

October

2010

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EDITORIAL CORRESPONDENCE:

Send to Editor, Onsite Installer, P.O. Box 220, Three Lakes, WI, 54562 or e-mail editor @onsiteinstaller.com.

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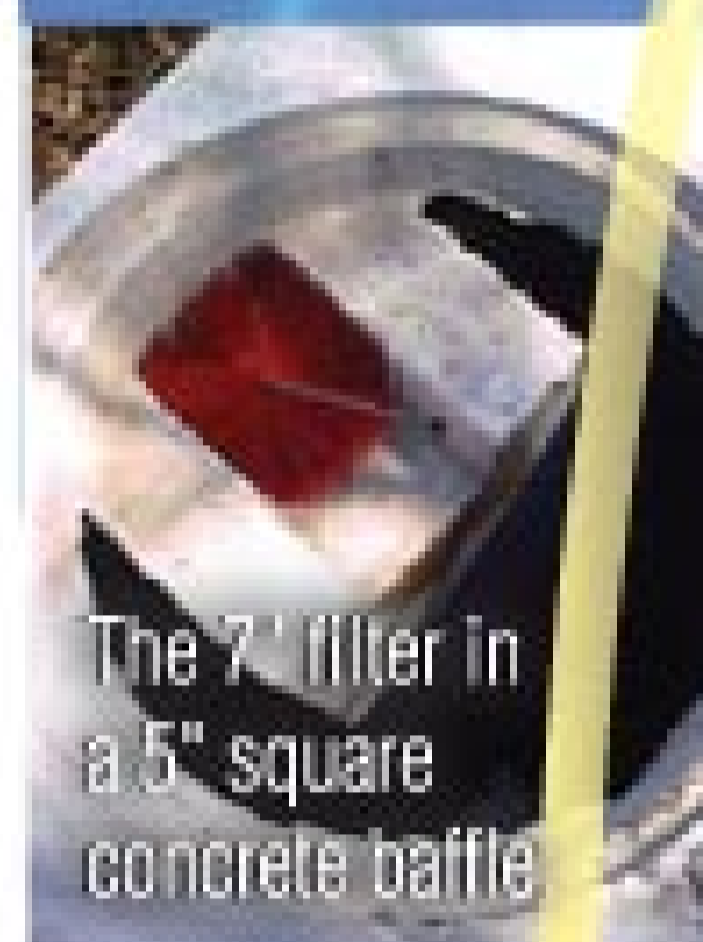


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It's In the Ground

A capable team takes on and beats the challenge of wedging a conventional onsite system into this editor's narrow, wooded, sloping Northwoods lake lot

By Ted J. Rulseh, Editor

When fishing on Birch Lake, during the summers before we bought a lot there last December, I occasionally would hear machinery laboring all day as someone cleared land to build a cabin or remodel a house.

It annoyed me on two levels: The noise disturbed my peace and quiet, and it told me someone else was pursuing a dream not available to me. On Tuesday, June 1, the noise was coming from my lot on Birch Lake, in Wisconsin's Northwoods.

I observed (and occasionally played go-fer) as a team of professionals spent much of the day installing a conventional septic system. It was a show of professionalism and teamwork that in a few hours did more for my appreciation of the onsite industry than six-plus years of editing this magazine. Things look very different when all of a sudden you're the customer and you're being well served.

Dealing with reality

I've written in this space (July and September) about the challenge of fitting the treatment system on a 100-foot-wide, heavily wooded lot with a steep slope down to the water. Before installation day, a builder, a soil tester/surveyor, and an installer had teamed up to determine where the system would go.

Now it was time to make the vision real. I don't need to explain

in detail how the trenches were dug, the chambers laid, the tank set, the piping connected, the excavations backfilled. You know how that goes, and this was after all a basic system with a 10- by 66-foot drainfield.

I do need to say what a great experience it was to observe the whole process up close. The idea of putting an entire system in the ground in about six hours may

I do need to say what a great experience it was to observe the whole process up close. The idea of putting an entire system in the ground in about six hours may not impress you, but it definitely impressed me, especially given the obstacles these guys had to work around.

not impress you, but it definitely impressed me, especially given the obstacles these guys had to work around.

Magic on tracks

To refresh your memory, the drainfield had to go across the width of the lot, on its only relatively flat swath of land, about halfway between the road and the lake. Part of the job was to preserve trees to the extent practical. Here, John Hoban of Schrom Excavating in Minocqua was a magician with the John Deere Model 120 excavator, fitted with a bucket that included a grabber for picking up and moving downed trees and brush.

A few nice red oaks and one mature birch had to go — there was simply no choice. But the trees Hoban could avoid, he spared. He played the machine in a variety of ways:

- Rough when he had to rip out saplings, topple a tree, or collect up the slash.
- Delicate when he had to cut close to a tree that would be staying.

- Fast when it was time to cut the trenches across the cleared ground.
- Deliberate when digging the hole for the septic tank and taking pains to avoid cave-ins in the soft, dry, sandy soil.

I may never know where someone learns to be, at the same time, so precise and so efficient with what is, after all, a good-sized machine, not mainly designed to be nimble.

Then there was his boss and company owner, Todd Schrom (who, as it turned out, hails from the next small town over from where my wife grew up in southern Minnesota). He quickly buzzed

felled trees into logs with a chain saw, helped lay out the chambers and run the piping, and hauled the cut brush away in a sharp-looking green dump truck.

Man with the level

John Ottoson, representing Everest Builders of Minocqua, showed up briefly to drop off a roll of silt fencing and stakes. And, orchestrating it all, there was Brian Grundy of Brian Grundy Septic Systems in Minocqua.

As the trenches progressed, Grundy kept checking elevations with his laser transit and directing the excavator with a point or a gesture. Before I knew it, one trench was dug, the chambers laid, the trench backfilled, another trench opened and chambers installed. Thomas Bablitch, from the Oneida County Planning and Zoning Department, arrived at noon to inspect the open trench and to sketch out an as-built drawing that will be part of the system's permanent record, eventually available online.

Hoban began carving out space for the septic tank and, right on cue, Dave Trapp, from concrete caster Trapp Bros. of Woodruff, arrived in a flatbed boom truck with the tank strapped on board. When the tank hole was ready, Trapp ran the hoist with a pendant control, while Grundy and Schrom nudged the tank into position.

Piping, effluent filter, high-water



Clockwise, from top left: Chambers are laid in the first of two trenches; John Hoban manipulates the John Deere excavator; Todd Schrom hand-carries chambers for placement in a trench; Schrom (foreground) and Brian Grundy position the septic tank.



alarm, risers, backfilling. It all happened quickly. Hoban then did finish work on the drainfield with the excavator while Schrom and Grundy installed the silt fence and neatly raked the surface.

Extra touches

Grundy then ran piping from the septic tank to a spot about 15 feet from the parking spot for our 27-foot camper trailer, and there installed an inlet for the trailer's sewer hose, so that I can easily discharge the grey water and black water into the tank.

And speaking of that trailer parking space, Hoban leveled it off with the excavator while Grundy checked the grades. Schrom then

used his pickup truck to back the trailer in, and Grundy checked with a bubble level on the rear bumper to make sure the site was level. Of course, it was. This whole procedure took all of 15 minutes, starting with ground that was very rough and uneven.

Soon the excavator was loaded onto its flatbed carrier and, after handshakes all around, everyone was gone. Now there's a clear sandy area halfway down our hill, bordered on the low end by black silt fence that will stay in place until vegetation takes hold on the exposed ground. In the meantime, that soil will need an erosion-control blanket to protect it against heavy rains.



A few days later our well was drilled, down to 80 feet. So from then on our trailer would have all the conveniences, and the site would be ready for the cottage we plan to build in (ideally) 2011.

Team effort

It was clear that the guys who built my system had worked together before. Grundy doesn't own machinery — he contracts for that with Schrom Excavating. In any case, each man knew exactly what to do and when. The coordination was impressive. Of course, that kind of efficiency is part of what keeps onsite systems affordable.

For the record, our tank was made by Trapp Bros., the Quick4 Standard chambers by Infiltrator Systems, the effluent filter, high-water alarm, risers and lids by Polylok.

In the end, I am grateful for the onsite industry — for the product manufacturers and for the enterprising people who are in business to install the treatment systems that enable folks like my wife and me to build homes and getaway retreats.

Next time I'm fishing Birch Lake and hear the sound of machinery working on someone's lot, I imagine I'll experience not annoyance but appreciation for the artists and craftsmen hard at work. ■

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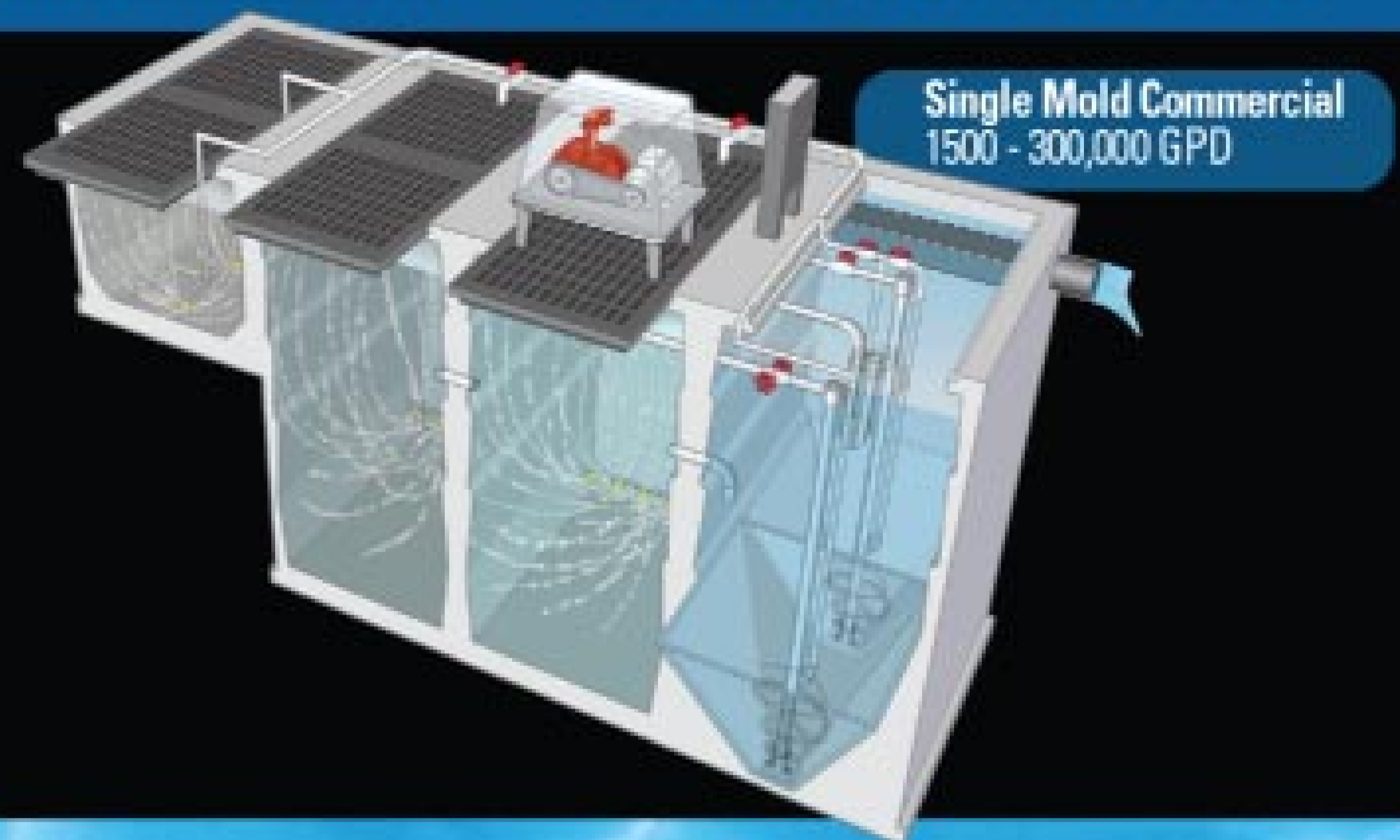
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The Bundick Well & Pump Co. installs a peat biofilter system at a private home on Chincoteague Island. (Photography by Teresa Rerras)



All About People

Bundick Well & Pump is ready to serve residents and communities amid challenging soil and groundwater conditions on the Delmarva Peninsula

By Gil Longwell

Bundick Well & Pump Co., Painter, Va.

OWNERS:
Jimmy Bundick and Jeff Shelley

YEARS IN BUSINESS:
35

MARKET AREA:
90 miles north to south

SPECIALTY:
Applying appropriate technologies to challenging sites

EMPLOYEES:
40 (12 onsite)

AFFILIATIONS:
Virginia Onsite Wastewater Recycling Association

WEB SITE:
www.bundickwellpump.com

Somewhere along the line, Jimmy Bundick's and Jeff Shelley's septic system and well installation company became a people business. Satisfying people's sewage and water needs has brought success and continued growth to their business on Virginia's history-rich eastern shore.

In addition to onsite systems, Bundick Well & Pump Co. installs domestic water wells and underground utility services in and around the rural community of Painter, about 60 miles north of Norfolk. "Not a lot of big things happen here," says Bundick. "Operating on a small scale, we seldom encounter large-scale problems."

The company has developed several subdivisions designed to provide building sites for what Bundick calls "affordable housing." Community-oriented and quality-driven, he and Shelley have a 35-year record of steady growth and success.

"We jump right on 'no water' or 'no flush' calls. It doesn't matter how rich or poor you are — people need basic services. We respond on the same day the call comes in. If we can't get there that day, we call. It is what people expect of us."

Jimmy Bundick

On the Delmarva Peninsula, less than three miles from the Atlantic Ocean to the east and the Chesapeake Bay to the west, the soils are mostly sandy clay over a thick layer of heavy blue clay. "We embrace advanced treatment technologies that enable less suitable sites to support new construction," says Bundick. "These same technologies are welcome tools to replace malfunctioning systems."

