspections. Skagit County includes pump records to make sure that all septic system information is available to the public. Thurston County attaches pump records to the database to provide a maintenance history of the system.

O&M Incentives and Rebates

One of the most effective ways to ensure regular O&M or at least to initiate O&M is to appeal to the owner's financial self-interest. Septic system incentives and rebates can take many forms and can be used for a variety of services such as system inspections, tank servicing, and riser retrofits. Inspection rebates can help lessen fears and motivate recalcitrant system owners. Eight jurisdictions report they have used some form of O&M incentive to help implement their management program.

Geographic Areas to Focus O&M

Local health jurisdictions prioritize where to focus O&M inspection compliance based on proximity to shellfish growing areas, marine and freshwater shorelines, type and age of systems, and other related factors. In short, jurisdictions focus their efforts and resources in areas where risks and potential impacts to water quality and public health are greatest. Water quality monitoring and PIC programs are

data-driven program elements that inform such decisions along with input received in local political and public processes.

Water Quality Monitoring

It would be nice if we could say with conviction that "the era of waiting until a septic system fails before making a repair is long gone." However, many people still live this way. Even with inspections and other preventive measures, problems still happen with systems old and new. In these situations, water quality monitoring plays a key role helping local health jurisdictions and other agencies assess background conditions and detect and correct problems in a timely manner.

Fecal coliform bacteria are the most common water quality monitoring parameter used to detect fecal pollution sources. Other indicators and tracers are also used or are being researched. Enterococci sampling is used for marine water monitoring in the state's BEACH program. Nitrogen can also be a contaminant of concern and is addressed in both the state on-site sewage code, chapter 246-272A WAC, and MRA statute, chapter 70-118A RCW. Where nitrogen is identified as a contaminant of concern, the design requirements in WAC 246-272A-0230 require addressing nitrogen through lot size or treatment. Concerns about nitrogen inputs in Hood Canal, South Sound, and other reaches of the Sound have raised the profile of this issue but have not yet led to widespread use of nitrogen reducing systems around these waters.

Pollution Identification and Correction

PIC programs are being established in many counties around the Sound. These local programs serve as the ideal complement to local septic system management programs. In fact, O&M and PIC are so closely related that PIC can serve as the water quality monitoring element of a comprehensive management program. Whereas O&M focuses on the septic system and system owner, PIC focuses on field inspections and monitoring of waterways in the receiving environment. Systematic monitoring searches for and finds high fecal coliform counts and then proceeds to search for the source(s) of the fecal pollution. In some counties the PIC work is led by public works, in other counties local health serves in a lead role. Regardless of the program design, PIC work requires close collaboration by agencies to work effectively.

PIC programs are beneficial in that the approach and tactics help identify fecal pollution from all sources, not just malfunctioning septic systems. Livestock on commercial operations, farm animals on hobby farms, or even raccoon latrines in areas where residents are feeding the raccoons may be identified.

Comparable to recent investments in the septic system management programs, since 2010 the Department of Health has awarded approximately $7 million in National Estuary Program (NEP) funds to Puget Sound local, tribal, and state agencies to design and implement local PIC programs. Like the NEP awards for the septic system programs, the PIC awards encourage local governments to establish local, dedicated funding to sustain the programs. Local funding tools exist to accomplish this and work continues at the state level exploring options to require a local dedicated fee on a regional scale.

Septic System Evaluation Opportunities

In addition to regular inspections driven by O&M requirements, there are other opportunities to evaluate or even upgrade a septic system.

Building Permits
The expansion or conversion of summer homes to larger year-round residences has been a growing trend in recent decades. These homes are often on small lots near shorelines with poor soils. The opportunity for the septic system to fail and directly impact surface water increases with any expansion of the building or its occupancy. An opportunity to evaluate and possibly upgrade the septic system is presented when a property owner applies for a building permit to remodel the home.

Change in Use
An opportunity to educate the system owner and possibly upgrade the septic system can occur when a property owner proposes a change in use for a building. For instance, a family home converted to a bed-and-breakfast can place a higher waste strength burden on the system. O&M specialists have reported high levels of fats and solids due to the fatty dairy products and baked goods in bed-and-breakfast operations.

Inspection at the Time of Property Sale
Property sales are an opportunity for local health to build its inventory database, inspect systems, and confirm a system is in good working order. Sale of property can also provide a teachable moment for the buyer to understand their role in maintaining a properly functioning septic system. Disclosure requirements apply to countless details in property transactions and include problems and maintenance issues with septic systems and sewer connections (WCRER 2004).

When a property is purchased, the buyer often sees the cost of having an inspection differently than if they have to take the cost out of their own pocket. The cost is the same, but is perceived as part of the cost of the sale. Eleven local health jurisdictions require system inspections at the time of property sale. Three require a permit or fee to assure the inspection is completed. Several counties partner with realtors or local escrow companies to notify property sellers about this requirement.

Industry Professionals

Service providers are critical to the success of a septic system management program. Regular communication with industry professionals to develop good working relationships is a core duty of all on-site sewage program staff. Local health jurisdictions rely on the expertise, professionalism, and data of industry professionals to design and run an effective program.

A well-trained workforce of industry professionals requires that they know what is expected of them. Providing inspection checklists, having regular meetings—both group and individual—and making sure they have up-to-date information regarding laws and codes all feed into the success of a local program.

Conversely, industry professionals provide local health jurisdictions information on what they are documenting in the field and other insights and feedback on program implementation. A local health jurisdiction is more likely to hear from industry professionals about system components with recurring problems if trust and respect have been developed through regular interaction.

Quality Assurance / Quality Control

Like any other environmental public health program, assurance that public health is protected is the mission. In food safety, inspections assure that chefs, wait-staff, and other food workers have the knowledge to safely carry out their work preparing and serving food. Permitting solid waste handling

facilities assures that work is done properly and garbage does not contaminate the environment. The same is true for septic system O&M service providers and homeowners who inspect their own systems. Such oversight is a cornerstone of all local health programs. Follow-up inspection of service provider inspections can be conducted as "ride-alongs" or after the inspection has been completed to check work protocols and work quality. It may take some coordination to accomplish this task, including permission of homeowners to come onto their property.

Enforcement

Verifying a Failure

It is local health's responsibility to verify septic system failures. Sometimes a failure is obvious, other times it's not so obvious and not an easy thing to confirm. When a failure is not obvious but water quality data or other information seems to implicate a system as a problem system, additional measures must be taken.

Dye testing is an effective way to verify a failure, but must be done correctly based on established procedures. Little is more definitive than seeing bright green dye flowing in a backyard or in surface water after passing through a property's plumbing. It is not without its challenges though. Flushing fluorescence dye into a septic system requires the property owner's permission to enter the premises.

The dye must be carefully flushed down the toilet and rinsed down sinks. It can be observed immediately when there is such an egregious failure that the dye is flushed out of the septic tank right away. The dye can also take longer to emerge, or show up in the middle of the night.

If the investigator suspects that it will take time for the dye to emerge, charcoal packets are placed in strategic locations down gradient and retrieved several days after the dye has been flushed into the septic system. Once retrieved, the charcoal packets are rinsed with an eluent to determine if the dye is present.

Figure 7. Photos illustrating the use and flow of fluorescence dye from the lab to the plumbing fixture to the environment.

Permission to go onto property must be granted by the system owner. A dye test can be straightforward with the property owner's cooperative. Indeed some are so certain they are not causing a problem that they are willing to accept the dye test. However, if that's not the case, RCW 70.05.060 and RCW 70.05.070 give local boards of health and local health officers (or their agents) the authority to do what is necessary to abate public health threats, including access to a property where a failing septic system is suspected. Court challenges have made this authority and compliance tool more tenuous. If an

environmental health specialist is refused access to a property, the next step is to try to verify a failure from a public right-of-way or gain permission to view the property from a neighboring property.

If these efforts fail, other avenues must be pursued. These can include obtaining a search warrant and being accompanied by law enforcement to the property. This can be an arduous task and is often not pursued. This option has been used successfully by Thurston County.

Taking the tool a step further, Thurston County requires all marine shoreline septic systems located in an MRA to be dye tested every six years. Their test data show that with a combination of system inspections every three years plus a dye test every six years, the percentage of failing systems has dropped from 14 percent to less than 3 percent.

When a property owner refuses to repair a failing septic system, political and legal support are both imperative. The bottom line for local health is that the septic system must not expose people to sewage and contaminate surface water or groundwater. This can also be accomplished by ordering the resident to vacate the property though this is generally the option of last resort.

Tracking Failures

Tracking the status of failures and repairs can be challenging. Local health jurisdictions use different approaches to track system failures and the status of work to repair or replace failed systems. This is accomplished by a combination of inspections by local health staff, final inspection from a septic system designer, and tracking via a database.

The challenge can be determining what level of failure to track and then confirming the corresponding repair permits. There is consensus among the Puget Sound local health jurisdictions that sewage seeping on the ground is considered a failure. Variables defining when a problem is a failure make county-to-county comparison of failure data difficult. Appendix B compares local definitions and protocols. Additionally, not all failures are obvious and the fix to the septic system may not require a permit (see earlier discussion of repair permits). Kitsap Health District has a detailed definition in code of what constitutes a failure. Other counties have adopted the definition in chapter 246-272A WAC with no further additions. Whatever the definition or means of permitting repairs, the tracking system needs to include the desired details for reporting purpose (such as location, system type, component problem, age, and soil type) and the problem needs to be fixed.

System Owner Education and Awareness

Communities are familiar with and generally support local health performing the familiar functions of permitting and complaint response. When O&M programs first emerged, the very concept was foreign and hard to accept for many people. Comments such as “You approved my system in ’72 and it’s been working fine ever since” or “I put an additive in it every month to keep it working” were not uncommon. Awareness and attitudes have evolved and shifted over time.

A continuing challenge for local health is convincing the public that privately owned septic systems are decentralized infrastructure that protects everyone’s health and our shared

Online Training from Home

Local health jurisdictions use a variety of techniques and material to help raise awareness, educate, and train system owners. Many of these materials and links to other material are listed on the Department of Health’s septic system website, www.doh.wa.gov/septic.

