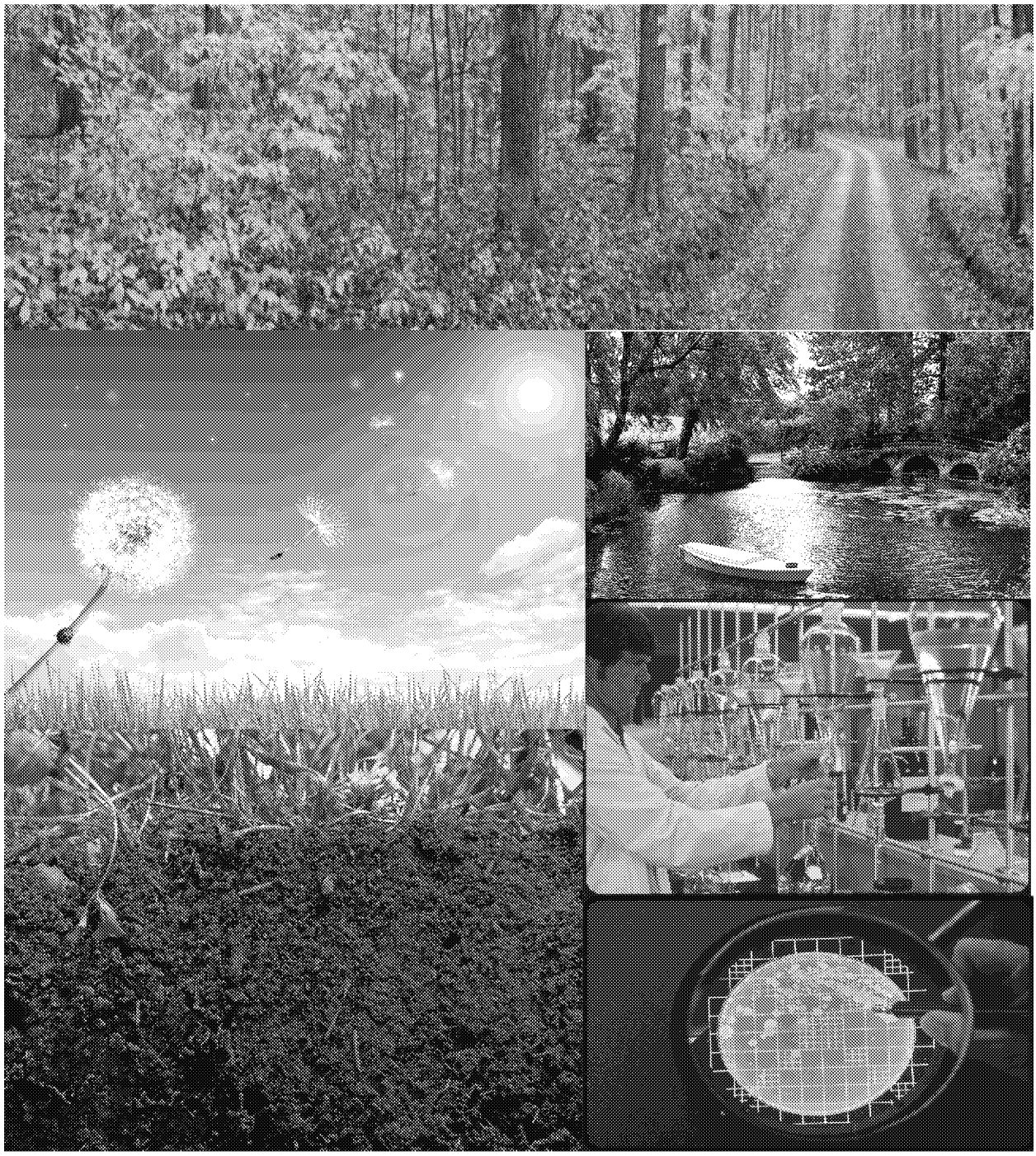
U.S. Environmental Protection Agency
Regional Laboratory Network



Annual Report 2016

Thanks to the Regional Laboratory Managers and scientists in all 10 regions of the United States for contributing to this report. It is your dedication to the science of the agency that directly supports and ensures clean air, land, water and chemical safety for the American people.

Thanks also to Region 4 Science and Ecosystem Support Divisions amazing support team including Jeff Hendel, Norma Stafford and Marilyn Maycock for all of their efforts in compiling, formatting, reviewing and revising this report.

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Executive Summary

The U.S. Environmental Protection Agency (U.S. EPA) Regional Laboratory Network (RLN) consists of state-of-the-art, full-service environmental laboratories delivering mission critical analytical services, field support, quality assurance and data review, and expert technical assistance. The analytical data produced by the Regional Laboratories is used regularly by EPA Regional Program offices as well as EPA's state, tribal, and local partners to make important public health and environmental decisions.

Sound analytical data is crucial for environmental decisions and effective environmental policy. EPA scientists use state of the art instruments and techniques and apply rigorous quality assurance methods. The regional lab network produces environmental analytical data that meet EPA's data needs for EPA's air, water, waste and enforcement programs. Importantly, the regional labs have the capability to support special or non-routine analytical needs that cannot be readily obtained from any other source. Because of this, the regional labs fill a gap between basic research and commercially available analyses.

Regional laboratories are responsive to specific regional needs. Services and expertise provided by each regional lab are tailored to meet the particular regional needs their state, local and tribal partners to address complex and emerging environmental issues, often where little background experience or knowledge exists. Scientific communication and collaboration across the regional laboratory network leverages regionally-specific expertise and methods across the nation thereby maximizing efficiency and flexibility while assuring responsiveness. The Regional Laboratories have significant analytical capabilities, as they are all accredited to run numerous methods addressing multiple matrices. While they generally provide routine data needed daily by the EPA Regional programs, they have the flexibility to quickly focus regional resources and capacity on the agency's highest priorities at any time [e.g., Per- and fluorinated Alkyl Substances (PFAS), harmful algal blooms, micro-plastics, Flint drinking water response, disaster response, etc.].

Additionally, through their close coordination with Regional program staff, they identify and then develop special methods and unique capabilities to address Region-specific needs. Examples include: human waste source-tracking method for identifying and documenting illicit sewage connections; nutrients in salt water; PFAS compounds and other emerging contaminants; chemical warfare agent analyses; pesticide formulation testing for FIFRA. The combination of routine, regular data outputs coupled with the flexibility to apply expertise and resources to address Regional challenges and priorities is what makes the Regional laboratories so valuable to the Regions.

Finally, to ensure and enhance the defensibility of our data, each regional laboratory participates in external third party accreditation programs for laboratories under either the NELAC Institute or ISO 17025. Under these programs the labs undergo periodic third party audits, conduct their own internal audits and participate in numerous Proficiency Testing studies all to ensure effective quality systems that continually improve performance and ensure high quality defensible data is produced.

Accomplishments presented in this report capture only a few of the overall activities provided by all Regional Laboratories. These accomplishments underscore the commitment of the RLN to be an integral part in protecting human health and the environment. This report highlights the diversity of support and capabilities, all of which reinforce EPA's mission and ongoing priorities.

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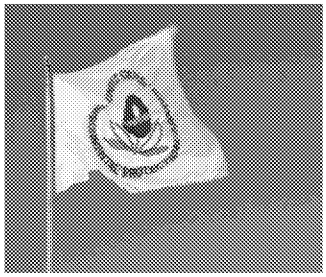
Regional Lab Network Overview

EPA has 10 regional offices, each of which has an analytical laboratory. The Regional Laboratories provide mission-critical support to the Agency, protecting human health and the environment. Service and expertise provided by each Regional Laboratory are tailored to meet the needs of that particular region or program and to address complex and emerging environmental issues.

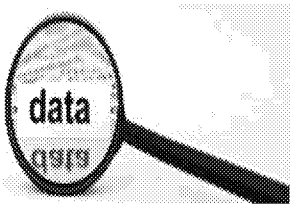
Services tailored to meet regional needs and to address complex and emerging environmental issues



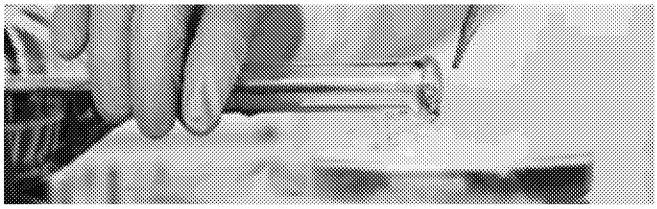
In addition to supporting each region, the 10 Regional Laboratories collaborate to form the Regional Laboratory Network (RLN). Efficiency, effectiveness, and flexibility are maximized by using scientific expertise, implementing and developing methods, and maximizing partnerships within the RLN and across the nation.

Support special project-specific objectives and goals towards a sustainable

Environmental decisions and policies provide the RLN with the analytical structure to meet program needs. Regional Laboratories also provide support to national initiatives and research. Each laboratory within the RLN constantly and consistently meets and supports project-specific objectives, achieves quality goals, provides analytical expertise, and produces accurate data within the Agency.



EPA Regional Laboratories are committed to producing quality data. The laboratories follow EPA organizational directives for a high-performing organization. All 10 laboratories are accredited by National or International Accreditation programs ensuring effective quality systems, improved performance, and defensible data. External assessments are performed regularly at RLN laboratories.



Accreditation following National Environmental Laboratory Accreditation Conference (NELAC) or International Standards Organization (ISO) 17025

Contracting mechanisms are used within the RLN to provide additional procurement of analytical services. The Contract Laboratory Program (CLP) provides standard analytical services supporting the Superfund Program. Each laboratory uses an Environmental Services Assistance Team (ESAT), which is a contract to support laboratory functions. This organizational structure permits EPA Regional Laboratories to provide quick response to emergencies, while providing timely completion of all projects. During FY2016, 10 Regional Laboratories supported over 148,000 sample analyses and over 1,300 projects.

RLN supports Agency quick responses to emergencies

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Regional Laboratory Network Overview

Regional Laboratory scientists are a valuable resource. Scientists have expertise in analytical methods, quality assurance and quality control principles, data validation, field analytical techniques, and solving complex analytical projects. During FY2016, the 10 Regional Laboratories supported more than 40 method improvement projects.

Support analytical method improvements

Regional Laboratory scientists are certification officers for the Drinking Water Laboratory Certification Program and participate in state drinking water audit programs. Laboratory scientists also provide management, technical, logistical and oversight support to EPA, State and tribal programs, operate air monitoring quality assurance programs, and support field sampling functions.

Serve crucial roles in keeping drinking water safe

Provide emergency response support for Homeland Security

EPA Regional Laboratories performed 4,367 analyses in FY2016 in support of significant emergency response events. EPA Regional Laboratories are capable of analyzing samples suspected to contain a variety of chemical constituents, including chemical warfare agents. Some Regional Laboratories developed and validated new methods for chemical warfare agent degradation compounds to characterize and remediate contaminated areas.

Within each Regional Laboratory, core capabilities allow support to various EPA programs. Unique capabilities provide the flexibility for each laboratory to meet geographical environmental demands or regional and national initiatives. Three tables (core, unique, and developing) summarize chemical, physical and biological/microbiological capabilities for each region. The Core, Unique, and Developing capabilities tables for each Regional Laboratory are provided at the end of this report and are available on the following EPA websites.

Regional Laboratories Core Capabilities

http://www.epa.gov/aboutepa/regional-science-and-technology-lab-core-capabilities

Regional Laboratories Unique Capabilities

http://www.epa.gov/regionallabs/epa-regional-laboratories-unique-analytical-capabilities-and-documentation-region

Regional Laboratories Developing Capabilities

http://www.epa.gov/measurements/collection-methods

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2016 ANALYTICAL SUMMARY

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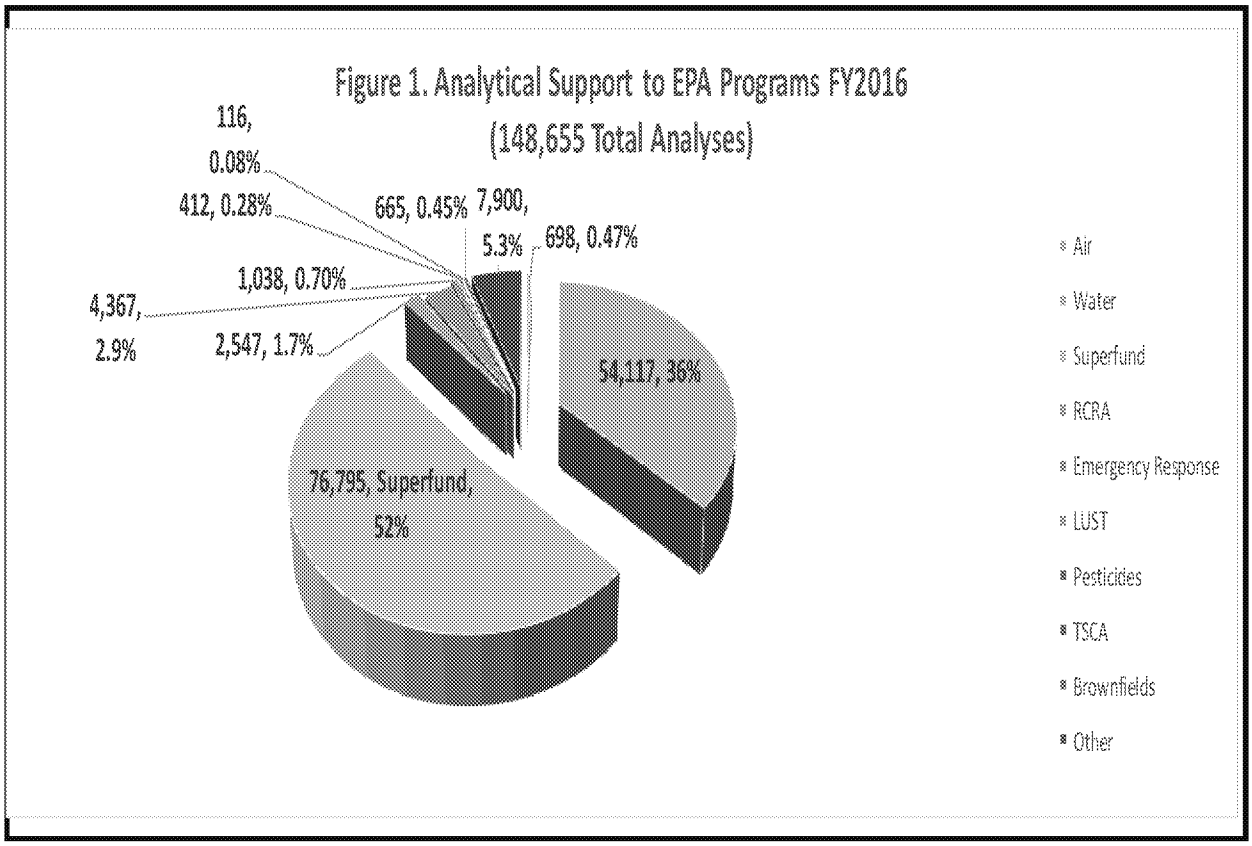
Analytical Support to EPA Programs

Regional Laboratory staff support diverse and challenging requests from the programs, states and tribes. During FY2016, the Regional Laboratory Network (RLN) conducted more than 148,655 analyses. The distribution of work by the RLN is shown in Figure 1. These totals exclude Quality Control (QC) samples, which add an additional 20%.