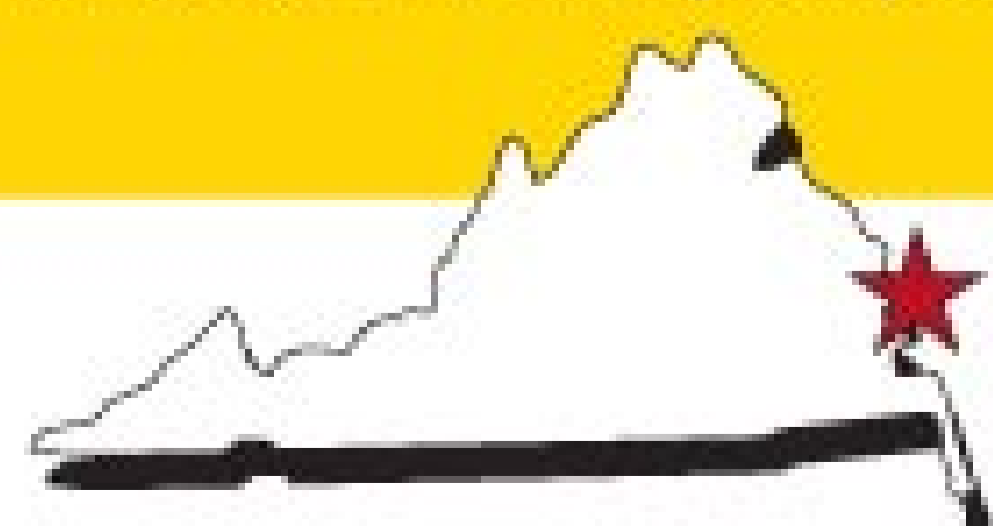
Family of employees

Bundick and Shelley started the business in 1975 with six employees, and they now have 40, most of whom interact with each other as a

family. The work includes about 20 percent complete system installations (new and replacement), 40 percent repairs, 30 percent pumping, and 10 percent service contracts.

"We have about 12 people assigned to the onsite installation and repair business, but because we cross-train our employees, it may not be the same 12 on an onsite installation from day to day," says Shelley. Bundick runs a fleet of three vacuum trucks as well as a crane.

"This is a family business," says Bundick. "My wife, Pat, is the bookkeeper — I call her 'the hub of the wheel.' Our daughter, Brook





Left photo: Members of the Bundick team include, from left, Brook Duer and Pete Duer, co-owner Jimmy Bundick, his wife Patricia Bundick, co-owner Jeff Shelley, and Danny Bundick. Lower photo: Becky Cavaliero, 7-year employee (left), and Denise Konkell, 37-year employee, are shown at the office. The company strives to create a positive work environment so that there is very little staff turnover.



Duer, handles fleet and equipment administration, prepares job quotes and does the billing." Other family members in the business are Jimmy and Pat's son, Danny, and Brook's husband, Pete. Danny heads up the water division, and Pete manages all permitting for onsite systems and wells.

In the division of labor, Jimmy Bundick is the first person most customers encounter on site. He handles site evaluations, works with system designers to match the system to the site, and coordinates with Pete Duer on all permit issues.

When the design is approved, Shelley's work begins. "My primary responsibilities include marshaling the personnel and ordering and staging the material so that work can proceed in an orderly manner," he says. "As the primary crane operator, Jimmy does the heavy lifting when treatment tanks, pump vaults and other items require a crane for installation."

The last two years have been challenging. "With a slowing economy we have had to go the extra mile to keep our employees productively employed," says Bundick. "As the demand for various skills has shifted, as individuals' preferred roles have been accommodated, we have reevaluated some jobs and reassigned some personnel. Through this, we have saved five positions."

Putting himself on the line first, Bundick is not drawing a salary this year. Most employees have been with the company more than 20 years, and given the way Bundick treats them, that is no surprise. "It helps that we have a lot of irons in a lot of fires," Shelley adds.

Small problems seem big

The local economy is changing. Agriculture, commercial fishing and food processing, long the mainstays, are being affected by environmental concerns, harvesting regulations, and shorter fishing seasons. Many folks deal with fixed incomes and jobs that do not command top wages. When the water stops flowing or the toilet stops flushing, Bundick Well & Pump is the first call homeowners make. Often, the second call is to a social services agency.

"We jump right on 'no water' or 'no flush' calls," says Bundick. "It doesn't matter how rich or poor you are — people need basic services. We respond on the same day the call comes in. If we can't get there that day, we call. It is what people expect of us."

Repairs for people on some form of public assistance have forced the company to become familiar with the agencies responsible for the social safety net and the administrative quirks of the various pro-

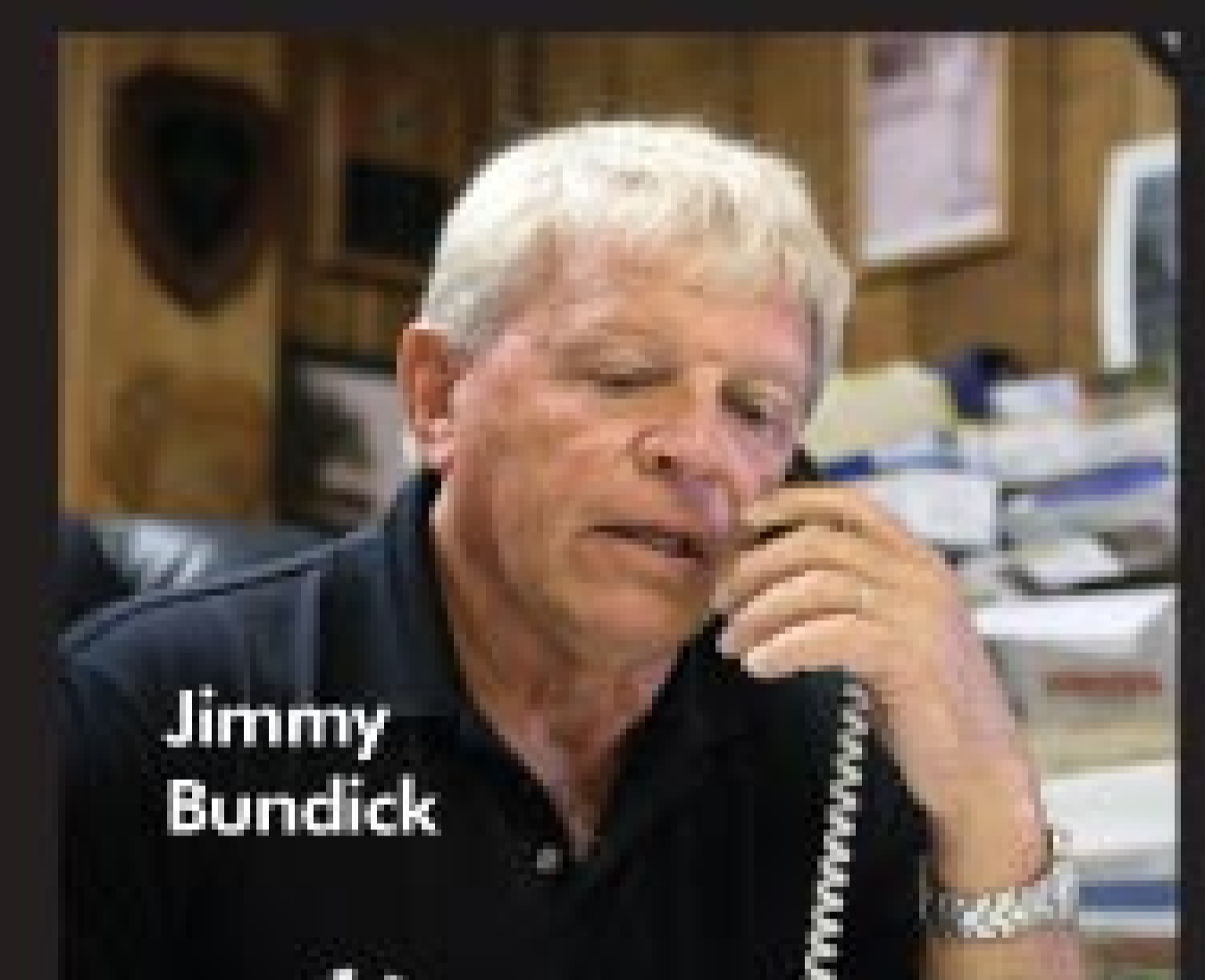
Regulations Bring Customers — and Costs

Virginia is regularly expanding its onsite regulations. This year, the state Health Department will notify about 65,000 landowners of a new requirement to have their advanced treatment system inspected by a state-licensed professional.

In addition, every newly installed alternative system must be supported by a service contract. Landowners' needs will drive business to credentialed practitioners. Most in the installation and service communities may read the word "regulation," but hear "opportunity."

Jimmy Bundick of Bundick Well & Pump Co. can't expect qualified people to knock on his door seeking employment. The company has to help its workers qualify for the necessary licenses, and also invest in training, certification, testing, and continuing education.

"Because we install alternative systems, we need employees with the alternative license classification," says Brook Duer, who handles the company's administrative issues. Every two years,



Jimmy Bundick

there is a registration fee of \$100 and an exam fee of \$84 per licensee. During the next two years, each licensee must accumulate 20 continuing education hours — tuition costs \$400.

"Before adding travel, lodging and food costs, our investment is nearly \$600 per licensed worker," says co-owner Jeff Shelley. "There are hidden costs, too. When an employee is at training, we cannot sell his hours, so the cost of wages and benefits is added to the price."

Bundick, Duer and Shelley understand the value and benefits of training. They just wish customers and regulators understood the costs they must pass through on every job they do.



Well driller and drill supervisor Jerry Fisher and well driller assistant Jason Cooper work on a domestic water well, drilling more than 250 feet.

grams. “Sometimes it is necessary to coordinate the work with multiple agencies, each paying a portion of the bill, and the landowner paying a part as well,” says Bundick.

“When the problem affects a person’s sewer or water service, there are no small problems, and while the solution may be simple and straightforward, restoring the system is always a big deal to the people affected. We use our vacuum trucks for both scheduled tank servicing and to relieve the pressure and buy some time when we encounter ‘no flush’ problems. It is an easy interim fix that reduces the homeowner’s anxiety.”



Bord na Mona peat biofilter systems are among the alternative systems the company installs to accommodate the diverse soils in the company’s service area.

New requirements

Virginia has expanded the variety of permissible onsite technologies to help overcome a wide range of site conditions. “Our service area is about 90 miles from north to south and runs from the ocean to the bay,” says Bundick. “Across this large area, we encounter a wide range of soils, some with deep water tables and others with very shallow water tables.”

Soil conditions can change rapidly in a short distance. “We had never seen water tables as high as they were last spring,” he says. “Some land that had never been known to flood did so repeatedly. We were not able to get into the field as quickly as we would have liked.”

Deeper soils can sustain the conventional septic tank and aggregate absorption area, requiring 18 inches of vertical separation between the water table and the bottom of the aggregate. As water tables creep closer to the surface, more advanced treatment systems and different effluent dispersal systems are needed.

New Virginia Department of Health “emergency regulations” provide more specificity about required treatment levels and the soil conditions that trigger their application. With a better understanding of the behavior of various soils and the availability of advanced technologies, a paired hierarchy of soils and systems has emerged.

“Only by keeping current on



Jimmy Bundick checks in with employees Jerry Fisher and Jason Cooper and well driller Barron Justice on a residential well-drilling job.

the various technologies and new regulations can we provide comprehensive, informed guidance to landowners,” says Bundick. “This in turn requires training from multiple sources: Virginia regulators, the Virginia Onsite Wastewater Recycling Association, and multiple manufacturers.”

In addition to the traditional training venues, at least one vendor, VAMAC, has opened its doors and hosted training events for all comers. That has helped Bundick and other installers avoid hundreds of miles of travel, overnight accommodations and related expenses. “We can get there and back in the same day — a long day, but the same day,” he says. “It’s a help.”

Diverse and flexible

Bundick’s installations, big or small, benefit from a flexible, cross-

trained crew. For a large installation at a school, Shelley deployed seven men representing every skill level. “Some men will return to the site for several days, while others, like an electrician, will be assigned only as needed,” says Shelley. For smaller jobs, the crew may only be one or two.

The company’s diverse operations and services require the first-contact office personnel to be well versed in all aspects of the business. “Our non-technical staff people have been with us so long and have learned so much that they make Jeff’s and my job easy,” Bundick says. Skilled office staff let the owners be more productive and

"The national economic situation on top of the traditionally slower pace of life and business on the shore mean that management will likely grow faster than new installation work rebounds."

Jimmy Bundick

spend more time on job sites or with customers.

The equipment inventory includes two Takeuchi excavators (2008 and 2000), a 2000 Volvo backhoe, a 2008 Ford leveling tractor, and a 1985 Ditch Witch trencher. Four dump trucks handle bulk transportation, and two other trucks are assigned for deliveries of septic tanks and Puraflo peat biofilter treatment modules (Bord na Mona).

As management requirements for advanced treatment systems kick in, Bundick and Shelley see the operations and maintenance market expanding. "The national economic situation on top of the traditionally slower pace of life and business on the shore mean that management will likely grow faster than new installation work rebounds," says Bundick. "This

change in focus is an opportunity rather than a barrier for our business."