Notable among the materials is a pair of videos used broadly by local health to introduce the basics of septic systems and do-it-yourself inspections. Check with your local health jurisdiction for added requirements for homeowner inspections.

water resources. Such perspective requires a paradigm shift, both for septic system owners and for local health jurisdictions. To assure that septic system owners realize that their systems are part of the public health infrastructure requires local health to expand its role to include marketing and outreach in addition to the traditional regulatory role.

Education, outreach, and even marketing are all essential tools to change behaviors and build a base of public support for effective management programs. How this is done varies by local health jurisdiction. Classroom trainings, field trainings, and even "septic socials" in Mason County have helped educate people on the responsibilities that come with septic system ownership.

Appealing to the system owner's social conscience is effective in reaching those with a heightened awareness of their role in protecting public health and the environment. Other methods and messages are necessary to reach diverse audiences with other interests and motivations. Broadly speaking, the best motivation is often the system owner's financial self-interest doing the right thing with their system. In other words, how can you help system owners understand, "What's in it for me?"

Maps and Other Tools

Maps are a valuable tool to communicate issues and progress. A septic system status map draws people in at public meetings. People will look for their property on maps to make sure their system is characterized correctly. One tool pioneered in Skagit County is the red-green-yellow method that can be used to indicate undocumented or problem systems (red), systems with up-to-date inspections and in good working order (green), and systems with dated inspections or other possible concerns (yellow). This approach has been adopted regionally to track inspection status of systems located in MRAs and other designated sensitive areas. Community peer pressure in achieving compliance with O&M requirements can be a powerful way of assuring systems are maintained, even in areas where local health jurisdictions may not be actively notifying residents of their responsibility. Maps are effective visual tools that help illustrate and advance these points.

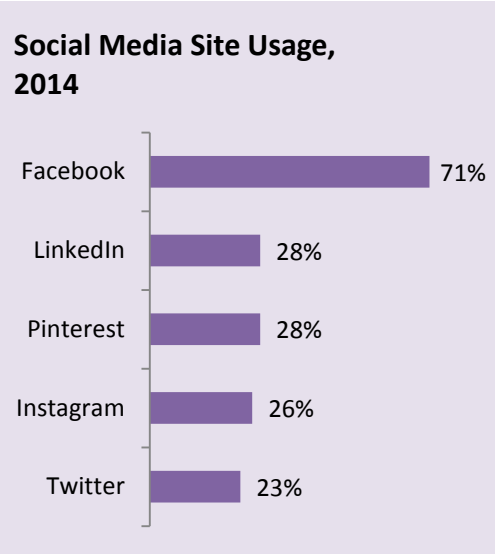

Figure 8. Percent of online adults who use these social media websites.

There are shared media resources available for use by local health jurisdictions. Clallam County led a collaborative effort and contracted with a professional media firm to develop the Septics 101 and Septics 201 videos currently available via the Department of Health's website. Thurston, Pierce, and Snohomish counties have led or participated in projects to develop social marketing tools for use by local health jurisdictions. This material is also posted on the Department of Health's website.

It is also necessary to assure that all generations in a community are kept informed about program activities and outcomes. That means it is important to stay culturally relevant by using communication tools that are now commonly used by large segments of society, especially young adults. Figure 8 shows survey results of popular social media sites by Pew Research Center (2014). You don't see many in this age group picking up a traditional newspaper. They go to their Facebook, Twitter, or Instagram accounts for the latest information.

Funding Mechanisms

There are numerous funding tools available to local health. However, the long-standing challenge for local health jurisdictions has been the task of garnering political support and using these tools to establish dedicated, sustainable funding for the local management programs. To that end, the Department of Health organized a Puget Sound Septic Finance Advisory Committee to evaluate program needs and finance options in an effort to establish sustainable funding across the region for these programs. Figure 9 sums and illustrates 2014 total funding, unmet need, and revenue sources for the 12 local programs using a "current services" cost analysis method (WDOH 2014c). It's a challenging picture at best, revealing shortfalls across the board and heavy dependence on state and federal grants for a significant portion of program revenue. When the financing analysis drilled down further to estimate the cost of providing baseline program services region-wide using a "foundational services" cost analysis method, the estimate surpassed $24 million annually compared to the total expenditures of $6.5 million depicted in figure 9 (WDOH 2014c).

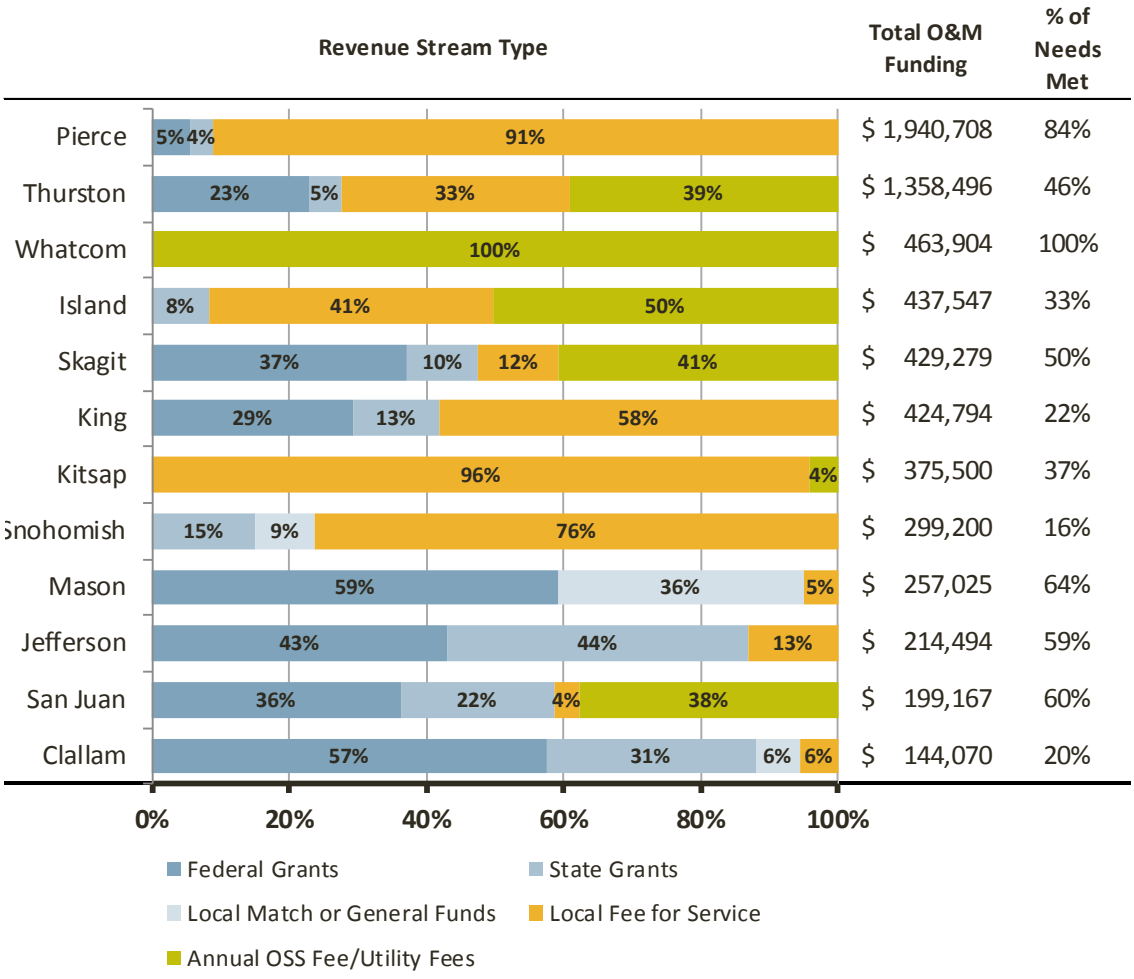

Figure 9. 2014 estimate of total current expenditures, percent contribution from different revenue sources, and percent estimated need met by the revenue using the current services cost analysis.

Septic System Management Program Fee
In 2012, the state legislature amended RCW 70.05.190, creating a simple, optional means to directly fund local management plan implementation. It allows local boards of health to "impose and collect reasonable rates or charges in an amount sufficient to pay for the actual costs of administration and operation of the on-site sewage program management plan." The fee can be collected via property tax statements, making it both sustainable and efficient. To date, the authority has been used by Whatcom County and San Juan County, charging $19 and $10 per system respectively. Several other counties are exploring use of the fee authority. In 2015 the Department of Health introduced legislation that would have enacted a minimum $30 fee on all systems in the Puget Sound basin. The legislation failed. Work on sustainable funding for O&M and PIC programs continues.

Permit Fees
Permit fees are the most common method of funding but they can be cyclical depending on growth and building trends. They can also be complicated and piecemeal. Permit fees can be collected for new or repaired septic systems, when a system needs an upgrade during a house remodel, or a change of use. Some counties have fees for filing inspection and pumpout reports ranging from $20 to $50, or tipping fees for septage disposal. Three local health jurisdictions have a fee tied to the inspection required at the time of property transfer. See fees described in the summary of local programs in Appendix A.

Grants
Grants are good for capacity building and special projects. They should be viewed as a bridge to instituting a sustainable funding source. The NEP funding distributed by the Department of Health for septic system program implementation includes direction advising local governments to research and establish sustainable funding. Similarly, state funds administered by the Department of Health for the management programs were conceived and intended only to serve as startup funding until local, dedicated funding could be established. While grants are an important revenue source for the local programs, they do not provide long-term stability or sustainability and are costly to apply for and administer.

Operational Certificate or Annual Maintenance Contract
Another option is to apply an annual charge for an operational certificate or require an annual maintenance fee for certain types of systems or for systems located in MRAs or other sensitive areas. Thurston County uses operational certificates in its MRAs and applies a variable rate structure based on system type, O&M services, location, and other factors. Kitsap Health District applies a $50 annual fee for maintenance contracts for all advanced systems in the county. Such mechanisms require integrated and automated databases that can effectively track the work and operate efficiently to keep administrative costs down. Collecting program rates or charges via property tax statements can further lower program costs.