In keeping with prior years, Superfund program continues to be the largest volume requestor of analytical services (51.7%), followed by Water Programs (36.4%). Emergency Response program support continues to be significant program at 2.9%, with RLN laboratories analyzing 4,287 samples in conjunction with time-critical responses to environmental disasters, hazardous materials releases, priority contaminant removals, and other threats to human health and/or the environment, which aided in timely and cost-effective decision-making in the field. All 10 Regional Laboratories augmented the National Enforcement Investigations Center's (NEIC's) capacity in support of important criminal cases, analyzing 382 criminal samples during the year.

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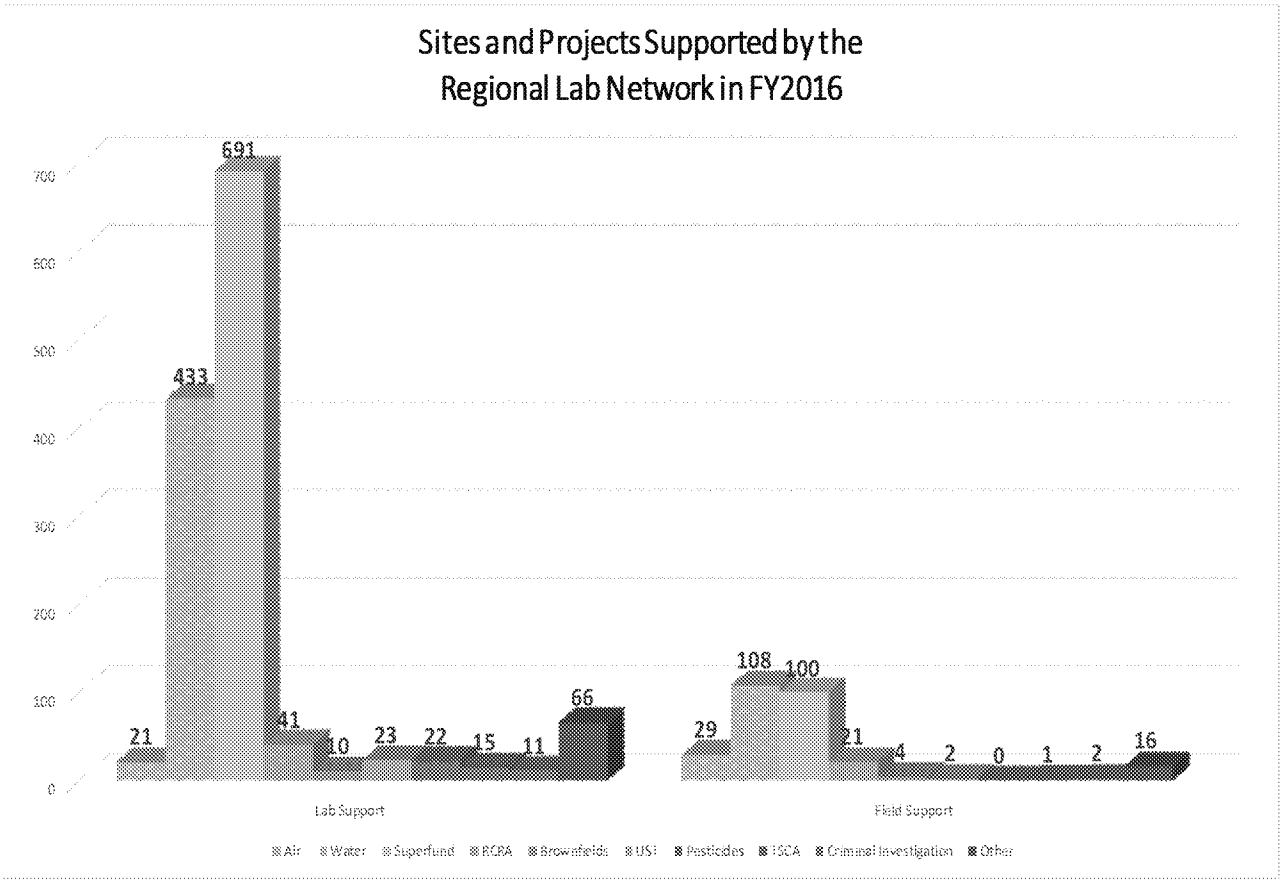
Sites/Projects Supported by Program

This graph summarizes the number of analytical and field projects supported by the Regional Lab Network (RLN) for each program . Collectively 1,333 laboratory projects and 283 field projects were supported.



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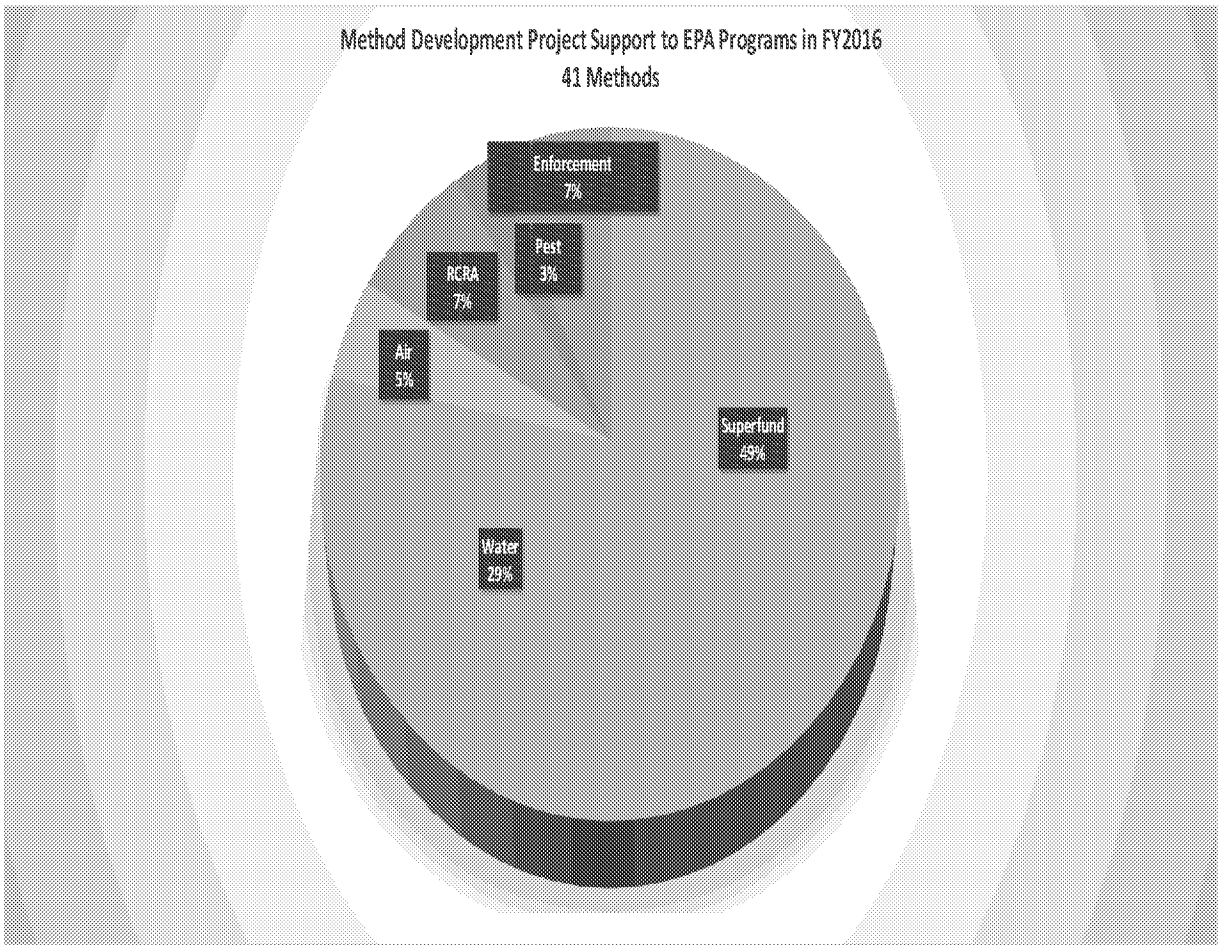
Method Development for EPA Programs

Because of the unique nature of the support provided by Regional Laboratories, the ideal Regional Laboratory scientist is part research scientist and part production scientist. Regional Laboratory scientists are capable of developing methods (often with short lead times), focusing on quality control, and operating under demanding delivery schedules.

A significant amount of work supported during the year required methods be developed specifically to address the unique needs of a particular region. Often, methods developed by a region to address a local environmental challenge are mobilized in other regions as their benefit is realized and/or as the need arises.



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SUCCESS STORIES

THAT SUPPORT AGENCY PRIORITIES

Success Stories Supporting Agency Priorities

The Regional Lab Network directly supports Agency Priorities to provide Americans with clean air, land, and water and to ensure chemical safety. The following is a list of Agency Priorities and just a few examples of Regional Lab Network projects supporting those priorities, as well as the regional lab leading this effort. Brief project summaries are also provided in this Section.

Protect and Improve Air Quality

- Vapor Intrusion Field Analysis (Region 7)
- Grenada Manufacturing (Region 4)
- Chloroprene Air Analysis & Data Review-LaPlace, LA (Region 6)
- Comparison of Passive/Active Sampling Methods for Assessing PCB Aroclors in Schools (Region 2)
- VOC Analysis of Radiello Passive Diffusion Sampling Devices (Region 9)

Accelerate the Pace of Cleanups

- Former Kil-tone Superfund Site Response (Region 2)
- Ely Mine Superfund Site Bat Study (Region 1)
- Cinnabar Mine Mesocosm Experiment (Region 10)
- Lead Bioaccessibility Method (Region 4)

Improve the Safety of Chemicals

- Progress on the analysis of Per– and fluorinated Alkyl Substances (PFAS) (Region 4)
- Heritage Crystal Clean (Region 6)
- Sky Valley Education Center PCB Inspection (Region 10)
- PFOA/PFOS Method Validation Study (Region 5)
- Dicamba Overspray in Missouri (Region 7)

Empower Communities, States and Tribes

- Cyanobacteria Monitoring Collaborative (Region 1)
- E Coli Concentrations in Bear Creek Watershed (Region 8)

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Success Stories Supporting Agency Priorities

(cont.)

Protect Water

- Passaic River Pathogen/Microbial Source Trackdown Study (Region 2)
- Region 3 Ocean's Program Ocean Vessel Artificial Reef (Region 3)
- Molecular Biology Analytical Support to RARE Projects
- Region 8 Algal Toxins in Water Method Development (Region 8)
- Flint Michigan Drinking Water Response (Region 5)
- Region 3 and Trash Free Maryland Work Together to Identify Micro-plastic in the Chesapeake Bay (Region 3)
- Formaldehyde in NW Aquaculture Facility Effluents and Receiving Waters (Region 10)

Increase Environmental Law Compliance Rate

- Allied Waste Landfill Enforcement Investigation – Joint Regional RS&T Project (Region 2)
- Region 3 Lab Response to Potomac River Sheen Discharge (Region 3)
- Ocean Dredged Material Disposal Sites
- Catalytic converter Washcoat Analysis for Platinum Group Metals by X-Ray Fluorescence Spectrometry (Region 9)

Affirm EPA as a High Performing Organization

- Advanced Monitoring and Next Generation Compliance Tools (Region 1)
- Forward Looking Infrared Cameras (Region 1)
- PhyloChip Development (Region 7)
- Ft. Riley Groundwater Analysis for Green Infrastructure (Region 7)
- Lead Bioavailability Study in Missouri (Region 7)
- Region 7 Lean Events (Region 7)

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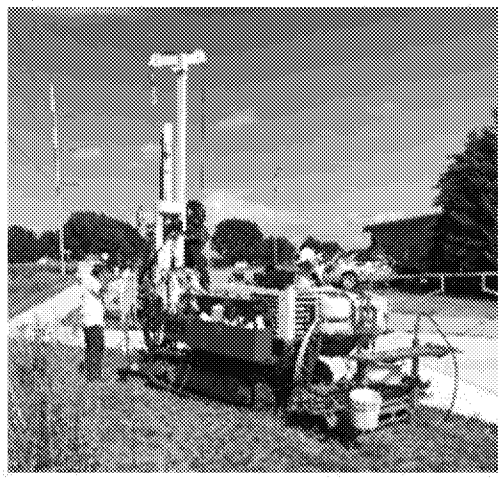
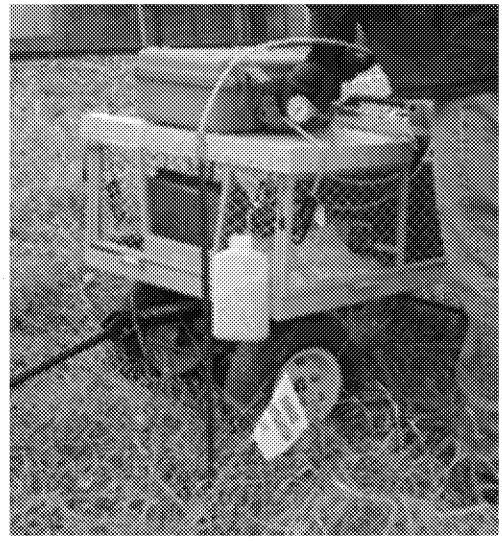
Protect and Improve Air Quality

Vapor Intrusion Field Analysis

Region 7 scientists provide a wide variety of field sampling and characterization services to regional program offices. Vapor intrusion from subsurface plumes of volatile organic compounds into residential living spaces is a major concern in Region 7. Our Monitoring and Environmental Sampling Branch (MESB) collects subsurface water, soil, and vapor samples using novel approaches developed locally. Using Geoprobe direct push technology coupled with the Membrane Interface Probe (MIP), MESB scientists can provide real-time information to site managers about site geology, depth to water, depth to contaminant, and contaminant characterization. Real time MIP data are used to determine contaminant plume extent, depth, composition, and location producing significant savings to project managers and programs over routine sampling approaches to site characterization. Additionally, MESB scientists have developed a novel approach to collection of shallow soil-gas samples that does not require employment of Geoprobe technology. Using a wagon mounted generator and a customized industrial hammer drill, our scientists can rapidly collect shallow soil gas samples at a depth of seven feet, typically representative of basement level elevations in residential homes. The trailer mounted generator is also used to power a pump that evacuates a sampling chamber equipped with a tedlar bag to collect the subsurface vapor plume sample from the soil gas sampling probe. When used in combination with Region 7's mobile gas chromatography/mass spectrometry (GC/MS) laboratory, this approach allows for very rapid characterization of shallow soil gas plumes with over seventy field samples collected in a day. In FY-2016, Region 7 scientists provided sampling support to ten different vapor intrusion sites and performed field analysis of 979 samples in our mobile laboratory providing substantial site characterization savings in both time and money.