For nearly 40 years, Bundick and his family have been there for business and homeowner neighbors. With "a lot of irons in a lot of fires," and the next generation moving into leadership roles, the company is positioned to ride the next wave of opportunities that sweeps across Virginia's eastern shore. ■

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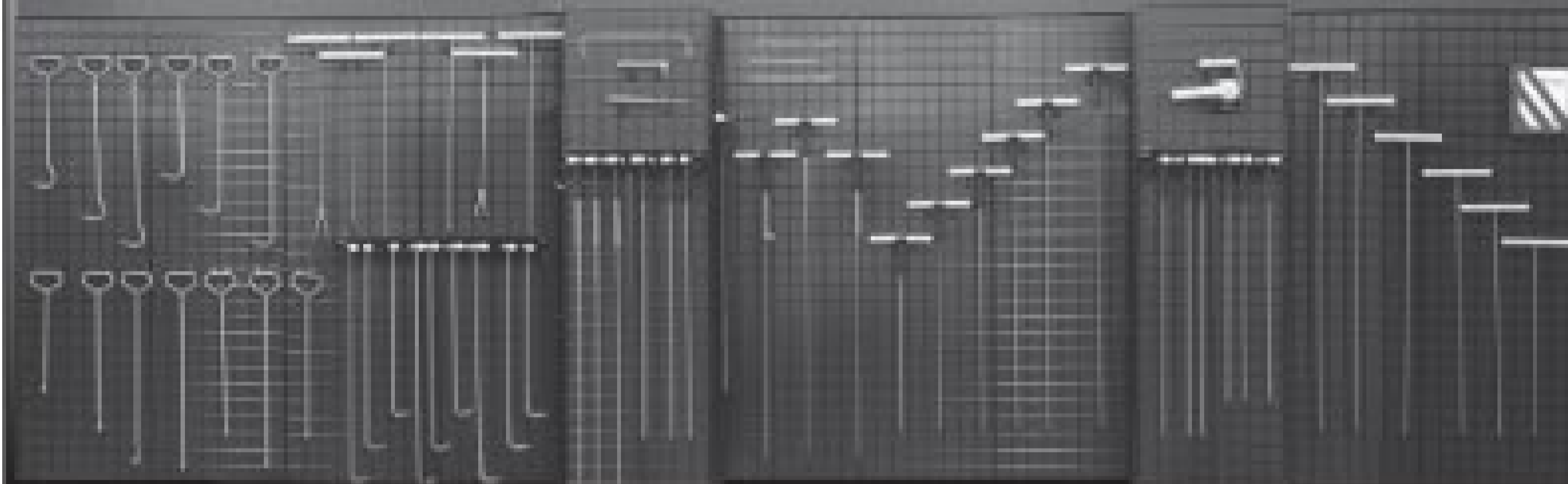


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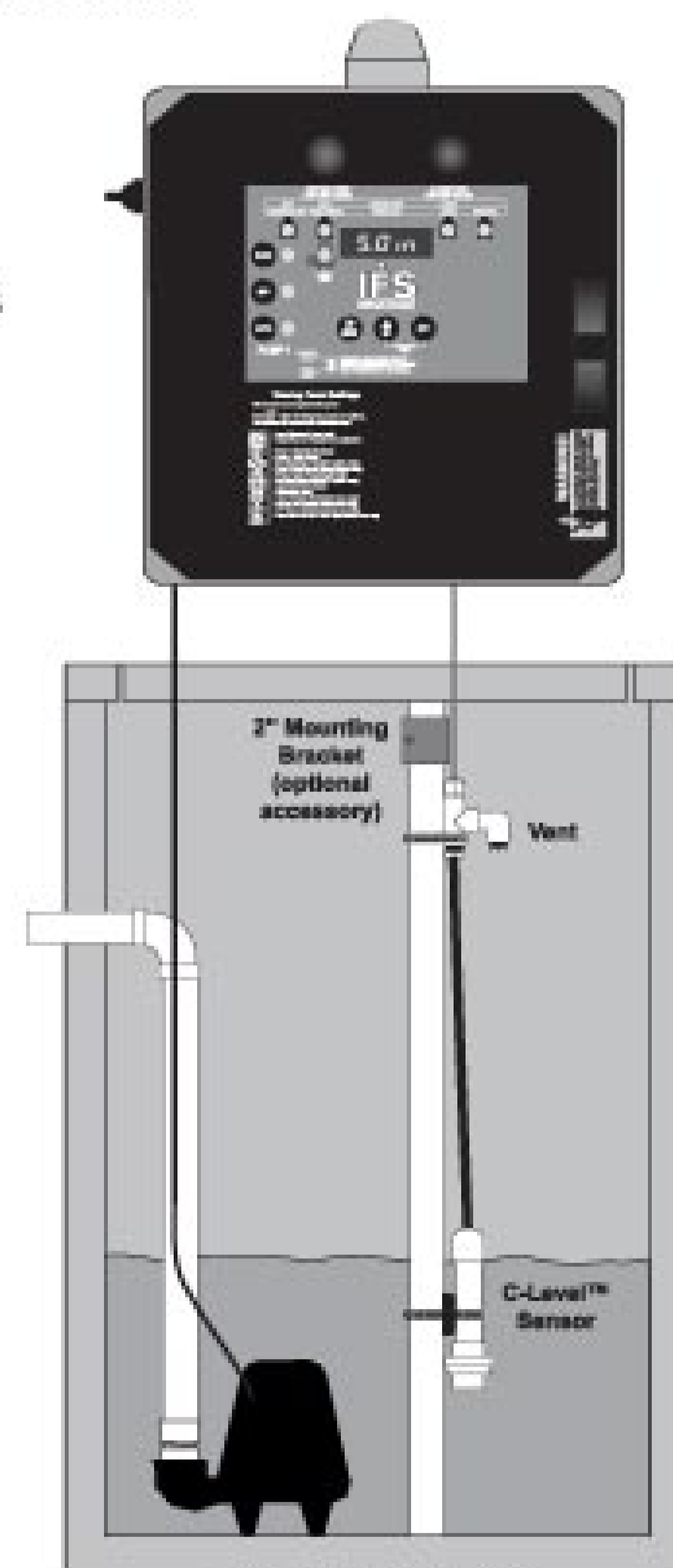
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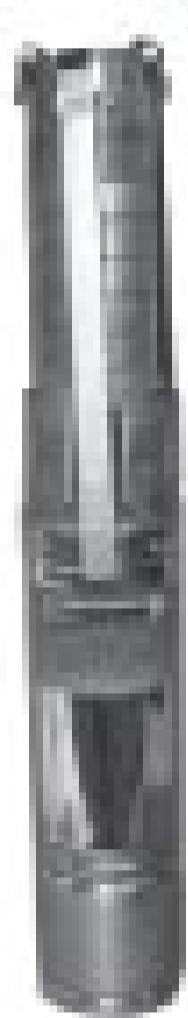
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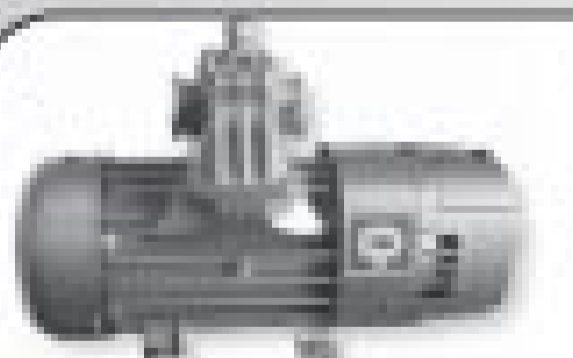
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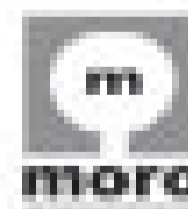


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‘If My System is Broken...’

There are a variety of ways to restore a failing onsite system, but always the first step is to determine the root cause of the problem

By Jim Anderson, Ph.D., and Dave Gustafson, PE.

One of the first questions that homeowners ask when they have you out to investigate a system that has problems is: “If my system is broken, can I fix it?”

In this column, we will relate a few of our experiences with system restoration. You can’t answer the customer’s question until you have done the troubleshooting to determine the cause of the problem. Some typical causes of failure include:

- Using too much water.
- Discharging effluent too high



Good septic tank maintenance is a part of any restoration strategy.



A media filter that can be used to clean up effluent.

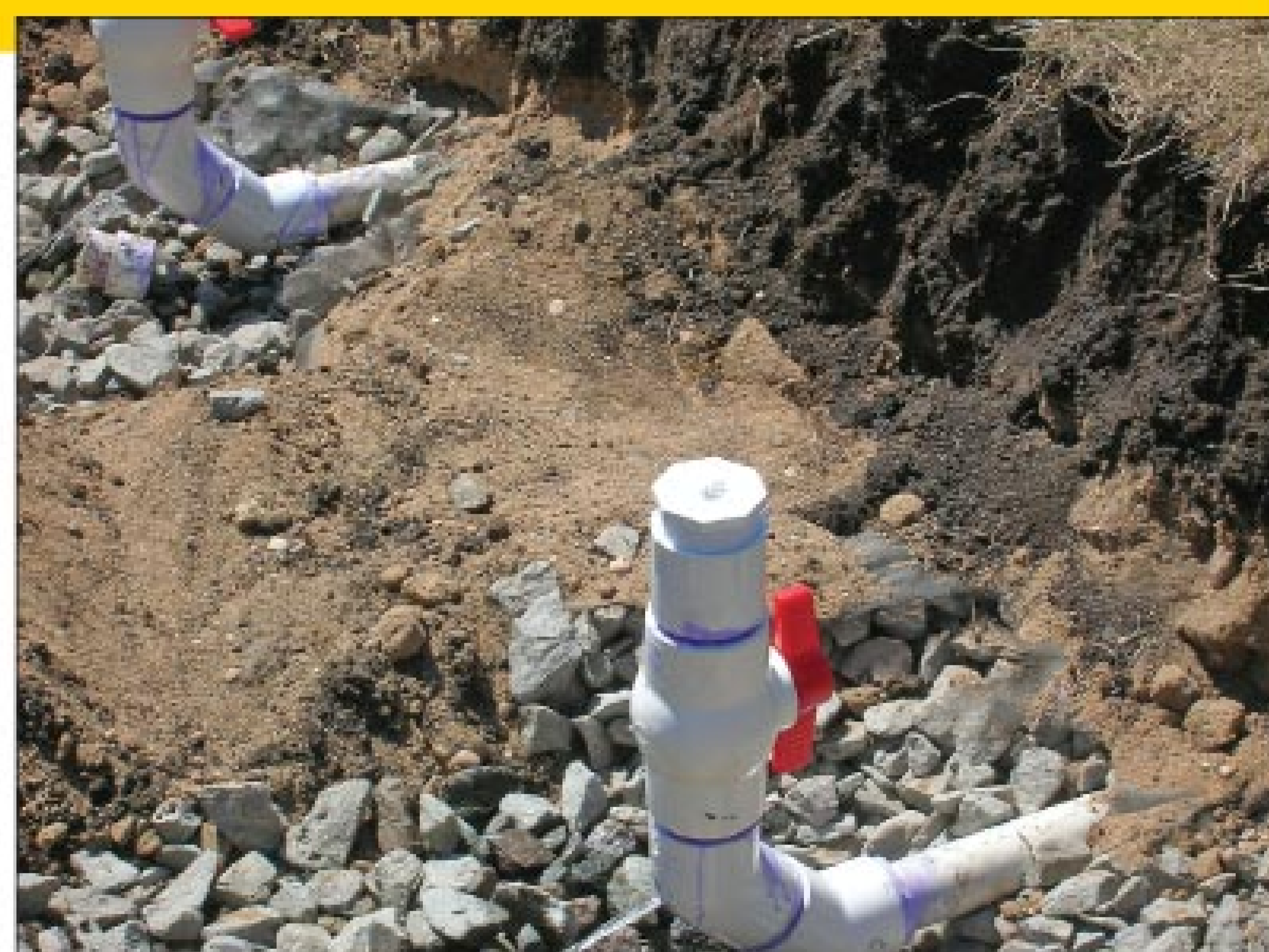
- in BOD and suspended solids.
- Designing the system too small based on soil conditions.
- A high water table.
- Soil smearing and compaction during installation.

Too much water

If the cause of the problem is using too much water, a solution is simply to cut back on the water usage to the point where it matches the system capacity. We like to highlight for clients or in our classes that systems have finite capacities and that soils can accept only so much water based on the texture and structure.

It is always interesting to speak with homeowners about water use. Most often they do not really know how much water they are using, and they almost always are way low in their estimates. We were involved in a research project about 30 years ago where we had a water meter installed. We were measuring flows in excess of 750 gpd for a three-bedroom house, and the system was designed for 450 gpd.

When we talked with the owners, they said they were not doing anything unusual, and it could not be that high. We recalibrated the meter and the numbers came out the same. This just means for their water use the system was half the size it needed to be. Restoration in this case involved cutting back water use and adding some treat-



Installing with management in mind can help in restoration of systems affected by organic loading. This includes providing the ability to clean the distribution piping.

ment trenches to handle the flows.

Another somewhat amusing example was a case where the system was failing and we determined that water use may be a factor. To avoid cutting down trees to add to the system, the client put a timer on the shower, limiting the time his teenagers could use it. It had dramatic results after a month in eliminating the surfacing effluent. These examples are why we encourage the use of water meters.

Too much BOD

If the cause of the problem is organic overloading from neglected septic tank maintenance, the release

of solids from the tank due to lack of a baffle, or the addition of a product that results in solids transport to the drainfield, there can be success in restoration.

Solutions here would involve fixing physical problems with the tank, getting the system on a regular maintenance routine, potentially resting the system or parts of it, or installing pretreatment devices such as a media filter or ATU.

Before we had all of the reliable products on the market today, the chief approach to restoration was to install at least another partial soil treatment unit, diverting the flow through a valve to the new part

Jim Anderson and Dave Gustafson are connected with the University of Minnesota onsite wastewater treatment education program. Dave is extension onsite sewage treatment educator. Jim is former director of the university’s Water Resources Center and is now an emeritus professor, as well as education program coordinator for the National Association of Wastewater Transporters. Readers are welcome to submit questions or article suggestions to Jim and Dave. Write to ander045@umn.edu.

while resting the old system, getting the system on regular maintenance, and perhaps adding septic tank capacity by installing a second tank.

This strategy would make for an effluent with lower BOD and TSS and would provide some management options in the future, chiefly switching between parts of the system to provide resting and recovery, thus controlling biomat development.

We have been involved in research and demonstration projects over the years to look at whether adding pretreatment would have a positive impact. The answer is a resounding yes, provided the only problem with the system is organic overloading, or provided any other problems, such as hydraulic overloads, are also addressed.

We have been involved in research and demonstration projects over the years to look at whether adding pretreatment would have a positive impact. The answer is a resounding yes, provided the only problem with the system is organic overloading, or provided any other problems, such as hydraulic overloads, are also addressed.

One set of systems we worked on showed that using either ATUs or media filters to clean up the effluent brought immediate improvement in system performance. In one case, additional trenches, installed to provide a relief area for resting, were never used.

The one thing to remember when cleaning up the effluent to restore systems is that no matter how clean the effluent is, the soil still has a finite capacity to accept water, and if for any reason the flow meets or exceeds that capacity on a regular basis, the restoration will fail. We often see cases where pretreatment is tried without first investigating the soils. The results are generally disappointing.

Damaged soil

If the soil was damaged during installation by compaction or smearing, cleaning up the effluent will usually not improve performance greatly, and in that case a new soil treatment unit may be necessary. The same goes for lack of

separation between the system and a zone of soil saturation. If the soil is already full of water, it simply will not be able to accept any more.

There are methods available that physically create cracks or add structure to the soil to help provide infiltration. These treatments can be successful in the short term, but if there are problems with organic loading, those new cracks and crevices will soon be plugged. So again, you need to know what the

problems are before deciding on a solution.

One other thing to be aware of when using physical restoration techniques that create cracks is the risk of opening a crack directly to creviced bedrock or an aquifer. In that event, we get rid of the water, but we are not providing adequate treatment. This is why some states and localities have banned some of these techniques. Make sure you work with your regulators when trying to restore a system.