Special Purpose District Fees
Creation of shellfish protection districts (also called clean water districts) under chapter 90.72 RCW allows per parcel funding for clean water activities. Used in Skagit County and elsewhere, this fee authority allows funding of septic system management programs as one part of a local nonpoint pollution program. Application of this authority, however, must be tied to the protection of areas where there's shellfish harvesting. Island County and Kitsap County are two jurisdictions that have adopted surface water utility fees under the broad authority of chapter 36.89 RCW. A portion of these clean water fees are directed to the septic system management programs and other related health and water quality programs.

OnlineRME — Report Fees
OnlineRME, which is an online reporting system widely used in the Puget Sound region, includes an option to add program charges that are collected via the reporting system and are directly transferred to the local health jurisdiction. Three counties use this option. The cost is typically passed on to the customer via the industry professional.

Program Comparison Conclusion

The chapter illustrates that local health jurisdictions design and carry out their septic system management programs using a variety of tools and approaches. The programs have diverse audiences and all operate under a unique set of political, financial, and cultural influences.

As septic system management programs continue to evolve, program evaluation will become increasingly important helping to find ways to improve and affordably implement core services for such as vast infrastructure. Hard-wiring the plan-do-check-act model into the entirety of the local septic system management programs can inform periodic updates of the local management plans. The health agencies also need to collaborate to further research and replicate O&M program best practices and to explore ways to standardize aspects of the region's core services and business systems.

Perspective of Industry Professionals

This chapter discusses how septic system professionals such as pumpers, monitoring specialists, and installers interact with local health jurisdictions to provide quality service to system owners. The Washington On-Site Sewage Association (WOSSA) authored the chapter as industry perspective on the local septic system management programs with input from the project team. Topics include the role of service providers, certification requirements, data collection and management, challenges working in multiple local health jurisdictions, quality assurance, and select best practices.

Role of Service Providers

Industry service providers are key players helping to manage and maintain the wastewater infrastructure of Puget Sound, and statewide for that matter. They design, install, inspect, repair, and service septic systems. Industry professionals work closely with local health staff during the permitting process from design to installation. Their ongoing operation and maintenance (O&M) services are vital to keeping the systems in good working order to protect public health and water quality and to extend the life of the system. Service providers are the primary interface between the community and the local management programs. They are the main portal for gathering clear and accurate information on the inspection and maintenance status of systems.

Service providers use a variety of business models. Whatever the model, the businesses must operate according to state and local health code for septic systems. In order for these businesses to be effective, efficient, and offer good service, local health jurisdictions needs to establish clear requirements for the certification of industry professionals and corresponding service levels as well as clear reporting methods and requirements. In addition, local jurisdiction should establish criteria and procedures to evaluate the performance of service providers and define consequences for noncompliance.

Certification Requirements for Service Providers

Each local health jurisdiction establishes standards for certification of service providers to do business in the area. These standards include the following:

- Minimum requirements for licensing, bonding, and insurance.
- Minimum experience requirements for certification levels and testing.
- Continuing education requirements.
- Record keeping and performance evaluation.

Licensing Requirements
Each local health jurisdictions has minimum business requirements for licensing, bonding, and insurance. A septic system professional is either a general contractor or a specialty contractor. RCW 18.27.040 sets the minimum requirements for a licensed general contractor to be bonded for $12,000 and have $250,000 of insurance (aggregate). For a licensed specialty contractor the minimum requirements are $6,000 for bonding and having $250,000 of insurance.

Industry professionals deal with significant variation in bond and insurance requirements among local health jurisdictions. For example, Kitsap Health District requires pumpers, O&M specialists, and installers to be bonded for $6,000 (regardless of license status) and $250,000 of insurance. In Thurston

County, installers need to be bonded for $12,000 and have $250,000 of insurance. Pierce County accepts the state minimum bonding requirements but requires insurance of $1 million. Island County requires the similar $250,000 for insurance, but has a $30,000 bond requirement for installers and O&M companies. For service providers who operate in multiple jurisdictions, these inconsistencies cause confusion and raise questions about interpretation and application of state law.

Vehicle licensing by the Washington State Department of Transportation (WSDOT) requires pump truck operators to have all pump trucks inspected by a certified company that checks weight limits of vehicle and ensures the integrity of the tank, valves, brakes, tires, fuel systems, air systems, electrical systems, and loose equipment (hoses and buckets) that are in the wells adjacent to the tank, as well as cleanup kits to address spillage. Additional WSDOT inspections can occur throughout the year at weigh scales. There is also a WSDOT requirement that daily pre- and post-trip inspections be documented and kept on file.

In several Puget Sound counties an additional inspection of pump trucks is required and conducted by local health staff. Frequency of county inspections ranges from annually to only at time of registration. Fees for these inspections range up to $110 per truck. Industry views these fees and requirements as duplicative and unnecessary. The industry encourages standardization of truck inspections and reciprocity between local health jurisdictions that require additional truck inspections.

For service providers working in multiple jurisdictions, standardizing licensing, bond, and insurance requirements on a regional or state level would promote consistency and more effective compliance. When requirements are different, administrative and production costs for the business owner increase and therefore increase costs for system owners too.

Experience Requirements
Local management programs typically have minimum experience requirements to establish a new company and for a service provider to obtain or advance to a higher certification level. Two slightly different processes are in place. One identifies what experience is required to certify the business or business owner, and the other for certification of employees of the business.

All Puget Sound local health jurisdictions require service providers to work at an entry level for a period of time before being eligible to apply and test for more advanced certification. Some counties recognize professional experience in other counties or states. When working to gain experience, the employee must be working under supervision. Working without the required supervision should be addressed by local health as a compliance issue.

Testing Requirements
All local health jurisdictions have a testing program to evaluate level of competence for each certification level. Local codes define:

- Who must be tested and how frequently.
- Who holds the certification (company or individual).
- Minimum pass/fail limits.
- Experience level to qualify for each test.
- Re-testing policy when service provider operating licenses lapse.

Eight of twelve Puget Sound local health jurisdictions have collaborated to develop a regional testing program with a memorandum of understanding with WOSSA serving as the testing administrator. Initiated in 2004, a review of local health exams was conducted. Exams were designed for each certification level and include 50 questions randomly selected from 280 possible questions. Questions cover general knowledge and knowledge of the state on-site sewage code, chapter 246-272A WAC, and associated state Recommended Standards and Guidance documents (RS&Gs). On-demand testing is available by appointment through WOSSA.

The other four Puget Sound jurisdictions administer their own exams for certification of service providers and their companies. Each local health jurisdiction sets minimum experience levels for their testing purposes and maintains local control over approval of licensing for the service provider to operate within their jurisdiction.

Some variation exists between local health jurisdictions regarding proprietary device testing and certification levels. For example, Pierce County requires additional training to install or inspect proprietary products. Having the individual who is doing the field inspection qualified at the level appropriate for the technology improves the quality of work.

Certification Levels

Operation and Maintenance (O&M)

Level 1: Technician, pump truck operator, inspector (with technology and system component repair limitations). May have to work at this level for a period of time ranging from 6 months to 1 year before upgrading certification to Level 2.

Level 2: Specialist, Pump truck operator (with privileges), Inspector (with no technology limits). All have an expanded list of allowable component repair work.

Installer

Level 1: limited with experience, may have limits on system technology.

Level 2: may install any technology (exception: Pierce County requires additional training on proprietary devices).

King County has a level called Master Installer. This is similar to WOSSA's Installer Level 2 (above) but also allows the installer to submit emergency repair designs for approval.

On-site Sewage System (OSS) Designer

Limited practice engineering license administered by the Washington Department of Licensing (DOL).

OSS Inspector Certificate

Local health equivalent of the OSS designer license, in place to review OSS designer work (same exam administered by DOL).

Multi-jurisdictional reciprocity and testing standardization minimizes downtime for service provider employees and cuts costs. For example, a service provider with ten employees working in three local health jurisdictions would spend $5,250 (exam cost of $175). Under the reciprocity model, this service provider spends only $1,750.

Education Requirements

Continuing education is a requirement for certified service providers in all Puget Sound local health jurisdictions. Periodic education in the form of continuing education units (CEUs) is necessary for a variety of reasons—technology evolves, inspection requirements change, regulations change, field staff who have gained more experience need education for their next certification level, and also turnover rates of industry employees is high and new people need to be trained. Because CEUs are required, local health must define:

- Which industry employees have to earn CEUs.
- How many CEUs are required and at what frequency.
- How CEUs are calculated.
- What is an approved CEU.
- How to document and report participation.

Aside from scheduling conflicts, two particular elements from the above list challenge industry's compliance with CEU requirements. First, the number of required CEUs for the same certification level can vary from jurisdiction to jurisdiction. Second, it is unclear what constitutes a valid CEU. Definitions vary depending on the jurisdiction. King County defines a CEU as 8 contact hours while Pierce County accepts a full day class as meeting the requirement. Other local health jurisdictions accept attendance at mandatory local health industry gatherings while still others issue CEUs for attending advisory group meetings. Standardizing the definition of a CEU—what are approved education courses and alternatives that meet the requirement—would simplify the process and improve compliance by service providers.

Data Collection and Management

Service providers collect data as they do their daily work installing, inspecting, and servicing septic systems and responding to what's happening on site. When doing field inspections, service providers focus their data collection and reporting on the following:

- Gather and verify new and existing system information.
- Verify accuracy of available documentation in county databases.
- Capture and upgrade information on unknown systems.
- Evaluate and report system performance including system failure and needed repairs.

When preparing for a site visit, a service provider normally gathers as much existing data on the system as possible. Service providers may need to search multiple databases on the local health website to get information for the work site. Accuracy and efficiency in completing a field report is affected when a service provider needs to wait several days to connect the inspector's report with the system component information from the county.

Local health programs rely heavily on service providers to identify and confirm system type and components, and to sometimes electronically document the system using the reporting tools. This system documentation can happen years after design, installation, and final inspection. This delay can affect quality and accuracy of site and system information. When entry level or office employees, rather than technical staff, create system documentation in online reporting systems, error frequency increases (TPCHD and WOSSA 2014).