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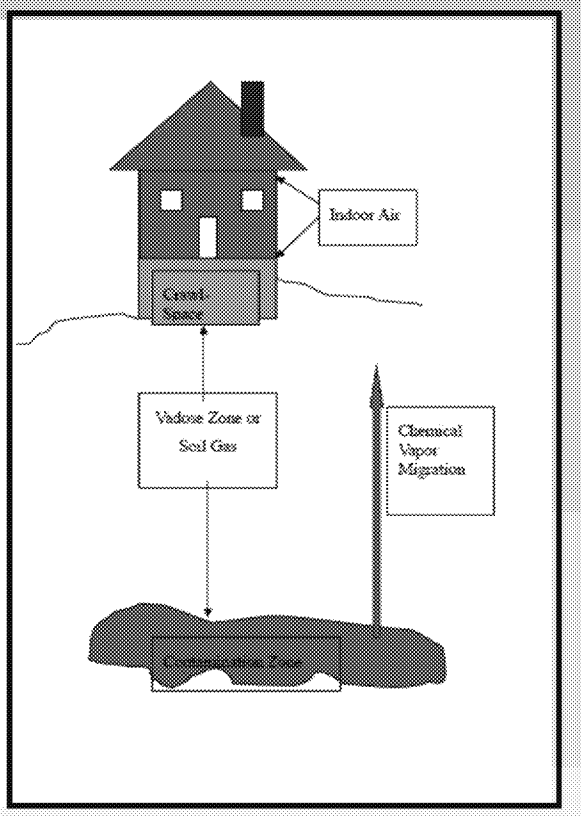
Protect and Improve Air Quality

Grenada Manufacturing

The Eastern Heights in Grenada, Mississippi is a subdivision located near a facility that utilized trichloroethene (TCE) in the manufacturing of automobile parts. For several years, EPA has worked to delineate a TCE groundwater plume around the manufacturing facility. Between 2011 and 2015, groundwater and soil vapor collected on the edge of the Eastern Heights neighborhood indicated a potential concern for TCE. It has been documented that the contaminated groundwater flows beneath the community raising concern among the residents regarding potential exposure to the contaminants from volatile organic compound (VOC) vapors, which could be released into their homes via crawl spaces and concrete floor slabs. Beginning in the Spring of 2016, **Region 4** conducted five vapor intrusion sampling investigations to determine if the residents were being exposed to harmful contaminants. Based on results of these studies, EPA has determined that there is no immediate threat to public health in the Eastern Heights neighborhood due to TCE.



EPA works in cooperation with states, tribes, and local governments to design and implement air quality standards and programs. EPA relies on other federal agencies, academia, researchers, industry, other organizations, and the public. These partnerships are critical to achieving improvements in air quality and reducing

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Protect and Improve Air Quality

Chloroprene Air Analysis and Data Review – LaPlace, LA

In December 2015, EPA released the results of its 2011 National Air Toxics Assessment (NATA) that provides information on the potential risks from breathing air toxics. This assessment identified higher than expected levels of chloroprene in the community of LaPlace, Louisiana. Chloroprene, a chemical used in the production of Neoprene, was recently classified by EPA as a likely human carcinogen.

To determine if elevated levels of chloroprene were indeed present in the air in LaPlace, the EPA and the Louisiana Department of Environmental Quality conducted air monitoring in the community. Samples were collected in summa canisters in the neighborhoods near a LaPlace facility. The **Region 6** Laboratory provided analytical support of multiple air samples to determine the presence of chloroprene. As the project continued, later samples were analyzed by a contract laboratory. The Region 6 Laboratory performed data review of 10% of the samples analyzed by the contract lab and collected in LaPlace. Region 6 Laboratory sample results and data review were provided to the Multimedia Division and will aid future actions for this site.

Comparison Study of Passive/Active Sampling Methods for Assessing PCB Aroclors in Schools

Polychlorinated biphenyls (PCB) Aroclors were used extensively in school building materials (caulk and lighting fixture ballasts) during the approximate period 1950-1978. A small sampling of such schools has registered elevated indoor air concentrations of PCBs. The common, standard method is based on an active sampling technique using pumps to collect air over a 24-hour period. Passive air sampling holds promise as a low cost, easily implemented method that can provide longer time-integrated sampling in public schools.

The performance of a passive air sampling device against the standard accepted active air sampling method in a school setting has not been established. A **Region 2** Regional Applied Research Effort (RARE) project was approved to evaluate a side-by-side performance of a passive air sampling device versus an active air sampling for measuring levels of PCB Aroclors in select, representative New York City public schools. The research was intended as a limited-scale effort to assess whether a passive sampling method for PCBs in indoor air can be used as a cost-effective approach for quantitatively measuring PCBs in school environments.

The Region 2 Laboratory provided the analytical support to this RARE project. This was largely an applied research effort and the Laboratory worked for several weeks to optimize the extraction method of the Poly Urethane Foam (PUF) material. This development involved several rounds of testing of QC samples and adjusting method parameters to obtain acceptable contaminant recovery with no appreciable contamination. After completion of the method development phase, The Laboratory processed over 50 PUF samples for the project, stemming from both the passive and active sampling methods applied during the study. The PCB Aroclor results of the two sampling methods were fairly consistent and comparable. The laboratory provided a summary of the results to the program office for evaluation.

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VOC Analysis of Radiello Passive Diffusion Sampling Devices at the EPA Region 9 Laboratory

Vapor Intrusion (VI) of toxic vapors into homes and businesses from contaminated soil and groundwater has become a growing concern. The customary method for collecting indoor air samples is through the use of steel air summa canisters. The canisters are expensive, bulky, and intrusive when left to collect air for 24 hours in a home or other building. Passive diffusive sampling cartridges offer some advantages over steel canisters. They are smaller, cheaper, less intrusive, and may potentially offer greater sensitivity than analysis from canisters. At many of the sites of concern, **Region 9** has begun large sampling projects using Radiello passive diffusion samplers, rather than using the traditional steel canisters with VOCs analyzed by GCMS SIM analysis using Method TO 15. The use of Radiello samplers is not dependent on the availability of canisters from the laboratory and the analysis of the samples, once collected on Radiellos, tends to be less expensive than steel canister analyses.

At the request of the EPA Region 9 Vapor Intrusion Work Group, the Region 9 Laboratory developed the capability to analyze Radiello samplers for VOCs. The capability developed by the Region 9 Laboratory uses a method that employs chemical desorption with carbon disulfide and analysis by GC-FID or GC/MS. This approach allows for the usage of cartridges that have larger capacity, which allows for cartridges to be left in place for a longer time, providing a lower reporting limit. With the addition of this capability, the Region 9 Laboratory anticipates significant additional requests for analytical support from our Superfund clients. During FY2016, the Superfund program submitted 367 samples from 5 sites that were collected and analyzed with this new methodology.

All 10 Regional Laboratories provide scientific expertise to support Regional and National Water Programs and Initiatives, which can include analysis, field support, quality assurance and data review, and technical support

Summa Canister & Radiello Passive Sampler

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Accelerate the Pace of Cleanups

Former Kil-tone Superfund Site Response

Region 2 Regional Science and Technology (RS&T) field and laboratory staff provided consistent, effective and high quality field sampling and analytical support to the Removal and Remedial Programs at the Former Kil-tone Company Superfund site. The community was very sensitive to the historic release of arsenic based pesticides contamination found on their residential properties immediately adjacent to the site. The application of innovative technologies such as X-ray fluorescence (XRF) by the field team to analyze > 900 soil samples collected during the initial characterization, coupled with data visualization via Excel, guided residential sampling of the surrounding neighborhood. A correlation was established between the XRF values for arsenic, lead, copper and zinc, which minimized the number of samples requiring traditional laboratory analysis and significantly reduced analytical costs during this Phase 1 effort. The geography surrounding the site was further explored and contamination was discovered migrating 3 miles offsite via a creek bed which required extensive characterization.

As a part of this response, the Region 2 Laboratory analyzed over 2000 sediment and residential yard flood-plain soil samples, primarily for Metals analysis, and provide validated results within 4 weeks of each sample delivery. In addition, another innovative technique, stable isotope analysis, was employed and generated results supporting the HRS scoring and NPL listing of this site. Use of the RS&T field and laboratory staff to form a multi-faceted project team resulted in a $200,000 overall cost savings to the limited site budget and kept the site cleanup activities on schedule.

By providing support at the regional level, opportunities abound to work in concert with states, tribes, and local entities in providing technical support. Types of activities where Regional Laboratories become involved include:

- Analytical support to states or tribes
- Assisting communities and volunteer monitoring groups with implementation of Citizen Science
- Providing training and technical support, including training in preparation of Quality Assurance Project Plans (QAPPs).

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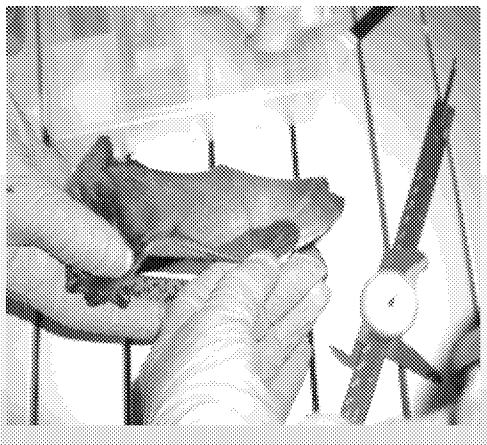
Accelerate the Pace of Cleanups

Ely Mine Superfund Site Bat Study

As part of **Region 1's** laboratory ecological risk assessment support to the Superfund program, lab staff performed a study of Threatened Northern Long-Eared Bats (NLEB) at the Ely Copper Mine Superfund Site (Ely Mine Site). The study findings supported consultation with the U.S. Fish and Wildlife Service on how to remediate mine wastes at the Ely Mine Site while minimizing adverse effects on NLEB, which were listed as Threatened under the Endangered Species Act in 2015. The consultation process is required where remedial activities might disrupt habitat used by a Threatened species.

The Ely Copper Mine Superfund Site (Ely Mine Site) is an abandoned copper mine located in the town of Vershire, Vermont. Copper mining activities occurred at the Ely Study Area from 1821 to 1920 with the most significant activities occurring from 1850s through 1880s. The Ely Mine Site encompasses approximately 350 acres, including about 30 acres of waste material. Remedial activities are planned to remove wastes that contribute to acid mine drainage into Ely Brook and Schoolhouse Brook. The site includes a number of historic mine openings that are used by several species of bat, including NLEB, for hibernation. These openings are critical habitat features because bats migrate from all over the Northeast to hibernate in caves and mine openings. Bat populations have been greatly reduced by a disease called White-Nose Syndrome, which damages the skin of bats and causes them to starve during winter hibernation.

Starting in the Fall of 2015, the Region 1 lab worked with contractors from TechLaw (ESAT) and the Biodiversity Research Institute to monitor the use of bats over a 1-year cycle. This cycle covered the fall when bats congregate near hibernation locations (hibernacula), spring emergence from hibernation, and summer foraging at the Ely Mine Site. The study included passive collection of bat echolocation and social calls (acoustic monitoring), which can be used to identify the species of bat present, capture and radio telemetry which is used to track the daytime roosting and night foraging areas of bats, and emergence counts at roosting locations to see how many bats come out of each roost. The acoustic monitoring took place at nine stations. Call files were evaluated by bat experts to identify the species present at each site. 147 nights of capture and radio tagging occurred at 24 sites. Weather permitting, capture would start at sunset and end at approximately 1:00 AM every night during the summer and fall. 647 bats were captured, of which 9 were NLEB in the summer capture season, and 1 in the fall. Overall this project suggests that some NLEB use the site for summer foraging at night, but not for daytime roosting. NLEB activity drops off significantly in the fall. This study provides an excellent baseline survey of bat activity, which will be used to establish when and where on the Ely Mine Site EPA can pursue remedial activities while minimizing disruption of bats' use of the site.



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Accelerate the Pace of Cleanups

Cinnabar Mine and Mesocosm Experiment with Carbon Amended Tailings

Cinnabar mine, located in central Idaho, is an abandoned mercury (Hg) mine which operated from 1921 to 1958. Cinnabar Creek flows through the tailings at the mine site and delivers water with elevated Hg concentrations into the East Fork of the South Fork of the Salmon River. The streams and river impacted by Hg releases from the Cinnabar mine contain several federally -listed threatened fish species and are part of the Nez Perce Tribe's usual and accustomed harvest areas. Limited road access to the mine site precludes traditional heavy equipment removal options. As a result, alternative remediation strategies are being considered that involve the addition of organic material to the tailings pile to promote vegetation growth in order to decrease erosion. While this action would likely reduce the bulk loading of Hg to Cinnabar Creek, it also has the potential to increase methylmercury (MeHg) production at the site through methylation by anaerobic bacteria. MeHg is a more toxic and bioaccumulative form of Hg. The goal of remediation at the site is to reduce Hg loading to the creek and, at the same time, not increase MeHg concentrations.

Region 10's Office of Environmental Review and Assessment (OERA) Environmental Services Unit and Laboratory worked with the Office of Environmental Clean-up to design a study to help site managers make effective remediation options by investigating potential increases in MeHg production at the Cinnabar mine from organic matter amendments to the tailings. While previous studies have established that additions of organic carbon stimulate microbial methylation of Hg, it was uncertain how bioavailable the Hg associated with the tailings would be to the methylating organisms. The investigation involved both field measurements of ambient environmental conditions as well as controlled laboratory experiments. The controlled laboratory experiments were run in triplicate and consisted of un-amended tailing and tailings amended with an engineered soil media typically applied at mine sites. The experimental results showed that the organic carbon amendments stimulated microbial activity which resulted in a large increase in MeHg concentrations, while the un-amended tailings did not show a change in MeHg concentrations over time. In addition, the experiments showed that the addition of organic amendments significantly increased the mobility of dissolved inorganic Hg in water, which has important implications for understanding the potential for increasing MeHg production downstream from the mine site. These results are currently being used by site managers to design an effective remediation at the site that is optimized to reduce MeHg production and decrease Hg mobility. The results are of interest to the Nez Perce Tribe which invited the EPA to present the results at a recent meeting.

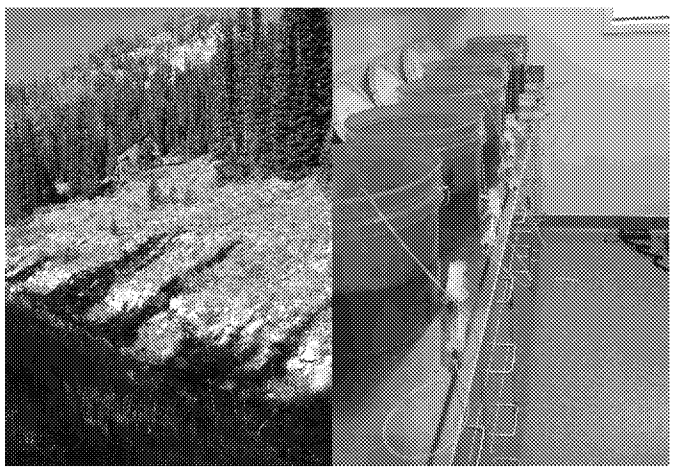

Figure 1. Photos show the abandoned Cinnabar mine site in central Idaho (left) and the setup of the laboratory mesocosm study to identify the impact of organic carbon amendments on Hg methylation (right).