In the past, chemical methods have been employed to break down the biomat and restore some system infiltration. In general, any improvements are temporary if the real cause of the problem is not fixed. In addition, these chemicals (acids and peroxide) are dangerous to work with. Hydrogen peroxide has been shown to break down the biomat but also to oxidize the soil organic matter that is the binding agent for soil structure. The result is that it actually reduces infiltration capacity in the long run.

The bottom line is that systems can be and are being restored. Before you select a method, though, make sure you know why the system is not working properly. Fix all problems with the system, and then select the products or strategies that will work. ■

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Tight Space, Tough Climate

A pre-engineered system meets tough effluent requirements while fitting a small footprint at a seasonal state park visitor center

By **Scottie Dayton**

The Lewis and Clark Caverns State Park in Whitehall, Mont., was building a visitor center that could accommodate 400 tourists per day. Interstate Engineering, a civil engineering contractor in Billings, hired Travis West, RS/REHS, of Land Development Solutions LLC in Columbus, Mont., to design the onsite system.

West's first concern was handling the high-strength waste (180 mg/l total nitrogen), as no graywater would dilute the volume. His second concern was the cold climate and its effect on the biological treatment process, since the park turned off the water from October through April, rendering the system dormant. Furthermore, the onsite code required a replacement drainfield, and space was limited.

"We needed a product that would reduce our drainfield footprint and require no maintenance or attention from the park staff," says West. After researching options, he chose the pre-engineered Eliminite system, a fixed-film bioreactor invented by Thomas Kallenbach, P.E., of Three Forks and Justin Buchanan of Bozeman, Mont.

The technology achieved aerobic nitrification, anaerobic denitrification, solids settling, and BOD reduction in a single tank. The onsite system functions perfectly with minimal maintenance.

Site conditions

Soils are sandy clay loam with a percolation rate of 32 minutes per inch and a loading rate of 0.3 gpd per square foot. The slope is 5.4



percent. The center is next to the Jefferson River, a noted blue-ribbon fishing and recreational stream.

System components

West designed the system to treat 2,000 gpd. Its major components are:

- Two 2,400-gallon dual-compartment concrete septic tanks made by Three Forks Concrete, Three Forks, Mont.
- Two A100-8 effluent filters (Polylok), one per tank.
- 4,000-gallon Eliminite 620C bioreactor and two 24-inch Polylok risers.
- 1 hp Hydromatic SKHS 100 recirculation pump, Hydromatic, Pentair Pump Group, Ashland, Ohio.
- 1/2 hp Hydromatic SHEF 50 discharge pump.
- 1,200 feet of 1.5-inch pressurized pipe inside 36-inch Quick4 chambers from Infil-

Workers guide the placement of the Eliminite tank. The all-in-one technology achieves aerobic nitrification, anaerobic denitrification, solids settling, and BOD reduction. (Photos courtesy of Thomas Kallenbach, P.E.)

trator Systems Inc.

- Siemens Logo Control Panel from SJE-Rhombus.

System operation

Wastewater gravity flows through 4-inch Schedule 40 PVC pipe to the two septic tanks, then into the bioreactor pump basin. The recirculation pump in the basin is set to recirculate four times before discharging to the drainfield. When activated, it draws 150 gallons of effluent into a spray bar with four heads that evenly distribute it over 620 cubic feet of MetaRocks.

"MetaRocks are spheres of closed-cell polyurethane resins with three deep-contoured channels that

System Profile

Location:	Whitehall, Mont.
Facility served:	Lewis and Clark Caverns State Park Visitor Center
Designer:	Travis West, RS/REHS, Land Development Solutions LLC, Columbus, Mont.
Installer:	David McKeever, Diamond Construction Inc., Helena, Mont.
Site conditions:	Sandy clay loam with percolation rates of 32 minutes per inch and loading rates of 0.3 gpd per square foot
Type of system:	Eliminite fixed-film bioreactor with pressure distribution
Hydraulic capacity:	2,000 gpd

Tony DeGidio, Eliminite production manager, fills the fixed-film bioreactor with MetaRocks, an ultra-lightweight biological treatment medium.



The Lung, a proprietary air entrainment device driven by the recirculation pump, supplies oxygen to the microorganisms. Every time the recirculation pump runs, it discharges air drawn into the spray bar from the previous cycle into the bioreactor. When the pump shuts off, liquid drains by gravity back to the pump chamber, simultaneously drawing air into the pipe.

During winter, the recirculation pump continues to cycle effluent over the MetaRocks, but none is discharged to the drainfield. When the visitor center opens in spring, the system resumes where it left off in fall.

the two beds barely fit on the slope," says West. "Using Squirt, the pressurized drainfield design program written by Thomas to size the pipes, orifices, and pumps, made it easy to see the result of different combinations and find the correct solutions."

McKeever drilled 1/8-inch orifices five feet apart in the pressurized pipe. Every fourth hole faced down and had a Polylok diffuser. The 100-foot-long laterals had 20 orifices. After installation, West pressure-tested the zones, and then McKeever backfilled after placing two layers of 2-inch styrofoam board over the manifolds. It took

"We needed a product that would reduce our drainfield footprint and require no maintenance or attention from the park staff."

Travis West



Tony DeGidio works on the bioreactor's electrical wiring.



The two 2,400 gallon septic tanks are in the foreground; the Eliminite fixed-film bioreactor tank is in the background.

provide large, open pores for passive air transfer," says Kallenbach. "A coating of coarse sand and finely crushed recycled glass enables a thin liquid film to cover the surface and promote even, consistent growth of microorganisms."

The 9-foot-deep packed media bed needs no cleaning or replacement. Nitrified liquid collects at the bottom of the tank. Each time the recirculating pump engages to dose the filter, it returns a portion of the fluid through the denitrification

line to the first septic tank.

At peak capacity and after the fourth cycle, the rising liquid at the bottom of the tank engages a float-activated discharge pump in the pump basin. The pump sends 327 gallons through a 2-inch 160 psi DR11 HDPE Schedule 40 force main to the drainfield six times per day.

An automatic distribution valve alternately doses three zones, each 400 by 100 feet. Each zone has 1.5-inch pressurized laterals suspended with plastic snap-tie fasteners inside the chambers. A 1.5-inch Valterra knife valve on each lateral provides equal hydraulic distribution.

Installation

David McKeever from Diamond Construction Inc. in Helena excavated the holes, set the tanks, and dug the drainfield trenches 32 inches deep to escape the frost. Tony DeGidio, Eliminite production manager, and Dustin Paulson then insulated the bioreactor tank with two layers of 2-inch-thick blue board foam and plumbed it.

Meanwhile, McKeever excavated a 6-foot-deep trench for the horizontal section of the force main to prevent freezing. He inserted its vertical section length into a 6-inch PVC sleeve filled with water-resistant foam insulation.

"Even with a 50 percent reduction of the drainfield's footprint,

one day to set the tanks and two to complete the drainfield.

Maintenance

EcoSentry LLC in Bozeman has the two-year service contract. The state Department of Environmental Quality requires effluent testing twice per year for the first two years, then annually. Septic tank pumpouts are scheduled every three to five years. When the center closes for the season, the service provider switches the system to the suspended mode. It restarts automatically in spring. ■

MORE INFO:

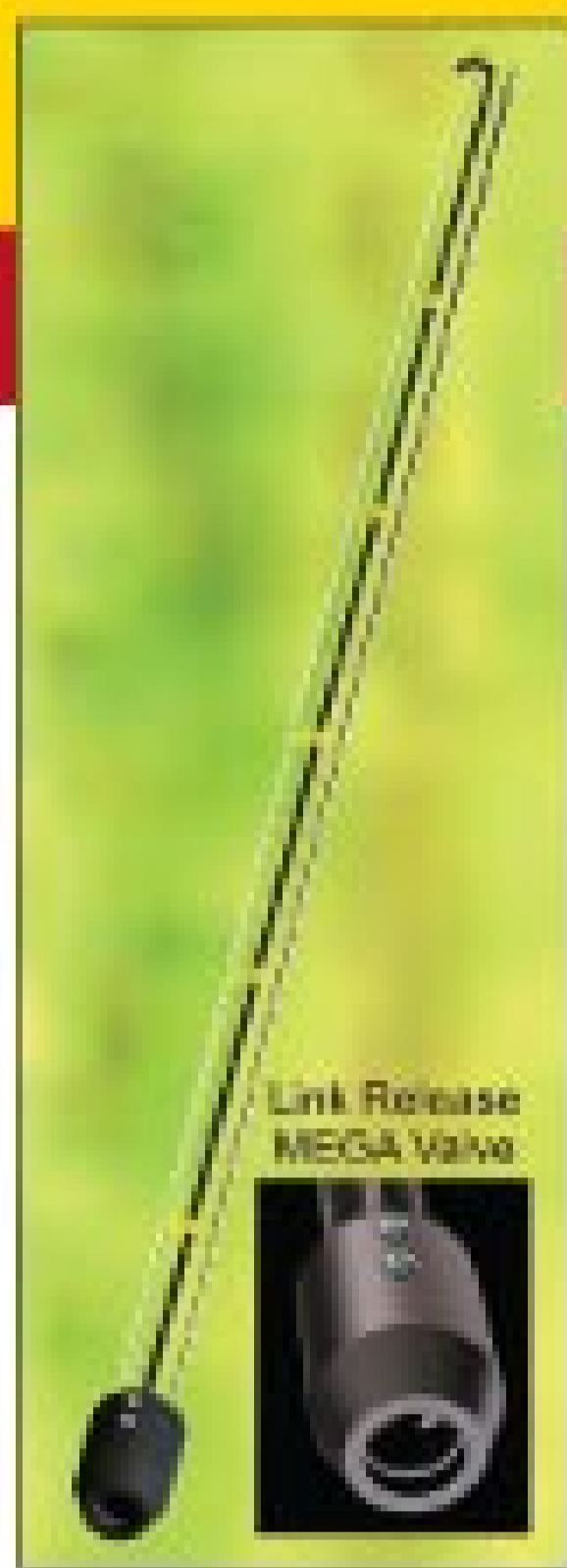
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Raven Offers Sludge Sampler

The Coretaker Max sludge sampler from Raven Environmental Products features a link release valve for taking in heavy sludge from septic tanks, grease traps, car wash pits and settling tanks. The valve is controlled from the top, releasing the sample into a tank or container. The sampler is made of 1.5-inch clear polycarbonate and has bright yellow level markers. **800/545-6953; www.ravenep.com.**

Liberty Introduces PC-Series Combination Pump

The PC-Series pump from Liberty Pumps combines a primary 120-volt sump pump with a 12-volt DC backup. Available in 1/3 and 1/2 hp models, the pumps use an energy-efficient 5.2 and 7.5 amps, respectively. In the event of a power outage or main pump failure, the 12-volt DC pump takes over automatically to protect against flooding. **800/543-2550; www.libertypumps.com.**



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The sump cleaner from CECOR uses a high suction lift to remove sludge from depths up to 15 feet. The unit, with pump-in, pump-out capability, can be used with a filter that separates solids from liquids. The pump can be maneuvered by one person for hauling between collection or disposal. The system is powered by a 20 hp twin-cylinder propane

engine designed to pump up to 110 gpm. Electric and air units are available. **800/356-9042; www.cecort.net.**

HBC-radiomatic Introduces Re-Designed Eco, Technos

The eco radio control system and technos transmitter from HBC-radiomatic feature five LED warning displays, two joysticks, up to six single-stage push-buttons and two toggle or rotary switches/buttons. The technos transmitter includes an AFS frequency management system, while the eco radio control system has a protective PA6GF30 plastic housing and vibration alarm. Eco options include a shock-off/roll-detect/zero-g safety feature that enables the controller to be turned off automatically in emergency situations. **800/410-4562; www.hbc-usa.com.**



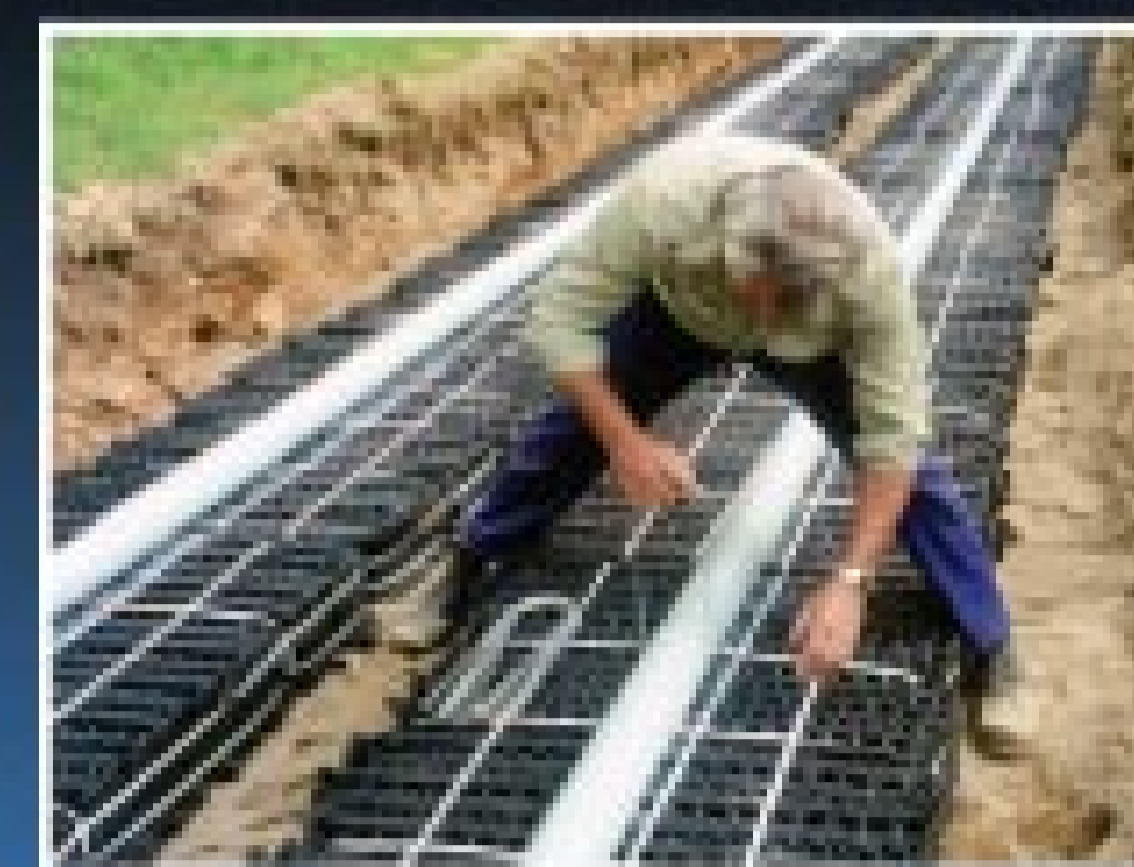
Infiltrator Introduces 300-, 500-Gallon Tanks