A recommended best management practice is to create system documentation with the final record drawing after construction, final inspection, and start up. Local health staff who conducted and approved the final inspection or the system designer who created the final record drawing are the best people to fully document the system.

Lastly, information management systems are evolving at a rapid pace, as is remote wireless access. Portable devices and live tracking of vehicles are used to improve customer response and productivity in

daily work flows. Portable devices are being used by some companies that require personnel to complete system reporting information on the current site before they are dispatched to the next job. Industry is moving in this direction. Anticipating these trends and automating data systems when planning for technology upgrades (including data-reporting to the Department of Health) will improve efficiencies and move the industry and health agencies into the future.

Challenges of Multi-Jurisdictional Work

A challenge for service providers working in multiple jurisdictions is keeping track of differences in local codes for inspections and reporting. To succeed and maintain good standing in the industry, service providers need to know the unique local requirements and expectations for all counties where they do business.

Inspection Information
Service provider productivity and accuracy are better when system documentation of previous inspections, maintenance activities, and record drawings are available in real-time to help facilitate system inspections and other services. Key to this are continued data management improvements by local health allowing easier access to system records and digitizing and uploading paper records to establish more complete files.

It can occasionally take several days to receive requested system information. Improvements to septic system information can be optimized if local health jurisdictions upload all archived information at the point when a service provider makes an information request. Over time, efforts by local health to upload and avail records will pay real dividends.

When the local health jurisdiction finds that no information exists for a septic system, the service provider should document basic information and create a site sketch that can be uploaded to the septic system database. The service provider is on site and typically finds all components during an inspection. It takes little time to document the system at this point and reduces work for everyone when the next inspection comes due. King County has successfully had a program like this in place to capture unknown septic system information on Vashon Island for several years. Other jurisdictions have required fully developed record drawings for sites that have no or missing documentation. Both approaches offer a potential solution that improves system records and overall system inventory over time.

Reporting Requirements
The variety of inspection reporting tools and data reporting requirements of the 12 local health jurisdictions presents a real challenge to service providers. Accuracy issues of data entry by service providers can happen when inspection protocols and requirements differ. A field study done by WOSSA with Tacoma-Pierce County Health Department in 2014 found significant data entry errors including incorrectly identifying components and not accurately recording inspection details, as well as failure to follow up on critical interim maintenance, such as UV light replacement (TPCHD and WOSSA 2014).

Regional standardization of septic system reporting tools and common inspection requirements for system components would improve reporting accuracy and would also significantly improve trend analysis for policy and decision making at the state level.

Fee Structure Challenges
Working in multiple jurisdictions requires the industry to adapt to different fee structures. Many of the

online reporting mechanisms require the service provider to collect and pass through an assortment of fees collected from the homeowner on behalf of the local health jurisdiction. The Department of Revenue has stated that these pass-through fees are taxable. Some service providers charge sales and associated B&O taxes on these fees while others do not. This inconsistency can be a challenge and may need some attention to clarify or improve fee collection systems and policies.

Performance Review

Local health oversight of service providers has a significant influence on the effectiveness of local septic system management programs. Whether service providers are held accountable fulfilling certification, servicing, and reporting requirements will ultimately determine what kind of work is produced. Certification testing can be effective but requires the support of local health rules to establish both what a service provider can do and who can to do it. Ongoing service provider assessment tools provide additional information for local health staff to monitor and assess professional performance. An adage from quality management circles is "If you set the bar low, people jump low." Local management programs need to be robust enough to identify issues and have compliance mechanisms in place that are both timely and applied consistently.

Local health jurisdictions can have clear regulations for service providers but falter when they don't enforce the code. Routine performance evaluation of professional service providers is critical to maintaining a high standard of service. Service providers invest in their company's equipment, staff, and management tools and want a professional and level playing field. When industry observes that local health doesn't respond when service providers do poor work, have legitimate complaints filed against them, or skirt the health code, the playing field isn't level.

An example is electrical work performed by a service provider who does not have an electrical license. The testing content for certification levels of service providers does not include any electrical licensing content. The net result is that it can become common practice to find non-licensed electricians completing and reporting this work to the local health jurisdiction. The work they produce can be poor to outright dangerous. From industry's perspective, "what you permit, you promote" and companies that make the investment to be compliant and use licensed electricians are no longer on that level playing field. If a local health jurisdiction wants to authorize service providers to replace electrical components, its health code should include clear language that all electrical work must be done by a licensed electrician.

Another example of oversight that confounds industry on local practice is when local health regulations require that the inspector who is doing the field inspection on a proprietary device be certified for that particular device, and then sets up a reporting system where the inspector isn't named nor is the device specified. Likewise, if the local health regulation says that proprietary device certification is needed "only if required by the proprietary device manufacturer" but has no data entry to identify which manufacturer requires it and no mechanism to ensure that the service provider is compliant, local health doesn't have the means to evaluate if adequate service or performance inspections are being completed by a competent person.

Quality Assurance / Quality Control

A quality assurance program should identify key benchmarks in the program and monitor the effectiveness of processes and the performance of participants in different roles. For industry, auditing

inspections and inspection reports is one mechanism that local health uses to provide a snapshot of service provider performance. It provides insight on whether field work is being completed and the information being reported is complete, accurate, and timely. As noted previously, a field study of service providers in Pierce County discovered data entry and data management problems (TPCHD and WOSSA 2014). Practices by both the local health jurisdiction and service providers resulted in data that was sometimes flawed. This included:

- Inspections done by service providers who didn't have required experience or certification.
- Standard reporting forms not used, no field notes taken, and reports filled out from memory or random scraps of paper.
- Data entry completed by administrative office staff with no field experience who create inaccurate records and incomplete reports.
- Limited review of inspection reports by local health staff checking accuracy and performance issues due to budget/staffing constraints.

Proprietary Technologies

Some local health jurisdictions require specific certification in order for installers and other service providers to work on proprietary systems. Proprietary technology requires careful design, design review and approval, and installation at a site for many important reasons. The professional who inspects the system at the time of installation and services the system thereafter needs to be competent.

Companies have interpreted these local regulations to mean that any employee can work on an advanced level treatment device under the company's direct supervision. This has been put into practice to mean the following: "If the supervisor can be reached by cell phone, it constitutes direct supervision." Pierce County interprets direct supervision as having the person with the appropriate certification level actually present 50 percent or more of the time on the site during installation or inspection. Clallam County requires a certified installer to be present and on site at all times during the installation. Field observations and discussion with approved proprietary device manufacturers affirm that individual certification of service providers doing the work at the site need a level of training appropriate for the technology and certification testing to confirm competency. Final inspections of these proprietary systems are critical to the ongoing performance of the system.

Compliance and Warranty Challenges

The state requires an initial two-year service policy to be included in the original purchase price of a proprietary system. This requirement is neither well understood nor consistently enforced by local health and industry members.

The issue is further complicated when the last point of sale is to a developer who doesn't know about the requirement or doesn't pass the information along to the new buyer. In addition, the regulation doesn't specify when the two-year time starts. Is it when the developer bought the system or is it when it went into service with the new owner? Local health doesn't always generate inspection letters to system owners where manufacturers require a higher inspection frequency in the first two years (quarterly or bi-annually). In short, property owners are rightly confused when talking to service providers trying to understand when an inspection is part of a two-year warranty, and when it is not. Best practices can be found in Kitsap and Thurston counties who respectively require enforceable, renewable "monitoring and maintenance contracts" and "operational certificates" that outline specific operational requirements for certain systems.

Management Program Best Practices

From an industry perspective, practices and procedures in the following areas are viewed as particularly effective and are key areas for continued attention in the local septic system management programs.

Professional Certification
Regional testing for service provider certification with reciprocity between participating Puget Sound local health jurisdictions and others has had a positive effect. Testing and reciprocity is recognized by industry and local health as a benefit for companies operating in multiple and single local health jurisdictions. Among other advantages, it takes a time-consuming task off the desks of local health staff. Some variability exists among local health jurisdictions regarding certification levels (proprietary devices), but increased participation by more counties has improved the overall quality of the testing program.

Continuing Education
Ongoing education strengthens knowledge in the workplace and provides a conduit for sharing best practices and new information as it develops. Raising the standard of professionalism and quality of work through education of service providers is very important to the success of the local management programs. Small business owners tend to operate in a relatively narrow service area and CEUs broaden their skills and knowledge. The industry has a relatively high turnover rate (estimated at about 25%) and always needs entry level educational opportunities.

Industry Support Groups
Service providers are the eyes and ears of day-to-day management of the septic system infrastructure. Working with industry to capture ideas and better understand what's working and what's not builds teamwork and more effective programs.

Industry support groups sponsored by local health have been successfully established in many jurisdictions. Septics professionals meet regularly in Pierce, Thurston, and Kitsap counties; meet annually in San Juan, King, and Jefferson counties; and meet as needed in Snohomish, Island, and Whatcom counties. Pierce County has the most active group and works collaboratively to identify and resolve issues.

By including service providers in the management process, they are empowered and motivated to make local programs better, simpler, and more effective. This is a key part of local adaptive management. These groups can help identify and resolve issues regarding quality assurance, inspection frequency, performance accountability, and data management.

Information Management and Record Keeping
All interests benefit as local health jurisdictions move to improve technology and upgrade websites to increase access to septic system information. Homeowners can get online information on septic system designs and O&M records without needing added staff time. Most counties have online videos available for homeowners to watch to improve their knowledge of septic system care and maintenance. Realtors benefit by getting real-time, site-specific septic system information prior to sale. Similarly, service providers benefit significantly when they have ready access to record drawings and other archived installation and inspection information. Areas that need continued attention include:

- Digitizing and uploading archival information to program databases where industry and the public can easily access the information.
- Updating and validating the accuracy of system components and other information in the databases.
- Identifying points of opportunity in work flow to minimize data entry error and improve database content.

Accountability
Industry views auditing, accountability, compliance, and enforcement as foundational elements of the local management programs. These form the basis for quality control of the program. Service providers who work in multiple jurisdictions know which local programs are effective and sustainable based on how prominently these elements are applied to industry and system owners. The industry welcomes and benefits from oversight that ensures quality service delivery and information management.