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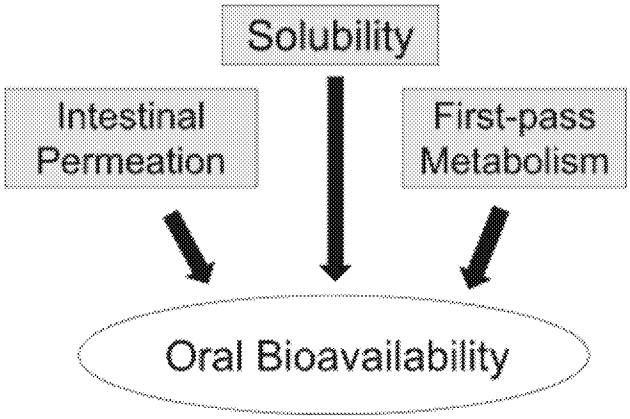
Keeping communities safe and healthy by reducing risks associated with exposure to chemicals in commerce, indoor and outdoor environments, and products and food.

Lead Bioaccessibility Method

The Office of Superfund Remediation and Technology Innovation (OSRTI) directed the program to lower the action level for lead in soils in order to be more protective of sensitive human populations. In response, the **Region 4 Laboratory** adopted the in-vitro bio accessibility Assay for Lead in Soil (SW-846 Method 1340) to determine the fraction of total lead in a sample that is will likely be available for accumulation in human tissue. A sample preparation method was chosen that extracts lead for the relevant particle size under conditions which mimic as nearly as possible the conditions of human ingestion. The Superfund Division has used the bio accessibility data for a high profile case in the Region to accurately assess the risk to human health from lead in soil.



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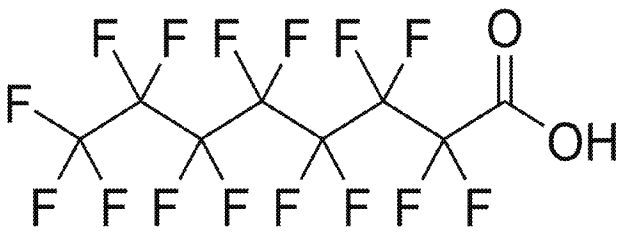
Progress on the analysis of Per- and fluorinated Alkyl Substances (PFAS) including Gen-X

Per- and polyfluoroalkyl substances (PFAS), are a broad class of environmental contaminants of emerging concern. PFOA and PFOS are two well-known compounds within this broader class of compounds. PFAS are increasingly being detected at low levels in our nation's eco-systems, including contamination of drinking water sources. Environmental monitoring for PFAS is becoming more requested at Superfund remedial and removal sites. PFAS analysis can be very challenging, especially given their diversity and lack of well-established analytical methods.

In an effort to address this increasing demand for analytical support for PFAS, the **Region 4** laboratory is actively involved in a cross-EPA workgroup on method validation and exposure. The workgroup consists of staff from HQ, Regional laboratories and ORD.

Currently, the focus within the chemistry subgroup is to develop multi-laboratory validated methods for water samples other than drinking water (surface, ground and waste water) and quantifying 24 PFAS. At this time, validation samples have been prepared, distributed, analyzed and the sample results submitted for statistical analysis by six laboratories. That data will be used in the effort to provide validated methods for non-drinking water matrices. The Science and Ecosystem Support Division (SESD) laboratory is actively participating in this effort.

As PFOA and PFOS have been eliminated from production, alternative replacement compounds are being produced. Recently, the scientific literature has shown these replacement compounds to be detectable in the environment. One area where these newer contaminants of concern have been detected is in the Cape Fear Watershed. Region 4 staff have been involved in a workgroup formed to address these detections. The workgroup consists of staff from NC environmental agencies, ORD and SESD. To monitor these emerging contaminants, the Region 4 SESD is currently single-lab validating a procedure to monitor water for hexafluoropropylene oxide dimer acid (HFPO-DA) (technical product known as Gen-X), a PFOA replacement. It is expected that the method validation will be completed in FY 2017.



Heritage Crystal Clean

A special request was made to the **Region 6 Houston Lab** to analyze samples from the Heritage Crystal Clean site, a facility that reuses hazardous wastes as manufacturing ingredients in parts cleaning products. Routine laboratory analyses volatiles, semi-volatiles, and metals were performed for these samples with an unusual request to determine a total volatile organic concentration (VO) and total organics by percentage (per RCRA Air Rule Requirements Section 3004 (n)). Routine laboratory tests normally report volatile and semi-volatile compounds as individual concentrations not as summations or percentages. To perform these complex calculations, the laboratory had to develop a special reporting package to meet the needs of the customer. The first step was to separate organic compounds as volatile or semi-volatile, according to the regulation, in highly concentrated and difficult samples. The RCRA Air Rule requires that only compounds with Henry's Law Constants (HLC) > 0.1 can be included in the VO calculation (HLCs are a measure of how much of the compound in water is released to atmosphere versus how much is retained in the liquid). The regulation does not have a set list of compounds with HLCs to include in the VOC calculation but has a list of compounds that are specifically excluded; therefore, each target and tentatively identified compounds (TICs) peak had to have the HLC individually verified through research of multiple sources to ensure they met or exceeded HLC criteria of other volatile compounds. To complicate matters further, the same organic compounds, predominantly TICs, were detected in both volatile and semi-volatile analyses, and the reviews had to ensure they weren't being counted by both techniques (i.e. counted twice). If the HLC could not be verified as >0.1, the compound was reported separately under the semi-volatiles analysis. Separation of the peaks between the analyses became a painstaking and lengthy process. Once the volatile and semi-volatile compounds were confirmed, the total organic concentration by percent was calculated using a summation of target and TICs for both volatile and semi-volatile analyses. This sample set took herculean effort to complete because they were highly concentrated samples, required complex calculations, and needed a special reporting package. Significant research and manual calculations were required for this project, which made the analysis, reporting, and reviews of the data very complicated and lengthy.

Sky Valley Education Center

In the fall of 2015, the Sky Valley Education Center (SVEC) in Monroe, WA began receiving complaints from parents and students regarding illnesses they believed were related to contaminants in the building. The complaints reported to the County Health Department were suspected to be associated with conditions at the school such as leaking ballasts of old fluorescent light fixtures. The EPA **Region 10 Laboratory** and the Office of Compliance and Enforcement (OCE) assisted the SVEC in determining whether Polychlorinated Biphenyls (PCBs) were an issue at the school.

The Region 10 Laboratory worked with OCE and EPA **Region 5** PCB inspectors to collect wipe samples of school room surfaces and light fixtures for the analysis of PCBs. The Region 10 Laboratory also analyzed caulking material samples for PCBs. Preliminary results were provided within a few days of the samples' receipt. To verify detected PCBs as aroclors, a gas chromatograph/triple quad mass spectrometer was used to confirm identifications. The results determined that the light fixtures were a source of PCBs and that the school needed to take remedial action. Additional sampling and analyses by the Region 10 Laboratory occurred after the school spent over $350,000 to replace light fixtures with LED lighting. The results indicated that the PCB sources had been removed.

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PFOA/PFOS Method Validation Study

The **Region 5 Laboratory** conducted a multi-lab validation study for direct injection of non-drinking water per fluorinated chemical samples into a Liquid Chromatograph-Tandem Mass Spectrometer. The effort is multi-programmatic with participation from **OLEM, ORD and several Regions**. The data are being evaluated. The method was developed in the Regional lab and a similar method for soils/sediments is also ready for method validation. The methods have been used for the analysis of PFCs at several sites across the county for ORD Environmental Response Team and the Regions. The methods for soil and water were adopted by ASTM International as ASTM Standards D7968 and D7979 respectively, and are being referenced worldwide.

Dicamba Overspray in Missouri

In the spring of 2016, over 100 dicamba overspray complaints were filed with the State of Missouri DEQ and Department of Agriculture. Cotton growers had planted GMO cotton that were resistant to dicamba, which improves the farmers ability to kill weeds without destroying their crops. Dicamba and a new Dicamba/2,4-D mixture was used on the genetically modified organism (GMO) crops. Unfortunately, non-GMO crops were adjacent to these cotton fields. Two main issues arose from this event. First, the pesticide label did not specify that it could be used on GMO crops, so it was a violation of the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA). Second, many of the neighboring farmers lost large amounts of edible crops such as peaches, beans, tomatoes, cantaloupes, and soybeans. Because dicamba is so volatile, it does not have a typical overspray pattern directly adjacent to the applied field. The number of complaints overwhelmed the state of Missouri, and EPA was invited to assist. Chemists were brought in to discuss options with the state and FDA, as well as OPPS. **Region 7** chemists set-up an analytical method following directions from OPPS, and prepared for additional samples. Region 7 chemists also worked with the local FDA office to understand the methods used by them for the food side of the project. By ensuring EPA's method is comparable to FDA's method, the data could be compared and used. The Region 7 lab director shared this information with Region 4 and 6 lab directors when the complaints expanded into Illinois, Kentucky, and Arkansas. EPA Region 7 has the method working and is ready for future events analyzing both soil and vegetation.

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Empower Communities, States & Tribes

Cyanobacteria Monitoring Collaborative

Cyanobacteria and their associated toxins are a major issue in New England. Starting in 2013, EPA's New England Regional Laboratory partnered with our states (including NY) to convene a region-wide cyanobacteria monitoring and "bloom watch" workgroup to collaboratively establish a uniform and consistent regional approach to monitoring cyanobacteria. Now called the **Cyanobacteria Monitoring Collaborative**, the program has significantly expanded each year. The Collaborative includes state environmental water quality and beach monitoring programs and departments of public health, tribes, public water suppliers, NGOs, citizen monitoring groups, and academics. Three key components of the Collaborative are:

- **BloomWatch** - a crowdsourcing, citizen science smart phone app that the public can use to identify and report potential cyanobacteria blooms by uploading time, location and photos of a potential bloom to the citsci.org webpage, which can be relayed immediately to a state specialist for follow up. BloomWatch not only educates people, but promotes the use of quality assured data submitted by the public to address the cyanobacteria issue.

- **CyanoScope** – Developed for trained citizen scientists and professional water quality managers to collect water samples and upload microscope images of cyanobacteria to the inaturalist.org webpage at http://www.inaturalist.org/projects/cyanoscope. Field monitoring kits complete with digital field microscopes and cyanobacteria samplers are provided through Region 1's Equipment Loan Program.
- **Cyanomonitoring** – this component engages environmental professionals and trained citizen scientists in monitoring using a field fluorometer to test for cyanobacteria in water samples to track the progression through the course of the sampling period, helping in the ability to forecast upcoming bloom events and manage recreational waterbodies and drinking water sources. The Collaborative's webpage (http://cyanos.org/) provides detailed information and links each of the three components. There is also a listserv with more than 300 subscribers.

Region 1's new mobile biology laboratory is being used extensively to conduct on-site training for engaged watershed protection and citizen science groups around the region. EPA staff have held trainings at more than 40 different locations around New England and trained in person more than 400 individuals, including state and local water quality staff and boards of health, municipal drinking water suppliers, citizen associations, academic researchers, lake and river associations, and others. EPA staff have also held numerous national webinars attended by hundreds. There have been numerous positive articles, news clips, blog posts, tweets and Facebook posts about the program, including a National Geographic blog including the program in the top ten citizen scientist programs in the US.

The architecture of this program has been designed to be flexible enough to be easily incorporated into existing monitoring and educational programs, yet rigorous enough to ensure uniformly consistent monitoring methods and protocols so that data can be aggregated across the region and utilized by many different entities. It can easily be implemented by citizen scientists and volunteer monitoring groups to advanced drinking water programs with limited investments of funds or labor. The program provides an educational component as well as the data necessary to responsibly manage our water resources. As a result of the national conferences, webinars and articles, the approach is being adopted by almost all Regions, many states, watershed groups across the country and even internationally. This program has been a highly successful collaboration between EPA and the states, involving the best experts working together to tackle a growing public health and environmental crisis, while engaging citizen scientists to collect quality data during these times of shrinking resources.

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Empower Communities, States and Tribes

EPA will strengthen its community-driven approach, which emphasizes public participation to better partner with states, tribes, and communities and to maximize the support and resources of the entire Agency to create tangible environmental results.

E Coli Concentrations in the

Bear Creek begins in wilderness snow atop 14,271-foot Mount Evans, visible to residents around metro Denver. The creek cascades through pristine forests starting in the foothills near Evergreen. Pristine water reaches suburban homes, roads, reservoirs, septic tanks, parks used by dog-walkers, golf courses and commercial sites. Chemical and biological contamination gets worse as Bear Creek approaches the South Platte River. In 2008, The USEPA deemed Bear Creek "impaired". Denver, Lakewood and Sheridan taxpayers would be fiscally responsible, facing federal Clean Water Act penalties, if Bear Creek water quality isn't improved. E. coli contamination in Bear Creek has been measured as high as 2,400 colony-forming units (cfus) per 100 milliliters. The state health limit is 126 cfus. The occurrence, fate, and transport of E Coli is an important water quality concern, both nationally and regionally and has gained public interest. The work conducted by this **Region 8** Team is providing valuable information to address those concerns and fill information gaps which could then be used to inform the implementation of the Safe Drinking Water Act (SDWA) and Clean Water Act (CWA), as appropriate. (continued on next page)

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Empower Communities, States and Tribes

E Coli Concentrations in the Bear Creek Watershed (cont.)

One of the most rewarding aspects of this project was the training of Metropolitan State University of Denver students and the training of Sheridan High School students. The students were trained in the proper sampling of the creek, the proper safety precautions, some were taught analysis methods, and then data review, data interpretation, and finally presentation skills. Region 8 Laboratory scientists, each with their own specialty, contributed to the outreach to these students. They accompanied them on sampling events, helped them understand the reasons why what they were doing was important, and helped them explain their results to the Sheridan City Council. The Region 8 Laboratory scientists, also made presentations about the methodology, background science on E Coli contamination, and results of the testing to all of the partners. Region 8 Laboratory scientists were also contributors to the City of Lakewood Sustainability Plan. (continued on next page)

The **Region 8 Laboratory** scientists negotiated, educated, and jointly developed plans to be more strategic with sampling locations. This strategic planning resulted in a more comprehensive monitoring program and the inclusion of more sampling sites than was initially fiscally possible. Over 1000 measurements have been made in the last three years.