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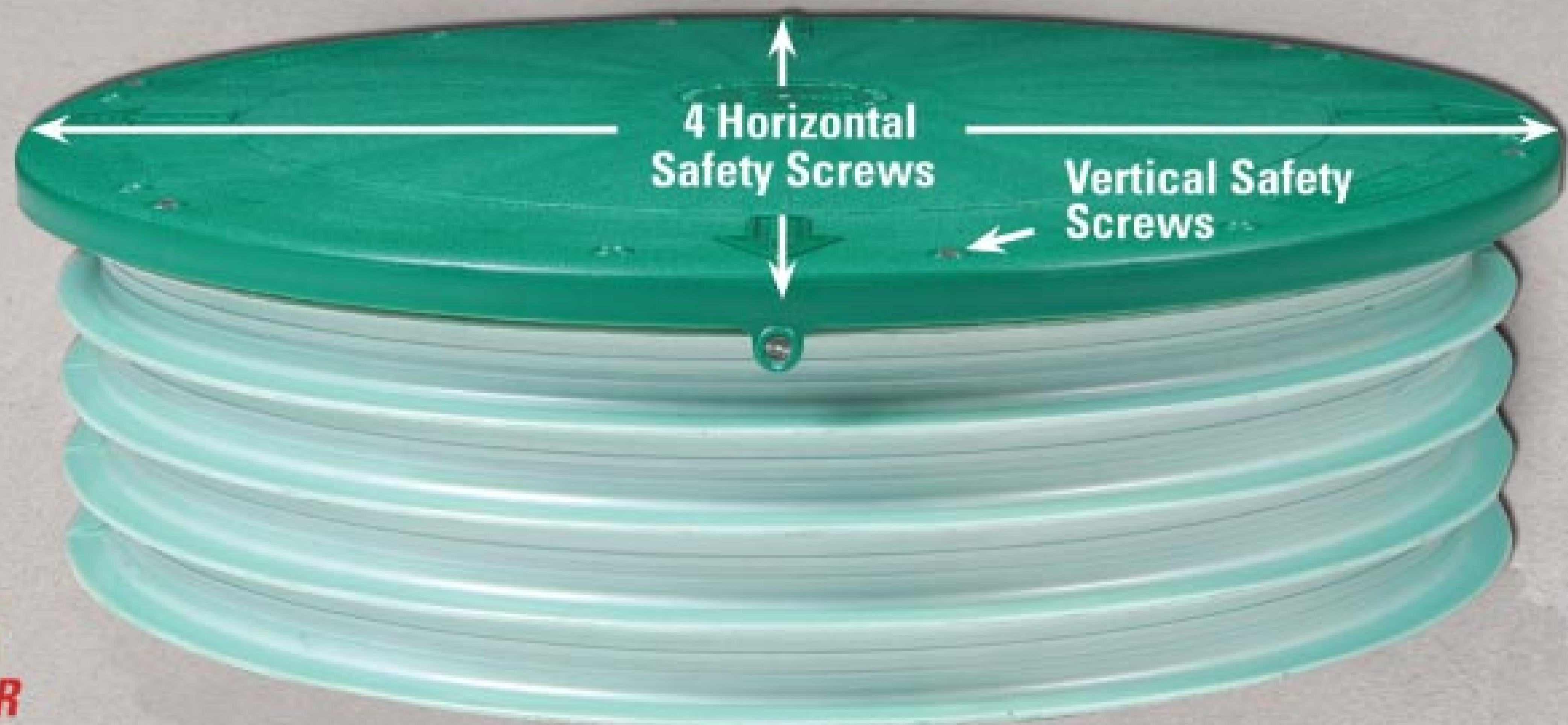
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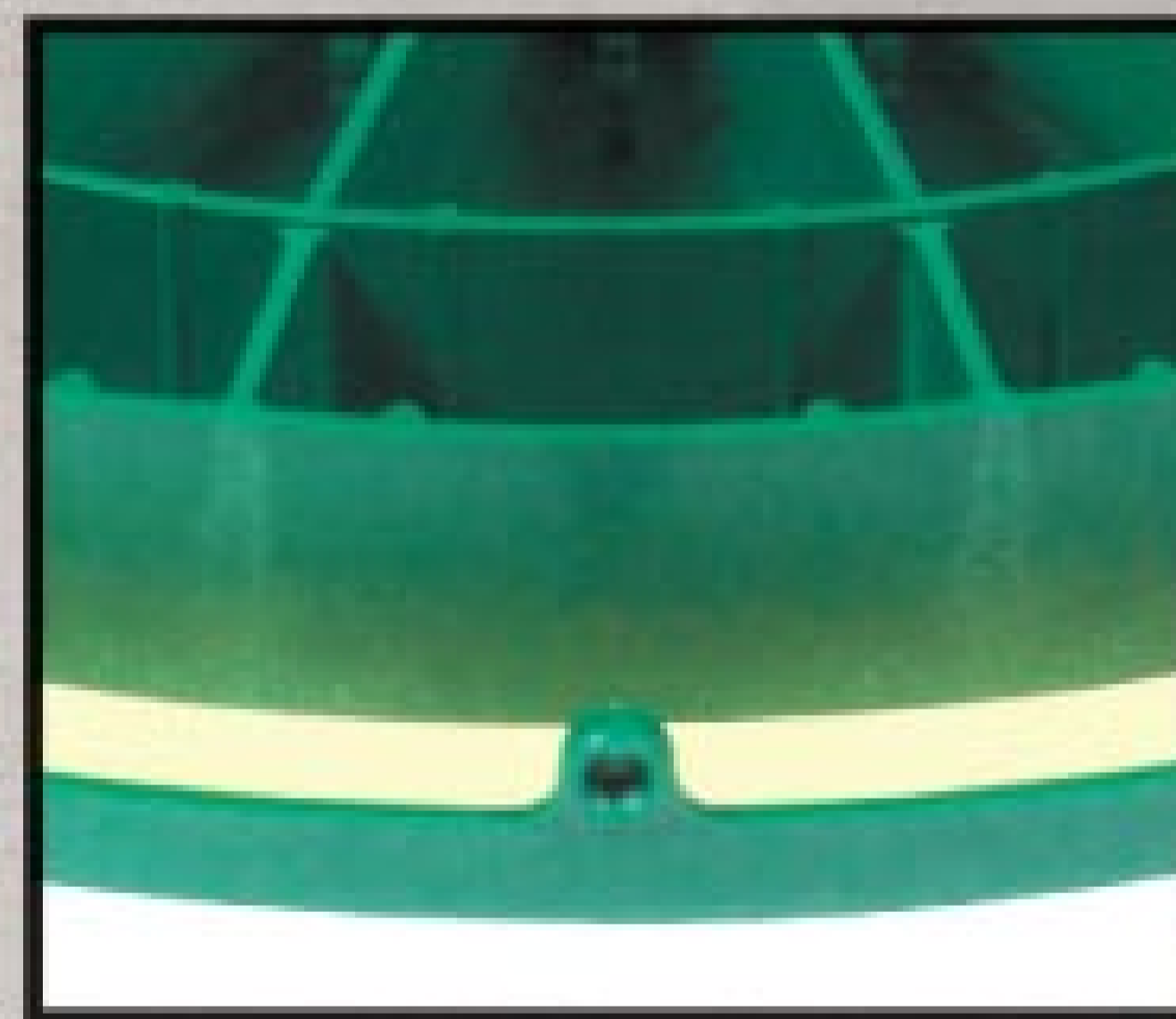
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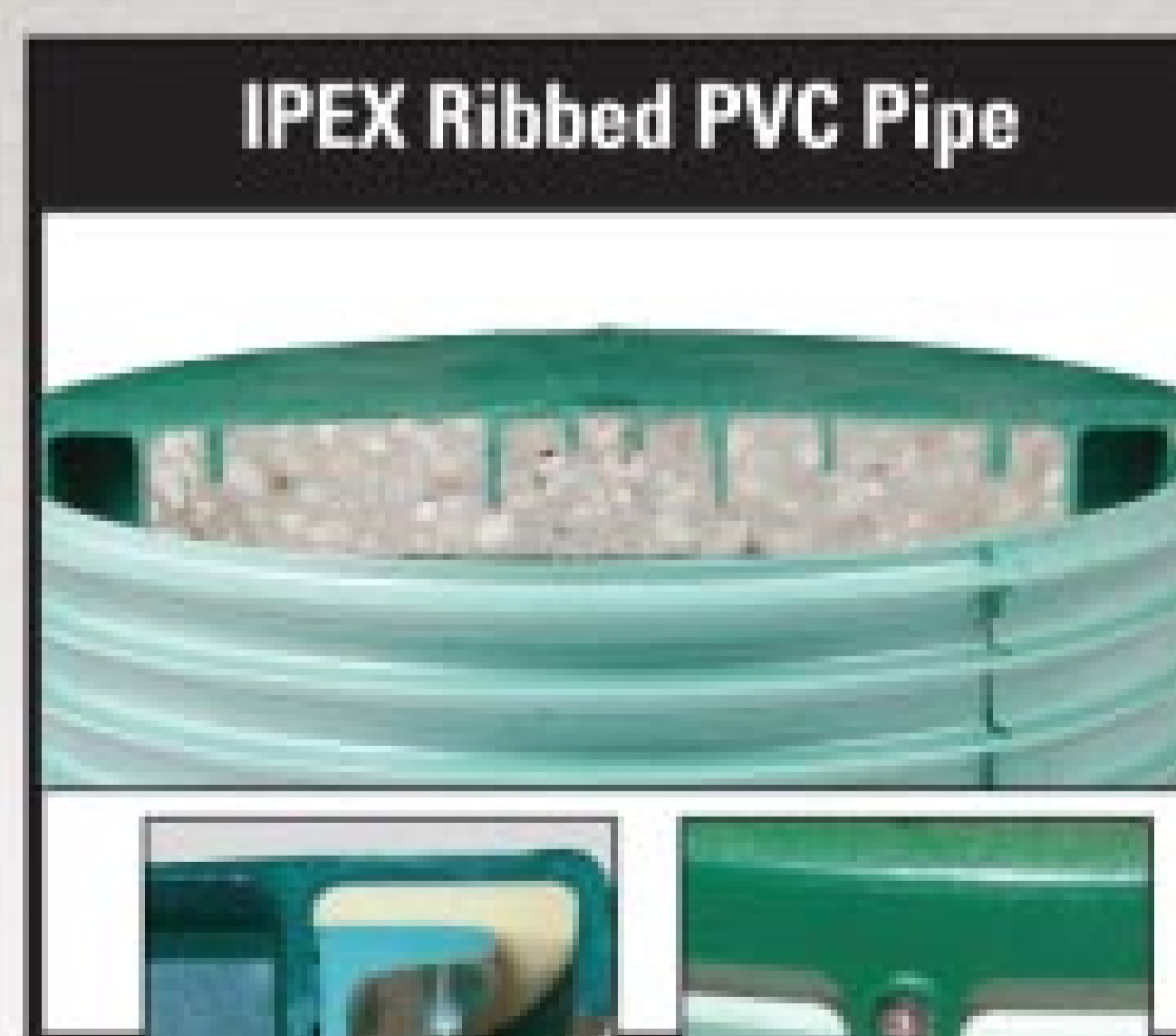
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All Aboard the Treatment Train



A properly functioning and long-lasting system requires effective maintenance on every component. That includes owner education.

By Kit Rosefield

One of our biggest challenges in the onsite industry is creating a management infrastructure to keep up with rapidly developing treatment technologies.

Technology manufacturers have made a significant effort to train practitioners on their proprietary products. And organizations such as Consortium of Institutes for Decentralized Wastewater Treatment (CIDWT) have developed curriculums providing a broader perspective.

Still, we haven't connected the dots to link up all the elements of training into a cohesive training and certification effort. As a consequence, we see a significant rate of premature advanced treatment system malfunction and failure.



Nothing is as effective as a good, face-to-face discussion. This is the time to begin to show your value to the client — it is time well spent. (Photo courtesy of Kit Rosefield)

With the mandatory O&M requirements accompanying NSF/ANSI Standard 40 product certification, many practitioners get good training on specific technologies, but they haven't received adequate training to understand how an integrated system of components work together.

Using the CIDWT materials, we learn to think in terms of the treatment train, where each individual component plays an integral role in the system, and where the components have separate and equal O&M requirements.

This occasional "O&M Matters" series in *Onsite Installer* will address each component that may be included in a treatment train and enumerate each item's basic O&M requirements. The aim is to spur discussions on what level of training professionals need as we move toward an industry-recognized certification program.

