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L.U.S.T.LINE

A Report On Federal & State Programs To Control Leaking Underground Storage Tanks

[Re]Introducing NEIWPCC

With this issue, the organization that has been bringing you L.U.S.T.Line for the past 35 years is delighted to introduce to you our new look, logo, and a bit of a twist to our name. In fact, we have decided to embrace our acronym as our name. From now on, simply refer to us as "NEIWPCC" [NŪ-Ē-PĬK]. As a regional commission that helps the Northeast states preserve and advance water quality, our work and impact fall into five interconnected categories: connections; protection; training; education; and engagement. The design elements you see reflected in this and future issues are meant to help enhance our important mission. We invite you to visit our website (neiwpcc.org) for more detail on these efforts.

Redeveloping Petroleum Brownfields

We all have our share of old, abandoned gas stations dotting the landscapes of our states. On the flip side, we have areas experiencing rapid economic growth, where redevelopment projects are rarely hindered by the presence of petroleum brownfields and solutions are affordable. However, making the business case for disused gas stations remains challenging.

In this three-part series, you can read about some creative and strategic approaches implemented in Colorado and Washington to help overcome various challenges to petroleum brownfield redevelopment. Both of these states have developed voluntary programs that provide financial assistance to owners and operators, enabling them to address aging infrastructure and potential liabilities associated with the former operation of petroleum storage tanks on their properties.

We all make great process improvements to our programs and often assume the good work we do speaks for itself. Our focus is usually on the technical merits of the improvements, but we may not spend enough time on communicating those improvements through marketing and outreach. The best laid plans and financial incentives are meaningless if the target audience is unaware of the opportunity. So to address this issue, the third article in this series highlights the importance of marketing and outreach and provides tips we can all use.

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Inside

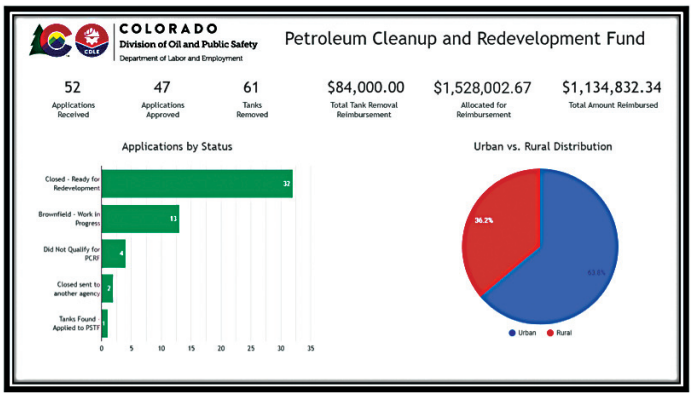
Redeveloping Petroleum Brownfields

Lessons Learned from Colorado's PCRF

by Mahesh Albuquerque, Michelle Howard

Making the business case for redeveloping old abandoned gas stations can be challenging. To help overcome some of the barriers to redevelopment, Colorado established the Petroleum Cleanup and Redevelopment Fund (PCRF) within the Division of Oil and Public Safety (OPS), using monies recovered from "double dipping" settlements. The PCRF is a voluntary program that enables property owners who are not eligible to participate in the very solvent Colorado Petroleum Storage Tank Fund (PSTF) to receive assistance to address potential liabilities associated with the former operation of petroleum storage tanks on their properties.

Since its creation in 2014, the PCRF has had considerable success stimulating redevelopment in both rural and urban communities, but Fund staff members have also recognized certain challenges that hinder redevelopment.



Redevelopment Challenges

- **Environmental Contamination and Associated Liability:** Inherent to brownfields is the presence of real or perceived contamination, which needs to be addressed before redevelopment can begin. The presence of contamination and the unknown cost of cleanup is often a concern for property owners and developers. Generally, the sale prices of these properties factor in potential cleanup costs.

- **High Upfront Capital Costs:** At many petroleum brownfield properties, assessment and cleanup of contamination needs to be completed before construction can begin, resulting in higher upfront capital costs.

- **Limited Financing Options:** The former use of a property and the presence of contamination can often limit financing options available for the purchase and redevelopment of the property. Fortunately, some lenders are very familiar with brownfield redevelopment, and funding sources like the PCRF can provide grants or reimbursement for cleanup expenses.

- **Smaller Footprints:** Older gas stations were built on small properties, often less than half an acre. These small footprints, especially in urban areas, require developers to work with multiple property owners to acquire the acreage they need for redevelopment. This is usually not a deterrent in areas that are experiencing exponential growth.

Programmatic Elements for Success

- **Solvent Funding Source:** Money in the form of grants, incentives, or reimbursements helps stimulate most redevelopment projects, so having a solvent funding source is critical. The PCRF is funded through enforcement fines and penalties paid by regulated storage tank owners and operators.

- **Simple Application and Efficient Approval Process:** Property owners can apply to PCRF by completing a simple eligibility application form, at no cost. In the application, they describe where or why they believe the property has or had USTs or petroleum impacts, and provide their ownership documentation.

  Once the applicant's PCRF is approved, the applicant and the environmental consultant prepare a work plan outlining the scope and costs. After the PCRF team approves the work plan and the work has been completed, the applicant submits a report describing the results. The PCRF team reviews the report and next steps are evaluated. If no contamination is found or it is determined to be below OPS cleanup standards, a No Further Action letter is issued to the applicant.

L.U.S.T.Line

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NEIWPCC is a regional commission that helps the states of the Northeast preserve and advance water quality. We engage and convene water quality professionals and other interested parties from New England and New York to collaborate on water, wastewater, and environmental science challenges across shared regions, ecosystems, and areas of expertise.

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- **Predetermined Reimbursement Criteria:** Having predetermined reimbursement criteria provides certainty and reduces the risk of unknowns, a huge plus for any redevelopment plan. Applicants know upfront what their out-of-pocket expenses might be.

  For instance, the PCRF provides $2,000 in reimbursement for tank removal costs, or $1 per gallon of tank volume removed, up to a maximum of $10,000, whichever is greater.

  For assessment and site characterization activities (Level I and II), the PCRF provides up to $50,000, with the property owner responsible for paying 10% of the costs.

  After the project exceeds $50,000, the property owner moves to Level III for cleanup costs. In Level III, the property owner pays 50% of costs up to $500,000.

- **Outreach, Outreach, Outreach:** Sharing information about the PCRF with potential stakeholders and using multiple means to communicate is critical for success.

Success Stories

Since its creation, the PCRF has enabled cleanup and redevelopment of many properties across Colorado. Former gas station redevelopment projects have ranged from the creation of greenspace gateways into towns, to mixed-use multi-story commercial/residential buildings, to incorporating EV charging at gas stations. Checkout our website at *https://ops.colorado.gov/Petroleum/PetroleumBrownfieldsProgram* for more information about Colorado's PCRF or to reach out to our brownfields team. ■

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27th National Tanks Conference Postponed

Given the overwhelming challenges associated with the COVID-19 pandemic, NEIWPCC has made the difficult decision to postpone the 27th National Tanks Conference (NTC). At this time, we are moving forward with plans to hold the conference on September 21-23, 2021, at the Wyndham Grand Hotel in Pittsburgh, Pennsylvania. Pre-conference workshops will be held on September 20. On the upside, we will be providing a series of webinars in 2020 based on themes planned for this year's now-postponed NTC. For more information on the next conference go to the official website of the 27th NTC at: *https://neiwpcc.org/our-programs/underground-storage-tanks/national-tanks-conference/*. In the meantime, check out the NTC archives at the following website: *https://neiwpcc.org/our-programs/underground-storage-tanks/national-tanks-conference/2018-ntc-archive//*. For more information on the many UST and LUST resources offered by NEIWPCC during this time, go to page 27 of this *L.U.S.TLine*.

Redeveloping Petroleum Brownfields

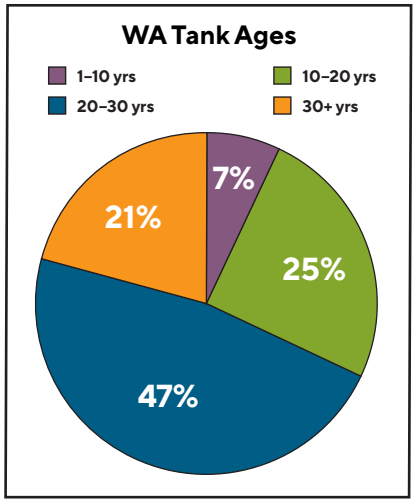
Washington State's Financing Option for Environmental Cleanup

by Phi V. Ly, J.D.

Washington State's Pollution Liability Insurance Agency (PLIA) provides petroleum underground storage tank owners and operators with an effective and efficient government funding model to help them meet financial responsibility and environmental cleanup requirements. Washington's Legislature created the agency in 1989 in response to the need for affordable insurance to cover many of the state's privately-owned gas stations. PLIA's role, mission, and primary goals are the same now as when it was established, despite changes to the economic and political landscape. However, the agency continues to evolve by developing and implementing novel programs that provide financial assistance to tank owners and operators. By focusing on opportunities for preventative efforts, PLIA is able to shift from reliance on reinsurance funding to creating a sustainable financing model.

The Problem in Washington State

Washington's underground storage tank (UST) infrastructure is aging; statewide, nearly half of the tanks are more than 20 years old. Over time it becomes more difficult and costlier to insure these aging tanks due to the risks of leaks and contamination. There are limited traditional financial resources available to tank owners and operators seeking to resolve contamination with cleanup. In some cases, UST owners and operators lack the necessary funding sources to meet federal and state financial responsibility



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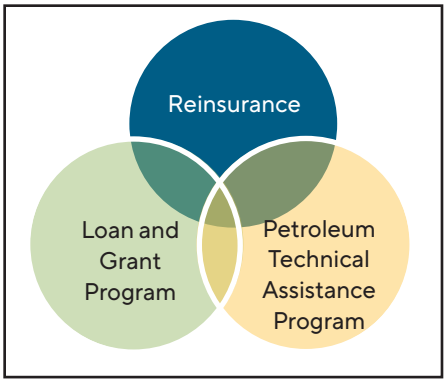


PLIA's Commercial UST Programs work together to enable cleanups and provide financial support to owners and operators.

requirements. To address these needs, PLIA takes a holistic approach by administering financial and technical assistance programs to assist UST owners and operators.

Financing Cleanup

Due to concerns about financial risk, commercial banks are not likely to underwrite loans for properties known to have contamination, but by offering viable funding options to coincide with cleanup plans, owners and operators receive funding for remedies not readily available through these traditional forms of lending. PLIA and its programs are funded from the Pollution Liability Insurance Program Trust Account and the Heating Oil Pollution Liability Trust Account. The Heating Oil Pollution Liability Trust Account is funded from a 1.2 cents per gallon fee paid yearly by heating oil dealers.

The Pollution Liability Insurance Program Trust Account is funded by the Petroleum Parts Tax (PPT). The PPT is an excise tax of 0.3% on the wholesale value of petroleum on its first introduction into the state. This revenue is not unlimited; statutorily when the PLIA's account balance is less than $7.5 million, the tax is reinstated. When the balance reaches $15 million—the statutory cap limit—the tax is suspended.

Under the agency's funding model, PLIA does not impose the PPT constantly and instead is able to save businesses millions of dollars on insurance premiums. In addition to these savings, PLIA sought a financing framework that would allow existing agency funds to be maximized.

A Pilot Program

In 2015, the Washington Legislature directed PLIA to conduct a pilot program before granting the agency authority to implement a loan and grant program. The program's concept was to serve as a financial resource model that would provide financial assistance and guide UST owners and operators through the process of site cleanup. PLIA began the program with $1.8 million and three study sites with aging tanks, contaminated soil, or groundwater, and then documented denial from traditional lending institutions.

At two of the project sites, environental cleanup as well as tank system removals, replacements, and upgrades have been completed. On the third project, investigation of residential vapor intrusion has been completed and vapor extraction is ongoing. Program assistance led directly to the preservation of at least 47 jobs between the two businesses, and it had additional positive impacts on many more jobs in associated businesses.

Based on the success of the pilot program, the 2016 Legislature not only appropriated $10 million for the establishment and operation of the UST Loan and Grant Program, but authorized PLIA to transfer $20 million into the Program's account every biennium as well. The program offers low interest loans and grants to owners and operators of UST systems. A grant or loan may not exceed $2 million and may be used: to upgrade, replace, or permanently close an UST; to install new infrastructure or retrofit existing infrastructure for renewable or alternative energy for motor vehicles at an UST facility; and to install and remove temporary aboveground petroleum storage tank systems.

The UST Loan and Grant Program

UST owners and operators are invited to submit Loan and Grant Program applications from October to March each program year. Applications are reviewed to determine an applicant's eligibility for the program. PLIA partners with the Washington State Department of Health (DOH) to evaluate the applicants' financial resources and administer the financial lending portion of the program. The DOH has existing underwriting capabilities and experience in administering loan and grant programs, while PLIA has the technical expertise and project management experience to efficiently and effectively guide cleanups and infrastructure upgrades to prevent future contamination. PLIA notifies applicants regarding acceptance by May of the program year.

Program Flow

Spring
Apply Online

Summer
Intake Meeting

Fall
Preliminary Planning Assessment (PPA)

Upon Available Program Funds
Construction

The first phase of the program after acceptance is the Preliminary Planning Assessment (PPA) process. At the start of each PPA, PLIA hosts an intake meeting with the applicant and the consultant who will complete data collection and assessment. This ensures that all parties are on the same page at the outset of the process.

A completed PPA provides the crucial groundwork for a successful project. Completing a thorough PPA at the outset of any project ensures accountability and efficiency, and it reduces the time it takes to successfully complete site cleanup. The PPA also provides participants with a better understanding of the site conditions and the costs of cleaning up and/or upgrading the site.