The work by this team supported the development of a multi-partner surface-water monitoring programs. Data generated from this study is being used in the region by states and local municipalities, but was also shared with OW, ORD, and other federal agencies. The data has been used to determine the broadness of the E Coli issue and to try and identify sources. This coordination, use, and sharing of data expands the utility of the data to improve our scientific understanding of the E Coli fate and effects, for use in regulatory decisions, and implementation of national water quality initiatives. This effort is improving and maintaining improvements in water quality as well as fostering partnerships within the agency and between the agency and local municipalities, universities, and citizen groups (Groundwork Denver and Trout Unlimited).

Environmental and public health impacts affect people most significantly where they live – at the community level. EPA is focused on providing better support to communities, especially in environmentally-overburdened, underserved, and economically-distressed areas where the needs are greatest.

Regional Laboratories coordinate technical assistance and other resources across EPA Programs; with states, tribes, and local governments; and with other federal agencies to support communities as they pursue environmental improvements that enhance economic opportunity and quality of life.

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Provide for Clean and Safe Water: Ensure waters are clean through improved water infrastructure and, in partnership with states and tribes, sustainably manage programs to support drinking water, aquatic ecosystems, and recreational, economic, and subsist-

Passaic River Pathogen/Microbial Source Trackdown Study

The Second River, a major tributary of the Passaic River located in Northern New Jersey, flows through an Environmental Justice area that is largely urbanized and includes several large townships. The river has shown some of the highest levels of fecal bacteria in the New York-New Jersey Harbor and the source of these elevated levels was not clear. The Region 2 program office, with the assistance of the Region 2 RS+T field and laboratory staff, designed an intensive study with the primary objectives of 1) assessing bacteria levels at multiple key locations throughout the Second River and 2) identifying the sources of the bacteria, specifically whether they were of human origin.

The Region 2 Laboratory provided analytical support for the project, analyzing samples for conventional bacteria indicators followed by molecular DNA marker testing of the bacteria to identify the sources. This conventional bacteria analysis included testing for Enterococcus, Escherichia coli, and Fecal Coliforms; the molecular DNA analysis included testing for two Human DNA markers to assess if the sources were of human, e.g., sewerage, or non-human, e.g., water fowl, animals.

The Laboratory processed approximately 25 samples each week during the study period, spanning over three months, for a total analysis of nearly 1200 analysis. The analysis for the conventional bacteria was especially demanding as the samples had to be processed within 6 hours of collection, with a team working several hours each afternoon to meet the time constraint.

The Laboratory provided a comprehensive analytical report to the program office, summarizing the conventional bacteria results and the molecular-based DNA results, for evaluation. The program office analyzed the study results and has identified several potential sources of the fecal contamination, from human origin, to the Second River. The study data will directly assist in the development of management strategies to address major sources of contamination.

Regional Laboratories play an important part in protecting and restoring the nation's water resources by providing:

- key data for regions and their partners and target actions to protect human health and aquatic ecosystems more efficiently
- technical and regulatory support to drinking water laboratories and training and support for water quality monitoring efforts
- analytical support for various projects across the U.S.

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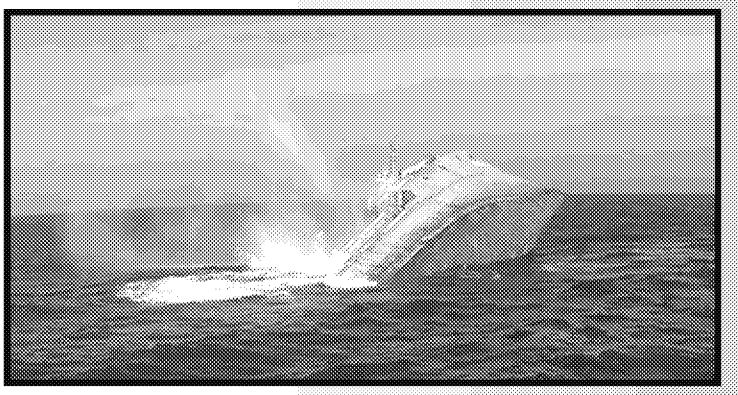
Region 3 Ocean's Program Assists with Sinking Ocean Vessel to Create Artificial Reef



Region 3's Ocean Program Team witnessed the former menhaden vessel, *Shearwater*, sinking as an artificial reef 26 nautical miles off the coast of Delaware on December 11, 2015. Because the approximately 180 foot long former military and fishing vessel was built in the late 1940s as a Coastal Fast Supply Ship for use in WWII, verification of the removal of PCB-laden materials was completed prior to the sinking. In September, EPA completed a walk-through of the vessel to verify that it had been fully stripped based on EPA and US Maritime Administration's (MARAD's) National Guidance: Best Management Practices for Preparing Vessels Intended to Create Artificial Reefs. The U.S Coast Guard also performed an inspection of the vessel to confirm there was no oil on-board. Residual plastic debris and insulation were removed during the walk-through and loose, peeling paint was exfoliated. At no time during the sinking process was any floatable debris or sheen seen coming from the *Shearwater*. A sonar survey of the *Shearwater* completed after deployment showed the top of the artificial reef is now 115 feet below the surface and she is resting on her side on the sand bottom in 127 feet of water. While the *Shearwater* will never see the light of day again it should have many productive years in her new role as an artificial reef providing food and habitat for fish and recreation for fisherman and divers

Molecular Biology Analytical Support to RARE Projects

The regional lab is supporting several ORD Regional Applied Research Effort (RARE) and Regional Methods (RM) projects in **Regions 1, 3, 5 and 8**. Non-EPA partners as well as EPA ORD Cincinnati scientists are assisting the effort as well. The region has a molecular biologist operating quantitative polymerase chain reaction (qPCR) equipment to determine the effects of endocrine disrupting chemicals in surface waters on the feminization of male fish and the impact of reproductive health of aquatic life. The effort is being conducted in the northeast, Chesapeake Bay, and Colorado. Large numbers of fish samples are processed and analyzed by gene expression, then the results are shared via a cloud based data portal with the research teams.

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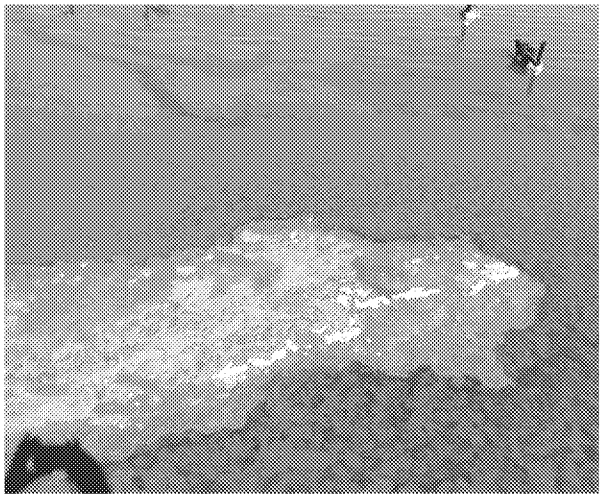
Protect Water: a Precious, Limited Resource

Algal Toxins in Water Method Development



Cyanobacteria or blue-green algae occur around the world in nutrient rich water environments. Some of these cyanobacteria produce toxins that are harmful to humans and animals. Humans and animals can be exposed to these harmful toxins by several pathways including ingestion, inhalation, and contact with the skin (bathing, and or recreation) in the effected waters. Over 500,000 people were ordered to not drink or boil their drinking water in Toledo, Ohio in August 2014 due to the detection of some of these toxins in the city's drinking water. Some of these toxins have been and are being detected in surface waters in **Region 8** and across the United States. There are concerns that low-level, chronic exposure to mixtures of these chemicals can have adverse ecological or human health effects. For example, new (2015) USEPA Health Advisories (HA) have recommended at or below 0.3 micrograms per liter for microcystins and 0.7 micrograms per liter for cylindrospermopsin in drinking water for children pre-school age and younger (less than six years old). For school-age children through adults, the recommended HA levels for drinking water are at or below 1.6 micrograms per liter for microcystins and 3.0 micrograms per liter for cylindrospermopsin.

The occurrence, fate, and transport of these chemicals are an important water quality concern, both nationally and regionally and have gained considerable public interest. The work conducted by Region 8 scientists is providing critical information addressing concerns in both a routine monitoring capacity and as needed when algal blooms develop. The gathered data are shared with the regional states and local agencies. The feedback is overwhelmingly positive and Region 8 was commended for developing this capacity by States and Tribal Nations alike. Additionally, Region 8 scientists are collaborating with the National Oceanic and Atmospheric Administration and Office of Research and Development (ORD) and providing some of the first data in the region for their inland Phytoplankton Monitoring Network initiative. These regional efforts directly support the EPA's recommendations for the management of cyanotoxins in public water systems, the Algal Toxin Risk Assessment and Management Strategic Plan for Drinking Water, and the Harmful Algal Bloom and Hypoxia Research and Control Act. Data generated from this collaborative approach are used in the Region by states and a municipality to access their drinking water and recreational water facilities. This coordination expands the utility of the data to improve our scientific understanding of the fate, transport, and affects from algal toxin exposure, and for regional and national water quality initiatives. The analysis of waters affected by algal blooms also provided timely data for making local public health risk decisions. This teamwork-based effort is improving and maintaining improvements in water quality as well as fostering partnerships within the agency, between the regional states, and other federal agencies.

The Drinking Water Unit from the Office of Partnerships & Regulatory Assistance (OPRA), the Water Quality Unit from the Office of Ecosystems, Protection and Remediation (EPR), and the Laboratory Services Program from the Office of Technical and Management Services all worked together to identify and develop the algal toxin analysis methods. This coordination resulted in the development of 2 analytical methods to monitor for 4 individual toxins, and 1 field screening method. Data have been collected in 3 regional states, for one municipality, and shared with one other federal agency (NOAA) as well as Office of Research and Development. Expansion of the analytical methods (new analytes) and laboratory sample analysis capacity are planned for 2016.

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Protect water: a precious, limited resource

Flint Michigan Drinking Water Response

The City of Flint, Michigan was discovered to have improperly treated drinking water at the end of 2015. The Region 5 Laboratory and later the regional lab network was invoked to assist with the response, totaling 11,830 analyses reported out within 5 days of receipt between all of the participating regional labs during Fy2016. The effort lasted throughout the entire fiscal year 2016 and into 2017. The **Region 5 Lab in Chicago had the lead,** analyzing drinking water samples for lead, copper, and zinc as the field team tried to locate residences with lead service lines. The workload was very high and **regional labs in Kansas City, KS, N. Chelmsford, MA, Athens, GA, and Port Orchard, WA, volunteered to assist** to alleviate the load of samples arriving every day. This effort involved taking one or two days of sampling each week, allowed the Chicago lab to keep pace with the rest of the week's sampling and all regional labs were able to meet the 5 day turnaround for all samples. The Chicago lab also performed anion, total phosphorus and alkalinity tests to support the Flint response effort.

Staff at the Chicago laboratory made many process improvements in order to keep up with what amounted to a doubling of the Chicago lab's annual workload. Three staff were trained on the use of the metals instrument to analyze samples, doubling this staff capability. This also helped with data review after the samples were analyzed. Three additional metals preparation stations were procured quickly with the assistance of the regional acquisitions team. This was necessary to ensure the drinking water samples were digested quickly so as to not hold up sample analysis. Several additional Chicago lab staff were trained to log in samples upon receipt, pour samples into digestion tubes and many other tasks to ensure peak efficiency of the entire sample process. One staff member kept a special log spreadsheet of each sample as they arrived to make sure none were lost or overlooked. One staff member took the lead to address questions from the field team and other regional labs, so those involved with processing samples were left undisturbed.

The Regional lab in Kansas City shifted to assisting with other projects the Chicago lab could not take, thereby allowing regular non-drinking water projects to continue while the Chicago lab was dealing with the Flint sampling effort. Many samples collected also meant many problems with shipping and receiving. The sample custodian had need of two backups to assist with the log-in of samples and many sample labelling or container issues that needed to be resolved before the samples could be prepped and analyzed in the lab.

Regional Lab staff receiving a bronze medal for their efforts during the Flint, MI emergency response

The entire effort was a great example of staff innovation, process improvement and regional lab network cooperation.

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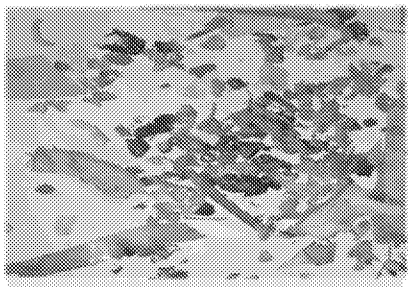
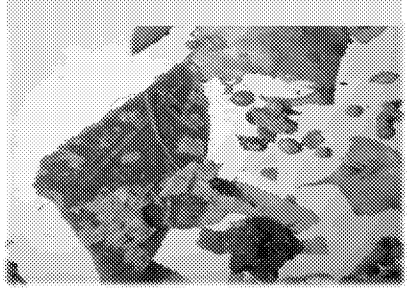
Protect Water: a Precious, Limited Resource

Region 3 and Trash Free Maryland Identify Microplastics in the Chesapeake Bay

The **Region 3 Laboratory** is collaborating with Trash Free Maryland (TFM), a non-governmental organization, to analyze water and fish tissue samples for microplastics. TFM received grant funds from the Five Star and Urban Waters Restoration Program, funded in part by EPA, to investigate the presence of microplastics in the Chesapeake Bay. Microplastics, which are small pieces of plastic less than 5 millimeters (mm), are marine debris that are of particular concern because they are found in numerous personal care products that find their way into coastal and estuarine waters. Microplastics are also formed by degradation of plastic trash such as plastic bags and bottles and may enter the food chain when consumed by fish.



Beads and monofilaments found in bay waters samples



The Region 3 Laboratory received 30 water samples and 5 fish gut samples. Water samples were collected from the top of the water column using a "manta" net with 2.5 um holes. Fish guts were removed by TFM from a variety of fish species provided from a single source from the Anacostia River Basin, a tributary of the Chesapeake Bay.

Isolating the microplastics particles from the water samples was based on National Oceanic and Atmospheric Administration (NOAA methods compendium), *Laboratory Methods for the Analysis of Microplastics in the Marine Environment: Recommendations for qualifying synthetic particles in water and sediment.* The Region 3 Laboratory provided the mass of particles per sample and photos of the isolated particles.

Isolating microplastics from fish tissue is the second phase of the project. The Laboratory is working with a digestion method provided by TFM. The method utilizes potassium hydroxide (KOH) to breakdown the fish tissue. Due to the harsh nature of a KOH digestion and concern that KOH may degrade some of the target particles the Region 3 Laboratory has performed some preliminary test utilizing papain, a proteolytic enzyme used to tenderize meat, in place of KOH. The tests revealed that the papain worked efficiently in the break-down of tissues. The papain is also inexpensive, readily available, non-toxic and does not appear to harm the particles.

The final step in the project will be to identify the different types of plastics in each sample. This will be done utilizing Fourier transform infrared spectroscopy (FTIR). The FTIR can be used to identify the different polymer types in the microplastic samples. The FTIR identification of microplastics will also be used to support two upcoming Office of Research and Development Regional Applied Research Effort (RARE) projects , which collaborates with Region 1 and Region 2 Laboratories. Region 1 will be looking at microplastics in sediment samples. Region 2 will be looking at coral samples.