Homeowner inspection compliance and any needed repairs to the septic system are strengthened when local health has compliance mechanisms and political will to enforce them. Kitsap Health District's program is a good example of this. Over time, the number of non-compliant system owners has been reduced. Virtually all inspection reports submitted by service providers are reviewed and acted on as needed. Their program has built-in triggers to manage and automatically initiate enforcement for non-compliant systems. Property owners are assessed financial penalties for noncompliance until the issues are addressed.

Conclusion

The development of programs to manage the region's decentralized wastewater infrastructure will continue to evolve. Professional service providers see value in standardizing regulations, certification, and education requirements. Collaboration on reporting methods and inspection requirements can have a positive regional impact. Coordination of these efforts and other initiatives can further improve management of the infrastructure through quality reporting and timely repair/replacement of failed and malfunctioning systems. Effective professional certification and continuing education will help ensure the industry has the experience and knowledge needed to successfully do the hands-on work of the region's septic system management programs.

Summary of Best Practices

The following is a summary of tools and practices available for use by local health, elected officials, realtors, industry service providers, system owners, and others who help design and carry out local septic system management programs. The program tools are grouped as follows and include discussion of certain approaches as recommended best practices:

- Primary Tools
- Program Implementation Tools
- Failure Identification Tools
- Compliance Tools
- Training Tools
- Communication Tools

An effective management program should include all of the primary and program implementation tools. Local health jurisdictions will also use many tools from the other categories as well. To ensure efficient, fair, and consistent application of these program elements, the jurisdictions should anchor program standards and requirements in well written code, policies, and procedures.

Following the summary of program tools and practices, the chapter gives a high-level snapshot of roles and responsibilities and closes with an overview of themes and challenges associated with implementation of these important management programs.

Primary Tools
Local Health Code
As the set of rules governing how septic systems are sited, designed, installed, inspected, operated, maintained, and abandoned, the code is that tool which directs and sets the legal standards and requirements. Among other laws, the local management programs implement chapter 246-272A WAC and chapter 70-118A RCW. Effective and efficient program management requires clear, concise language and specific criteria. Supporting departmental policies and procedures further define practices to enable consistent application and program compliance.
Database
An electronic database is the most valuable tool in administering a septic system management program. Many counties implement more than one database. In such cases it is critical that they are compatible and information can easily transfer from one database to the other (e.g., copy inspection data into the program tracking database). Equally important is the ability to sum and share data with the Department of Health and other Puget Sound counties and to provide supporting documentation to ad hoc committees, advisory groups, and decision makers. To facilitate efficient data retrieval from all 12 Puget Sound counties, a list of

standardized data that should be part of all Puget Sound databases can be found in Appendix C.

Achieving a life-cycle electronic record of all septic system information will increase program efficiency. Paper files will no longer have to be searched and copied repeatedly. All staff will have access to the same records which will support consistent reviews and compliance actions.

Inventory

A complete septic system inventory is foundational to a local management program. This includes information on system location, age, type and components, and maintenance activities that's as accurate and complete as possible. This can be accomplished over time using a combination of tools and procedures.

An inventory is baseline information. Without it, it's guesswork. Decision makers often want hard numbers, not estimates. An inventory determines program scope, provides the big picture.

All Puget Sound counties have inventories—some more robust than others. Many jurisdictions are using state and federal grants to make progress on this baseline work locating and documenting systems.

Maps and Graphs

Maps are essential visual tools that present information by connecting data with physical geography (such as county, neighborhood, property, water resources). The data is tied to something familiar that people can relate to. Maps and companion graphs can visually display water quality data and trends to communicate impacts to streams and other water resources.

If you've attended public hearings, workshops, conferences, or board meetings, people are drawn to maps. Maps and other graphic illustrations make septic system inventories and database information more relatable and easier to understand.

Program Implementation Tools

Notices

Jurisdictions need some method to notify system owners it's time to do an inspection or to take other types of action. Operation and maintenance (O&M) work is cyclic and unending. Puget Sound counties use a variety of methods including batch mailings, regularly scheduled notices for required inspections, and routine prescribed inspections with contracted septic system professionals.

In a culture with information overload and busy lifestyles, it's extremely helpful to remind system owners of their legal responsibility. If a program goal is to have septic systems routinely inspected, it is necessary to notify and remind system owners. Without effective notification methods, fewer than 20 percent of septic system owners will conduct inspections.

In contrast ongoing engagement by local health with system owners in Marine Recovery Areas (MRAs) and other sensitive areas has yielded inspection compliance rates over 80 percent in some places. Such work is intensive and costly. When resources and effort drop so do inspection rates and related

maintenance work.

Inspections

All septic systems require routine inspections. Other than sewage backing up into a structure or a pump alarm signaling a problem, it's almost impossible to gauge a system's condition without looking at it and in it.

Specific inspection requirements vary across local health jurisdictions. Industry professionals typically do inspections though many counties certify owners to do their own inspections under certain circumstances. Inspections at the time of property transfer are common among Puget Sound local health jurisdictions.

Inspections find failures and also find minor problems that can be affordably fixed before turning into costly failures. However, inspections can't always see everything and may miss subsurface failures that are diagnosed via water quality monitoring or dye tests.

Regularly inspecting a septic system is key to ensuring good performance, protecting homeowner investment in the system, and extending system lifespan. The septic system is often the most expensive appliance on a property. Minor problems can be found early and corrected before becoming bigger and more costly problems. Tracking system maintenance can alert the system owner if household practices need to be adjusted, such as using less water, not using a garbage disposal, or not using "flushable" wipes.

Reports

Processing and tracking inspection reports and other O&M activities (such as tank pumpouts) are core functions and should be designed to answer specific questions that will help track the status, condition, and performance of systems. The program database captures report data that can help answer other questions.

Brainstorming what kinds of questions should be answered about septic systems will result in a list of standardized system data that are answered on the inspection and tank pumpout reports and recorded in the database.

All inspection and pumpout reports need to be reported in order to build a record of system O&M.

The majority of Puget Sound counties are using OnlineRME to capture information on inspections and other O&M activity. This reported data can easily be queried and reviewed to observe what components are causing problems and how frequently; how frequently scum and sludge are building up in tanks; how often and where tanks need to be replaced; how systems are performing in specific sensitive areas as well as countywide.

When the report data is linked to a county's septic system permit data, queries can then be run on age of systems, common features or characteristics of system failures, etc.

Report data can be used in adaptive management to adjust program standards and requirements.

Monitoring Advanced Technologies

State and local codes tailor inspection requirements to the needs and risks of different types of systems and different types of areas. The Department of Health requires proprietary systems to have at least a two-year maintenance contract with a licensed service professional to assure the systems are properly serviced, performing as designed, and meeting required standards. Several Puget Sound counties require the contract for the life of the system.

Maintenance contracts require a prescribed routine for inspections and assessment of system performance. Complex systems are periodically evaluated and adjusted as needed. Maintenance and system performance issues can be forwarded to the Department of Health. Specific components, regardless of the system type they are used in, can be tracked and evaluated.
Required sampling to test for fecal coliform bacteria, suspended solids, nitrates, or oils/fats/greases can be used to investigate treatment problems and adjust monitoring and maintenance.

Incentives

Offering system owners incentives can help change behaviors and initiate the habit of O&M. People respond and take action when they receive something in return. Incentives such as financial rebates—money refunded to system owners for purchasing risers, having inspections done, pumping their septic tank—make it less expensive to do what needs to be done and help facilitate ongoing maintenance.

There may be legal restrictions and requirements when gifting money to system owners. It is important to check this with your county prosecuting attorney before proceeding. And work with other local health jurisdictions and the Department of Health to learn from other experiences and approaches.

Program Review

Annual program reviews are important. Design an annual program report using program data to assess if:

- Program goals are being met.
- Public health is being protected.
- Water quality is improving – or at least not declining.
- Work is being done consistently.
- The number of failures is decreasing.
- System owners are having inspections done routinely.

Provides a basis for adaptive management of the program as well as annual trend analysis—what is working, what isn't, where should adjustments be made.

Annual reviews provide a ready-made basis for updates to local boards of health, system owners, service providers, and other stakeholders. Program reviews and adaptive management also feed directly into regular management plan updates.

Failure Identification Tools

Dye Tests

Dye testing is a sensitive and effective way to find septic system failures along marine and lake shorelines that have drainage pipes or subsurface flow that is discharging to surface water. Dye testing is a standardized method using fluorescein dye and fecal coliform confirmation. It is a highly effective tool in identifying unseen failures that cumulatively degrade water quality and result in shellfish growing area closures.

Dye testing has been used in many areas of Puget Sound to identify failures. Thurston County, for example, identified about 14 percent of systems along its marine shorelines as failing without other signs of failure. Repair of identified failures have upgraded and reopened shellfish areas. In Thurston County, requiring dye tests of Henderson Inlet shoreline systems every six years as a standard O&M requirement has resulted in fewer systems found failing over time. Consistent adherence to procedures is imperative to ensure reliable results and for use in possible compliance cases.

PIC Program

Pollution Identification and Correction (PIC) is an effective method for identifying and cleaning up nonpoint pollution sources in problem areas. Water quality monitoring identifies areas that require follow-up with more intensive investigations and correction of confirmed problems.

PIC is a proven approach for working systematically in a project area or watershed to locate and correct nonpoint pollution sources. When effectively designed and executed, the combination of protocols (monitoring, source investigation, landowner engagement, and enforcement) can reliably detect and correct problem septic systems and other nonpoint pollution sources.

Some local water quality monitoring programs may adopt or mirror PIC principles but not fully adopt all the protocols and terminology. The important point is that counties should aim to couple septic O&M activities with ambient water quality monitoring and PIC work to ensure protection of water quality. Counties should also aim to sustainably fund both types of programs.

Compliance Tools

Tickets

When clearly outlined in local health code, civil infractions (tickets) can be written when system owners and service providers do not comply with code requirements. Consistent with code, staff should be authorized and trained on how and when to issue tickets. Several Puget Sound health jurisdictions use tickets for clear-cut infractions that do not require building a body of evidence.

Writing tickets to gain compliance can be an effective means of enforcing accountability. When the criteria are outlined in local code, there is no need to build a case to argue in court. The purpose is to efficiently correct an existing problem, not to punish and accumulate additional expenses.