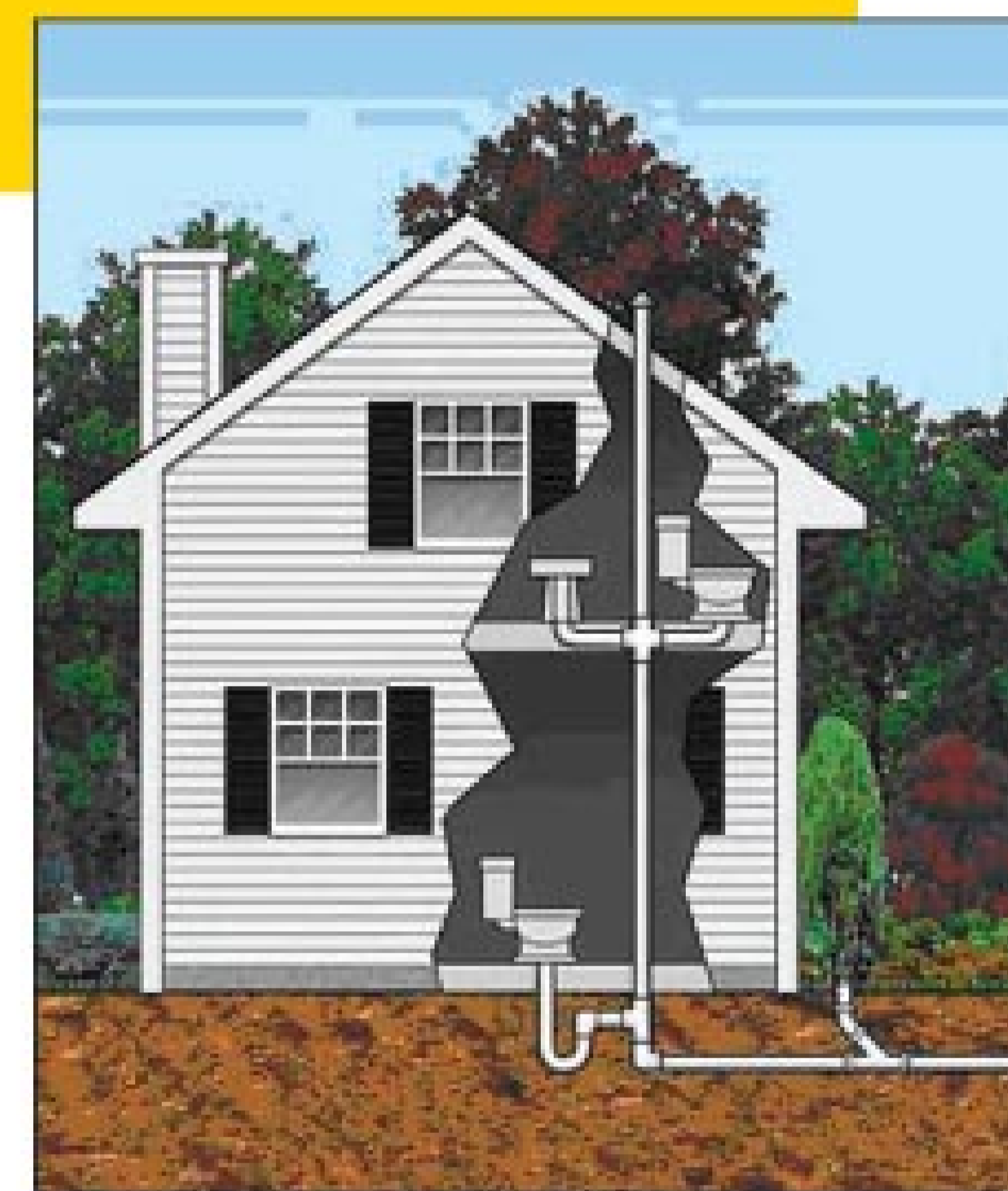
Where does it start?

The first step to understanding the O&M needs of any onsite treatment system is to understand the wastewater process. Again, breaking the system down into components and viewing it as a treatment train is the best way to put things into perspective. This approach helps practitioners evaluate the O&M needs of a system and then communicate those needs to the owner.

What would you consider to be the first component of any onsite system? How about the source? That would be the system users and the facilities that generate the wastewater. The waste habits of the system users and the type and condition of plumbing fixtures can make or break any system. And you, the onsite practitioner, are the key to this important component.

What can I do?

You all are probably saying, "Right — I can control what the users are putting down the drain." Maybe not, but what you can do is educate owners on the impact their



The onsite treatment train really starts with the source of the wastewater — in this case a single-family home.

Upon setting up any service agreement, it is a good idea to sit down with the system owner to discuss your service agreement terms and to inform them of their role in assuring a long, effective system life. You might call it a shared responsibility approach.

habits have on the system, physically and financially. People listen when you talk money!

Where do you start? Upon setting up any service agreement, it is a good idea to sit down with the system owner to discuss your service agreement terms and to inform them of their role in assuring a long, effective system life. You might call it a shared responsibility approach. Here are some of the issues you might discuss:

- Excessive water use can overload systems.
- Garbage disposals create unwanted solids in the system.
- Toilets are not good waste-baskets.
- Water softener waste should not go into the system.
- Toxic materials put down the drain can kill a system and pollute groundwater.
- Leaky plumbing fixtures create excess wastewater.

How Can I Get Trained?

The National Association of Wastewater Transporters (NAWT) now delivers Consortium of Institutes for Decentralized Wastewater Treatment training materials through a two-part O&M program nationwide.

With the NAWT Inspector basic training and adequate field experience, O&M training and certification can prepare practitioners for a successful, sustainable business opportunity while ensuring the highest level of consumer protection for onsite treatment system owners.

The CIDWT training materials go beyond what will be discussed in this series of articles to address such topics as business and ethics, negotiating contracts, wastewater constituents, safety, applied math, tools of the trade, and more. To learn more or to find a training session near you, watch the *Onsite Installer* magazine calendar of events or check the NAWT Web site at www.nawt.org.

- Improper landscaping and landscape maintenance can create problems.
- Rodents and pets digging for rodents can damage systems.
- Driving or parking on system components can cause damage.
- Livestock atop the system can cause soil compaction and erosion.

Yes, this information and more is available on a number of Web sites, publications and handouts that you could just mail or give to the owner. However, nothing is as effective as a good, face-to-face discussion. This is the time to begin to show your value to the client — it is time well spent. And about those Web sites, publications and handouts: use them. They show the care and professionalism of our fast-growing industry.

What will I learn from this series?

This O&M Matters series will

take you for a ride on the treatment train. We will embark from the source and travel to the pretreatment septic tank, then on to the gravity soil treatment area. We'll visit a pump tank in a pump-to-gravity system, move on to a low-pressure pipe soil treatment area, then explore a range of advanced treatment options, including media filters, aerobic treatment units, disinfection options, and drip dispersal systems. Along the way, we'll have a discussion on system controls.

Stay tuned for an educational ride.

Kit Rosefield is an adjunct instructor at Columbia Community College and a trainer for NAWT and the California Onsite Wastewater Association. His company, Onsite Wastewater Management in Mi Wuk Village, Calif., has a consumer education service at www.septicguy.com. Reach him at 209/770-6760 or kit@septicguy.com. ■



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"Rules and Regs" is a monthly feature in Onsite Installer. We welcome information about state or local regulations of potential broad interest to onsite contractors. Send ideas to editor@onsiteinstaller.com.

Increased Septage Volume Concerns Florida

By **Scottie Dayton**

As of July, the state septic code required all 2.6 million onsite systems to be inspected and pumped every five years. The state has estimated that one in 10 septic tanks are failing and expected about 260,000 to be replaced by 2020.

Health officials, however, are concerned about what to do with all the septage pumped from those systems, since the state's new water supply legislation bans land application of septage in 2016.

Because of the legislation, Marion County commissioners repealed sections of the Springs Protection

Ordinance. They rescinded provisions requiring tanks to be inspected every five years and failing systems to be replaced with low-dosing systems.

Replacement systems must now have a 24-inch separation between the drainfield trenches and the water table. Since the county land-applies septage, health department officials must submit a septage management report to the legislature by February. They are considering a mandate providing incentives for private waste-processing plants to increase their disposal capacity.

New Mexico

Socorro County is using American Recovery and Reinvestment Act and USDA Rural Development funds to replace onsite systems with sewer service for homes in the Middle Rio Grande Watershed.

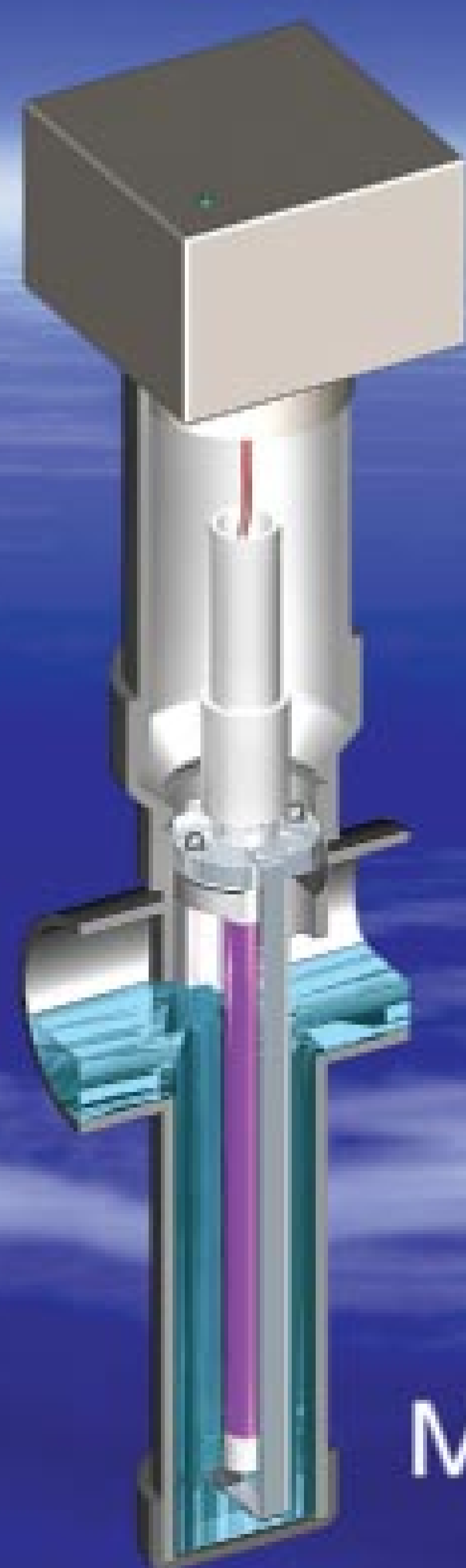
The state Department of Environmental Quality categorized the area as impaired based on levels of *E. coli* bacteria traced to onsite systems. The agency also requires systems to pass an inspection before transfer of the property, making the switch to sewers an incentive for homeowners.

California

The assembly amended a bill that would prevent nondispersible or poorly dispersible products from entering sewer or onsite systems and potentially causing overflows. The rule would enable consumers to identify which products are safe to dispose of via the plumbing system, and update the guidance criteria for flushability published by the Association of the Nonwoven Fabrics Industry to reflect new plumbing, onsite, and sewage technologies. If passed, the law would take effect Jan. 1, 2012. ■

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Feeling Right at Home

Eric Casey, new executive director of NOWRA, looks to more value for members and a major role for the organization on the national stage

By Ted J. Rulseh

Eric Casey picked a challenging time to take over as executive director of the National Onsite Wastewater Recycling Association.

He stepped in as many in the onsite industry — from design and installation contractors to state onsite organizations — were still struggling from the decline in home construction. But he brought along a positive attitude and confidence built on some 30 years in the association management profession.

He reports being pleased to discover a dedicated and energetic board of directors and corps of volunteers, a membership made up mainly of small-business owners

Before joining NOWRA, Casey was president of Casey Management & Marketing Services, a consulting firm in Arlington, Va., providing management and consulting services to trade and professional associations.

Before that, he held senior management positions for associations involved in industries such as business travel, direct mail, financial services and forestry. He shared his perspective on the industry and its future in an interview with *Onsite Installer*.

OI: After your first couple of months on the job, what are your impressions of NOWRA?

"I like the people in this organization very much. They're genuine, down-to-earth people. They're not afraid to tell you when they're not happy, and they're not shy about saying when they're happy. You don't find that kind of candor everywhere."

Eric Casey

who are "down-to-earth" and "genuine," and a mutually productive affiliation with the Water Environment Federation.

While he's not making big promises so early in his tenure, he expects to see NOWRA remain a significant player nationally as an advocate for the industry and a proponent of sound wastewater management policy. And he aims to help the organization develop new and better offerings that deliver value to members.

Casey: First of all, I am very impressed by the presence NOWRA has in Washington, D.C., and among the decentralized community.

That includes our relationships with the EPA and with other major water organizations here: the Water Environment Federation, the Water Environment Research Foundation, Clean Water Action, the National Groundwater Association, and others. Some of the bigger national organizations look to NOWRA for guidance and for

expertise on important decentralized wastewater reuse issues.

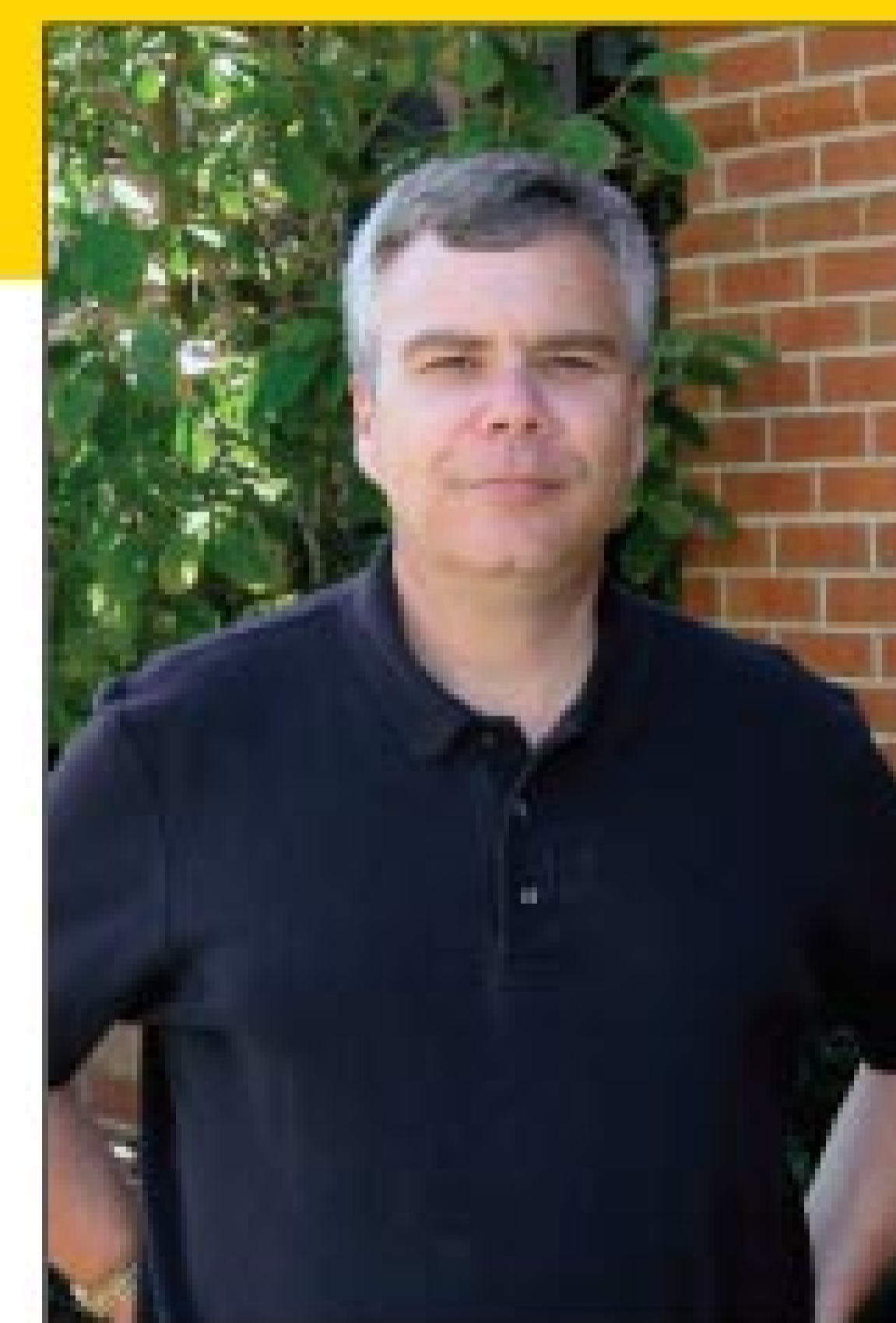
That's good for the industry because it gives us a platform and a voice with which we can advocate on behalf of regulations that will benefit the industry, or help bring new technologies and techniques to the field. We can also include wastewater recycling in broader discussions on issues such as integrated watershed management.