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Study of Formaldehyde in NW Aquaculture Facility Effluents and Receiving Waters

In 2016, the **Region 10** Office of Environmental Review and Assessment (OERA) and the Washington State Department of Ecology (Ecology) conducted water sampling and field analysis at 10 federal and state fish hatcheries in Washington and in Idaho. The objective was to provide data on the concentrations of formaldehyde being discharged from hatcheries after applications of formalin, which is used by the hatcheries to control external parasites on hatchery fish and their eggs. Formalin is a generic term that describes a solution of 37% formaldehyde gas dissolved in water. The Food and Drug Administration (FDA) requires a 10-fold dilution of finfish treatment water and a 100-fold dilution of finfish egg treatment water. This should lead to an effluent discharge concentration of no more than 25 parts per million (ppm), which is equivalent to 25 µL/L formalin, or 10 ppm of the formaldehyde active ingredient. Recently, a risk assessment of hatchery effluents under the EPA National Pollutant Discharge Elimination System (NPDES) General Permit for Federal and Indian Country Aquaculture Facilities in Washington State was conducted by EPA Region 10. The assessment concluded that formalin use at hatcheries (which is covered in the NPDES General Permit) is not likely to affect salmonids listed under the Endangered Species Act (ESA) if present at concentrations below 10 ppm formaldehyde in the receiving water.

EPA and Ecology worked with staff and managers at the U.S. Fish and Wildlife Service and Washington State Department of Fish and Wildlife to identify which hatcheries in the Northwest use the most formalin, and to ensure that sampling included a range of formalin use scenarios (i.e., egg, juvenile, and adult treatments). By sampling formaldehyde in the effluent of Washington and Idaho facilities that use the most formalin, and by sampling during peak formalin use, the study was designed to capture reasonable worst-case concentrations. Sampling was performed in accordance with an approved quality assurance project plan (QAPP) at a minimum of three locations per fish hatchery: 1) the influent (raw water); 2) the effluent; and 3) the receiving water. Samples of treated effluent from facility outfalls were collected both as grab samples and by discrete interval sampling with an automated sampler. Grab samples were collected at a period when the highest likely concentration of formaldehyde was being discharged through the outfall. The analytical parameters collected for the influent and effluent included applicable field measurements (temperature, total chlorine, ammonia, dissolved oxygen, conductivity, turbidity, pH, and formaldehyde screening) and laboratory analysis for formaldehyde. Sample collection and shipment was coordinated with the Region 10 Laboratory to ensure that samples were processed on the day of receipt (formaldehyde samples have a short hold time due to analyte degradation). Sample extracts were analyzed with an analytical method mobilized for this project. Based on the data collected from the hatcheries that participated in this study, as well as the available toxicological data for threatened and endangered salmonids, EPA believes that current levels of formalin use are generally protective of aquatic life and ESA listed salmonids in Pacific Northwest waters.

ED_002434_00004518-00035

Allied Waste Landfill Enforcement Investigation Joint Regional RS&T Project

Region 2 Regional Science and Technology (RS&T) provided support to an enforcement monitoring investigation for air pollutants at a major Landfill, the Allied Waste Landfill, located in Niagara Falls, New York. The site investigation included monitoring at 35 locations for Methane, Ethane and Air Toxics. The site investigation included two phases, Phase 1 was performed by three inspection teams made up of **Region 2 and Region 5** inspectors to monitor the landfill surface and vents with flame ionization detectors for the presence of air toxics, particularly Methane. Based on the results of the Phase 1 monitoring, the Region conducted Phase 2 of the monitoring. This phase included the collection of air samples using summa canisters for the analysis of methane, ethane and air toxics by Method TO-15. As the Region 2 Laboratory did not have the analytical capability for these air contaminants, Region 2 reached out to the other laboratories within the Regional Laboratory Network for support. The **Region 4** Laboratory offered their services for the analysis of Methane, Ethane and Air toxics. It involved pre-cleaning and shipping of 35 SUMMA canisters, followed by the analysis using two separate methods – one for Methane and Ethane and the second for Air Toxics. In addition, compounding the effort, nearly all of the samples required dilutions demanding more attention to analysis, data processing and data review.

After several months of collaboration and preparation between the staff from all three Regions (2, 4 and 5) this project was successfully implemented and yielded results for the Region to take the necessary actions to improve nearby community air quality. This type of support, leveraging the expertise of the RS&T field inspectors and regional laboratories to assist in meeting critical mission needs, is a testament to the need, importance, and value of collaboration among the RS&T's and the regional laboratories.

Increase Environmental Law Compliance Rate

In all of its works, EPA's enforcement program strives to address noncompliance in an efficient and timely manner, applying a broad range of enforcement and compliance tools to achieve the goals of reducing noncompliance

Region 3 Laboratory Response to Potomac River Sheen Discharge

In November 2016, an oil spill from an unknown source was reported in the Potomac River near Montgomery County, MD. The NRG Dickerson Power Plant notified the National Response Center of accumulated oil on the Potomac River outside their facility outfall. A Unified Command was assembled including EPA, Maryland Department of the Environment, Virginia Department of Environmental Quality, and the District Department of the Environment. Approximately 10 miles of heavy sheen was observed from the air. Several water authorities were impacted and utilities were forced to shut down Potomac intakes.

The **Region 3** Water Protection Division reached out to the Region 3 Laboratory for assistance. Initially, the laboratory provided technical advice on best methods based on existing data from the DC Forensics Laboratory. Analysis of the spill presented some challenges since it was not detected by any of the standard drinking water methods.

The Region 3 Laboratory was able to provide rapid analysis of the river samples. The analysts utilized Fourier Transform Infrared Spectroscopy (FTIR) as well as volatile, semi-volatile and hydrocarbon analysis for identification of the unknown. Results were reported in less than 24 hours. Additional analytical support was provided by the Maryland Department of Health and Mental Hygiene (DHMH). Through the diligent work of the Region 3 analysts, the laboratory was able to identify the contaminant as "lube oil" based on pattern matching the results of the hydrocarbon analysis. Results of fingerprint analysis from the United States Coast Guard (USCG) agreed with the Region 3 laboratory results. The USCG was able to determine that the cause of the sheen was a turbine lubricant oil from the NRG Dickerson Power Plant.

ED_002434_00004518-00037

Ocean Dredged Material Disposal Sites

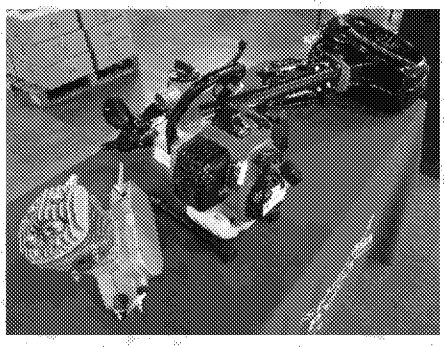
EPA is responsible for designating and managing ocean dumping sites under the Marine Protection, Research and Sanctuaries Act (MPRSA). Many of these ocean disposal sites are located offshore of major ports and harbors nationwide. Designated ocean disposal sites are selected to minimize the risk of potentially adverse impacts of the disposed material on human health and the marine environment. Science and Ecosystem Support Division (SESD) Chief Scientists, in collaboration with EPA **Region 4** program office, plan and conduct oceanographic surveys at and around ocean disposal sites located off the U.S. Atlantic and Gulf Coasts to monitor the impacts of regulated dumping at these sites. The surveys characterize the changes in chemical, biological and physical properties in and around OD-MDS sites to ensure that dumping will not endanger human health or the environment and to verify that unanticipated adverse effects are not occurring from past or continued use of the site. Data collection and analyses conducted through OD-MDS surveys include water measurements and chemistry, sediment chemistry, topography, coral habitat and fish community assessments.

ED_002434_00004518-00038

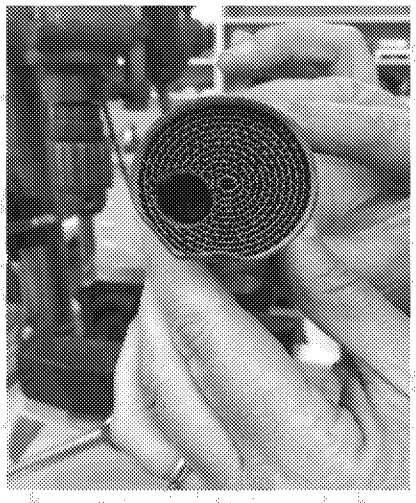
Increase Environmental Law Compliance

Catalytic Converter Washcoat Analysis for Platinum Group Metals by X-Ray Fluorescence Spectrometry

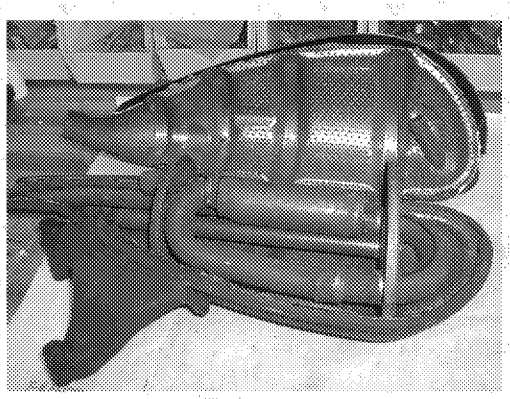
EPA conducts vehicle and engine exhaust system inspections to verify compliance with mobile source Clean Air Act (CAA) requirements. Engine exhaust systems may be equipped with catalysts to accelerate the chemical reactions that decrease nitrogen oxides (NOx) concentrations in combustion exhaust gas, oxidize hydrocarbons that were not initially combusted, and oxidize carbon monoxide to carbon dioxide (CO2). Vehicle manufacturers are required to submit catalyst specifications, including dimensions and precious metal catalyst content, in the application for certificate of conformity and ensure that all vehicles entering the U.S. meet the design specifications. Typical precious metal catalysts used in small engines are platinum (Pt), palladium (Pd), and rhodium (Rh). For small engines, the precious metals are mixed with a binding agent such as aluminum oxide and then applied as a washcoat to a ferrous metal substrate. The **Region 9 Lab** developed the capability to extract catalyst washcoat samples from small engine exhaust systems, verify catalyst dimensional specifications and quantify the precious metal content of the washcoat using a FP-XRF.



The Air Enforcement Program uses the data to prevent the importation of sub-standard engines and assure compliance with CAA requirements. During FY2016, the Lab processed over 50 exhaust system samples collected by Region 9 inspectors at the Ports of Los Angeles, Long Beach, and Oakland. The results of these tests led to the seizure of 3,035 vehicles and engines and prevention of 1.5 million pounds of emissions being released into the air.



Drilled Catalyst



Muffler: cut open

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Advanced Monitoring and Next Generation Compliance Tools

Region 1 deployed a real time, continuous flow, optical sensor system from ZAPs LiquID technologies. The unit was first set up at the Regional lab and tied into the lab's wastewater pretreatment system which allowed field staff to become familiar with instrument operation and maintenance in a secure setting. The device was then field deployed to an Massachusetts Bay Transportation Authority (MBTA) railyard in Boston where it monitored total suspended solids (TSS), E. coli, a surrogate for refined hydrocarbons, chemical oxygen demand (COD), and nitrate/nitrite. Low flow conditions at the site defined one operational limitation of the device, but also prevented a true test of system capabilities in the right setting. The device was redeployed to a municipal wastewater treatment system where it monitored the biochemical oxygen demand (BOD) and COD loads from an individual manufacturing operation that discharges to a Publicly Owned Treatment Works (POTW) through a dedicated pipeline. Upon preliminary review, the device's outputs were well correlated with the results of concurrent grab sample lab data. In both field deployments, there has been a need for high frequency manual maintenance tasks to be performed. In the future, an add-on technology will be tested to try

Forward Looking Infra-Red Cameras

Region 1 has continually explored new applications of Forward Looking Infra-Red cameras (FLIR). During 2016 we partnered with:

- New Bedford and Coast Guard to evaluate potential ability of FLIR to spot illegal fishing vessel bilge water discharges in New Bedford Harbor.
- The Region 1 drinking water program to evaluate ability to rapidly determine groundwater discharge zones into surface waters.

Low-level aerial photography – EPA is prohibited from using drones, so we went old school and borrowed a small blimp from Region 4 with a remote controlled camera mount. We tested the device at Shepley Hill Landfill in Massachusetts and on first deployment were able to capture high-resolution images of a groundwater seep adjacent to the landfill discharging to a nearby pond. These aerial images provide a perspective not attainable from ground level and help focus efforts to quantify post-slurry wall groundwater seepage and contaminant flux essential to remedial performance evaluation. The method shows great promise for reviewing dozens of other Region 1 superfund sites in relation to site characterization, remedial performance monitoring and long-term monitoring.

ED_002434_00004518-00040

EPA as a High Performing Organization

PhyloChip Development

Region 7 is collaborating with Lawrence Berkeley National Laboratory (LBNL) to deploy, assess, and evaluate PhyloChip technology under a wide variety of environmental conditions through a contract mechanism available to EPA partners nationwide. The ultimate goal is to develop the capability and capacity to perform PhyloChip analysis in-house at the Region 7 Science & Technology Center. The PhyloChip is a forensics tool that identifies human, animal and environmental sources of bacteria with a single test. It can provide a source-specific DNA fingerprint of contaminant sources by measuring the composition of the entire microbial community.

Animal feces and environmental sources contain unique combinations of thousands of distinct microbial species—highly specific "fingerprints." PhyloChip can detect this microbial fingerprint. The PhyloChip contains a unique microarray that can simultaneously detect most known microorganisms—testing for over 58,000 bacterial taxa. The glass microarray holds 1.1 million separate tests, each measuring a specific nucleic acid sequence. PhyloChip has the ability to measure thousands of source-specific microbes at very high or low quantities, and has many built in statistical controls and quantitative standards. Older methods of sampling and growing cultures in the lab took days to weeks and could miss species that cannot grow on the culture medium. In validation studies, the PhyloChip has a high degree of sensitivity and specificity for human sources, cattle, swine, house pets, birds, and diverse wildlife. PhyloChip also has the unique capability to identify non-fecal bacteria sources such as sediments, soils, and decaying vegetation.

The costs of using the PhyloChip are the device itself (about $250 each) and analytical costs. Currently, the analytical test for each chip costs $500 with labor and results typically obtained within a week (batches of at least 10 chips). Analytical testing is done by the University of California Berkeley.

EPA is currently testing the use of the PhyloChip in several regions under a wide variety of environmental conditions in urban and rural settings. Several collaborative projects are currently underway in cooperation with states and tribes using Region 7's contract mechanism with LBNL . Data uses are expected to include waste profiling, pollutant source bracketing (upstream and downstream), emerging contaminants, sewage effluent, groundwater contamination, and harmful algal bloom research. EPA will be seeking to determine the effectiveness of PhyloChip in each of these unique circumstances and how this technology may be effectively applied in the future.