In some cases, data collection during the PPA alerts a participant to previously undiscovered contamination, for which they may be able to access pollution liability insurance funds to help offset project costs. In other cases, data from the PPA reveals that contamination at the site has already been remediated adequately to bring the site to closure with no further action required.

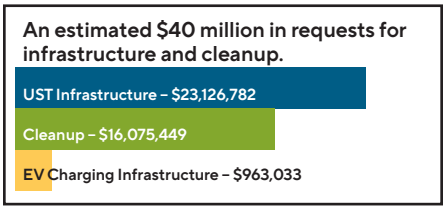
While PLIA provides the funding for the PPAs, the cost is subtracted from the financing limit for each participant. This approach and business model ensures reliable, high-quality data collection and reduces uncertainty in environmental projects over the long-term. PPAs also provide information needed to right-size financing, so as to fit participant needs and successfully bring projects to closure.

UST owners and operators who receive a PPA from PLIA are not guaranteed financing through the Loan and Grant Program. PLIA works with recipients to identify all existing funding sources (e.g., current insurance policies or other financial responsibility mechanisms) to ensure the use of these private funding sources before expending loan and grant funds.

Recipients select an environmental consultant to complete the cleanup work outlined in the PPA. PLIA, the recipient, and the consultant hold a project kickoff meeting to develop shared project expectations, timelines, and milestones. After the meeting, the consultant completes a cleanup and construction plan for review and approval. Once approved by the recipient, the plan is submitted to PLIA for review to ensure it meets program requirements and state cleanup regulations.

With PLIA's approval, the consultant begins work on the project, including submittal of permit applications. PLIA schedules meetings and site visits as necessary throughout the project to ensure oversight of cleanup activities, regulatory compliance, and continued transparency for interested parties. Upon completion of cleanup activities, the consultant submits a plan to PLIA for a Model Toxics Control Act[1] compliance review through PLIA's Petroleum Technical Assistance Program.

Through January 2020, PLIA has received 78 applications, completed 40 PPAs, with 33 more PPAs in process. There are currently five projects working through cleanup and infrastructure upgrades using a total of $7,892,693 in financial offers. The completed PPAs from the 2016-2017 program year, reflect project requests totaling $40,165,264. Due to the high demand for the Loan and Grant Program, PLIA stopped accepting applications for the 2020-2021 program year so that we can better serve current program participants, by prioritizing staff resources in order to move more sites into the cleanup and construction phase.



PLIA's UST Loan and Grant Program serves as a model for addressing future financing needs that arise from environmental cleanup requirements. We welcome opportunities to share our experience with other agencies facing some of the problems we have in Washington. Learn about our program and PLIA's other financial options at *www.plia.wa.gov.* ■

Phi V. Ly, J.D. is PLIA's Legislation, Policy and Communications Manager. Her contact information: phi.ly@plia.wa.gov and (360) 407-0517.

Footnote

1 Washington State's cleanup regulation, Chapter 173.340 WAC.

Redeveloping Petroleum Brownfields

Marketing and Outreach: Is it Worth It?

What Michigan Has Learned

by Carrie Geyer

When state agencies are looking at ways to improve their state environmental cleanup and redevelopment programs, the focus tends to be on technical aspects of the program. Whether the program focuses on leaking underground storage tanks, hazardous materials, or brownfields, program improvement emphasis tends to be on activities such as helping owners and operators respond to releases, increasing the number of site closures, or developing innovative financial assurance programs. These are truly the backbone of state environmental cleanup and redevelopment programs. They are also the things that those of us involved in managing state programs do best.

As scientists, we focus on collecting and analyzing data and solving the technical problems at hand. Lacking the time to develop creative marketing and outreach strategies, we assume the technical work we do will speak for itself. But the importance of marketing and outreach, which is often overlooked and underutilized in our programs, can do wonders for achieving our goals.

If we hope to have a sustainable program that continues to receive support, it is up to us to message both the importance and success of that program. This begins with identifying the outcome you desire from a specific audience. It should not be a surprise that state programs have many audiences to consider, be it the general public, owners/operators, developers, practitioners, or legislators. Communicating the value of our work relies not only on messaging what matters to the specific audience we are targeting, but also on maintaining the trust and relationship we build with that audience. This is not something that happens overnight; it is a long-term commitment.

Developing program materials with a consistent look and feel helps with program recognition and messaging.

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The Michigan brownfield program began this work five years ago. At that time, funding for the program, as well as the hazardous materials cleanup program, was nearing an end. The programs desperately needed support for funding, but in the wake of the Flint water crisis, the state's environmental agency (then DEQ, now EGLE) had lost the public trust. Moving forward with any level of support for the programs would require rebuilding that trust.

Identifying our audience was easy, it was everyone—the general public, businesses, the local units of government, and of course the legislators. Narrowing the focus was more difficult. We determined that the place to start was with our stakeholders. They knew us and our programs and were both our greatest critics and our strongest allies.

A stakeholder workgroup was convened to perform a full evaluation of the brownfield program and its associated legislation and policies. The workgroup included representatives from over 20 organizations, including state and local governments, economic development organizations, professional associations, business associations, and others.

During the 9-month process, workgroup subcommittees tackled various issues that ultimately resulted in a 54-page report that detailed 72 recommendations and proposed legislative changes to four statutes. The recommendations sought to integrate best practices, update policies, eliminate unnecessary rules, consolidate and integrate enabling legislation, and streamline all aspects of program administration. EGLE agreed with and ultimately implemented all recommendations.

The outcome of the stakeholder process was significant program improvements, improved relationships, and the building of support for the program from the people most directly affected—namely, those that use the program.

The next step was to add eight regional brownfield staff who were focused on community outreach and relationship building. These staff meet one-on-one with communities, providing guidance and education regarding the brownfield program and the associated incentives. They help identify sites in the community where the brownfield program could help with the future redevelopment of abandoned and contaminated properties, such as former gas stations. They attend board meetings of local entities (e.g., city councils, economic development authorities, brownfield redevelopment authorities, planning commissions, and downtown development authorities) to answer environmental questions and be an environmental resource to the community.

While outreach staff were building relationships and trust in their assigned regions, tools were being developed to tell our story to various audiences. Press releases and social media posts were used to announce the award of new funding and to highlight interest-

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Project Signs are placed on active sites and point to the RenewMI website.

The Brownfield Flip video series is a tool used to highlight successful projects and the impact they have on a community.

McNeely Says Bye Bye OUST, Hello Garden

by Will Anderson

After 33 years in the tanks program, Steven McNeely recently retired to work in his garden and dramatically increase his hours as uncle Steve to his family and friends. The consummate networker during his years at USEPA, Steve seemed to know just about everyone in the tanks community. He was always in his element at national tanks conferences and brownfield conferences where he held court at the OUST booth and worked the crowd like a master, often times losing his voice by the end of the first day.

Over the years Steve worked on a wide range of important projects and issues, including risk-based corrective action and environmental justice. But cleaning up and redeveloping petroleum brownfields was his true passion. He led OUST's 40-site USTfield pilot project and was always on the lookout for the next collaboration with states, localities, industry, and other feds.

In addition to encouraging states to develop inventories of LUST sites that could be marketed to the private sector, Steven promoted area-wide and corridor approaches to cleanup and redevelopment, areas such as the I-66 initiative in the southwest and the Tamiami Trail in Florida (*http://neiwpcc.org/tanks2010old/presentations/Tuesday%20Presentations/herrington%20petroleumbrownfields%20tuesday.pdf*). He worked with a variety of federal, state, and private sector partners and stakeholders on the Healthfields initiative, which included a focus on redeveloping old gas stations into health clinics, often in underserved areas. See the tool kit from the Agency for Toxic Substances and Disease Registry: *https://www.atsdr.cdc.gov/sites/brownfields/land_reuse_toolkits.html*).

Knowing Steven, it's likely that he's having great fun in retirement...and rightly so! Cheers to you Steven! ■

Will Anderson is Director of OUST's Cleanup and Revitalization Division. He can be contacted at anderson.will@epa.gov. All are invited to stop by the OUST petroleum brownfields website https://www.epa.gov/ust/petroleum-brownfields to find all kinds of interesting and exciting redevelopment resources!

A Message from Carolyn Hoskinson

Director, USEPA's Office of Underground Storage Tanks

Cleaning Up LUST Releases

Lessons Learned from States' Backlog Reduction Strategies

I was extremely pleased to see that as of the end of September 2019, the national underground storage tank (UST) program completed over 490,000 cleanups since our inception—that's an impressive body of work. Collectively we reduced the backlog of releases remaining to be cleaned up to approximately 64,000. We've accomplished an impressive reduction in the backlog since 1995, when there were almost 172,000 releases to be cleaned up. Cleaning up leaking underground storage tank (LUST) releases is what we do, and we are pretty darn good at it!

Of course, our national UST program cleanup number is the result of the amazing ongoing work of states, territories, the District of Columbia, (collectively referred to as states hereafter), and tribes who make it happen one cleanup at a time. I commend states and tribes for their achievements in cleaning up LUST releases. Looking at our September 2019 data, we see that 34 states have completed cleaning up 90 percent or more of their backlog, and eight more states have completed cleaning up 87 percent or more of their backlog.

States have made great progress in reducing their backlogs by implementing a variety of approaches to their cleanup processes. Many states shared their insights and paths to progress with us at the September 2019 Association of State and Territorial Solid Waste Management Officials (ASTSWMO) Leaking Underground Storage Tank Technical Workshop in New Orleans, Louisiana.

To celebrate the success of the national LUST program and illustrate the importance of individual state efforts, for this issue of LUSTLine *I am showcasing some state cleanup stories I heard at the New Orleans workshop. These stories demonstrate how states uniquely addressed their LUST release backlogs and exemplify states' dedication to cleaning up LUST releases.*

States' Lessons Learned

Increasing the number of cleanups completed remains a priority for the national UST program, and some states have effectively implemented dedicated strategies and efforts focused on boosting their number of cleanups completed. And, of course, those efforts add to the number of cleanups completed nationally. USEPA's recent focus on the UST program's cleanup work has raised our program's visibility; it has given us an opportunity to highlight the strategies state UST programs are using as they lead the way in cleaning up LUST releases.

States' strategies encompass focusing on low-threat releases; concentrating on legacy releases, which can be 10 to 20 or more years old; and evaluating which treatment and technologies to use for cleaning up LUST releases. Many states use a combination of strategies tailored to each state's unique cleanup backlog. Below I share stories and lessons learned about actions Alabama, California, Colorado, Minnesota, Oklahoma, and South Carolina are taking to reduce their LUST release backlogs, and I conclude with takeaways about their strategies.

Alabama Accurately Characterizes Old, Challenging Releases

Alabama determined that more accurately characterizing LUST releases was key to advancing the cleanup of their release backlog. In order to make that progress, they characterized 63 old, challenging releases using high resolution site-characterization techniques. They invested approximately $2.5 million in this effort, and although it involved additional costs at an average of approximately $40,000 per cleanup, they have seen positive results.

For Alabama, spending some extra money to get these releases on a path to closure was less expensive than prolonged operation and maintenance costs associated with cleaning up the releases. In one instance, high resolution site characterization identified a significant amount of contamination at a lower depth, giving Alabama valuable information and enabling them to do additional source removal. Without high resolution site characterization, they would have stopped digging and missed a significant amount of free product.

California Closes Thousands of Releases Over 10 Years

How did California close over 9,000 releases since 2009? They implemented several approaches: a low-threat closure policy; a stalled release initiative; and funding programs for releases ineligible for their UST cleanup fund (Emergency, Abandoned and Recalcitrant Fund and Orphan Site Cleanup Fund). These approaches helped California make significant progress in reducing their LUST release backlog. In 2009, California's and USEPA's Region 9 UST programs started looking at the state's backlog of almost 12,000 open LUST releases. California began by examining their back-

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log in depth, noting impediments and sorting releases into categories while evaluating every open release against the state's new low-threat closure policy. This analysis, supported by USEPA Region 9 and a contractor and paid for using California's grant money to procure in-kind services, informed changes to state funding programs and led to a new initiative to specifically address stalled releases.

Begun in 2012, California's most well-known initiative is their low-threat closure policy *(see www.waterboards.ca.gov/ust/lt_cls_plcy.html)*. The goal of the policy was to lead appropriate low-threat releases to closure; this ensured that regulatory agencies could use available money and other resources to clean up the highest threat releases, particularly those without viable responsible parties. The policy underwent external scientific peer review and contained general and media-specific criteria that must be satisfied for the policy to apply. The policy also promoted consistent closure criteria for low-threat releases across California.

The state found that the policy was effective and applying it resulted in California closing over 1,000 releases a year for three consecutive years. From 2012, when the policy was implemented, to 2019, California reduced its backlog of releases by more than 60 percent, from 7,703 to 2,871. The low-threat closure policy replaced a 1992 overarching policy that required cleaning up to background levels, where possible, which led California to realize that releases weren't being closed.

California is also conducting a stalled-release initiative, where the State Water Board and USEPA Region 9 examined the caseload for each of California's nine Regional Water Boards and initially selected 10 to 25 stalled releases managed by each. California held all day meetings with each Regional Water Board to develop action plans for every release. The state then held regular follow-up meetings to ensure plans were implemented and readjusted. As a result, California closed 49 previously stalled LUST releases and began fieldwork at another 55. The initiative expanded from 175 initial cases to more than 250. In addition, California recently enhanced the project by creating a stalled release enforcement team, which included hiring a dedicated attorney and reassigning existing staff to pursue enforcement at stalled petroleum LUST releases where initial efforts have failed to spur progress.