OI: What was it that attracted you to this industry, and what have you since discovered about the industry that appeals to you?

Casey: One thing that attracted me was my own background. I've worked for a variety of organizations across different industries. One place that I enjoyed most was working with a trade association in the mailing and fulfillment industry that dealt with smaller businesses.

It was a place where I just felt comfortable around the members — I liked them tremendously. I felt well suited to help another association that represented small businesses. It looked like my skills were a nice fit with what this organization needed. And now that I'm here, it really is living up to what I anticipated.

I like the people in this organization very much. They're genuine, down-to-earth people. They're not afraid to tell you when they're not happy, and they're not shy about saying when they're happy. You don't find that kind of candor everywhere.



Eric Casey

The biggest surprise, and it's a pleasant one, is to see how green this association is and how much we're an integral part of the environmental community. Onsite wastewater recycling is one of the original green industries. That is an accepted fact here in Washington — that what NOWRA members do is green by nature.

OI: How would you rate the support you've received so far from the NOWRA leadership and members?

Casey: Everybody wants NOWRA to be a successful, viable organization. The support I've had from the board and from volunteers and people outside the NOWRA membership directly has been really gratifying, and it provides a base of support to hopefully move the organization forward on a variety of fronts.

OI: What do you see as some of the organization's biggest challenges?

"Right now I'm setting up a working group between all of the affiliates and even some non-affiliated onsite wastewater organizations that have executive directors. I think there are a number of ways in which we can benefit by working together."

Eric Casey

Casey: The economic conditions have been challenging, and there have been a lot of changes in the management of the organization, particularly over the last two years or so. I think we need to do some work to restore trust and confidence among our members, our affiliates, and our manufacturers.

I have to give a lot of credit to the NOWRA board and the executive committee in particular, and to the president, Tom Groves. The executive committee has made a lot of really good decisions that I think set the stage for significant progress going forward, in terms of communicating effectively to our members and delivering value to them.

OI: What would you say are a few of those good decisions?

Casey: I would start with the arrangement with WEF to house NOWRA and provide a variety of support. I think that arrangement represents in some ways the best of all possible worlds for our organization, especially since NOWRA remains completely independent in its governance and decision-making.

WEF has been terrific in terms of providing support to NOWRA. Not only are they providing office space, but they're providing us with a good deal of administrative support — everything from IT to telecommunications to access to their business learning facilities. And that has been done without really any obligation on our part other than to cooperate with them on projects of mutual interest. They obviously see the value of a strong onsite wastewater industry.

I believe the board has also strengthened our committee structure, and we have a lot of strong people serving as chairs. And they've done some innovative things, such as the partnership formed last year with COLE Publishing to hold our Installer Academy and Roe-D-Hoe

in conjunction with the Pumper & Cleaner Environmental Expo.

OI: What steps are you taking to strengthen relationships between NOWRA and its affiliate organizations, and between those groups themselves?

Casey: Right now I'm setting up a working group between all of the affiliates and even some non-affiliated onsite wastewater organizations that have executive directors. I think there are a number of ways in which we can benefit by working together.

I see pockets of innovation in places like WOSSA (Washington Onsite Sewage Association) and the Missouri Smallflows Organization in terms of what they're doing with education. IOWWA (Iowa Onsite Wastewater Association) recently secured some grant money from the U.S. Department of Agriculture to fund an onsite wastewater project they're doing with Habitat for Humanity.

A couple of our affiliates are doing some distance learning programs that might have some value in being shared with other affiliates around the country. And there are probably some other best practices taking place in certain affiliates that can be shared with others.

OI: What has been your relationship so far with the National Association of Wastewater Transporters?

Casey: I have met their executive director, Tom Ferrero. Our members overlap to some degree, and I think there are opportunities for us to collaborate on some projects. I fully support what NAWT does. They're an integral player in the onsite community.

OI: Long-term, what benefits do you see NOWRA offering to members that are not being offered now?

Casey: I don't know how far

my telescope goes here, but I see several things NOWRA can do to deliver more direct benefits. I'd like to see us do many of those things cooperatively with our affiliates.

One initiative already in progress involves the NOWRA Resource Library. We're transitioning our Web site back in-house at our Alexandria offices. I think the Resource Library is a huge opportunity to provide much more information to our members and to people who aren't members as well.

Another thing NOWRA can do is provide advice that addresses the concerns of small-business owners in general: How do they make their businesses better? How do they grow their businesses? How do they collect their debts? Another benefit could be negotiating a contract on the national level for hotel space for our affiliates' annual conferences — where we get a better deal from a hotel chain than they

that expands business opportunity for the members on the ground. So the work NOWRA does on the front does ultimately translate down to practical things that benefit companies in the field.

OI: Historically, participation by installers and designers at national events has been rather low. How might you envision getting more of those professionals to events such as the annual conference?

Casey: I absolutely think our national education events need to appeal to all segments of our membership. One thing we're doing with our annual conference this year is developing an education track specifically for designers, installers, and O&M providers. We're calling it the Contractors' Education Track.

It's tied into the issue of surface discharge, which is gaining impor-

"I absolutely think our national education events need to appeal to all segments of our membership. One thing we're doing with our annual conference this year is developing an education track specifically for designers, installers, and O&M providers."

Eric Casey

would get if they all tried to negotiate for space individually.

OI: How do you reconcile the need for NOWRA to be on the forefront of major issues with the need rank-and-file installers have for basic, hands-on information about their craft?

Casey: NOWRA was established to be the national representative to advance the science and technology of the industry. By definition, that means we're out front on a lot of issues. I think many things NOWRA is working on now won't translate down to the installer in the field perhaps for several years, but that's the way it's always been.

For example, NOWRA did a lot of the heavy lifting to gain acceptance for many technologies that now go into alternative systems. Every time you create an opportunity to put an onsite system in a less receptive space than before,

tance in states like Missouri, Ohio and Illinois. So we've put a track together that is designed primarily to attract people from that region.

OI: What are some of your other key priorities here in the early part of your tenure as director?

Casey: One of my priorities is to increase the flow of communication from NOWRA to all of its stakeholders. That includes not only our members, affiliate organizations and their members, but also other organizations, such as NAWT, the Consortium of Institutes for Decentralized Wastewater Treatment, the National Environmental Services Center, and others.

That is a huge priority — to communicate why NOWRA is a vital and important organization that deserves support, and to make sure people in all corners of the onsite community know what we're doing. ■

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WOWRA pursues WRA partnership

The Wisconsin Onsite Water Recycling Association (WOWRA) met with the Wisconsin Realtors Association to educate them about the Certified Private Onsite Wastewater Treatment System (POWTS) Evaluator Program and the need for uniform standards statewide.

WOWRA developed its certification program four years ago to standardize onsite inspections. The goal of the meeting was to show Realtors the value of the program so that they and lenders would help create a demand for it. The state has 70 certified inspectors. For more information, call Ann Gryphan at 608/256-7757 or e-mail agryphan@ekgmail.com.

COWA accredited

The California Department of Public Health has approved the California Onsite Wastewater Association as an Accrediting Agency for the Registered Environmental Health Specialists CEU program. The organization's Onsite Wastewater Treatment System Controls course and all other training provide required CEUs for health specialists. Call Evelyn Rosefield at 530/321-2207 or e-mail cowaemail@gmail.com.

Tank deterioration

The Oregon Onsite Wastewater Association newsletter had a follow-up article on septic tank deterioration. Robb Barnes of Kings Pumping in Dallas, Ore., wrote that once the scum layer is formed, the only way out for gases is through the top of the baffles. That is why deterioration concentrates on the corner of the lid directly above the outlet baffle top.

His installers carry glue in test caps that they lay on top of the 4-inch PVC or ABS outlet baffles. "We don't glue them in to retain access to the outlet line should it require jetting, but we hope to stop gases from escaping to the top of the tank," he says. "When we install a replacement baffle with the Poly-

lok drive-in insert, we also install a gas baffle at the bottom of the replacement baffle." Read the entire letter and view the illustrations at www.o2wa.org/pages/news.php.

Teamwork

"Get Pumped" septic tank workshops in Alabama gave Shelby and Chilton County residents an opportunity to have their tanks pumped or onsite system repaired. To receive a \$250 service voucher, homeowners attended the one-hour workshop on how to maintain their systems. The money is part of a \$75,000 grant to improve water quality of the creek and surrounding watershed.

Participating service providers were not asked to limit fees, but most accepted the vouchers as full payment for a pumpout. The Calera Waste Treatment Plant supported the program by processing the septage.

Scholarship winner

Joseph Craven, a graduate of Rushville Consolidated High School, won the 2010-2011 Indiana Onsite Wastewater Professionals Association scholarship. He is attending Indiana University-Purdue University Indianapolis and plans to start his own business managing or designing wastewater treatment products. Craven has worked with his father, Richard Craven of McCreary Concrete Products in Rushville, since he was 14.

No chlorine

Reports from Texas Onsite Wastewater Association maintenance providers to the Brazos County Health Department showed that almost 40 percent of the area's 6,000 aerobic onsite systems had no chlorine in the recycled irrigation water. That number is up 20 percent from two years ago. Technicians check the chlorine level discharging through the sprinklers three times per year.

Soda and pharmaceuticals

Janet Murray, REHS, president of Missouri Smallflows Organization, states in the group's newslet-

ter that people can properly dispose of pharmaceuticals at home if communities have no drop-off points. Simply empty the medications into a plastic container such as a coffee can, add 12 ounces of Coca Cola, and allow the acid in the soda to dissolve the capsules for an hour or more. Once everything is well dissolved, add coffee grounds or cat litter to absorb the moisture. Screw the lid onto the container and seal it with duct tape. Place the can in the garbage on collection day.

CALENDAR OF EVENTS

Oct. 18-20

North Carolina Annual Onsite Water Conference, Jane S. McKimmon Center, Raleigh. Call Joni Tanner at 919/513-1678 or visit www.soil.ncsu.edu.

Oct. 19-20

Delaware Onsite Wastewater Recycling Association Conference, Dover Downs Hotel and Casino, Dover. Call Jim Williams at 302/492-3915 or visit www.dowra.org.

Oct. 21-24

Ontario Association of Sewage Industry Services Conference and Expo, Great Wolf Lodge, Niagara Falls. Call 877/202-0082 or visit www.oasisontario.on.ca.

Oct. 25-27

National Onsite Wastewater Recycling Association Technical Conference and Exposition, St. Louis, Mo. Call 800/966-2942 or visit www.nowra.org.

March 2-5

Pumper & Cleaner Environmental Expo International, Kentucky Exposition Center, Louisville, Ky. Call 800/257-7222 or visit www.pumpershow.com.

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Small Flows, and Pipeline are available only in PDF format at www.nesc.wvu.edu. To receive postings of new issues, sign up at www.nesc.wvu.edu/listserv.cfm.

NAWT

The National Association of Wastewater Transporters has these sessions:

- Nov. 11-12 – Operation and Maintenance, Mill Valley, Calif.
- Dec. 2-3 – Installer Training, Sonora, Calif.

Call Kit Rosefield at 530/513-6658 or visit www.cowa.org.

Alabama

Licensing classes are the joint effort of the Alabama Onsite Wastewater Association (AOWA) and University of West Alabama (UWA). Courses are at UWA Livingston campus:

- Nov. 10-12 – Basic Installer
- Dec. 2-3 – Continuing Education
- Dec. 8-10 – Advanced Installer Level II

The first day of Continuing Education classes is for installers and the second day is for pumpers and portable restroom operators. Call 334/396-3434 or visit www.aowatc.uwa.edu.

Arizona

The Arizona Onsite Wastewater Recycling Association has these classes:

- Nov. 1-2 – Intro to Design of Onsite Wastewater Treatment Systems, Tucson
- Nov. 3-4 – Advanced Design of Onsite Wastewater Treatment Systems, Tucson

Call Kitt Farrell-Poe at 520/621-7221 or e-mail kittfp@ag.arizona.edu.

Iowa

The Iowa Onsite Wastewater Association has the CIOWTS Installation Overview and NEHA credentialing exam Nov. 19-20 in Prairie City. E-mail Alice Vinsand at exccdir@iowwa.com or visit www.iowwa.com.

Missouri

The Missouri Smallflows Organization is offering these CEU courses:

- Nov. 9-10 – High-Strength Waste, Branson
- Nov. 16 – Selling System to the Site, Camdenton
- Nov. 17 – Profitable Business, Camdenton
- Dec. 7 – Selling System to the Site, St. Clair
- Dec. 8 – Profitable Business, St. Clair
- Dec. 14 – Pumps, Panels, and Electrical, El Dorado Springs
- Dec. 15 – Drainfields and Water Management, El Dorado Springs

Call Tammy Yelden at 417/739-4100 or visit www.mosmallflows.org.

New England

The New England Onsite Wastewater Training Center at the Uni-

versity of Rhode Island in Kingston has these workshops:

- Nov. 4 – Rhode Island Designer Examination Preparation
- Nov. 18 – AutoCALCS: Automated Bottomless Sand Filter Sizing, Pump Calcs, and Support Material
- Dec. 2 – Rhode Island Regulatory Setbacks and Buffers
- Dec. 9 – Nitrogen in the Environment and Onsite Wastewater Systems
- Dec. 14 – Designing Nitrogen Removal Technologies

Call 401/874-5950 or visit www.uri.edu/ce/wq.