Region 1 also collaborated on this multi-regional project proposal to evaluate the PhyloChip system. Field staff screened, selected, and sampled waters downstream from Concentrated Animal Feeding Operations (CAFO) and bay shoreline waters in the St. Albans Bay, Lake Champlain, Vermont watershed. The project study area is a heavy agricultural use area, with several dairy operations and a vast amount of crop field acreage. The project evaluated PhyloChip capability to apportion microbial indicators between CAFOs and other sources (i.e., human, non-human, birds, cows, septic systems, wildlife, etc.). An important result in this agriculturally dominated setting was an indication that failed septic systems are a significant potential contributor to nutrient loading. Further study of Vermont CAFOs are being planned to further evaluate this new technology.

ED_002434_00004518-00041

Ft. Riley Groundwater Analysis for Green Infrastructure

The Office of Research and Development signed a Memorandum of Understanding with the U.S. Army facilitating collaboration on the Army's Net Zero initiative on conserving energy and water while recycling waste at military installations. Ft. Riley, Kansas, was the selected site as a pilot NetZero Water facility. **Region 7** facilitated research relationships with ORD, Ft. Riley, and the U.S. Geological Survey, using RARE funding to support Green Infrastructure (GI) at a Ft. Riley elementary school educating the community on the benefits of the sustainable water resource management.

Managed properly, green infrastructure applications and technological approaches can reduce, capture, and treat storm water runoff at its source. There is clearly a need for communities to better understand how to set up monitoring and modeling environments for GI activities. These data and models are necessary to understand the anticipated functionality of green infrastructure, especially as an alternative for grey water and to furthermore determine its efficiencies as a compliance method to correct combined sewer overflow violations.

In the Fall of 2015, Region 7 chemists agreed to assist ORD/ADA with sampling and analysis. At this point, construction had been completed on a new school parking lot which was permeable, and 25 test wells had been drilled. The monitoring plan tested horizontal and vertical water samples for contamination migration, if any. Four large sampling events were scheduled to analyze a wide range of pollutants to determine the impact on the ground water from a permeable surface. In support of this project, Region 7 chemists performed a wide range of extractable organics using the Gerstel SBSE technology (Twister), volatiles, nutrients, and metals. In addition, laboratory chemists provided field support to ORD chemists during these large sampling events. Chemists met ORD staff at the site, assisted with sample collection and transported samples back to the laboratory for analysis. The data was submitted to ORD for their review. This project has been extended, and Region 7 chemists will continue to provide field and laboratory support for this study.

ED_002434_00004518-00042

Lead Bioavailability Study in Missouri

Thousands of residential and other properties in the U.S. are sampled each year to detect high levels of lead, due to concern of contamination by past mining or smelting activities or materials. The financial burden of these investigations is an incentive to find procedures that reduce costs while still providing the desired level of confidence that unacceptable exposures and unnecessary cleanups are avoided. Soil heterogeneity can cause contaminant data to be highly variable, thus diminishing this level of confidence. Statistical analysis is the tool that can be used to control the chance of decision error when data uncertainty exists. In partnership with **Region 7**, the Technology Integration and Information Branch (TIIB) within EPA's HQ Superfund program conducted a field study that examined several sampling design factors relevant to residential sampling for metals. EPA Region 7, EPA Headquarters and the Missouri Department of Natural Resources collaborated on a field study involving 18 residential properties in the Furnace Creek Lead Superfund Site in Caledonia, Washington County, MO (impacted by Pb from mining operations). A total of 23 yard areas (DUs) were sampled for surficial soil. All DUs were sampled with triplicate 5-, 9-, and 30-point composites, so that all DUs produced 9 independent samples each. All samples were processed to control within-sample heterogeneity via drying, disaggregation, and sieving to a <250-micron particle size. The data collected for this field study were utilized to address data gaps identified through the expansion of this Superfund Site and to help develop a site specific cleanup goal for the Record of Decision for this same Site

Region 7 chemists supported this work in several ways. First, they provided input and suggestions to the draft plan. Second, they provided space for contractors to dry and sieve 400 samples in a safe environment. Two hoods, and six ovens were reserved for this month long project. Finally, the chemists analyzed the samples for total lead, and bioavailable lead. The data were submitted for evaluation. ORD's report compared the various triplicate composite results to each other and to the XRF readings. This information was used to determine an accurate and rapid approach to single property evaluations at this particular site, as well as future sites.

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Lean Events

In 2016, **Region** 7 completed two LEAN events and initiated a third LEAN event. As a result of initiating QAFAP, the staff realized that there was not a good system to track field training, and many supervisors were not tracking the training at all. A small team of laboratory chemists and field staff met to discuss what programs existed, if any could be adopted, or if we needed to develop our own training tracking system. The team identified the critical components of a tracking system, and began the research of possible existing systems. As part of the research, an Access database that existed with NEIC was obtained, modified and implemented.

The laboratory continues to review and map the various laboratory processes. In 2016, the team of chemists tackled the sample disposal process to understand and streamline, if possible, the process. One of the problems observed by the laboratory was receiving responses from project managers to identify the legal status of the samples (litigation hold), the disposal status of the original samples, and to provide customer feedback. The LEAN team completed the process mapping in less than 8 hours, and then spent another 4 hours to create an electronic survey with customer oriented and understood questions. The discussions centered on why this information was needed. Once the project managers understood that the laboratory had to comply with RCRA standards on waste disposal, and needed customer feedback for the laboratory certification, they were more willing to comply with a response. Unfortunately, the number of response have not improved because of a number of new project managers. The next step is educating the new project managers.

A third event was initiated focusing on laboratory sample data and the IT issues. As a result of the initial meeting to discuss processes by chemists and computer scientists, a smaller task was implemented. Instead of tackling the complete LIMS system, EPA compatible computers, and the many differences in methods of implementation, the management team decided to implement installing EPA compatible computer on analytical instruments. After one year, 15 of 45 computers have been deployed to analytical instruments on three different vendors' instruments. The computer updates are controlled by the chemists, preventing untimely interruptions of sample analyses. The new installations require a chemist, a programmer, and a computer scientist with the vendor's IT service. Each time an installation happens, it takes all four staff approximately 2 days to ensure the full operation of the instruments. This smaller scoped team is now testing remote control of the instruments and remote/electronic data reduction.

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LAB CAPABILITIES

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EPA REGIONAL LABORATORIES CORE CAPABILITIES SUMMARY
Inorganic Chemistry

FY2016

ANALYTE/GROUP NAME	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	REGIONAL CAPABILITY									
			1	2	3	4	5	6	7	8	9	10
Acidity	Water	Titrametric		X	X	X	X		X	X	X	X
Alkalinity	Water	Titrametric	X	X	X	X	X	X	X	X	X	X
Asbestos	Solids/Bulk material	PLM	X						X	X	-	X
	Soil/Sediment	PLM	X						X	X		X
Anions	Water	IC	X	X	X	X	X	X	X	X	X	X
	Water	Titrametric		X	X							
Chromium, Hexavalent (Cr+6)	Water	Colorimetric		X					X			X
	Soil/Sediment	Colorimetric										X
	Water	IC			X	X	X	X	X		X	
	Soil/Sediment	IC			X	X	X					
Cyanide, Amenable	Water	Colorimetric	X	X		X	X		X	X	X	X
	Soil/Sediment	Colorimetric	X	X		X			X	X		X
Cyanide, Total	Water	Colorimetric	X	X	X	X	X	X	X	X	X	X
	Soil/Sediment	Colorimetric	X	X	X	X	X	X	X	X		X
	Waste	Colorimetric	X	X	X	X	X	X		X		X
Fluoride	Water	ISE	X	X			X					
	Water	IC	X	X	X	X	X	X	X	X	X	X
Hardness	Water	Colorimetric										
	Water	Titrametric		X	X			X			X	
	Water	ICP/Calculation	X	X	X	X	X	X	X	X	X	X
Mercury, Total	Water	CVAA	X	X	X	X	X	X		X	X	X
	Water	Direct Hg Analysis							X			
	Soil/Sediment	CVAA	X	X	X	X	X	X		X	X	X
	Soil/Sediment	Direct Hg Analysis	X				X		X		X	
	Tissue (fish &/or plant)	CVAA	X	X	X	X		X		X	X	X
	Tissue (fish &/or plant)	Direct Hg Analysis	X					X	X		X	X
	Waste (oil, drum, etc..)	CVAA	X	X	X	X	X	X		X	X	X
	Waste (oil, drum, etc..)	Direct Hg Analysis							X			
	Water	ICP-MS				X						
	Soil/Sediment	ICP-MS				X						
Mercury (TCLP)	Soil/Waste (oil, drum, etc..)	CVAA		X	X	X	X	X		X	X	X
	Soil/Waste (oil, drum, etc..)	Direct Hg Analysis					X		X			

EPA REGIONAL LABORATORIES CORE CAPABILITIES SUMMARY
Inorganic Chemistry

FY2016

ANALYTE/GROUP NAME	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	REGIONAL CAPABILITY									
			1	2	3	4	5	6	7	8	9	10
Metals, Total	Water	ICP /AES	X	X	X	X	X	X	X	X	X	X
	Soil /Sediment	ICP /AES	X	X	X	X	X	X	X	X	X	X
	Tissue (fish &/or plant)	ICP /AES	X	X	X	X			X	X	X	X
	Waste (oil, drum, etc..)	ICP /AES	X	X	X	X	X	X	X	X	X	X
Metals (TCLP)	Soil/Waste (oil, drum, etc..)	ICP /AES		X	X	X	X	X	X	X	X	X
Metals, Total	Water	ICP/MS	X	X	X	X	X	X	X	X	X	X
	Soil/Sediment	ICP/MS	X	X	X	X	X	X	X	X		X
	Tissue (Fish &/or plant)	ICP/MS		X	X	X			X	X	X	X
	Waste (oil, drum, etc..)	ICP/MS			X	X		X	X	X		
Metals (TCLP)	Soil/Waste (oil, drum, etc..)	ICP/MS				X		X	X	X		X
Nitrogen (Ammonia)	Water	Colorimetric	X	X	X	X	X	X	X	X	X	X
	Soil/Sediment	Colorimetric	X		X	X	X		X			
	Water	Electrode		X								
Nitrogen (NO3 &/or NO2)	Water	Colorimetric	X	X	X	X	X	X	X	X	X	X
	Soil	Colorimetric	X			X	X		X			X
	Water	IC	X	X	X		X	X	X	X	X	X
	Soil	IC	X		X		X		X		X	X
Nitrogen, Total Kjeldahl	Water	Colorimetric		X	X	X	X	X	X		X	X
	Soil	Colorimetric			X	X	X	X	X			
Perchlorate	Water	IC					X		X		X	
	Soil	IC							X		X	
	Water	IC with LC/MS confirmation			X		X					X
	Water, Soil/Sediment	LC/MS			X							X
	Water	LC/MS/MS	X					X		X	X	
Phosphorus, Ortho	Water	Colorimetric	X	X		X		X		X		X
	Water	IC	X	X	X		X		X	X	X	X
Phosphorus, Total	Water	Colorimetric	X	X	X	X	X	X	X	X	X	X
	Soil	Colorimetric	X		X	X	X					X
Sulfate	Water	IC	X	X	X	X	X	X	X	X	X	X
	Soil	IC	X		X	X	X		X	X	X	
	Water	Turbidimetric	X	X								
	Soil	Turbidimetric	X									

EPA REGIONAL LABORATORIES CORE CAPABILITIES SUMMARY
Inorganic Chemistry

FY2016

ANALYTE/GROUP NAME	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	REGIONAL CAPABILITY									
			1	2	3	4	5	6	7	8	9	10
Sulfide	Water	Colorimetric		X					X			
	Soil	Colorimetric										
	Water	IC, Turbidimetric						X				
	Water	Titrimetric		X							X	
Biological Oxygen Demand	Water	Membrane Electrode		X	X	X	X	X	X	X	X	X
Chemical Oxygen Demand	Water	Photometric			X			X				
	Water	Colorimetric		X	X		X		X	X		
Oil & Grease	Water	Gravimetric		X	X		X		X			X
	Soil/Sediment	Gravimetric		X					X	X		
Total Organic Carbon	Water	Combustion / IR		X	X	X	X		X	X	-	X
	Soil	Combustion / IR		X	X	X	X		X	X		X
	Water	UV/Persulfate						X		X	X	

EPA REGIONAL LABORATORIES CORE CAPABILITIES SUMMARY
BIOLOGY/MICROBIOLOGY

FY2016

ANALYTE/GROUP NAME	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	REGIONAL CAPABILITY									
			1	2	3	4	5	6	7	8	9	10
Coliform, Total	Water, Soil &/or Sludge	Various	X	X	X	X		X	X	X	X	X
Coliform, Fecal	Water, Soil &/or Sludge	Various	X	X	X	X		X	X	X	X	X
E. coli	Water, Soil &/or Sludge	Various	X	X	X	X		X	X	X	X	X
Toxicity (Acute & Chronic)	Water	Fathead, Ceriodaphnia	X		X			X		X		
Heterotrophic PC	Water	Various	X	X	X	X		X	X	X	X	X

EPA REGIONAL LABORATORIES CORE CAPABILITIES SUMMARY
Organic Chemistry

FY2016

ANALYTE/GROUP NAME	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	REGIONAL CAPABILITY									
			1	2	3	4	5	6	7	8	9	10
BNA	Water	GC/MS	X	X	X	X	X	X	X	X	X	X
	Soil/Sediment	GC/MS	X	X	X	X	X	X	X	X	X	X
	Waste (oil, drum, etc..)	GC/MS	X	X	X	X	X	X	X	X	X	X
	Tissue (fish &/or plant)	GC/MS				X						X
BNA (TCLP)	Solid/Waste	GC/MS		X	X	X	X	X	X	X	X	X
BNA (TPH)	Water	GC/MS or GC					X	X	X	X	X	X
	Soil/Sediment	GC/MS or GC					X	X	X	X	X	X
EDB & DBCP	Water	GC/ECD	X				X	X		X	X	
	Water	GC/MS				X						
	Water	LC/MS/MS				X						
Herbicides	Water	GC/ECD; GC/NPD				X		X	X			
	Soil/Sediment	GC/ECD; GC/NPD						X	X			
	Waste (oil, drum, etc..)	GC/ECD; GC/NPD							X			
	Tissue (fish &/or plant)	GC/ECD; GC/NPD							X			
Herbicides (TCLP)	Solid/Waste	GC/ECD						X	X			
	Solid/Waste	HPLC/UV Detec-tion										
Pesticides / PCBs	Water	GC/ECD	X	X	X	X	X	X	X	X	X	X
	Soil/Sediment	GC/ECD	X	X	X	X	X	X	X	X	X	X
Pesticides / PCBs	Water, Soil, Waste	GC/MS/MS				X					X	
Pesticides / PCBs	Tissue (fish &/or plant)	GC/ECD	X	X		X			X	X		X
Pesticides (TCLP)	Solid/Waste	GC/ECD		X	X	X	X	X	X	X	X	
Pesticides (TCLP)	Solid Waste	GC/MS/MS				X						
Phenolics	Water	Colorimetric		X	X				X	X		
	Soil/Sediment	Colorimetric			X				X	X		
PAHs	Water	GC/MS	X	X	X	X	X	X	X	X	X	X
	Soil/Sediment	GC/MS	X	X	X	X	X	X	X	X	X	X
	Air	GC/MS	X						X			
	Tissue (fish &/or plant)	GC/MS	X			X			X			X
	Waste (oil, drum, etc..)	GC/MS	X	X	X	X		X	X	X		X