After addressing those releases that met the low-threat closure policy, California turned to other initiatives, such as addressing a lack of money. Legislative changes to the Orphan Site Cleanup Fund eliminated requirements that releases must be brownfields projects in urban areas. As a result, the state can now address releases that are no longer owned by the original owner or operator who caused the release.

Currently, California is implementing process improvements to streamline their Emergency, Abandoned and Recalcitrant (EAR) cleanup program. The state uses EAR to hire contractors who directly clean up the most challenging LUST releases, often after obtaining a warrant. California has not fully used EAR's annual dollar allocation to date, and recently committed to nominating $5 million worth of new EAR projects in 2020. At the same time, California transformed its UST cleanup fund's initial technical case review document into a draft scope of work to reduce back and forth negotiations, rework, and associated wait times for EAR releases. Additionally, the state agreed to modify its GeoTracker database to better track and share information unique to EAR cases.

Colorado Uses SMART and The Treatment Train

Colorado uses adaptive site management, which is a formal and systematic site or project management approach centered on rigorous site planning and a firm understanding of site conditions and uncertainties. Rooted in the sound use of science and technology, this technique encourages continuous re-evaluation and management prioritization of cleanup activities to account for new information and changing conditions. This helps the state target management and resource decisions with the goal of incrementally reducing uncertainties while supporting continued cleanup progress.

Colorado's SMART approach to cleaning up LUST releases encompasses:

- **S**pecific—targeting the treatment area and ensuring technology-specific end points are clearly stated
- **M**easurable—using performance metrics that demonstrate progress toward the end point
- **A**greed upon—ensuring common understanding and acceptance of concerns, goals, objectives, treatment areas, metrics, and end points
- **R**ealistic—demonstrating the ability to achieve objectives
- **T**ime based—targeting a date of remedial end point that is achievable.

Because not all treatments and technologies work for all contaminants in all media, Colorado is combining multiple technologies and products to manage, reduce, and control risks from petroleum UST contamination. Known as a treatment train, this approach includes a plan to use the most effective aspects of multiple technologies or products, or both, in succession to make cleanup progress.

Colorado uses a sequence of remedial technologies based on contaminant concerns and remedial objectives. They first consider starting with a primary technology, such as excavation, which is tailored for higher contaminant mass; then continue with a second treatment technology, such as in situ chemical oxidation; and then possibly a tertiary polishing step using carbon-based injection, to address remaining contaminant mass and eliminate contaminant concerns. The treatment train approach helps Colorado systematically plan and understand the end goal for each stage—from beginning to end—of a cleanup. To ensure everyone

A Message from Carolyn Hoskinson

involved possesses a clear and consistent understanding of a cleanup's remedy, Colorado holds an initial conceptual discussion with UST owners or operators and cleanup consultants prior to initiating the cleanup.

Colorado applied these techniques to LUST releases in their state and, as a result, was able to take a critical, structured, and systematic approach. This includes deciding when monitored natural attenuation is an appropriate remedy and when it is not. To support decisions relating to the use and progress of monitored natural attenuation, the state uses a spreadsheet to calculate expected contaminant reduction. If contamination reduction goals are not being met via monitored natural attenuation, the state may require additional work to clean up a release.

Minnesota's Commitment to Continuous Improvement Reduces the Number of Legacy Releases

As a firm believer in improving processes, fostering innovation, and implementing improvements, Minnesota applied continuous improvement to addressing their legacy LUST releases. They identified challenges, examined their processes, evaluated causes and barriers, and developed solutions. Minnesota identified 230 LUST releases that were more than 10 years old and pre-dated their current policies. Because of this work, they were able to reduce the number of legacy releases to 63 (as of September 2019).

How did they achieve that? Minnesota created a cross-sectional review team, which brought outside eyes and a fresh perspective to this effort. The team began by looking at the 50 oldest LUST releases and grouped them by categories: current policy provides a path to closure; additional assessment or remediation needed; and complex LUST releases. The complex LUST release category included complex geology, sensitive ground or surface water areas, poor remediation performance, and administrative or legal issues. To address their legacy LUST releases, Minnesota developed and used the following array of solutions:

- Created implementation plans and milestones for LUST releases
- Developed new approaches for complex releases, including overhauling their corrective action guidance
- Redistributed the state's workload and provided additional support by spreading the complex LUST releases among their case managers and paying a contractor to add capacity in managing releases.

Oklahoma Reduces Its Inventory of Legacy Releases by 85 Percent

Oklahoma applied four overarching strategies to reduce the number of legacy releases. As a result of those strategies, the number of backlogged releases was 64 in 2019, down from 422 in 2005, a whopping 85 percent reduction. What strategies did Oklahoma use to make that kind of a difference in its inventory of legacy LUST releases?

Oklahoma changed its policies, rules, and statutes. A statutory increase to $2.5 million for the state's fund cap allowed for continued spending on those legacy releases that previously hit the $1.5 million cap; it also allowed Oklahoma to implement current cleanup technologies that didn't exist years or decades ago. Those changes also established explicit timeframes—for work plans, purchase orders, technical reports, claims—for various steps in the cleanup process, with the goal to keep work moving.

Oklahoma changed payment procedures for cases (that is, cost and payment procedures that streamline the overall funding process, clear communication, and dissemination of procedures to the regulated community). The state also worked for and received buy-in from the regulated community, eliminating long negotiations. As a result, allocating money for cleaning up a LUST release is quicker and reimbursing claims is faster; plus, overall, there is quicker decision making on corrective actions needed for all releases, not just legacies.

Since Oklahoma established unit costs structure and added those to their on-line portal in 2013, they are seeing a direct correlation between expedited closure of legacy releases. Oklahoma's database has streamlined the budgeting process and provides real time status of their state-fund budget down to the release level, enabling them to make funding decisions more quickly. Identifying money for future work enables the state to implement and sustain projects over time. Their corrective action portal streamlined and automated technical reporting requirements, resulting in an improved and more efficient process for state staff and external users. This seamless linking of Oklahoma's portal and database means greater ease of use for all.

Oklahoma made technical decisions that modified their cleanup process and overall program. They implemented risk-based corrective action strategies and instituted practices such as searching for sensitive receptors within 660 feet of LUST releases and identifying and screening utility manways within 330 feet. They decided filling data gaps on legacy releases was a priority and then, once data needs were met, applied risk-based corrective action at those releases and closed many of them.

Oklahoma's process also includes identifying exposure pathways of concern and using models to determine the likelihood of exceeding risk-based screening levels. The modelling line of evidence is supported by data from periodic monitoring. Additionally, they work to eliminate receptor pathways. They offered to connect public water supply to residences and pay citizens' water bills for a year in exchange for closing nearby private wells. Engineering controls are used where possible.

Improved processes and technologies have been applied to the state's LUST legacy releases. Their powerful database, launched in 2005, allows for efficient paperless tracking and automated processes. The system includes flags, alerts, and canned reports that identify old, dormant cases; Oklahoma continues to enhance its database. In 2013, a portal to receive on-line sub-

■ *continued on page 10*

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missions from owners and operators as well as cleanup consultants was launched. The portal contains validations and business rules that ensure quality and consistent data, plus it allows for fast submissions of work plans, purchase orders, change orders, technical reports, and claims.

South Carolina Improved Processes to Better Address Backlog of Releases

Because, over the years, South Carolina has struggled to maintain adequate staffing levels and deal with high staff turnover, their project managers were awash in managing many LUST releases. How many? Surprisingly, each manager was working on approximately 110-120 releases. As you might surmise, it is difficult to manage 100 plus releases at one time. As a first step to address this issue, South Carolina evaluated their workload. The evaluation revealed that of the approximately 2,300 LUST releases, 250 were in monitored natural attenuation and 250 were being actively remediated, meaning that the remaining 1,800 releases still needed to be evaluated for monitored natural attenuation or active remediation. As a result of what they discovered, they decided to take a two-pronged approach to low-threat closures.

First, they determined a critical component of their need was more resources, and so they took steps to increase their resources. South Carolina created three hourly positions. Two of the staff performed time-consuming tasks, such as running models to create site-specific cleanup levels, for state LUST project managers; one member of the staff evaluated low-threat closures by reviewing technical files of state-lead releases and recommending next steps. South Carolina also decided an important piece involved approving overtime pay for project managers so they could focus on backlog reduction. In addition, South Carolina's temporary tank fee increase brought more money to the cleanup program and allowed for a focus on low-threat releases.

Want to learn more about cleaning up LUST releases?

USEPA Leaking Underground Storage Tanks Correction Action Resources; *www.epa.gov/ust/leaking-underground-storage-tanks-corrective-action-resources*

NEIWPCC LUST Corrective Action Webinar Archive; *neiwpcc.org/our-programs/underground-storage-tanks/lust-training-resources-corrective-action/webinar-archive-corrective-action/*

Interstate Technology & Regulatory Council; *www.itrcweb.org/;* choose the training tab or documents tab for remediation information

South Carolina also streamlined its evaluation process for closures. They began allowing for one-time approval of multiple groundwater sampling events, rather than previously, when each event required separate approval. They also allowed outside contractors to evaluate low-risk releases. The state focused efforts on releases that were in monitored natural attenuation status; they looked at the releases and triaged them. As of September 2019, South Carolina evaluated 123 low-risk releases in a record time of three to four weeks. Overtime was assigned to project managers who, as a result, were able to review almost 45 percent—or 53—of those releases. Out of the 53 releases, 15 have been issued closures thus far. These improvements are helping South Carolina see some results, with approximately 127 LUST releases closed during the last federal fiscal year.

Takeaways from States' Backlog Reduction Strategies

I am impressed by the wide variety of strategies and approaches Alabama, California, Colorado, Minnesota, Oklahoma, and South Carolina used to reduce the number of LUST releases in their states. Here are some useful takeaways I learned from these states:

- **Goodbye Groundhog Day!** Commit to trying something new and give it sustained attention. The initiatives described above succeeded because managers were willing to try a new approach and support it.
- **Change is good.** As the experts, you know that overcoming some of your challenges might require ambitious changes to legislation, policy, or guidance. Be persistent and do all you can to make those important changes happen.
- **Dig into the data.** Data excavation and in-depth analysis of your caseload and backlog can help unearth and identify old releases, stalled releases, and geographical clusters of releases. Next, identify reasons why these releases aren't moving forward and look for opportunities to address pockets of releases within your caseload through process or guidance changes.
- **Money isn't everything,** but it sure helps. Consider shifting or re-allocating internal resources—such as teams, caseload, and especially stalled releases—and look for more money and partners. Collaborate within your USEPA region and consider using a portion of your grant money to get in-kind assistance and support to review cases. Engage with your state colleagues in the voluntary cleanup or brownfields program and evaluate whether a geographic or corridor approach might work.
- **Old dogs and new tricks.** Dust off your old LUST releases and apply your current guidance, which may help in closing some. Other releases may need a little more data, such as another round of sampling. Newer cleanup technologies and approaches may also be effective at some of your old dog releases.

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- **Evolve.** When one initiative or approach to closing releases has run its course and you reaped all the benefits you can, move on and tackle a different batch of releases with a different approach.

I hope you will consider applying these strategies and others to help you make a meaningful difference in reducing the backlog of LUST cleanups in your state. If these states' stories intrigue you and you want more information, you can access their presentations and others from the September workshop on ASTSWMO's website; *astswmo.org/event/lust-workshop-2019/*, scroll to "Presentations." Also, I'd venture that state staff will gladly share more details about their strategies with you. USEPA's UST website contains state contact information; *www.epa.gov/ust/underground-storage-tank-ust-contacts#states*.

As always, I appreciate your commitment to and continuation of exceptional work to protect our environment from UST releases. I am extremely grateful to all our UST partners—states, tribes, UST facility owners and operators, responsible parties, environmental consultants, contractors, equipment manufacturers, trainers, and insurance and state fund representatives—for their efforts in preventing and cleaning up LUST releases. ■

A Shout Out to Our UST Community

I am thankful each and every day for the community of all who work in the UST field. During this global pandemic, we are each facing personal and professional challenges unlike anything we have encountered before. Gas stations and convenience stores are an essential critical infrastructure; all Americans count on them to stay open in a crisis for food, fuel and other extremely important necessities.

I appreciate all the efforts that so many people are making to ensure that our community stays viable, open, and at the same time continuing our vigilance to properly maintain, operate, and test our equipment as best we can to prevent potential releases to the environment. We are all also carefully considering what work should be paused during this time in our LUST cleanup programs.

I absolutely know that the current health advisories and social distancing make it harder, if not impossible, to perform certain activities that we would be doing under more normal conditions. USEPA and our state partners are developing guidance on compliance impacts that we hope will be available soon. Some states have released guidance already. In the meantime, if you have questions, please don't hesitate to reach out to us.

Stay safe, tell your loved ones how much you care about them, and stay in touch with us!

Carolyn

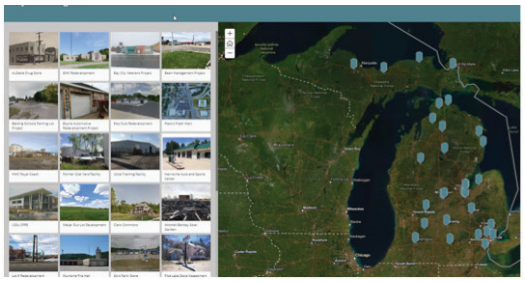
■ **Redeveloping Petroleum Brownfields** *from page 6*

ing project activities or events. Project success stories, videos, and GIS mapping tools that show current and past project locations were created to highlight the reach and impact of the program. Different tools were geared toward different audiences. Program metrics and outcomes—such as private investment and job creation leveraged, the return on the investment of brownfield funds, and the number and location of completed projects throughout the state—were a key part of the storytelling process.