North Carolina

The North Carolina Septic Tank Association is offering the Installers and Inspectors course Nov. 11-12 in Hickory. Call 336/416-3564 or visit www.ncsta.net. ■

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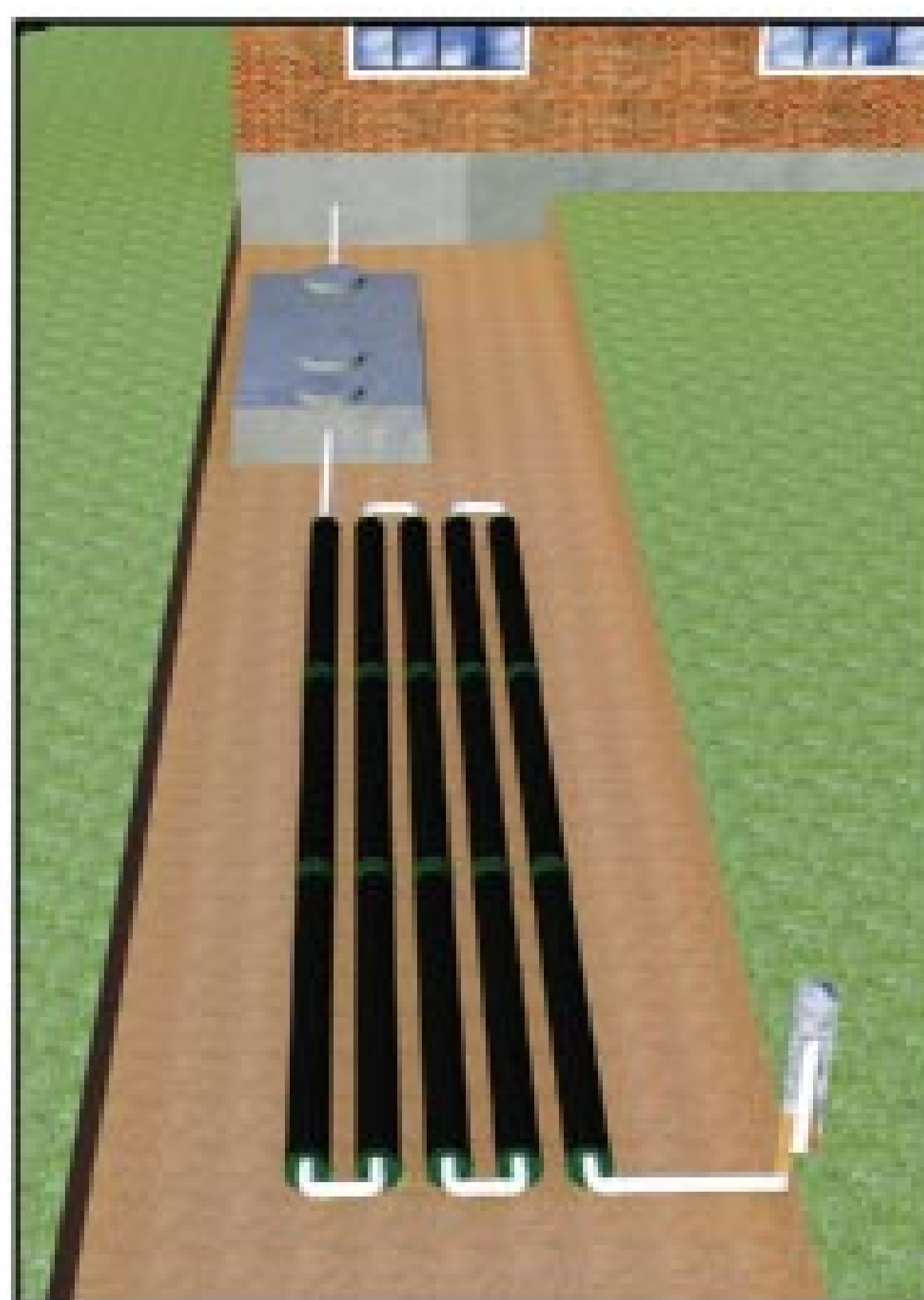
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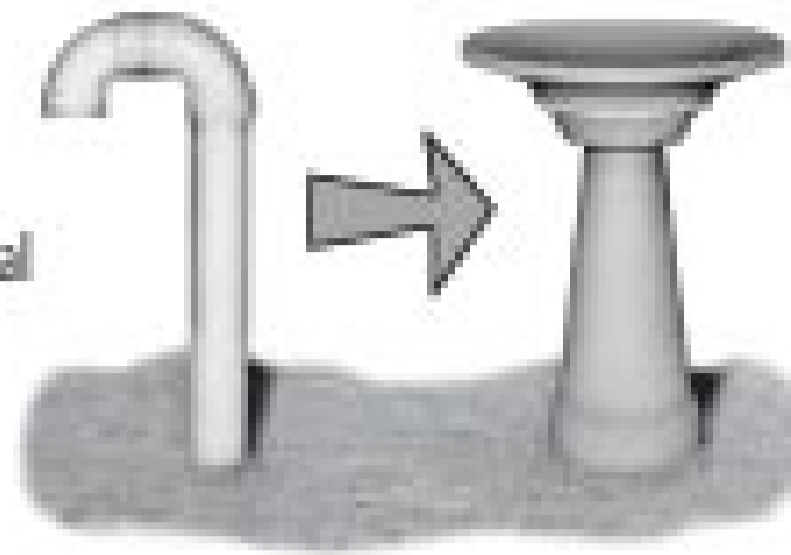
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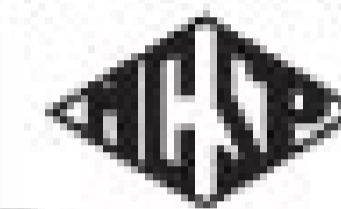


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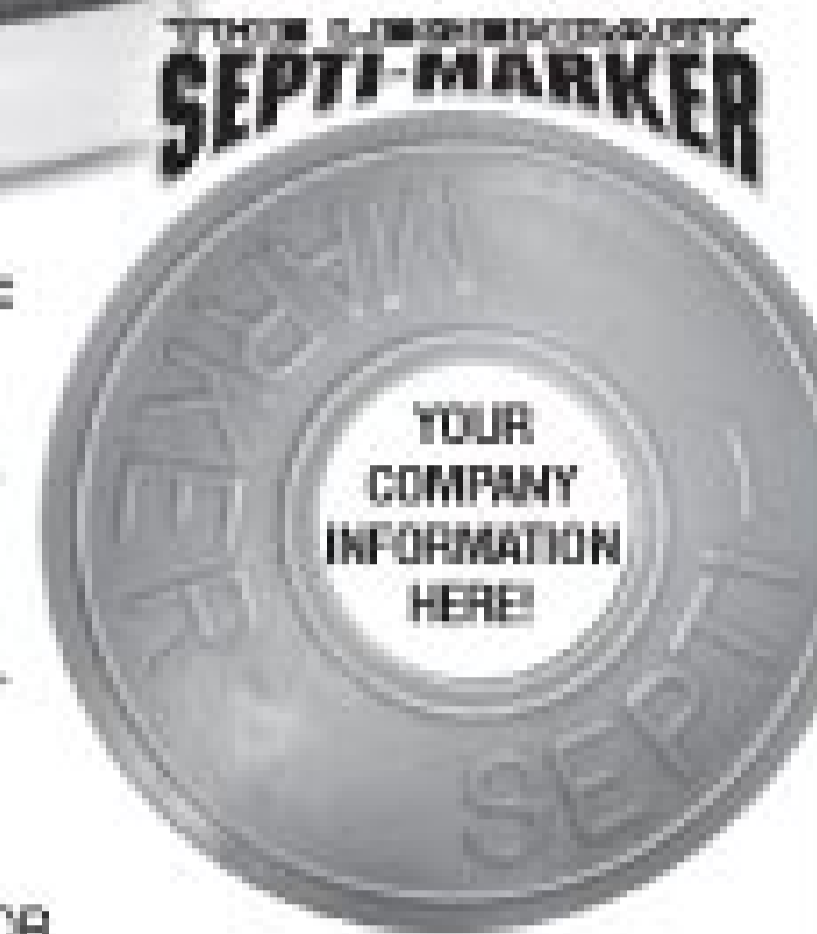
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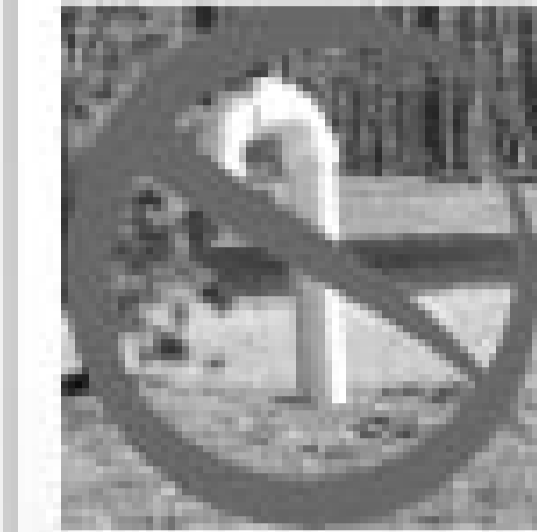


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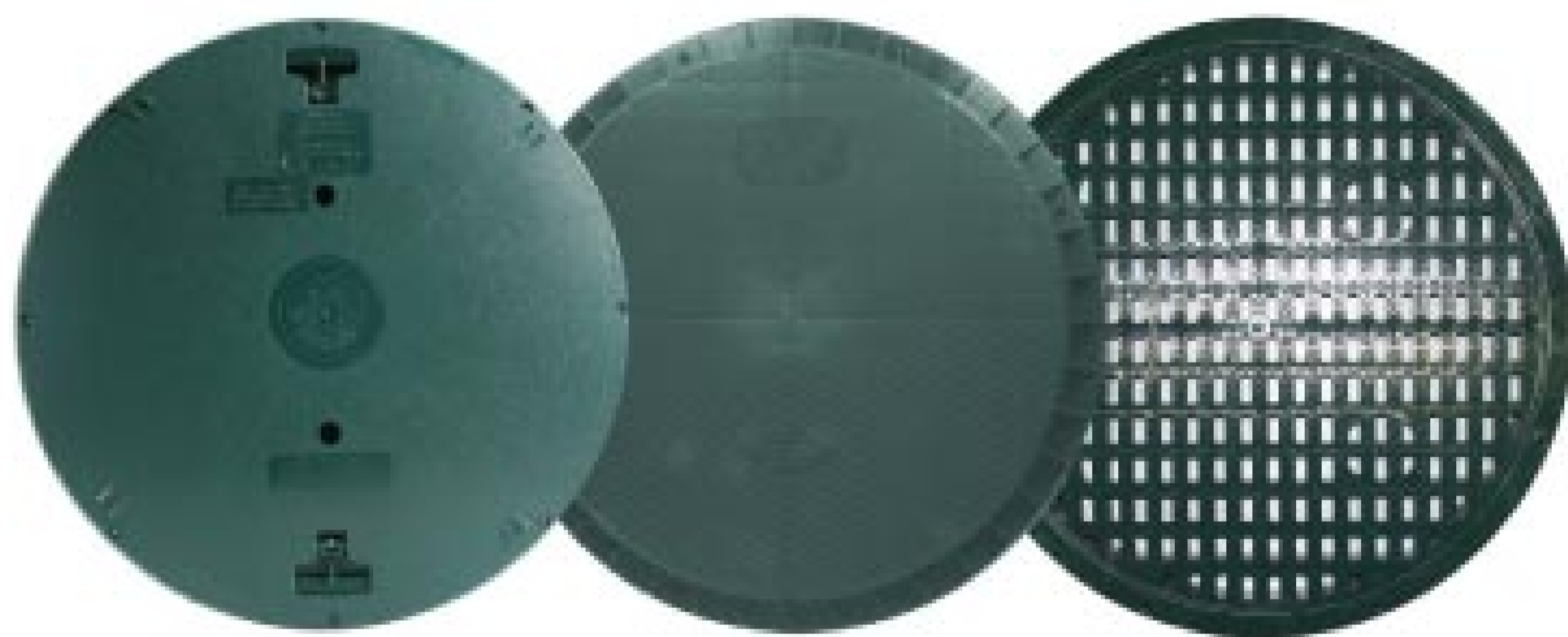
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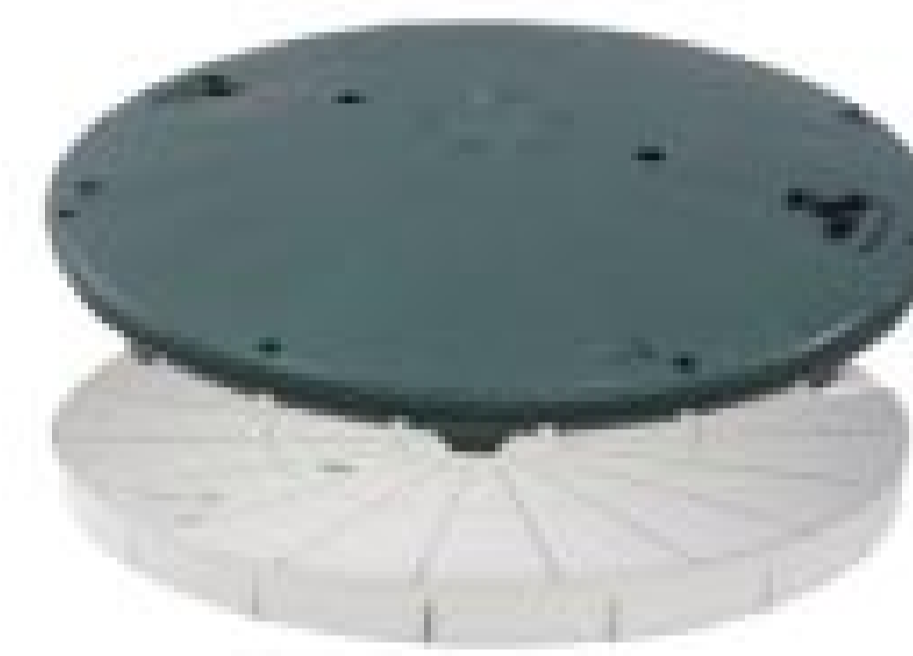
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