Deny Permits

Any building permit can be denied until the septic system is compliant with all inspection requirements and any problems found are repaired. This includes inspections that occur at the time of property transfer.

This is an effective tool to gain compliance because the system owner needs a permit to do work, be it to install a furnace or build a deck or any other project that requires a building permit. This tool has worked very well for several counties and has raised their compliance rates significantly.

Reduced Fees

Ability to pay fees is difficult for some system owners including program fees, service provider costs, and repair permit fees. Reducing some of these fees when a system owner meets certain established criteria provides some financial relief. The system owner can then fulfill their responsibilities.

Reducing fees can show that the local heath jurisdiction understands the cost of operating and maintaining a septic system, and that personal circumstances can get in the way of doing what's needed (such as pump a septic tank, repair a broken component, etc.) Reducing fees can help meet the objective of getting problems fixed.

Local Health Assists with Repairs

Working with system owners to figure out and help design a fix to a problem can expedite repairs. However, not all counties choose to do this nor do all counties have the capacity or legal authority to do so.

Using this tool saves the system owner money, can improve the relationship between the public and the local health jurisdiction, and may encourage willing acceptance of problems that need to get fixed.

Training Tools

System Owner Inspection Training and Certification

Training system owners to conduct their own inspections can be a powerful educational tool. It also is an incentive to save the system owner some money.

With this tool there is a range of practice in Puget Sound counties: no owner inspections, no training options, online training and certification, online training and field certification, in-class training and certification, only an option for specific system types, rebate incentives with certification, free training and fee based. Check the table in Appendix A to learn what is offered where.

Some type of hands-on experience in addition to the Septic 101 and 201 videos is best to confirm that the system owner understands the maintenance concepts and inspection techniques.

The education and training help people learn and take ownership of how the system operates and performs. Once an owner learns how a system functions and what might stress a septic system, they are better equipped to practice household habits that enable sustained performance.

The outreach shows that government is sensitive to the needs and costs homeowners face. Such programs need clear policies and procedures to maintain consistency and accountability.

Demonstration Area

An effective visual educational tool is a demonstration area with actual septic system components. Such an area is useful for training purposes. It provides a perspective that words, graphics, and videos can't offer.

Septic system owners can actually see a sample of what's in their yard. The demonstration helps explain the treatment process and makes a septic system real.

Realtor Workshops

For some homeowners, the house they just purchased may be their first experience owning or using a septic system. The realtor whom they worked with may have provided some information about how to operate and maintain their system. Or the realtor may not have provided any information. In many instances, realtors are frontline educators. Local health should develop workshops for realtors to provide them with good, accurate information on how septic systems function and what prospective buyers need to know.

Workshops specifically designed for realtors can improve the distribution of accurate information and dispel old wives' tales.

As an incentive, the workshops can be offered as certified education units (CEUs) in the profession which helps increase participation.

Communication Tools

Communication options are numerous and dynamic in our technology-rich information culture. It's important to identify and understand your audience and determine the best methods of communication. To assist with this and to develop successful materials and campaigns, it's important to consult with public information officers, IT staff, and others.

Newsletters

Newsletters can be used as a communication tool to introduce new programs or provide program updates for residents in MRAs or other areas and audiences. They can include program summaries, interesting statistics, and appreciation for being part of the program's success. They can be mailed, published online, and shared via social media.

Newsletters keep system owners informed and exhibit transparency, appreciation, and acknowledgement that no one player or partner gets the credit for success … or responsibility for failure.

Clear, compelling content and design are key to grab people's attention, increase readership, and avoid quick recycling as junk mail.

Septic System Report Cards
Some form of a written summary of an individual septic system can be a valuable historical property record. The report can include the component detail of the system as well as any repairs or modifications to the system. In addition, the chronology of maintenance can be listed. This can be an option to send to septic system owners at the time of next inspection or for use with time-of-transfer inspections. Provides a record of maintenance and can help forego additional paperwork at the time of transfer. Such a report can expedite real estate transactions as well as provide prospective buyers with pertinent information.
Meetings with Industry Professionals
Industry professionals are an integral part of the team that carries out a successful management program. The best practices they implement in all parts of their work are key to ensuring septic systems perform to high standards. It is important to foster a positive, working relationship with members of the professional community. Holding regular meetings (which can be offered as CEUs) to discuss a range of topics helps build the partnership. The relationship is two-way. Listen to feedback and the issues and problems observed in the field. Industry outreach helps maintain a professional working relationship of trust and respect, and helps promote accountability. Professionals have a different relationship with the public than regulators. Pierce, San Juan, and Snohomish counties have regularly scheduled meetings with their service providers.

Participants Roles and Responsibilities

Good management of septic systems happens as a team effort. Successfully meeting the goals of protecting public health, water resources, and system owner investment happens because all participants understand their roles and successfully carry out their responsibilities. Below is a list of team roles and responsibilities in septic system management programs.

State

- Develop state regulations and guidance.
- Track and support local programs.
- Review and approve local code.
- Review and approve management plans.
- Review and approve products.
- Distribute grant funds.

Local Health Jurisdictions

- Adopt local regulations, policies, and procedures.
- Set O&M standards.
- Certify service providers.
- Monitor performance, assure compliance.
- Maintain system inventory and database.
- Conduct water quality monitoring.

System Owners

- Proper O&M.
- Regular inspections.
- Fix problems.
- Contact county with issues and questions.

Designers

- Maintain state license.
- Meet code requirements.
- Assure proper installation.
- Keep CEUs current.
- Submit record drawing. (Designers or installers may do this—depends on the local health regulations.)

Installers

- Certified by county.
- Bonded (9 of 12 Puget Sound counties).
- Meet code requirements.
- Install systems per approved design.

- Keep CEUs current.
- Submit record drawing. (Designers or installers may do this – depends on the local health regulations.)

Pumpers and Maintenance Specialists

- Certified by county.
- Bonded (9 of 12 Puget Sound counties).
- Perform required maintenance.
- Submit required reports.
- Keep CEUs current.

Realtors

- Educate prospective system owners.
- Stay current with O&M issues.
- Track time-of-transfer inspections.

Conclusions and Challenges

In the Puget Sound region and statewide, wastewater must be properly managed in order to protect public health and water resources. Good management also protects valuable personal and public investment in wastewater infrastructure.

This infrastructure includes both decentralized on-site sewage systems (septic systems) and centralized wastewater treatment plants (WWTP) served by sewer collection systems. WWTPs are carefully managed and are closely regulated by the state. WWTPs are publicly owned and are typically operated by local governments or sewer utility districts. When a WWTP has a performance problem, attention and resources are immediately devoted to fixing the problem.

Septic systems also have state and local oversight. The management programs are developing, but the style and degree of attention is very different, relying heavily on the willing efforts of the people who own and operate the systems. When a septic system has a performance problem, there may be no crisis and may even be no sign of an immediate problem. However, a single system failure can present a serious public health risk. Proper monitoring and regular inspections help diagnose problems involving system use and performance and help avoid costly system failures. Both septic systems and WWTPs need oversight and compliance with O&M standards to assure protection of public health and safety and confidence in the infrastructure.

Puget Sound is renowned for its valuable and sensitive water resources such as salmon-bearing streams, shallow drinking water aquifers, and rich shellfish tidelands. Across the region's diverse landscapes, septic systems serve all kinds of development. Simply put, these systems have to work properly in order to safeguard our prized water resources. Counties with thriving shellfish industries (commercial, recreational, and tribal harvesting) have heightened awareness of the risks and impacts of septic systems and added motivation to establish good management programs that protect the jobs and uses of these waters.

To be effective, septic system management programs need to engage homeowners in preventive maintenance and also find and fix failed or malfunctioning systems. Homeowners need to view and embrace the programs as working in their self-interests and collective public interest. Nothing accomplishes this better than selling people on the financial value of regular, proactive maintenance that improves system performance and lengthens system lifespan. A program that only emphasizes finding and fixing failures may foster unwarranted fear and impede buy-in of government oversight which aims to deliver much needed O&M services.

Figuratively, with a comprehensive management program the whole pie must be addressed. The pie plate serves as the foundation or up-front permitting portion of the program—designing, installing, and inspecting systems when they first go into the ground as well as follow-up repair work when needed. This foundation assures that what is in the ground meets all code requirements, is designed to adequately treat sewage, and has been correctly installed on the location it was designed for.

The pie filling, if you will, is everything that happens after installation—the remaining life-cycle use, maintenance, and oversight of the system. This is the focus of the local septic system management programs and is composed of a variety of program elements. Because the infrastructure is so vast, as a practical matter state law calls on system owners to ensure proper use and care of their systems, including regular inspections. Complementing this, state law calls on local health jurisdictions to institute oversight programs to educate and engage system owners to help ensure good, ongoing O&M, especially for systems and sensitive areas that present higher risks.

As noted throughout the manual, the local programs share common elements and services. However, they are all uniquely designed and implemented. The manual identifies many areas where there's need for further research on best practices and room for standardization. As the Puget Sound local health jurisdictions work to secure stable, sustainable funding, the scope and services of the local programs will continue to evolve and improve. How this work will unfold is uncertain and faces many challenges.

This manual has helped unearth many themes and findings that the Department of Health, local health jurisdictions, on-site sewage industry, and other stakeholders should consider as we move forward with this work. Clearly there's much to do and it will require close collaboration. Here are a few conclusions and recommendations to consider.

- In the brief arc of on-site sewage history, we are clearly in the age of "management" focusing on good use and care of the systems after they go into the ground. This takes nothing away from the continued need for proper siting, design, and installation. Decentralized infrastructure is not temporary and centralized sewers and WWTPs are not affordable or feasible in many areas. Septic systems are the permanent sewage solution for a large portion of Puget Sound's development and population. This paradigm shift will continue to evolve and will focus more attention and resources on life-cycle management of septic systems.

- The region's local septic system management programs are all different and evolving. They come from different starting places and differ significantly in scope, design, and style of implementation. All have strengths and weaknesses and are at different points implementing program elements and using various practices. As such there are model approaches and practices but there is no model program.