The goal was to show the impact of our program throughout the state and provide a means for various audiences to understand how the program directly affected them. The culmination of these efforts led to a better understanding of EGLE's brownfield program and, ultimately, a new sustainable funding source for both the brownfield program and the hazardous materials cleanup program in Michigan.

Although these efforts were not specifically focused on securing funding for petroleum sites, the concepts are relevant and applicable for the development of a LUST-focused marketing program. In fact, Michigan EGLE's outreach focus did not end when funding was secured and now includes a LUST-focused component. Brownfield staff are developing LUST-focused materials to communicate our program successes and the relationships brownfield staff build are relevant regardless of the type of project we are undertaking. The role of outreach in EGLE's brownfield program remains a priority as we continue to build relationships and trust into the future.

State environmental programs are funded by the taxpayers. As a result, we will always need to justify the effectiveness—if not the very existence—of our programs to them. That is how it should be. Unfortunately, too little emphasis is put on how we tell that story, and as a result, the good work that is accomplished by state environmental cleanup and redevelopment programs often goes unnoticed. It is up to us, as state program managers, to change that consequence. Not doing so is shortsighted. ■



The Brownfield Flip video series is a tool used to highlight successful projects and the impact they have on a community.

Carrie Geyer is the Brownfield Program Manager for the Michigan Department of Environment, Great Lakes, and Energy. She can be contacted at: geyerc1@michigan.gov.

Tennessee's New State-of-the-Art Training Facility

A Partnership with the State's UST Division and Parks

by Mark Braswell

The Tennessee Department of Environment and Conservation's (TDEC) Division of Underground Storage Tanks' (Division) Infrastructure Project aims to replace existing fueling systems with modern fueling equipment at three locations: Montgomery Bell, Pickwick Landing, and Fall Creek Falls State Parks. The first completed design and installation is at Montgomery Bell State Park.

The purpose of this project is to provide a modernized fueling system and inventory management for vehicles and maintenance equipment utilized at Montgomery Bell State Park. The site will also serve as a safe, low traffic location for operational compliance training for Division staff, service contractors, UST equipment vendors, and staff from other agencies around the country. Montgomery Bell State Park's fueling system in middle Tennessee was completed in 2019. The other two fueling facilities are scheduled for future construction.

An additional benefit to Tennessee State Parks is the increased use of park services (i.e., lodging, conference rooms, and restaurant) by third-party vendors in addition to other state/federal agencies that may want to use the unique setup of this training facility to educate and train their own staff.

The costs of running Tennessee State Parks is mostly self-funded so additional revenue streams are critical to the operation and maintenance of the facilities. For example, Purpora Engineering, a Wisconsin-based tank testing, pipeline-testing, and release detection vendor began scheduling regular training events for Petro-Tite® certification in November 2019. They are making plans to hold another certification class in 2020.

USEPA Region 4 UST directors held their fall end-of-year meeting at Montgomery Bell State Park. The Tennessee UST Division staff and contractors provided a tour, conducted tests, and demonstrated training facility features.

Tennessee State Parks is also experiencing enhanced and more accurate electronic fuel management through the Syntech FuelMaster® system. This system provides modern reconciliation of fuel inventories as well as inventory control planning and management features designed to ensure that maintenance operational costs are easily documented. This was previously not possible using their old fueling system.

According to Mike Robertson, Director of Tennessee State Parks Operations, "our partnership with TDEC's Division of Underground Storage Tanks helps us stay in compliance with the state's UST rules and regulations, which can ultimately save us money and protect the park's natural resources. It also helps us generate revenue internally and externally by having a state-of-the-art training facility that vendors and agencies use for that purpose. It's a win/win!"

The Montgomery Bell State Park Training Facility

Cathodic Protection

The facility includes a cathodic protection (CP) training facility that simulates many common real-world testing scenarios designed by Division staff and a NACE-certified corrosion expert. Simulated scenarios can be performed through a centralized control panel. The numerous conditions that can be set allow training to take place in a controlled environment with known conditions, a set-up which was previously not possible without having to visit numerous active service stations.

The testing facility consists of two separate fabricated steel storage tanks, piping, and dispensers. Each tank is cut diagonally in half with a flat plate welded to the bottom of both halves to represent a similar surface area of buried steel UST systems. One portion of the system uses galvanic anodes and the other uses impressed current cathodic protection.

The galvanic tank system was bonded, coated, and equipped with isolation bushings to simulate a prefabricated galvanic tank but with two types of anodes (zinc and magnesium). The impressed current tank system is constructed like a typical bare-steel tank, having two mixed metal oxide anodes, a rectifier, and an anode junction box.

The cathodic protection system was designed with multiple bond wires attached to individual components of each tank system (e.g., tank shell, risers, flex connectors, vents, anodes). Each system is designed with the ability to disconnect the anodes to simulate depleted or inoperable anodes in the system. All bond wires and anode wires are routed to a centralized control panel with on/off switches that provide any number of continuity/isolation and/or test failure scenarios found at typical facilities with steel tanks. Simulations include a typical galvanic system, a galvanic system with impressed current, a typical impressed current system, an impressed current system with an internally lined tank, and various continuity issues or system test failures that may be encountered.

The ultimate goal with this testing center is to educate testers and staff on proper data collection procedures and interpretation, and to have them demonstrate an understanding of various cathodic protection principles. Richard S. Rogers, a NACE CP Specialist instrumental in the design and installation of the CP system attested: "I am extremely happy that a facility like this exists. It provides excellent opportunities for UST Cathodic Protection training. I have performed UST Cathodic Protection work in 48 states, including Hawaii and in Canada, and as far as I know there are no other facilities like this."

Release Detection

The system at Montgomery Bell State Park consists of a Xerxes dual compartment 6,000 gallon double-

walled tank equipped with hydrostatic (brine) interstitial monitoring. The APT flexible plastic piping is equipped with containment sumps at each submersible pump and dispenser location. A Veeder-Root TLS 450 plus automatic tank gauge (ATG) monitors tank brine levels, product levels, and sump sensors for each containment sump. The two-compartment UST system is fully functional and is used for dispensing diesel and gasoline fuel for state park vehicles and equipment.

The Veeder-Root /ATG system provides the following benefits:

- A fuel management system for monitoring fuel inventory and deliveries
- Environmental compliance for UST fuel storage through continuous interstitial monitoring and in-tank leak detection
- Remote monitoring of the site on a 24-hour basis and electronic notification of alarms and reports to facility staff and certified operators
- Forward-looking technology for training inspectors and service providers into the foreseeable future.

The system consists of magnetostrictive probes installed in each tank that is capable of monitoring product and water-level measurements to within 1/1000th of an inch. The continuous in-tank leak detection and continuous interstitial monitoring of the brine-filled tank interstice provide training opportunities for technology likely to be used at UST facilities more frequently in the future, as well as offer maximum protection of natural resources and the environment within and around the park.

Mobile Training Incident and Investigation Unit

The Division has also equipped a mobile trailer with tools and test equipment that can be mobilized quickly in the event of an emergency, or used to conduct testing and training at any location throughout the state.

The Operational Compliance Training and Incident Investigation Unit was designed in preparation for the implementation date of Tennessee's UST Rule changes effective October 13, 2018 (generally new facilities) and October 13, 2021 (generally existing facilities). Division staff can mobilize for onsite training and testing demonstrations to ensure tank owners and service providers are ready to meet these new requirements.

The Mobile Field Office unit allows response capability for:

- Facility compliance assistance
- Onsite facility training
- Service provider training at Tennessee State Park UST training facilities
- Release investigations
- Disaster response
- Subsurface UST investigation at abandoned facilities
- UST tank/line tightness testing by certified Division field staff.

Division staff can now provide onsite regulatory technical assistance with operational testing equipment including:

- Mesa 2-D non-volumetric
- Alert 8200 underfill and ullage tank testing methods
- Purpora Engineering Petro-Tite line tester
- Hydrostatic testing of Secondary Containment Sumps.

Corrective Action System Storage

During the summer of 2018, the Division was in the process of renewing the contract to manufacture and refurbish state-owned Corrective Action Systems (CAS). At that time, unused CAS were being shipped to and stored at the CAS manufacturer's (MK Environmental, Inc.) factory located at their Columbia, Louisiana factory. The CAS were removed from where they were last in operation and then placed into storage in Louisiana for possible later refurbishment and deployment.

With the contract awardee unknown at that time, the Division decided to refurbish and relocate approximately half of the CAS that was in storage to a single, centrally located area in middle-Tennessee. Because of the dwindling number of contamination cases requiring a CAS, the Division auctioned the other half of CAS in storage. A requirement of the auction was for the winning bidder to pick up the CAS at their own cost.

The Division relocated the refurbished CAS to Montgomery Bell State Park, within close proximity of Interstate I-40 which traverses the entire state. An underutilized 1.0-acre lot of the park, next to the maintenance facility used for fallen trees and mulch storage, was converted from a muddy, dead-tree laden area to a gravel-topped level storage area for the state-owned CAS. The regional state Corrective Action Contractor (CAC) began construction of the storage area during November 2018 and was completed during early-January 2019. The first shipment of refurbished CAS arrived the first week of January 2019. The area is also used to store other equipment used with some CAS (e.g., product tanks, catalytic oxidizers, rotary-phase converters). The storage area also provides a centrally located point for rapid deployment of already refurbished CAS to sites as needed.

The ultimate goal with this testing center is to educate testers and staff on proper data collection procedures and interpretation, and to have them demonstrate an understanding of various cathodic protection principles.

The Division saved approximately $258,750 to refurbish and relocate half of the CAS in storage under the previous contract, which was renewed during April 2019. Division staff coordinate with the CAS manufacturer and state CACs to arrange and oversee CAS deliveries and deployments to and from the park. They are mobilized in groups to optimize the use of forklift rentals and transportation contractors. The CAS manufacturer also provides CAS Specialist (operator) training for CACs and Division staff at the park.

A park ranger's residence is located at the gate of the storage area and, along with other park personnel, provides a secure and secluded location for CAS storage. Compared to other high-priced real-estate options in the Nashville area, this CAS storage area offers a significant savings and optimum security from vandalism/theft.

Looking Forward

Phase two of this project includes the design and installation of training

■ *continued on page 14*

■ TN State-of-the-Art Training Facility *from page 13*

facilities at Pickwick Landing and Fall Creek Falls State Parks. Design features at these park facilities will be modified to include different and unique release detection scenarios and showcase different types of equipment commonly found at UST facilities. Highlights of some of the features include:

- Release detection equipment from various manufacturers
- Tank and piping equipment from various steel and fiberglass manufacturers
- Single- and double-walled secondary containment systems
- Spill and overfill prevention devices.

The Division expects to have these projects completed by March 2021. The centralized locations of the three training facilities in Tennessee will allow convenient access for service providers and inspectors in Tennessee as well as the Southeast and beyond. Stan Boyd, Division Director, notes that: "While these training facilities were built for the benefit of the Division and Tennessee State Parks, we invite vendors and other agencies to take advantage of these facilities as well. Protecting the environmental and conserving our natural resources is important to all of us." ■

Mark Braswell is Deputy Director of Field Office Operations for the Tennessee Division of Underground Storage Tanks. He can be contacted at: Mark.Braswell@tn.gov

Dale Utke with Purpora Engineering instructing students for line tightness testing technician certification

National UST and LUST Facilities and Vulnerabilities

by Alex Hall and Fran Kremer

Where there are people, there are tanks; where there are tanks, there may be leaking tanks. The operative word is where. The where establishes the relationship between the cause and the effect. Below we will explore some of these spatial relationships made possible by a new national database of LUST and USTs, as well as assess environmental vulnerabilities of the UST/LUST universe that can affect human health and the environment.

What About the USTs and LUSTs?

From the perspective of a federal regulatory agency, leaking underground storage tanks (LUSTs) are an anomaly in terms of available data. For example, we know the locations of every Superfund site in the country, every permitted water discharge, and every permitted hazardous waste site. We've mapped the locations of these sites and in doing so, can answer some fundamental questions on a national scale. These include: How many people live near Superfund sites? Are there any public water intakes downstream from a permitted water discharge? and, Are there any drinking wells near hazardous waste sites? These are important questions that can only be answered with good spatial data. Until recently, there was no comprehensive national map of LUSTs and USTs.

USEPA's Office of Research and Development (ORD) and Office of Underground Storage Tanks (OUST), along with the Association of State and Territorial Solid Waste Management Officials (ASTSWMO), have compiled state-sourced LUST and UST data into a national map describing UST and LUST attributes and their locations. For the first time we can now visualize the spatial dimension of the of UST and LUST universe.

Figures 1-3 depict the spatial dependency of USTs, LUSTs, and population, respectively. Figure 1 shows the number of active and historic USTs per 10 square miles (excluding California), Figure 2 shows the number of active and historic LUSTs per 10 square miles, and Figure 3 shows where people live. The spatial distribution and density of these three datasets are very similar. This tight relationship allows us to explore where population will be increasing in the future and con-

comitantly, where tanks will be constructed/where leaks might occur in the future, based on projected population changes.

Figure 4 shows projected trends in population growth from 2019 to 2024. Coastal areas, specifically areas prone to hurricanes and other flood inundation, will experience population growth over the next half decade, if not beyond. The potential for more flooding in these high growth areas can be problematic for tank infrastructure.

Vulnerability

Hurricane Harvey offers an example of the vulnerability of UST infrastructure to flooding and demonstrates the value of a national UST and LUST database to quantify impacts. Data from the Dartmouth Flood Observatory estimated Hurricane Harvey flooded 229 million square miles of land from Corpus Christy, Texas to Layfette, Louisiana.

Using the national UST/LUST database, we estimate these floodwaters inundated 29 active LUST sites, 535 UST facilities, and 1,152 USTs—totaling 14 million gallons of fuel when at capacity. The median age of these inundated tanks was 22 years old. Tank flooding can cause product loss, increased microbially induced corrosion from water infiltration, and even tank dislodging.

While we are expecting increased development of tank infrastructure in coastal communities, inland flooding is also a major issue. The "Great Flood of 2019" in Nebraska, Missouri, South Dakota, Iowa, and Kansas was a wake-up call to the increasing risk of inland flooding from extreme weather events. As a result, USEPA investigated the number of vulnerable tank assets within the agency's estimated 100-year floodplain for the conterminous United States.

Using the national UST dataset, we estimate 33,000 active USTs are within these floodplains, totaling 363 million gallons of storage capacity. Going forward, USEPA along with the states and federal partners will be developing an advanced flood warning system to notify states and owner/operators of at-risk tanks in impending floods.

Finally, having this spatial database allows us to broadly assess risk (where are populations in relation to USTs/LUSTs, and where are public drink-

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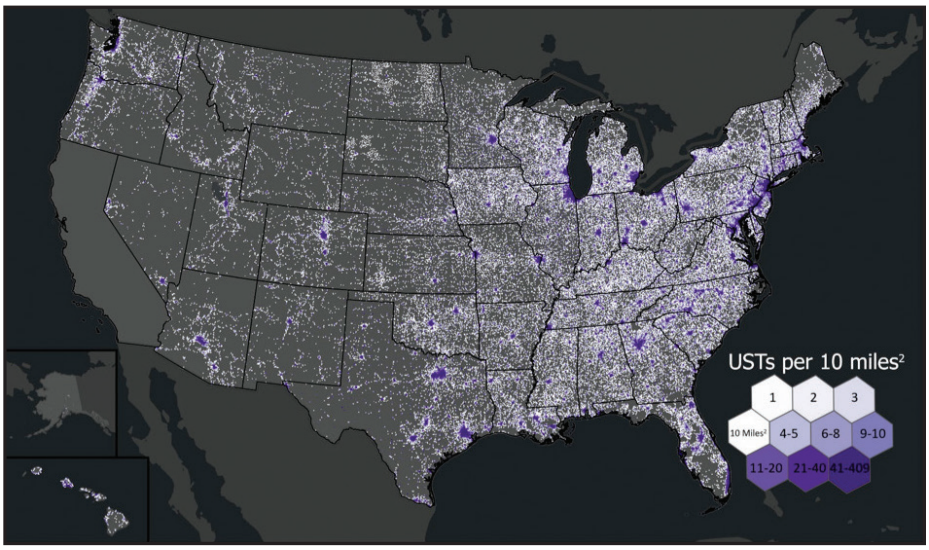

Figure 1. *Underground storage tanks (historic and current) per 10 square miles.*

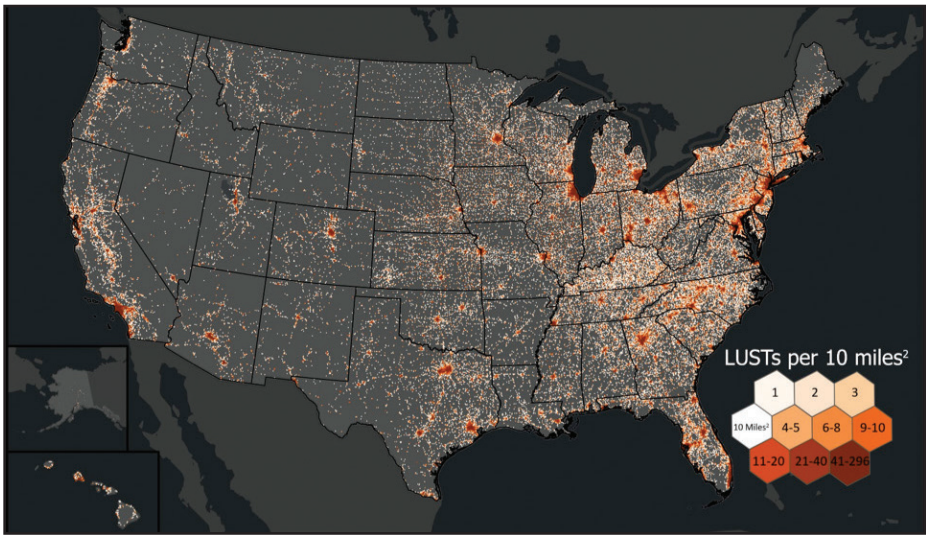

Figure 2. *Leaking underground storage tanks (historic and active) per 10 square miles.*

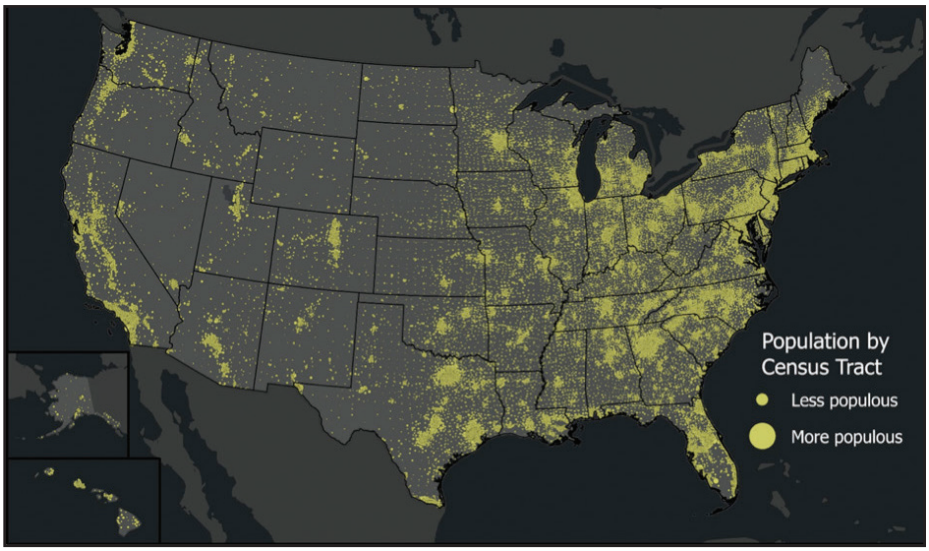

Figure 3. *US Population by Census block centroid.*

Tank-nically Speaking

by Marcel Moreau

Marcel Moreau is a nationally recognized petroleum storage specialist whose column, ***Tank-nically Speaking****, is a regular feature of* LUSTLine. *As always, we welcome your comments and questions. If there are technical issues that you would like to have Marcel discuss, let him know at* **marcel.moreau@juno.com.**

Will Fiberglass Rise to a New Occasion?

UST technology has seen major changes in the last half century. Bare steel tanks have become double-walled and are protected against corrosion or made of non-corrosive materials. Galvanized steel piping has become secondarily contained and made of fiberglass or flexible materials. Dispensers have progressed from mechanical marvels that could calculate the cost of fractional gallons of fuel priced at fractional cents per gallon, to electronic wonders that accept payment and attempt to lure you into the store with enticing video displays.

But one aspect of the UST system that has remained unchanged is the tank riser, that lowly but indispensable pipe that extends from the tank top to grade. Consisting of a short length of four-inch diameter, schedule 40 steel pipe threaded at both ends, the multipurpose tank riser originally served as a means of delivering fuel into a tank. Over time, it has evolved to also serve as a mounting point for a submersible pump, a vapor recovery port, an access opening for extractor fittings, an ATG probe holder, and a secondary containment sensor access port. The steel tank riser has served admirably in all of these roles. It has remained structurally sound, relatively unscathed by corrosion, and compatible with motor fuels... until now.

In the last decade, internal corrosion in the vapor space of diesel fuel storage tanks has become a significant problem.[1] This corrosion problem extends to the inside of tank risers, where corrosion products can reduce the effective diameter of the inside of the riser, complicating maintenance tasks such as removing drop tubes, ATG probes, and submersible pumps. Corrosion between aluminum drop tubes and steel fill risers is also a significant issue in gasoline tanks. Regulatory requirements for periodic inspection and testing of overfill and leak detection equipment, which is often accessed via tank risers, has increased the visibility and significance of this corrosion problem.

So What Can Be Done?

The root cause of the corrosion remains under investigation, so a solution to this problem is not imminent. While good fuel management practices can help reduce vapor-space corrosion in diesel tanks, a reliable method for completely preventing the corrosion seems out of reach, at least for now. That said, an approach to combatting corrosion that has served the tank and piping industries well over the last half century seems attractive: why not use non-corrosive material for the riser?

At first blush, this seems an obvious solution. Fiberglass pipe has a long track record in the petroleum industry for being impervious to corrosion. I have personally examined fiberglass piping installed in a very corrosive marine environment that was untouched by corrosion 40 years after it was installed. But there are other issues. In addition to being non-corrosive, fiberglass has some very different material properties than steel:

Steel is ductile. This means it can stretch or bend a little when subjected to significant forces. Fiberglass is brittle. This means it fractures or breaks when subjected to significant forces.

While both steel and fiberglass can resist substantial pressure if it is spread out over a wide area (think pressure due to air or liquid inside the pipe), they differ in resistance to point loads, when the pressure is applied over a small area. You can't drive a nail through steel pipe, but you can drive a nail through fiberglass pipe. This has been demonstrated many times over by grade stakes being driven through installed fiberglass pipe.

Steel piping conducts electricity, while fiberglass does not. This is a concern because of the static charges that can be generated by the high velocity of the fuel flowing through the fill riser when fuel is delivered.

So, what physical properties are important in a riser pipe? Does brittleness matter? Is lack of resistance to point loads a significant concern? Does electrical conductivity matter? And how do you connect a fiberglass pipe to the steel fitting on the top of the tank? And the ultimate question: How would fiberglass risers perform in the real world?

These are not idle questions. A major manufacturer has in fact developed a special fiberglass pipe intended specifically for use as riser pipe. The pipe has thicker walls than the two-inch diameter fiberglass piping that has been a staple of UST installations for many years. A four-inch threaded fiberglass adapter screws into the four-inch bung on the tank, and the pipe is glued into the adapter. The adapter is also used at the top of the riser pipe so that a spill bucket, ATG probe cap, or other fitting can be screwed onto the top of the fiberglass riser.

This is the same approach that has been used for many years to connect two-inch diameter fiberglass pipe to steel fittings. Testing by the manufacturer indicates that the four-inch diameter fiberglass adapter can be tightened with a force of up to 500 ft-lbs. This means that if you had a wrench that was one foot long, you could pull on that wrench with a force of 500 pounds without damaging the fitting, as long as you used an appropriate wrench, such as a strap wrench.

This is substantially more than the force required to tighten a spill bucket, and so provides some assurance that routine tightening will not damage the fiberglass adapter. This does not take into account the 'gorilla' installer who feels it is necessary to tighten a threaded joint beyond what is reasonably required.

But tightening force alone does not determine whether a threaded joint will be leak-free. Steel riser connections to the tank top are a not uncommon source of water entry into tanks. The brittle nature of fiberglass threads is not likely to improve this situation. Careful assembly and liberal amounts of appropriate pipe dope will be required to make four-inch diameter fiberglass to steel threaded connections leak free.

What Does the Industry Have to Say?

The manufacturer has obtained a letter from Underwriters Laboratories (UL) stating that the riser pipe is "encompassed" by the listing for traditional fiberglass pipe and is thus a UL listed product.[2] The lack of a separate UL listing for the fiberglass riser pipe implies to me that UL did not conduct testing specifically intended to evaluate the performance of the pipe when installed as a tank riser.

Given industry experience with early versions of flexible piping.[3] I am wary of manufacturer claims and UL listings. Neither of these lines of evidence has proven to be a guarantee of satisfactory performance of a new product in the field.

A significant obstacle to adoption of this pipe in the marketplace is Petroleum Equipment Institute's (PEI) RP100, *Recommended Practices for Installation of Underground Liquid Storage Systems*. RP100 is a well-regarded and widely utilized guidance document on what materials to use and how to install the various below-grade components of underground storage systems. Section 10.13 of the current edition of RP100, published in 2017, states, "Do not use nonmetallic piping for fill risers." PEI's RP100 Committee is reviewing the manufacturer's request to change this language. See Rick Long's *Field Notes* article in this issue of *LUSTLine* on page 18 for more information about this review. In a recent issue of PEI's newsletter, PEI requested that any members with installation experience or other knowledge of fiberglass risers share their perspectives, whether for or against this new technology.

In many areas of the country, RP100 provides guidance but has not been adopted as enforceable regulation. As a result, some UST owners have already begun to utilize FRP risers. Time will tell how these installations perform.

As of this writing, the RP100 Committee has not decided whether RP100 should accept fiberglass as an appropriate material for riser piping. I know you'll be sitting on the edge of your seats in breathless anticipation of the RP100 Committee decision, but you'll have to wait for the next edition of *LUSTLine* (or the next edition of RP100) to learn of their verdict. ■

PEI requested that any members with installation experience or other knowledge of fiberglass risers share their perspectives, whether for or against this new technology.

Footnotes

1 For more information on this problem see the USEPA web page: *https://www.epa.gov/ust/emerging-fuels-and-underground-storage-tanks-usts#submersible*

2 Red Thread™ IIA Riser Pipe Testing and Technical Guidance," National Oilwell Varco, Fiber Glass Systems, March 2019.

3 See, for example, "Flexible Piping: Still Failing After All These Years," *LUSTline* Bulletin #82, June 2017

■ UST and LUST Facilities and Vulnerabilities *from page 14*

ing water sources or private domestic wells?). Accidental releases of petroleum products from USTs is one of the most common causes of groundwater contamination. Fifteen percent of the country gets their drinking water from private domestic wells—roughly 50 million people.