- The region's local programs need significantly more work on baseline/core program elements and data. This includes more complete system inventories and documentation. An undocumented, hypothetical infrastructure is unmanageable. Coupled with the work on system documentation, the programs need more accessible system records that can be continually updated via electronic devices and automated reporting systems. OnlineRME holds promise as this type of platform.

- There are many inconsistencies in how the local health jurisdictions interpret and apply state code, which contribute to the differences in the local programs. Sample issues include the definition and repair of system failures and deficiencies, inspection frequencies and requirements, and related data reporting and tracking. Going forward, the Department of Health and the local health jurisdictions should explore the question of where these inconsistencies matter most and consider codifying or standardizing certain practices on a regional or statewide scale.

- The local health jurisdictions need to hardwire adaptive management into the local programs to continually learn from experiences and data to improve management program systems and services. This should include and inform periodic updates of the local septic system management plans. In similar fashion and in keeping with the previous bullet, the Department of Health should explore needs and opportunities to bridge and connect the local programs with common performance measures and minimum standards to more clearly anchor certain program elements and services on a regional or statewide scale.

- The Puget Sound geography and on-site sewage infrastructure are incredibly vast. Likely financial resources will never be sufficient to implement robust programs everywhere. And it's probably not needed given how risks and needs vary with system type, geography, and other factors. The region's best practices show widespread use of risk-based approaches placing greater emphasis on higher-risk systems and areas. Complementing this is the finding that all systems need ongoing attention and proper O&M, requiring certain baseline services on a broader geography. As a result, the local health jurisdictions need to continue researching and developing program structures and best practices that facilitate efficient and fair application of different O&M requirements and service levels.

- The local programs benefit greatly from shared information and good teamwork. The programs should be designed and managed to seek out feedback and input. Coupled with this, good communication among the many stakeholders is key to good, ongoing program implementation. Often limited only by resources, there's much opportunity for improved collaboration and communication among the many stakeholders to improve the services and results of the programs.

- And finally, efforts to strengthen the local programs hinge on progress instituting stable, sustainable funding on a regional scale. If addressed on a county-by-county basis, there will likely continue to be a mix of successes and failures securing funding, resulting in a management landscape where differences in the scope and quality of the local programs widens. As such, expectations for the region's programs need to line up with adequate and sustainable revenue on the same scale. In other words, expectations for stronger, more standardized programs across the Puget Sound region need the backing of sustainable funding regionally.

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Appendix A: Puget Sound Local Septic System Management Programs

County Info				Inspection Elements									OSS Education / Training			Funding & Fees		Additional information		
County	**# OSS**	**MRA / Sensitive area**	**O&M program start**	**Inspection Frequency**	**Inspection Notification**	**How reports rec'd**	**RME**	**QA/QC**	**Compliance**	**Enforcement**	**# of Failures / Year**	**Time of transfer**	**Homeowner Inspections**	**Education / Training**	**Education Fee**	**Funding sources**	**Report Fees**	**Notes**	**Pop**	**Database**
Clallam	20,007	MRA	2000	**annual**: in MRA 1st inspection done by professional	not yet	paper	yes: pumpers + O&M service providers	not yet; want to	not yet	not yet	1 -2%	in sanitary code; prof inspection required; banks are requiring	yes; existing record + DIY training	Septic 101 + 201 online	free	Grants	no charge for home-owner	Must register for class online; Lower Dungeness - public support for insp prg	71,863	Tidemark
Island	32,000	Sole source aquifer	2008	**annual** in both sensitive areas	send 3 letters	paper: staff enters data	all	yes	22%	$25 fine	estimated 100	in code; prof inspection required;	yes: gravity + pump to gravity	contract with CD + WSU	$25 for certificate	Clean Water Dist - $39 on prop tax - 3% to OnSite program	$1.99	New website in Oct 2103 pumpers not req to report	79,177	Granicus
Jefferson	13,500	MRA	1997	gravity = **every 3 yrs**; risk areas = **every 2 yrs** anything with pump-**annual**	postcards	online	all	random checking	poor	not yet	25	in code; prof inspection required;	400 certified; not ATU, proprietary, drip	Septic 101 (2 hrs) and 201 (online/3/5 hrs wksp); Req tests	$10 authorization fee	Clean Water District; $20 per parcel + grants	$52 inspection rpt fee	Must have professional every 9 years; to be 'known' must have an inspection	29,854	Tidemark
King	157,500	MRA	1999	gravity = **every 3 yrs** all others **annual**	in MRA	paper + online	all	yes	90% for ToT	not active; NOV followed by Notice & Order; fines possible	13 as reported by RME	permit - $111; escrow company oversees	yes	workshops discontinued due to lack of interest	$40 paid by buyer	NEP grants, fees	$28		2,007,440	Envision
Kitsap	54,000	None	1995	**annual** for all except gravity and pump to gravity	industry responsibility; 300 notices/month to lapsed owners; 50 tickets per month to service providers	online	all	PIC program	gravity + pump to grav = 40%; alternative OSS = 98%	50 tickets / mo $524 / violation / day	1%	disclosure program; $202 permit with full site evaluation (how gravity and pump to gravity get inspected)	6 in county; must become CMS with all fees	no	NA	$50 /contract /year for all alternative systems = $750,000 annually; fines for delinquency; tipping fees -2 cents per gallon		Find problems with gravity and pump to gravity thru PIC program; tickets in $8000 range; contractors get tickets - $30,000 annual online from contractor enforcement Contractor gets a monthly 'report card'... $50 / contract after 60 days past due	254,991	RME
Mason	25,735	2 MRAs	2004	gravity + pressure reminder = **every 5 yrs** mound + sand filter = **every 3 yrs** **annual** = ATU, Glendon, drip irrigation	direct mailing to address; 16¢ per card	paper + online	no	no	Oakland Bay > 50% Elsewhere = 47%	letter sent	~ 70 / yr	in code; prof inspection required + req pumping	yes; gravity, pressure, mounds, sandfilters	WSU	no charge	Grants, County Gen Fund	none	Scanning record drawings	60,832	Carmody
Pierce	110,028 (gravity = 80%)	1 MRA	1997	gravity + pressure = **not req'd** out MRA for sand, mound, off-site df, duplex, small comm = **every 3 yrs** ATU, drip, experim, lg comm = **annual**	send monthly; 4th letter - going to file on title	all online; all professional	yes - insp + pump	at ToT and PIC grants	60 - 70%	record on title; must pay $470 to remove and comply		$230 permit, EH site inspection; + $50 prof filing	no	general info workshops	NA	Fees + grants	$50 insp $20 pump	Incentives: $124 for inspection, $124 for risers, $200 for pumping within MRA	811,681	Envision
San Juan	8,600	entire cty	2007	gravity = **every 3 yrs**; all else = **annual**	postcards	online only	no	yes; site visits	80 - 90%	passive; no bldg permit; at ToT must be compliant		compliant with code; up to realtors	yes 4,000	training sessions on-site by staff	no	Fees + grants	$30/report		15,824	in house
Skagit	13,500	12 MRAs	2001	gravity = **every3 yrs**; all else = **annual**	every 2 yrs	online	yes	check work of inspectors	98% MRA	3 ltrs ... $75/day fine up to $5000 ... then collection	60 / yr	prof inspection within 6 months; repairs within 90 days of closing; seller subject to fine if no inspection	yes; not shoreline; gravity + pressure; must be permitted OSS; pump = more training	101 online; 201 field class; tests; qualify for $100 rebate	no	Cty funded $175K	none	Incentives: inspections + risers	118,222	Septic Management
Snohomish	78,000	None		not doing	none	online baseline of information	no	not yet	not yet	notice to title when permitted; owner responsible	~250	no program	none ... too costly	nothing active	NA	Grants	not yet	Septic Issues committee meets monthly; state supreme court upheld "can not change structure without meeting code" Low repair	733,036	in house OSSOM
Thurston	52,560	2 MRAs	1990	**every 3 yrs** in MRA's (all OSS) + countywide mounds, sandfilters, Glendons; ATU, food, comm = **annual**	renewal basis = 3 letters; then nonconforming	online; paper for homeowners	yes - insp + pump	10% of inspections in MRA	84% in MRA	no permits allowed when out of compliance	~100	permit required; inspection and pump within last 6 months	yes: MRAs only; gravity, pressure, mound, Glendon only; 2,500 certified	5.5 hours class with demo park	no, class only for MRA owners	MRA charge; fees; grants	only pumping $15	incentives: low income assistance, risers	258,332	Amanda
Whatcom	29,000	None	2008	MRA's = **annual**	annual	paper	no	not yet	96% sensitive area; 87% MRA; 30% remainder	$125/day - capped at 4 days - then issue $500 penalty	68 per yr	not mandatory; professional must do	Yes; gravity, pressure, sandfilter, mound	online only	no	$19/prop on tax statement used SSBH 6116	no	Issue with parcel numbers; changed to a site # for each OSS; treasurer notifies EH when a parcel # is changed	205,262	WHAMO

Appendix B: Puget Sound Local Definitions of Failure and Repair Requirements

One of the primary objectives of a septic system management program is to find failures and get them fixed. In order to find them, a definition is needed of what they are. In order to fix the failure, enforcement may be needed. The following is an analysis describing how the 12 Puget Sound local health jurisdictions define septic system failure, apply the definition, and ensure repair of the system. Sources include chapter 246-272 WAC, county health codes, and responses to the 2014 survey of Puget Sound environmental health directors (WDOH 2014g).

Definition of Failure

Chapter 246-272 WAC regulates all on-site sewage systems in the state with flows below 3,500 gallons per day. All local health jurisdictions must, at a minimum, adopt the following definition of failure into their local health codes. The local health jurisdictions may add to this—and to other portions of the state code—but may not subtract from it. WAC 246-272A-0010 defines failure as follows:

"Failure" means a condition of an on-site sewage system or component that threatens the public health by inadequately treating sewage or by creating a potential for direct or indirect contact between sewage and the public. Examples of failure include:

> (a) Sewage on the surface of the ground;
>
> (b) Sewage backing up into a structure caused by slow soil absorption of septic tank effluent;
>
> (c) Sewage leaking from a sewage tank or collection system;
>
> (d) Cesspools or seepage pits where evidence of groundwater or surface water quality degradation exists;
>
> (e) Inadequately treated effluent contaminating groundwater or surface water; or
>
> (f) Noncompliance with standards stipulated on the permit.