Using the national database, we estimate that approximately ten percent of the population, or 30,000,000 people, live within 1500 feet of an active LUST site. This national database of LUST and UST sites allows us to explore the spatial relationship between potential sources of contamination at a national level and potential impacts to public health. Additionally, it will provide states and local communities needed geospatial information to assist in triaging sites to prioritize cleanup. An application with this data and visualizations will be available later this year. ■

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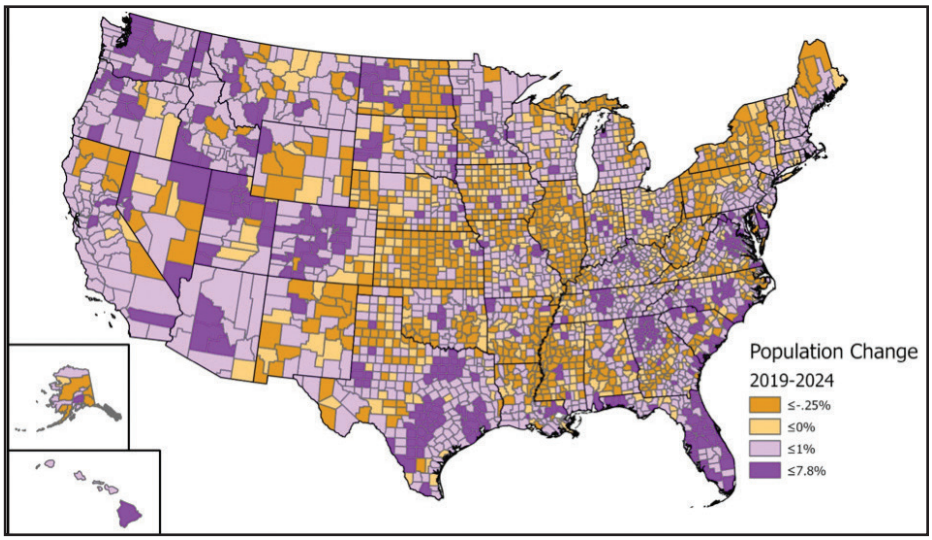

Figure 4. *Projected population change, 2019-2024 (source: Esri).*

Field Notes

from Rick Long, Executive Vice President,Petroleum Equipment Institute (PEI)

Tuning Up PEI's Recommended Practice Process

As regular readers of LUSTLine *know, PEI recommended practices have promoted safe, effective, and environmentally-friendly installation, maintenance, testing, and inspection procedures for fuel-handling equipment for more than 30 years.*

Widely used by regulatory authorities and industry professionals alike, the documents have proven their worth. And recent changes in the process by which PEI reviews and revises our recommended practices promise to make them even more timely, more responsive, and more helpful in the years ahead.

The Basics

PEI recommended practices now address 17 of the biggest operational issues in the industry:

- RP100: Installation of underground storage systems (USTs)
- RP200: Installation of aboveground storage systems (ASTs)
- RP300: Vapor recovery systems
- RP400: Testing electrical continuity
- RP500: Design and maintenance of motor fuel dispensing equipment
- RP600: AST overfill prevention
- RP700: Design and maintenance of lube systems
- RP800: Bulk storage plants
- RP900: UST inspection and maintenance
- RP1000: Marina fueling systems
- RP1100: Storage and dispensing of diesel exhaust fluid
- RP1200: Testing spill, overfill, lead detection and secondary containment
- RP1300: Design, installation, service, and repair of aviation fueling systems
- RP1400: Design and installation of emergency generator fueling systems
- RP1500: Design, installation, operation, and maintenance of CNG fueling facilities
- RP1600: Design, construction, installation, operation, and maintenance of LNG fueling facilities (coming soon)
- RP1700: Closure and removal of UST and shop-fabricated AST systems

Each document is drafted by a committee of equipment suppliers, contractors, tank owners, regulators, and other subject matter experts. Public comment periods produce additional ideas that greatly improve the original drafts. And regular revisions—typically, every five years—have allowed the incorporation of new technologies and practices that have emerged since the previous edition.

What's New?

The traditional five-year review cycle has worked pretty well. Five years is enough time for the industry to develop new practices that are worthy of recommendation. It's also frequent enough to ensure that the documents stay reasonably current.

But progress doesn't always wait five years. In fact, technological advancements in the fuel-handling equipment industry are accelerating. As a result, it's becoming much more likely that an important development will crop up shortly after publication of a recommended practice. Something that promises to improve the results, reduce the cost or increase the efficiency of the installation, maintenance, service, testing, or inspection procedures in a PEI document, may be needed.

That's why PEI has decided to launch more rapid recommended practice revisions when warranted. The five-year review cycle will still be the norm, but when the industry needs faster action, we will make it happen.

One big reason we can do this? We have have the options to print-on-demand and provide electronic document delivery. For decades, PEI printed several thousand copies of each new recommended practice edition and then sold out of that inventory for the next five years. It wasn't economical to contemplate, much less undertake, revisions more frequently than once every five years. Any change to a document, even a small one, would require us to throw out the old inventory and reprint the new version.

Today, digital printing and electronic document delivery allow PEI to be much more nimble. We don't keep thousands of copies of each document on hand for future fulfillment needs. Documents are printed (whether on paper or digitally) only as orders are received. Changes to a document can be incorporated and made available to the industry almost instantly.

To facilitate speedier revisions, PEI now accepts comments on our recommended practices 24 hours a day, seven days a week. We haven't—and won't—abandon the formal every-five-years public comment period. But anyone can submit a comment at any time. If there's a need to act quickly, our recommended practice committees can do so.

Since mid-2019, two committees have initiated accelerated review:

Field Notes

Low-Level Sump Testing. The 2017 edition of RP1200: Testing and Verification of Spill, Overfill, Leak Detection and Secondary Containment Equipment at UST Facilities recommended a sump integrity test that required filling the sump with water to a depth of at least 4 inches above the highest penetration point or sidewall seam. At the time of publication, the RP1200-17 method was the only hydrostatic method deemed sufficient by USEPA to meet the 2015 federal requirement that containment sumps used for interstitial monitoring be tested at least once every three years.

However, in November 2017 (after publication of RP1200-17), USEPA outlined a package of requirements for a low-liquid-level sump test that could meet its sump testing requirements. In June 2018, USEPA issued additional guidance for conducting a low-liquid-level test. USEPA did not, however, describe precisely how the test should be conducted.

In May 2019, PEI's RP1200 committee decided to step in. Proposed amendments for conducting low-liquid-level sump tests were submitted to the industry for public comment, and in Oct. 2019—three years before the next regularly scheduled revision of the document—RP1200 was amended to incorporate the new test procedures.

Non-Metallic Tank Risers. The 2017 edition of PEI/RP100: Recommended Practices for Installation of Underground Liquid Storage Systems does not recommend the use of non-metallic tank risers. However, in 2018 manufacturers began developing new heavy-duty fiberglass reinforced plastic (FRP) tank riser piping and fittings to counteract the corrosion increasingly affecting metallic risers. Several states that had incorporated RP100's procedures into their regulations contacted PEI to see whether we intended to recommend the new FRP products.

At the time of this writing, the RP100 committee is soliciting initial public comments on whether RP100 should recommend this new generation of non-metallic risers.

Whether the RP100 committee decides to amend the document or not, the willingness to consider such a change two years before the regularly scheduled review is a testament to the association's new willingness to respond quickly when needed.

Where to Draw the Line?

PEI's intent is not to open all 17 recommended practices to a constant cycle of revisions. Situations in which we will accelerate the five-year review cycle will be rare.

The RP1200 and RP100 examples above illustrate the kind of factors that might lead to this kind of extraordinary action:

1. Regulatory requests. USEPA's decision to approve low-liquid-level sump tests, without providing procedures for conducting the tests, was a call to action for PEI's RP1200 committee. The RP100 committee reached the same conclusion when state regulators requested an opinion on the new heavy-duty FRP risers.
2. Inconsistency. Without uniform standards for conducting low-liquid level sump tests, U.S. tank owners and operators could have faced a patchwork of conflicting procedures. The RP1200 committee's decision to act replaced confusion with consistency.
3. Urgent situations. Tank owners need to know whether use of the new FRP tank risers will violate their state's regulations. Without knowing whether the RP100 committee would recommend the product, many state regulators were unwilling to decide.

You can continue to expect revisions to PEI's recommended practices every five years or so. But in special cases, PEI is now ready, willing. and able to act more quickly than that. ■

National Work Group on Leak Detection Evaluations

FAQs from the NWGLDE

...All you ever wanted to know about leak detection but were afraid to ask.

Statistical Inventory Reconciliation (SIR)—the Rules, the Listing, the Site Report—Revisited

The NWGLDE has been asked to correct its article "Statistical Inventory Reconciliation (SIR)—the Rules, the Listing, and the Site Report," published in *LUSTLine*, Bulletin 83, December 2017. The leak threshold used to determine whether a given SIR analysis passes or fails described in the December 2017 article is not consistent with USEPA's interpretation of how the leak threshold should be used. (See the sidebar if you need a refresher on SIR leak detection terminology.)

With regard to SIR, the 2015 revised federal UST regulation at 40 CFR 280.43(h)(3) states "Use a [leak] threshold that does not exceed one-half the minimum detectible leak rate." In our December 2017 article, we described using the leak threshold calculated by the SIR vendor for a given data set as the number to use to determine whether the result for the data set was "pass" or "fail." However, the USEPA's Office of Underground Storage Tanks (OUST) has confirmed that the leak threshold to be used in a SIR analysis is a set rate of 0.1 gph. This set leak threshold is based on USEPA's long-standing performance standard of 0.2 gph. The leak threshold most commonly used to detect leaks of 0.2 gph is fixed at 0.1 gph.

Using a leak threshold calculated from each 30-day data set versus a set leak threshold of 0.1 gph may seem like a small change, but it can produce a significant difference in the results of the SIR analysis. For very good quality inventory data sets, declaring a leak based on a leak threshold of one-half the calculated minimum detectible leak rate (MDLR) could result in some UST system owners and operators having to report leaks well below the regulatory performance standard of 0.2 gph. An example of this difference is provided below in the section "The Federal Performance Standard and the Term Minimum Detectible Leak Rate." Although this approach would arguably provide better environmental protection through the investigation of smaller potential leaks, it sets up a situation where SIR methods would be held to a more stringent performance standard than other 30-day release detection monitoring methods allowed by the federal UST regulation.

To avoid confusing this issue further by simply listing changes to be applied to the December 2017 article, NWGLDE has rewritten the December 2017 article below to be consistent with USEPA's use of a set leak threshold of 0.1 gph. We also took the opportunity to clarify some of the other points made in the article.

SIR–An Update of Our December 2017 Article

The USEPA's 2015 changes to the underground storage tank (UST) rules included new language regarding statistical inventory reconciliation (SIR). What does this mean for your site?

The Rules SIR Analyses Must Follow

The 2015 regulation included SIR as a specific release detection method for the first time. Under the previous 1988 UST rules, SIR was regulated under the general "other methods" option at then 40 CFR 280.43(h). The 2015 federal UST regulation established the following:

1. The performance standard of SIR methods used for 30-day monitoring is that the method must detect a leak rate of at least 0.2 gallon per hour (gph) with a 95 percent probability of detection and no more than a 5 percent probability of false alarm. (40 CFR 280.40(a)(4) and 40 CFR 280.43(h)(2))
2. SIR methods are similar to inventory control methods and rule requirements associated with inventory control apply to SIR. (40 CFR 280.40(h))
3. Each SIR method must perform a quantitative analysis. This means that the SIR method must calculate a leak rate based on the inventory data submitted, not simply indicate a result of "pass" or "fail." (40 CFR 280.43(h)(1))
4. To meet the performance standard of detecting 0.2 gph leaks, the SIR method must "use a [leak] threshold that does not exceed one-half the minimum detectible leak rate" in determining whether a release has occurred or not. This last requirement is the one we will focus on in this article. (40 CFR 280.43(h)(3))

The NWGLDE Listing

In order to meet listing requirements for the NWGLDE, vendors of SIR release detection must document that their method meets the required federal performance standard for 30-day monitoring (i.e., can detect a 0.2 gph leak with a 95 percent probability of detection and no more than a 5 percent probability of false alarm), by having their method or equipment evaluated by a third-party. NWGLDE maintains a list of SIR vendors who have met this requirement. The listing for each method summarizes the third-party evaluation, the method, the leak threshold, the performance parameters, and the limiting criteria, as applicable.

The Federal Performance Standard and the Term "Minimum Detectible

FAQs from NWGLDE

SIR - Leak Detection Terminology

Minimum Detectable Leak Rate (MDLR)	The leak rate that determines the boundary between "compliance" and "noncompliance." For a given SIR data set, the MDLR is the smallest leak rate that can be detected with 95% accuracy. To be in compliance with regulations, the MDL cannot exceed the performance standard set in the rule. In other words, to meet regulatory requirements, the MDLR for each SIR data set must be less than or equal to 0.2 gph. If the MDL for a given data set is greater than 0.2 gph, it does not mean that a leak is present. It means that the data quality standard set in the rule has not been met and therefore leak detection requirements have not been met.
Leak Threshold	The leak rate that determines the boundary between "pass" and "fail." If the leak rate calculated for a given set of inventory data is equal to or greater than the leak threshold, the result of the analysis is "fail." While SIR vendors can calculate a leak threshold for each data set they analyze, the USEPA is only requiring that the standard 0.1 gph threshold be used to determine whether a set of inventory data is pass or fail.
Performance Standard	The size leak that must be reliably detected according to the federal rule. For SIR, the performance standard is that a 0.2 gallon per hour leak must be detected 95% of the time with a false alarm rate of no more than 5%.