Table 3 summarizes the following variation in the local definition of failure. Of the 12 Puget Sound local health jurisdictions, six have adopted the state definition with one of the six making a minor addition by expanding part (c) above to include pump chamber and holding tank as well as a cesspool (d) always being a failure. Three of these six counties adopted the failure definition by reference and have no language in the code to describe what a failure is. Two of the 6 adopted the definition verbatim and printed it out in their code for easy reference. The sixth made the minor additions described above.

The other six counties expanded the definition of failure in various ways as follows:

- Included connection to public sewer system / side sewer in the definition statement.
- Added
    - Pump chamber, holding tank, septic system component other than the drainfield and conveyance to (c) *Sewage leaking from a sewage tank or collection system*
    - Metal tanks unless they are either certified or free from rust, perforation or damage
    - Criteria for dye testing OSS and establishing background bacteria levels
    - Water intrusion into tank or collection system
    - Dry wells

    - System malfunction, components broken, in disrepair or not functioning and sewage not conveyed to the soil absorption component as permitted, designed, or intended.
- Changed
    - (d) *Cesspools or seepage pits where evidence of groundwater or surface water quality degradation exists* to state that a cesspool is a failure as well as seepage pits, pit privies and unlined privies.
- Clarified
    - (*e) Inadequately treated effluent contaminating groundwater or surface water* by adding components installed below the ordinary high water mark or located in groundwater.
    - (f) *Noncompliance with standards stipulated on the permit* by adding "regulations in effect at the time the system was approved for use, or with the regulations in effect at the time the structure was constructed or modified."

Some additions to the local definition of failure were the result of specific incidents. Often compliance efforts to ensure a repair were labor intensive because the definition was either not concise or detailed enough to accomplish timely enforcement. For example, Thurston County added the dye test criteria to the definition because the dye test methodology to identify failures had been adopted, as had department policies and procedures. Rather than prove the validity of the method each time an enforcement case was undertaken, the failure definition in the code was amended to include the dye test criteria that confirmed a failure. Two other counties have added these criteria to their definition also.

Monitoring results provided data for other failure definition additions. Again, Thurston County was able to establish a background bacteria level for Summit Lake, a lake that many residents use as their drinking water source. When conducting dye tests around the lake, a dye positive test confirms a failing septic system when the required water sample exceeds the background fecal coliform count which is much lower than the fecal coliform count of the dye test criteria. Having this addition in the code reduces the time spent by staff and legal counsel to gain compliance, and often results in a timelier repair.

Kitsap Health District has the most detailed definition of OSS failure. Their experience is that when the objective is to repair a failing system component it is helpful and time-saving to have enabling legislation that includes clear, concise definitions stating which components can fail. When gaining compliance, a concise definition can expedite fixing the problem and forego enforcement.

Many local health jurisdictions use the term "deficiency" as a category for problems that aren't considered failures and don't require a repair permit. Other counties define these deficiencies as failures and require that they be repaired. It is easy to understand how these differences in definition can make it difficult to accurately and consistently summarize and report on septic system failures in Puget Sound.

This dilemma deserves further discussion of how to identify and track septic system problems. One option would be to track problems, deficiencies, failures by component rather than by system, or in addition to system tracking. Such an approach would focus on the problem rather than the definition and hopefully result in more accurate and useful findings region-wide.

Table 3: Definition of Septic System Failure among Puget Sound Local Health Jurisdictions

Local Health	Cite State Code	In Local Code	Expand item (c) to include sewage leaking from…	Fail Regard-less Item (d)	Metal Tanks	Dye Test Criteria	Other Additions
Clallam			• pump chamber • holding tank	• cesspool			
Island			• pump chamber • holding tank	• cesspool • seepage pit			• violates state WQ laws • effluent accessible to people, animals, insects, or other possible carriers of disease • nuisance due to odor or unsightly appearance
Jefferson			• pump chamber • holding tank, • system component sans drainfield			x	• disposal component located in groundwater
King			• pump chamber • holding tank • conveyance	• cesspool • seepage pit • pit privies			• includes side sewers
Kitsap			• pump chamber • holding tank				• malfunction • connection to sewer system • broken, in disrepair, or not functioning • DOH discharge permit • sewage not conveyed to soil absorption component • reference to sanitary survey protocols • clarification of permit conditions
Mason	x						
Pierce				• cesspool • unlined privies	• unless certified	x	• DOH discharge permit • component installed below ordinary high water mark • water intrusion into tank or collection system • dry wells • clarification of permit conditions
San Juan	x						
Skagit		x					
Snohomish	x						
Thurston				• cesspool	• with any rust, per-foration, or damage	x	• septage and sludge clarification • established background bacteria levels
Whatcom		x	• pump chamber • holding tank				

Definition Applied

Responses from the 12 local health jurisdictions (not all 12 answered each survey question) showed that application of the definition also varied. How they apply the definition is based on public health priorities, risk level, legal interpretation, local board of health BOH support, staff availability, and funding.

WAC 246-272 Definition	Number of the 12 Puget Sound Counties	
	Who enforce this as a OSS failure	Who require a repair permit
(a) Sewage on the surface of the ground;	12	12
(b) Sewage backing up into a structure caused by slow soil absorption of septic tank effluent;	11	10
(c) Sewage leaking from a sewage tank or collection system;	Component 10 Broken transport 6 Dosing timer not working 3 Broken pump 2	9 6 1
(f) Noncompliance with standards stipulated on the permit.	2	

System Repairs

When failures occur, repairs follow. And, other questions arise:

- When is a repair permit required?
- What does a repair permit cost?
- How long is a repair permit valid?
- To what extent?
- What to do about non-permitted repairs?
- What triggers enforcement?
- What barriers exist that prevent repair?

Once again when surveyed, the responses from the 12 local health jurisdictions (not all answered each question) showed how responses vary based on public health priorities, risk level, legal interpretation, local board of health support, staff availability, funding and other factors ("it depends").

When is a repair permit required?
All jurisdictions require a permit for surfacing sewage. Ten jurisdictions require a permit when sewage is backing up into a structure. If the drainfield lines are broken or crushed, nine require a permit to do the repair. However, if the transport lines are broken or crushed, only six require a permit. Only one jurisdiction requires a permit to repair a broken pump in any part of the system. King County has a

special category of repair permit – *Extended Maintenance Minor Repair*. Snohomish County handles deficiencies with a *branch permit*.

What does a repair permit cost?
Half of the Puget Sound jurisdictions have a reduced fee for the repair permit which, for at least 3 of the counties, was done to remove financial barriers. The opposing view is that the work involved in approval of a repair takes the same amount of time as for a new system. In Snohomish Health District staff can assist owners with design preparation in select situations which helps reduce cost barriers. In Kitsap health District, a Master Installer may submit a repair proposal.

How long is a repair permit valid?
The range is from 6 months to 3 years.

Extent of repair?
Chapter 246-272A WAC allows for repairs via Table IX to make accommodations for difficult sites while assuring that the sewage is treated to a high level before being discharged to the drainfield. One jurisdiction requires the repair to fully meet existing code. The other 11 make a determination based on the site conditions between a Table IX repair and fully meeting existing code. One of the 11 requires compliance with current code first, then using the waiver process with "appropriate mitigations" as a second step rather than going directly to a Table IX.

What to do about non-permitted repairs?
Seven jurisdictions have procedures for how to approve illegal repairs including local health inspection, final from a designer, and flagging/tracking performance via the database. Three jurisdictions do not have a procedure for how to resolve illegal repairs while another two have a procedure but it is not written down.

What triggers enforcement?
This often falls into the "it depends" category.

What barriers exist that prevent repair?
In a word, "cost" associated with:

- Permit fees.
- Designer fees.
- Shoreline expenses for archaeological areas, shoreline jurisdiction permits and geotechnical engineering for steep slopes.
- Installation cost.
- Monitoring requirements.

Options for relief:

- Reduce permit fees
- Increase loan and grant options
- Options for the truly indigent
- Local health design assistance
- Staffing for failure response

Appendix C: List of Common On-Site Sewage System Inspection Data in Puget Sound Counties Using Online RME

All eight Puget Sound counties required the following inspection data:

- Alarm mechanism functioning as intended
- All required baffles in place (N/A = No baffles required)
- Controls functioning
- Effluent levels within operational limits (if NO explain in comments)
- Gallons Per Dose
- Pumps: Cycle Count (override in parentheses - if present)
- Pumps: ETM hours (override in parentheses - if present)
- Border effective and in good repair (lagoon)
- Scum accumulation (Inches, if other specify)
- Sludge accumulation (Inches, if other specify)

Seven of eight Puget Sound counties required the following:

- Aerobic Chamber solids accumulation within manufacturer operational limits
- Aerobic Mechanism appears to be functioning per manufacturers specifications
- ATU serviced per manufacturers requirements including cleaning of applicable filter(s)
- Average squirt height (if performed) (feet, if other specify)
- Border effective and in good repair (lagoon)
- Clarifying Chamber solids accumulation within manufacturer operational limits
- D-Box in good condition
- D-Box outlets set to allow equal effluent distribution
- Disinfection agent present
- Disinfection unit light on
- Distributing valve dosing as intended
- Equalized dosing
- Lateral lines flushed
- Ozone sensor working properly
- Panel functioning (including alarm)
- Ponding present? If YES explain in comments
- Pressure gauges indicate normal operation
- Siphon Dose Volume
- Slope integrity maintained
- Tested gallons per minute flow
- Trash Compartment solids accumulation within operational limits per manufacturer
- Vegetation in good managed condition

Six of eight Puget Sound counties required the following:

- Component appears to be functioning as intended
- Drip system flushed
- Effluent Filter Cleaned (N/A = Not Present)
- Siphon Cleaned
- Siphon functioning
- Surfacing effluent from any component (including mound seepage)
- UV bulb cleaned

Data provided by Eric Evans, OnlineRME