Leak Rate"

To meet the federal performance standard the vendor of a leak detection method must demonstrate that the method can reliably detect leaks as small as 0.2 gph. For vendors of hardware-based leak detection methods such as automatic tank gauges, this accuracy is determined by the measurement accuracy of the tank-gauge probe. Because probes are made in a factory, the accuracy of all tank-gauge probes is very similar. A challenge for SIR vendors is that the accuracy of raw inventory data is subject to human foibles and can vary wildly from tank owner to tank owner. To deal with this variability, SIR vendors must establish that the quality of each monthly inventory data set submitted is sufficient to reliably detect a 0.2 gph leak if a leak of this magnitude were present.

The smallest leak rate that can reliably be detected in a given inventory data set is known as the minimum detectable leak rate (MDLR). SIR vendors should report the MDLR for each data set analyzed in order to show that the regulatory performance standard of detecting 0.2 gph leaks has been met. This MDLR will vary from month to month because it is affected by the throughput, the accuracy of the data, the consistency and range of the data, among other factors.

Confusion arises because the "minimum detectible leak rate" USEPA cites in the 2015 rules at 40 CFR 280.43(h)(3) refers to the 0.2 gph performance standard required for SIR methods described in 40 CFR 280.43(h)(2) and not the MDLR described in the previous paragraph of this article.

In other words, the term "minimum detectible leak rate" in the 2015 rules refers to the performance standard of 0.2 gph, and was not intended to apply to each inventory data set gathered in a 30-day monitoring period. Applying a leak threshold of one-half the minimum detectible leak rate for each inventory data set could lead to "failed" SIR analyses for leak rates that are below the established federal performance standard of 0.2 gph.

For example, if the MDLR for an inventory data set were 0.15 gph, the leak threshold calculated specifically for this data set would be 0.075 gph (0.15 / 2 = 0.075). If the calculated leak rate for this data set were 0.8 gph, the result of the analysis would be "fail" because the calculated leak rate of 0.8 gph is greater than the leak threshold of 0.075 gph. This would trigger the requirements for investigating a possible leak, even though the magnitude of the leak indicated in this data set (0.15 gph) is less than the performance standard of 0.2 gph.

Although there is no acceptable leak rate, USEPA wishes to create a level playing field among all leak detection methods. As a result, SIR vendors may use the standard 0.1 gph threshold rather than a threshold calculated for each set of inventory data. The SIR result for the data set described in the previous paragraph would then be "pass" because the calculated leak rate of 0.8 gph is less than the standard leak threshold of 0.1 gph.

■ *continued on page 22*

STATISTICAL INVENTORY RECONCILIATION TEST METHOD (QUANTITATIVE)

Certification	Leak rate of 0.2 gph with PD > 99.9% and PFA = 0.0%. Leak rate of 0.1 gph with PD > 99.0% and PFA < 1.0%.
Leak Threshold	0.1 gph for leak rate of 0.2 gph. 0.05 gph for leak rate of 0.1 gph. A tank system should not be declared tight if the test result indicates a loss or gain that equals or exceeds this threshold. Gains (water ingress) are analyzed and evaluated on an individual basis.

Table 1. *This is a portion of the NWGLDE listing for a SIR method. Go to www.nwglde.org for all the National Work Group listings.*

FAQs from NWGLDE... continued from page 21

The SIR Site Report

When you look at a site report, you may see several leak-related numbers. For example, the report may include a leak threshold, a calculated leak rate, and a minimum detectable leak rate. How do you determine the pass/fail/inconclusive status of an UST from these numbers?

Reading the Report

There are three steps to read a SIR site report.

1. Look at the NWGLDE listing for the method you are interested in (Table 1). Find the leak threshold associated with detecting a 0.2 gph leak rate. In the Table 1 example, it is 0.1 gph. This vendor can also detect 0.1 gph leaks using a leak threshold of 0.05 gph, but for monthly monitoring, the 0.2 gph leak rate and the 0.1 gph leak threshold are the relevant numbers.
2. How does the calculated leak rate for the data set compare to the leak threshold?

   The leak rate the SIR vendor has calculated for the data set (Column #3 in Table 2) must be compared to the leak threshold of 0.1 gph (Column #2 in Table 2) to determine if the storage system passes or fails. If the calculated leak rate for the data set is less than the 0.1 gph leak threshold, then the result is "pass" (Column #5 in Table 2) as long as the MDLR requirement has also been met.
3. Is the MDLR less than or equal to the performance standard?

   The vendor must also report the MDLR (Column #4 in Table 3) for the inventory data set to show that the inventory data were accurate enough to detect a 0.2 gph leak if it were present. If the MDLR is greater than the performance standard of 0.2 gph, then the SIR vendor should report an "inconclusive" result (Column #5 in Table 3, months of June and July) for the UST system as long as the calculated leak rate is less than the leak threshold.

Column #1	Column #2	Column #3	Column #4	Column #5		
Month Year	EPA established Leak Threshold	Calculated Leak Rate for the Data Set	MDLR for the data set	Result: Pass, Fail, Inconclusive		
	gph	gph	gph	P	F	I
Oct 2015	0.10	.085	0.17	*		
Nov 2015	0.10	.095	0.20	*		
Dec 2015	0.10	.085	0.17	*		
Jan 2016	0.10	.065	0.13	*		
Feb 2016	0.10	.065	0.13	*		
Mar 2016	0.10	.085	0.17	*		
Apr 2016	0.10	.09	0.18	*		
May 2016	0.10	.095	0.19	*		
Jun 2016	0.10	.085	0.17	*		
Jul 2016	0.10	.01	0.02	*		
Aug 2016	0.10	.09	0.18	*		
Sep 2016	0.10	.09	0.18	*		

Table 2. *An annual summary of SIR analyses showing passing results. For each month, the calculated leak rate for the inventory data (Column #3) is less than the standard leak threshold of 0.1 gph (Column #2). The MDLR for the data set (Column #4) is also less than or equal to the performance standard of 0.2 gph.*

Column #1	Column #2	Column #3	Column #4	Column #5		
Month Year	EPA established Leak Threshold	Calculated Leak Rate for the Data Set	MDLR for the Data Set	Result: Pass, Fail, Inconclusive		
	gph	gph	gph	P	F	I
Oct 2015	0.10	.085	0.17	*		
Nov 2015	0.10	.095	0.20	*		
Dec 2015	0.10	.15	0.17		*	
Jan 2016	0.10	.12	0.22		*	
Feb 2016	0.10	.11	0.13		*	
Mar 2016	0.10	.085	0.17	*		
Apr 2016	0.10	.09	0.18	*		
May 2016	0.10	.095	0.19	*		
Jun 2016	0.1	.095	0.21			*
Jul 2016	0.1	.080	0.22			*
Aug 2016	0.10	.09	0.18	*		
Sep 2016	0.10	.09	0.18	*		

Table 3. *An annual summary of SIR analyses showing varied results. When the calculated leak rate is less than the leak threshold and the MDLR is less than or equal to 0.2 gph, the result is "pass." When the calculated leak rate is greater than or equal to the leak threshold, the result is "fail" (See December, January, February). The result is inconclusive when the calculated leak rate is less than the leak threshold but the MDLR is greater than the performance standard of 0.2 gph (See June, July).*

FAQs from NWGLDE

In Summary

Each month for each set of inventory data submitted for an UST, SIR vendors must report quantitative results with a calculated leak rate and a minimum detectable leak rate. A passing result requires two criteria:

- The calculated leak rate is less than the standard leak threshold of 0.1. gph
- The MDLR is less than or equal to the performance standard of 0.2 gph

A failing result has only one criterion:

- The calculated leak rate is greater than or equal to the standard leak threshold of 0.1 gph

An inconclusive result requires two criteria:

- The calculated leak rate is less than the standard leak threshold of 0.1 gph
- The MDLR is greater than the performance standard of 0.2 gph.

Note: Using a variable leak threshold calculated from a specific data set as we described in our December 2017 article is still allowed by the federal rule. This is because using a variable leak threshold is more stringent than the USEPA requirement described in this article. If a SIR vendor chooses to use a variable leak threshold based on the quality of the data analyzed, the leak threshold will be half of the MDLR calculated for a specific inventory data set. The MDLR must still be less than or equal to 0.2 gph. ■

Secondary and Spill Containment Test Methods

The "Acceptability" of Containment Sump and Spill Equipment Testing Methods Listed by NWGLDE

NWGLDE has received several inquiries about the increasing number of listings we've posted on our website under the Secondary and Spill Containment Test Methods category. These inquiries were all from state UST implementing agencies. States wanted to know if the listed methods could be used to meet their new containment sump and spill equipment testing requirements contained in the 2015 federal UST regulatory requirements. The following is NWGLDE's response to these inquiries.

Can NWGLDE's Listed Secondary and Spill Containment Test Methods be used to Meet Spill Prevention and Containment Sump Testing Requirements?

The short answer is yes, they can. The longer and more accurate response is that, according to the federal UST regulation, and language similarly adopted by many state UST regulations, this is a decision that must be made at the state level. State UST implementing agencies may allow equipment or methods to be used when the implementing agency determines that the equipment or method is no less protective of human health and the environment than requirements developed by the manufacturer or a code of practice developed by a nationally recognized association or testing laboratory.

In other words, a state implementing agency may determine whether the methods listed by NWGLDE are sufficiently protective of human health and the environment. The state's decision then determines whether these methods may or may not be used in that state.

In this article, NWGLDE wants to provide additional information to assist state UST programs in making their determinations as to whether the methods we list meet their state's standards. NWGLDE currently lists four methods applicable for testing containment sumps and spill containment equipment. These methods are:

- **Dri-Sump Containment Tightness-Test Method, AC'CENT Environmental**
  - Uses a proprietary heavy vapor aerosol instead of water to completely fill the sump. A leak is determined by observation of a change in the specialized laser light beam from a dot to a line in the viewing chamber(s) installed outside of the sump.
- **Incon TS-STS Sump Test System, Franklin Fueling Systems**
  - Uses a portable magnetostrictive probe suspended in the containment area to measure a drop in the water level in the sump over a 15-minute test period. Sump must be filled above all penetration holes as per PEI RP-1200.
- **Hydro-Tite™ Leak Detection System For Secondary Containment, Fueling, and Service Technologies, Inc.**
  - Uses a portable magnetostrictive probe suspended in the containment area to measure a drop in the water level in the sump over a 12-minute test period. Sump must be filled above all penetration holes as per PEI RP-1200.

■ *continued on page 24*

FAQs from NWGLDE... continued from page 23

- **Differential Pressure Leak Test – DPleak™ Leak Detection and Leak Location Test Method, Leak Detection Technologies, LLC.**
  - Uses a camera and soap solution to observe the sump and detect any fluid ingress while under vacuum. Liquid ingress is observed directly while air ingress is observed by bubbles in the soap solution.

Editor's Note: *LUSTLine* #86 includes an article titled "Update on Sump Testing" that provides more detailed descriptions of the operation of the Dri-Sump and Differential Pressure Leak Test methods.

These methods, like all methods listed by NWGLDE, were evaluated using a standard USEPA test procedure or equivalent approach specifically allowed by USEPA procedures. NWGLDE reviews and subsequently lists only methods that are evaluated by a qualified third-party evaluator.

Each of the methods noted above were tested to tank tightness-test standards. That is, they can detect a leak rate of no greater than 0.1 gallons per hour, at a probability of detection of at least 95 percent and probability of false alarm not to exceed 5 percent. These performance standards are NOT required by the federal UST regulation for spill prevention equipment and containment sumps. The performance standards were part of the test procedures that the equipment manufacturers chose to use. Method developers may choose different performance standards against which to have their equipment evaluated. NWGLDE's listings and Test Methods category page provides pertinent information, including the name of the vendor, equipment name, leak rate, leak declaration threshold, and maximum tank or containment area capacity for which the method is applicable.

Limitations

We want to point out that all release detection methods have limitations. Some of these limitations have to do with the operating principle used by the method, such as performance challenges due to varying weather conditions (e.g., hot or cold climates). Other limitations or restrictions for use of the method may be due to how the evaluation was performed. Based on the third-party evaluation, user guides, and other such sources, NWGLDE identifies known limitations and other users and regulators can easily view to help determine whether a method is acceptable for use.

Not all information provided in the third-party evaluation can be presented on the NWGLDE listings due to limited space. NWGLDE attempts to be as consistent and complete as possible with information we provide on our listings across method types. Unfortunately, NWGLDE listings may not contain all the information a state may want or need to make an informed decision about acceptability for use in its jurisdiction.

The listings contain contact information for the vendor and third-party evaluator, who may be contacted for more information. Also, the full evaluation report may have additional information that may be helpful for a state UST agency to make a fully informed decision regarding acceptability of method use in its jurisdiction. Like other equipment and methods listed by NWGLDE, interested parties may obtain a copy of the full third-party report, upon request, from the vendor or NWGLDE.

The Listing Process

As part of the review process, NWGLDE assigns one reviewer who is responsible for ensuring that all necessary documentation has been provided by the vendor. This initial review is designed to spot any glaring omissions and inconsistencies with requirements of the test procedure. The initial reviewer coordinates with, in this case, the Secondary and Spill Containment Test Method team for a more technically robust assessment. A draft listing is prepared that may go through several revisions. Finally, after any necessary revisions are made or potential supplemental information is received from the vendor and/or evaluator, other NWGLDE members may review and comment on the draft prior to final listing.

In Summary

The Federal UST regulation at 40 CFR 280.35(a)(1)(ii) allows for the use of vacuum, pressure, or liquid testing of spill-prevention equipment and containment sumps used for interstitial monitoring of piping, at least once every three years. This testing must be in accordance with either requirements developed by the manufacturer, a nationally recognized code of practice such as PEI RP 1200, or the UST implementing agency. State UST implementing agencies may allow if they determine acceptable, the secondary and spill containment test methods listed by NWGLDE to be used in their jurisdiction in line with their state's equivalent to 40 CFR 280.35(a)(1)(ii)(C). NWGLDE-listed methods are not limited to equipment intended to meet the compliance requirements for release detection in 40 CFR subpart D. They may be used, if allowed by a state, to meet the spill equipment and containment sump testing requirements in 40 CFR subpart C or no less stringent requirements under 40 CFR Part 281. ■

About the NWGLDE

The NWGLDE is an independent work group comprising 11 members, including 10 state and 1 USEPA member. This column provides answers to frequently asked questions (FAQs) the NWGLDE receives from regulators and people in the industry on leak detection. If you have questions for the group, please contact them at questions@nwglde.org.

NWGLDE's Mission

- Review leak detection system evaluations to determine if each evaluation was performed in accordance with an acceptable leak detection test method protocol;
- Ensure that the leak detection system meets USEPA and/or other applicable regulatory performance standards, if applicable;
- Review only draft and final leak detection test method protocols submitted to the work group by a peer review committee to ensure they meet equivalency standards stated in the EPA standard test procedures; and
- Make the results of such reviews available to interested parties.

WanderLUST

by Jeff Kuhn

Jeff Kuhn retired from a career in environmental cleanup with the Montana Department ofx Environmental Quality (MDEQ). He is a veteran at the state and national level having tackled almost every technical issue that has arisen in petroleum xremediation in the last 30 years. Jeff can be reached at jkuhn@bresnan.net.

What's Up With Total Petroleum Hydrocarbons (TPH)?

What is TPH? Seriously, what meaning can possibly be contained in so simple an acronym? Being a curious person, I typed the three letters into a Google search, and whammo...no clear answer! Wikipedia's prioritized list, however, began with suggestions like a Walther TPH (a kind of pistol), Trains Per Hour (something relevant to the United Kingdom), Tryptophane hydroxylase (a neato neuro-transmitter), and Tonnes Per Hour (a measurement relevant to industrial machinery). Finally, last—but certainly not least—my intended target:

Total Petroleum Hydrocarbons - an expression of chemical content.

A very simplistic definition for a term that encompasses hundreds of chemical compounds, and something that still causes us a great deal of consternation.

Our Long History with TPH

The same compounds found in our modern "TPH" were also found in seeps of bitumen used by many ancient cultures for all kinds of purposes. The Babylonians caulked their ships with it, the Egyptians used it in the construction of the great pyramids, and Native Americans in California used it to make baskets watertight and bind projectiles to shafts. It's been around for a while.

Since the advent of environmental remediation there has been a lot of research and discussion on the topic of "TPH." States, petroleum chemists within industry, and environmental consultants have carried the discussion a very long way down the field. But there's always more to know. Because TPH is not a single compound, but rather spans a huge range of compounds, that can present significant remediation challenges.

Most states grappled with TPH in the early development of their petroleum cleanup programs in the mid-1980s. What number do we choose that represents a safe level based on available risk data...100 ppm, 1,000 ppm, 10,000 ppm? How clean is "clean"? How and what exactly do we test for in this broad range of compounds? Although most states adopted specific BTEX standards by the early 1990s, and standards for fuel oxygenates, such as MtBE, by the late 1990s, many regulatory agencies have been slow to adopt specific TPH threshold standards. Residual TPH continues to come up as a large remediation challenge.

Given the time most environmental regulatory agencies have existed, why haven't we found a better approach to address residual TPH at cleanup sites? And remember, it is also naturally occurring.

The "TPH Risk Tech Reg Overview"

In response to this challenge, the Interstate Technology and Regulatory Council (ITRC), formed a new team entitled TPH Risk Evaluation at Petroleum Contaminated Sites (a.k.a., "TPH Risk Team"). The team was created in 2015 with the goal of helping to answer some of the recurring questions posed by remediation professionals and to gather information on the state of the science into one coherent and concise document. The conundrum of TPH and the cause for frequent regulatory questions is aptly described in ITRC's "TPH Risk Tech Reg Overview" Section 1:

> *"...carcinogenic indicator compounds (e.g., benzene, naphthalene, and, for some regulatory agencies, ethylbenzene and additives such as methyl tertiary-butyl ether [MtBE]) typically drive risk-based decision making rather than other petroleum compounds that may be present. However, very few field-based studies comparing risks posed by individual compounds found in TPH (e.g., benzene) to risks posed by the broader spectrum of TPH-related compounds have been published (Brewer et al. 2013). Additionally, concentrations of carcinogenic compounds might be reduced to low concentrations relative to other hydrocarbons due to natural attenuation processes. At such sites, the remaining petroleum hydrocarbons and petroleum-related degradation products (e.g., petroleum-related metabolites) can be expected to contribute to the potential human health noncarcinogenic risk at petroleum release sites."*

The final Tech-Reg document, completed in November 2018, represents a two-year work effort by 240 team members from regulatory agencies, industry, environmental consultants, and stakeholder groups. ITRC Tech-Reg documents are now published in an on-line format that is different from the previously published paper copies of ITRC Tech Reg documents distributed at the end of each team process. This was an adjustment for our team in the final distillation of the document. However, a printed version of the final TPH Tech-Reg is still

■ *continued on page 26*

WanderLust... continued from page 25

available for download and printing from ITRC's website.

The Tech-Reg Overview highlights 10 primary sections that examine TPH from many perspectives, including the regulatory history and framework of TPH, TPH fundamentals, conceptual site models, human and ecological health risks, risk calculators, some special considerations for TPH, and stakeholder concerns.

Team members worked very hard to provide risk tools and calculators that would help guide regulators and consultants and aid in the site-specific risk evaluation process. A detailed appendix provides fact sheets, a risk evaluation reference tool, a State Survey of TPH (conducted by our team in 2018), and a matrix of suggested field screening methods. The State Survey is particularly interesting as it demonstrates the broad spectrum of approaches used by states to address TPH problems, and it has doubtlessly changed since the publication of the Tech-Reg. As with specific contaminants and groups of contaminant compounds, it is extremely helpful to see approaches taken by other regulatory agencies. States, territories, and tribes certainly have a lot to learn from each other on this topic.

On to Internet-Based Training

Since the completion of its Tech-Reg, the TPH team has transitioned from an 'active' status into the internet-based training (IBT) stage, for which ITRC teams have become well known. Four offerings conducted in 2019 were well-received. Four more IBT training sessions are scheduled for 2020. State regulators, industry representatives, and environmental consultants should all take advantage of these sessions that present a detailed overview of the ITRC TPH Risk Tech-Reg. ■

Tanks On Tribal Lands

Overcoming Compliance Challenges in Indian Country

by Victoria Flowers

Todd Ferguson discussing tank system failures with Boot Camp participants hosted by the Lac Courte Oreilles Band of Lake Superior Chippewa.

The Oneida Compliance Assistance Program (OCAP), implemented by the Oneida Nation, has developed and delivered an Underground Storage Tank Boot Camp to approximately 400 students. Attendees and participants represent 79 federally recognized Tribal Nations.

The Boot Camp is a unique three-day event that uses a mix of classroom and hands-on experiences to train participants about the requirements defined in the Chapter 40 of the Code of Federal Regulation, Section 280 (40CFR280). Sharing by participants during the event offers a glimpse into the real-life challenges faced by Tribal Nations in meeting those requirements. Specifically, finding contractors and service providers who are aware that any gas station within a Reservation boundary is subject to federal requirements rather than state.

The Boot Camps have a diverse set of presenters from the petroleum industry. Many of the presenters are industry experts on corrosion protection, UST operation and maintenance, biofuels, and environmental cleanup. Both presenters and attendees have commented on the unique and exciting experience of the Boot Camps, stating it has expanded their understanding of the complexities of USTs and compliance with federal regulations regarding Reservations.

The Boot Camps continually evolve and are reflective of the greatest challenges faced. The new regulations emphasize 30-day walk-through inspections, hydrostatic testing, and operator training. These are the most cited deficiencies. OCAP works very closely with owners and operators within the Oneida Reservation and with attendees at the Boot Camps to make sure they are aware of these challenges and work to correct them. This assistance is also available to other Wisconsin Tribal Nations (when requested). OCAP also receives calls and requests for technical assistance from other Tribal Nations across the country.

OCAP hosts up to three UST Boot Camps a year and has partnered with Northern Arizona University's, Institute of Tribal Environmental Professionals on several occasions to bring training to other parts of the United States. For more information contact Mike Arce at (920)869-4552 or email at marce@oneidanation.org, or Victoria Flowers at (920)869-4548 or email at vflowers@oneidanation.org. ■

Victoria Flowers is the Oneida Nation's Environmental Specialist and Brownfields Coordinator.

Tank News From NEIWPCC

NEIWPCC recognizes that many UST inspectors and compliance personnel, as well as LUST cleanup personnel, have been working remotely due to the COVID-19 pandemic. This article highlights resources available from NEIWPCC for continued training and education during this unprecedented time.

NEIWPCC provides webinars for a national audience covering topics determined by our planning team, which consists of federal, state, and tribal partners in the tanks community. Talented and experienced speakers from across the country participate in the webinars to provide training for UST and LUST staff on both technical issues and best management practices.

Our UST Inspector Training Webinar Series aims to improve UST program performance; educate UST inspectors on policy, systems, and equipment; and ultimately prevent UST releases to the environment. On April 30, 2020, NEIWPCC held an UST webinar on the topic of Spill Bucket/Containment Sump Testing and Repair. NEIWPCC also held four webinars in 2019 on the topics of Emerging Fuels, Automatic Tank Gauges, Financial Responsibility, and Cathodic Protection. Our upcoming UST webinars will be posted at the following website: *https://neiwpcc.org/our-programs/underground-storage-tanks/ust-training-resources-inspection-leak-prevention/upcoming-ust-inspector-training-webinars/*. The full UST Webinar archive can be found at the following website: *https://neiwpcc.org/our-programs/underground-storage-tanks/ust-training-resources-inspection-leak-prevention/webinar-archive-inspector-training/*.

The goal of NEIWPCC's LUST Corrective Action Webinar Series is to improve LUST program performance, increase technical capability and understanding, and minimize the impact of LUST releases to the environment. Refer to the NEIWPCC website for more information on our upcoming LUST webinar planned for this spring, Evaluating Remediation Workplans. Our upcoming LUST webinars will be posted at the following website: *https://neiwpcc.org/our-programs/underground-storage-tanks/lust-training-resources-corrective-action/upcoming-lust-corrective-action-webinars/*. Last year, NEIWPCC hosted the second part of a LUST webinar focused on Risk-Based Corrective Action, which covered advanced considerations and institutional controls related to risk-based corrective action. This webinar and many more can be viewed on our LUST webinar archive page; including topics of LNAPL Conceptual Site Models, Emerging Clean Up Technology, and Smart Characterization. The full LUST webinar archive can be found at the following website. *https://neiwpcc.org/our-programs/underground-storage-tanks/lust-training-resources-corrective-action/webinar-archive-corrective-action/*.

Please note that all 87 issues of L.U.S.T.Line can be found at the following website: *https://neiwpcc.org/our-programs/underground-storage-tanks/l-u-s-t-line/l-u-s-t-line-archive/*. In addition, the L.U.S.T.Line Index provides a guide to all past articles to help identify specific areas of interest. It can be accessed at the following website. *http://neiwpcc.org/wp-content /uploads/2019/08/LUSTlineIndex_1-86.FINAL_.pdf*.

Please stay safe, and NEIWPCC will continue to use this recurring article, along with our newsletters and website, to provide you with updates from our UST and LUST programs. If you have any questions or comments, please contact Nick Bissonnette (nbissonnette@neiwpcc.org). To subscibe to LUSTLine use the form below or go to *http://neiwpcc.org/our-programs/underground-storage-tanks/l-u-s-t-line/*. ■

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To download the index, click on LUSTLine Index at *http://neiwpcc.org/our-programs/underground-storage-tanks/l-u-s-t-line/*

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A Note to the UST Community

from Carolyn Hoskinson

The 2015 Federal UST Regulation and ASTM E3225-20 Standard Practice

Some of you may have already seen that ASTM recently published a new standard for spill bucket and sump testing *https://www.astm.org/Standards/E3225.htm*. We received several inquiries on whether this new standard meets the requirements of the federal UST regulation for spill prevention equipment or sump testing (40 CFR § 280.35). The 2015 UST regulation requires that spill prevention and sump testing be done using a liquid, pressure, or vacuum test. The ASTM E3225-20 is visually based, and while a thorough visual check can always be beneficial, these procedures do not meet the requirements in 40 CFR § 280.35.

If owners and operators follow this standard and do not perform the correct testing requirements, they will be in violation of the regulatory requirements, and subject to appropriate enforcement. I am personally very concerned that some in our community might get confused by this. Please help us in spreading the word that these procedures do not meet the requirements in 40 CFR § 280.35.

To address this matter, we added two new questions and answers to OUST's web-based UST Technical Compendium about the 2015 UST Regulation at *https://www.epa.gov/ust/underground-storage-tank-ust-technical-compendium-about-2015-ust-regulation#spillbuckets* (click on "Spill buckets, under dispenser containment sumps, containment sumps").

We appreciate the continued dedicated effort and work by state and tribal UST programs; owners and operators; and others in the UST community in meeting all regulatory compliance requirements. As always, I thank you for all that you do to help us keep our environment safe from petroleum UST releases, a leading source of groundwater contamination.

If you have questions about this, or feedback on what USEPA can do to better assist you in achieving compliance, please contact me or Tony Raia (raia.anthony@epa.gov; 202-566-1021). ■