EPA REGIONAL LABORATORIES CORE CAPABILITIES SUMMARY
Organic Chemistry

FY2016

ANALYTE/GROUP NAME	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	REGIONAL CAPABILITY									
			1	2	3	4	5	6	7	8	9	10
VOA	Water	GC/MS	X	X	X	X	X	X	X	X	X	X
	Soil/Sediment	GC/MS	X	X	X	X	X	X	X	X	X	X
	Air	GC/MS	X		X	X	X	X	X	X	X	
	Waste (oil, drum, etc..)	GC/MS	X	X	X	X		X	X	X	X	X
	Water	GC				X				X		
	Soil/Sediment	GC				X				X		
	Waste (oil, drum, etc..)	GC	X			X	X			X		
VOA (TCLP)	Solid/Waste	GC/MS		X		X	X	X	X	X		X
VOA (TPH)	Water	GC/MS or GC					X	X	X	X	X	X
	Soil/Sediment	GC/MS or GC					X	X	X	X	X	X

EPA REGIONAL LABORATORIES CORE CAPABILITIES SUMMARY
PHYSICAL & OTHER DETERMINATIONS

FY2016

ANALYTE / GROUP NAME	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	REGIONAL CAPABILITY									
			1	2	3	4	5	6	7	8	9	10
Flash Point	Aqueous/Liquid Waste (oil, drum, etc.)	Pensky-Marten or Se-ta	X	X	X	X	X	X	X			X
Conductivity	Water	Specific Conductance	X	X	X	X	X	X	X	X	X	X
Ignitability	Soil/Sediment	Ignitability of Solids		X	X	X	X	X	X			
	Waste (oil, drum, etc.)	Pensky-Marten or Se-ta Closed Cup		X	X	X	X	X	X	X		X
pH	Water	Electrometric	X	X	X	X	X	X	X	X	X	X
	Soil/Sediment	Electrometric	X	X	X	X	X	X	X	X	X	X
	Waste (oil, drum, etc.)	Electrometric	X	X	X	X	X	X	X	X	X	X
Solids, Non-Filterable	Water	Gravimetric	X	X	X	X	X	X	X	X	X	X
Solids, Percent	Soil/Sediment	Gravimetric	X	X	X	X	X	X	X	X	X	X
Solids, Total	Water	Gravimetric	X	X	X	X	X	X	X	X	X	X
Solids, Total Dissolved	Water	Gravimetric	X	X	X	X	X	X	X	X	X	X
Solids, Total Volatile	Water	Gravimetric				X	X	X	X	X	X	X
Turbidity	Water	Nephelometric	X	X	X	X	X	X	X	X	X	X

Regional Laboratories Unique Capabilities -- FY2016

REGION 1				
ANALYTE / GROUP NAME	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	SUPPORTED PROGRAM(S)	COMMENTS
Inorganic Anions	Water	IC (EPA Method 300.0)	Water	
Mercury	Water, Tissue	Direct Mercury Analyzer (Thermal Decomposition, Amalgamation & Atomic Absorption Spectrophotometry) EPA Method 7473	Superfund, Water	
Metals	Water, Sediment, Soil, Waste (drum), Paint, Dust, Cosmetics	XRF (EPA Method 6200)	Superfund, TSCA (Pb)	Field Screening and Laboratory Testing
Perchlorate	Water	LC/MS/MS (EPA Method 331.0)	Superfund / Water	
Carbonyls	Air	HPLC (EPA Method TO-11A	Air	
1,4-Dioxane	Water	GC/MS Purge & Trap (EPA Method 8260)	Superfund	
Ethylene Glycol	Water	GC		
Explosives	Water, Soil	HPLC (EPA Method 8330)	Superfund	
Oil Identification	Water	GC/FID (ASTM D-3415-79)	Superfund	
Organic Compounds	Solid, Liquid	FTIR	Superfund - ERB	Unknown ID
Oxygenated Compounds/Benzene	Fuel	IR (RFG Inspector's Manual)	Air	
PAHs	Soil/Sediment	Immunoassay (EPA Method 4035)	Superfund	
PCBs	Air, Wipes	GC/ECD (EPA Method 3508A)	Air / Superfund	
Pentachlorophenol	Soil, Sediment	Immunoassay (EPA Method 4010)	Superfund	
Pesticides/PCBs	Water, Soil, Sediment, Waste (drum)	GC/ECD (EPA Method 8081A/8082)	Superfund	Field Method
Pesticides/PCBs	Water, Soil, Sediment, Waste (drum)	GC/ECD (EPA Method 680)	Superfund	Field Method
Pharmaceuticals and Personal Care Products (PPCPs)	Water	LC/MS/MS	Water	Endocrine disruptors, Illicit Discharge Detection
PFAS	Water	LC/MS/MS (EPA Method 537)	Superfund/ Drinking Water	
VOCs	Air (mini-cans)	GC/MS (EPA Method TO-15)	Superfund	Air Toxics
VOCs	Water, Soil, Air	GC/ECD/PID	Superfund	Field Screening
Grain Size	Soil, Sediment	Sieve (Modified ASTM)	Superfund, Water	Region 1 SOP
Loss on Ignition (LOI)	Sediment		Water	
Percent Lipids	Tissue	Gravimetric		
Enterococci	Ambient water	Enterolert/ EPA Method 1600	Ambient monitoring	
Chlorophyll a	Ambient water	EPA 445.0	Ambient monitoring	
Toxicity (Acute)	Sediment	C. dilutus, H. azteca	Water, Superfund	Bulk sediment

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Regional Laboratories Unique Capabilities -- FY2016

REGION 2				
ANALYTE / GROUP NAME	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	SUPPORTED PROGRAM(S)	COMMENTS
CO	Air / N2	EPA Reference or Equiv. Method as in 40 CFR Part 58	Air	
NOx	Air / N2	EPA Reference or Equiv. Method as in 40 CFR Part 58	Air	
SO_2	Air / N2	EPA Reference or Equiv. Method as in 40 CFR Part 58	Air	
Percent Sulfur	Fuel Oil	ASTM D4294	Air	
Methane, Ethane, Ethene	Water	GC/FID	SF/RCRA	
Ozone Precursors (hydrocarbons)	Air	GC/MS/FID	Air	
Pesticides	Wipes	LC/MS/MS and GC/MS	General	
Perfluorinated Alkyl Substances	Water	LC/MS/MS	Superfund, Water	EPA Method 537
PCB Aroclors	PUF	GC/ECD	Air	EPA Method TO-10A
Total Petroleum Hydrocarbons	Water, Solid	Hexane Extraction (EPA Method 1664)	Water	
Density	Ink, Paint	ASTM D1475	Air	
Grain Size	Solid	Pipet Method	Superfund, Water	
Grain Size	Solid	Hydrometer Method (based on ASTM D422-63)	Superfund, Water	
Particulates (Fine)	Air	EPA Reference or Equiv. Method as in 40 CFR Part 58	Air	
Percent Volatile Matter		ASTM D2369	Air	
Percent Water	Ink, Paint	ASTM D4017	Air	
Viscosity	Fuel Oil	ASTM D88	Air	
Cryptosporidium	Water	Fluorescent Microscopy (EPA Method 1623)	Water	
DNA - qPCR (*Enterococcus)*	Water (Fresh & Marine)	EPA/Cepheid Methodology	Water	
DNA-qPCR E. coli	Water (Fresh & Marine	EPA/CDC Protocols	Water	
DNA, Markers, Various	Water (Fresh & Marine)	Geese, Gull, Cow, HF183, Gen Bacteroidales	Water	
Enterococcus Group	Water	Membrane Filtration	Water	
Giardia	Water	Fluorescent Microscopy (EPA Method 1623)	Water	
mColiblue24	Water	MF/Hach	Water	
Enterolert w/ Quantitray	Water	Defined Substrate Technology	Water	
Colilert 18/Colilert w/ Quantitray	Water	Defined Substrate Technology	Water	

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Regional Laboratories Unique Capabilities -- FY2016

REGION 3				
ANALYTE / GROUP NAME	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	SUPPORTED PROGRAM(S)	COMMENTS
Nitroaromatics & Nitroamines	Water, Soil/ Sediment	HPLC	Water	Method 8330
Nitroglycerine	Water, Soil/ Sediment	HPLC	Water	Method 8332
Chemical Warfare Agents	Water/Solid/Wipe	GC/MS	Emergency Response	
Poly fluoroalkyl substances (PFAS)	Water	LC/MS/MS	Superfund	Method 537
Benthic Macroinvertebrate	Freshwater	Identification	Water	
Marine/Estuarine Benthic Invertebrate Taxonomy	Invertebrate Specimens or Unsorted Sediment	EPA EMAP Protocols		Organisms identified to species or lowest taxonomy possible
ID Ozone Depleting Compounds	Propellants/ Aerosols	FTIR	Air Enforcement	
ID Unknowns	Bulk Mercury	Density	Superfund, RCRA	
ID Unknowns	Water	FTIR	Water	Screening it, identify unknowns
ID Unknowns	Soil/Sediment	FTIR		Screening it, identify unknowns
Alcohols	Water, Soil/ Sediment	FTIR	RCRA	When necessary for Ignitability
ID Unknowns	Wastes	FTIR		Screening it, identify unknowns

Regional Laboratories Unique Capabilities -- FY2016

REGION 4				
ANALYTE / GROUP NAME	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	SUPPORTED PROGRAM(S)	COMMENTS
Chromium (+6)	Soil/Sediment	IC	Superfund	Std Method 3500 CrD
	Water	IC	Water, Superfund	Method 218.1
Mercury, Total - Ultra Low Detection Level	Water	CVAF	Water	Method 1631
	Tissue	CVAF	Water, Superfund	Appendix 1631
	Soil/Sediment	CVAF	Water, Superfund	Appendix 1631
Metals, Total	Waste (oil, drum, etc...)	ICP/MS	RCRA	Not Commonly Available
	Air	Hi-Vol Filters	Air	
Lead bioaccessibility	Soil/Sediment	ACID EXTRACTION/ICP ANALYSIS	Superfund, RCRA	High resolution GC/ MS
Metals (TCLP)	Soil/Waste (oil, drum)	ICP/MS	RCRA	
Freon Products	Canister & Air	GC/MS	Air, OECA	Special analysis technique developed for criminal investigations of illegal Freon
Natural Attenuation Analytes	Water	GC/FID	Superfund	Methane, ethane, ethene
Toxaphene Congeners	Water/Soil	GC/NIMS (EPA Method 8276)	Water, Superfund	6 Parlars, 2 break-
Chlorophyll	Water		Water	

Regional Laboratories Unique Capabilities -- FY2016

REGION 5				
ANALYTE / GROUP NAME	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	SUPPORTED PROGRAM(S)	COMMENTS
Bromide/Chloride Ratio	Brine Samples	IC & related characterization techniques; ion balance	Water, UIC & SDWA	Difficult analyses
Chloride	Soil/Sediment	IC	Sediment	
Metals	Suspended Particulate Matter	ICP-MS	Air	Analysis of TSP, Pm10, PM2.5 filters for metals
Pb, As via IVBA SW846 1340	Soil	ICP-AES	SF	
Nonylphenol (NP), NP-1 and 2-ethoxylate, octyphenol & bisphenol-A	Water	GC/MS (ASTM D7065-11)	Water	Endocrine disrupter - High Concentration method (ppb)
Nonylphenol (AP), AP-1 and 2-ethoxylate, octyphenol & bisphenol-A	Soil/Sediment	GC/MS (8270 modified / Internal SOP)	Water	Endocrine disrupter
Nonylphenol (NP), NP-1 and 2-ethoxylate, octyphenol	Water	LC/MS/MS (ASTM D7485-09)	Water	Endocrine disrupter Low level method (ppt)
Bisphenol-A	Water	LC/MS/MS (ASTM D7574-09)	Water	Endocrine disrupter Low level method-(ppt)
Nonylphenol carboxylates	Water	LC/MS/MS	Water	Endocrine disrupter
Long chain NP, NPEOs (n=3-18)	Water	LC/MS/MS (ASTM D7742-11)	Water	Endocrine disrupter
COD	Soil/Sediment	Colorimetric	Sediment	
PCBs	Water, Oil, Soil, Wipes	8082 (GC/EC)	TSCA	Aroclor specific TSCA reg. Compliance method & multiple action levels
PCB Congeners	Water. Sludge	GC/MS/MS, GC/NCI-MS	RCRA, SF, TSCA, Water	Compare with HRGC/HRMS method
Chlorthalonil	Water	GC/MS	FIFRA	Stream Survey
Purgeable 1,4-Dioxane & Tetrahydrofuran (THF)	Water	Method 624-Dioxane (Wide-Bore Capillary Column GC/MS)	Superfund	Specific analyte analysis method
Toxic Industrial Chemicals (TICs) & CWA degradants	Drinking Water	LC/MS/MS Library Screening	WSD, NHSRC	Library search routine developed under CRADA with Waters Corp. Now use NIST LC/MS/MS Library of over

Regional Laboratories Unique Capabilities -- FY2016

REGION 5				
ANALYTE / GROUP NAME	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	SUPPORTED PROGRAM(S)	COMMENTS
Aldicarb, aldicarb sulfone, aldicarb sulfoxide, carbofuran, oxamyl, methomyl and thiofanox	Water	LC/MS/MS, ASTM7645-10	NHSRC	SAP Method
Aldicarb, bromadiolone, carbofuran, oxamyl, and methomyl	Water	LC/MS/MS, ASTM7600-09	NHSRC	SAP Method
Thiodiglycol	Water	LC/MS/MS, CRL SOP MS015	NHSRC	SAP Method
Thiodiglycol	Soil	LC/MS/MS, ASTM E2787-11	NHSRC	SAP Method
Thiodiglycol	Wipes	LC/MS/MS, ASTM E2838-11	NHSRC	SAP Method
Diethanolamine, triethanolamine, n-methyldiethanolamine and methyldiethanolamine	Water	LC/MS/MS, ASTM D7599-09	NHSRC	SAP Method
Dioctyl Sulfosuccinate (DOSS) in Seawater	Seawater	LC/MS/MS, ASTM D7730-11	NHSRC/SF	SAP Method
Dipropylene glycol monobutyl ether and ethylene glycol monobutyl ether in seawater	Seawater	LC/MS/MS, ASTM D7731-11	NHSRC/SF	SAP Method
Bromodiolone, brodifacoum, diphacinone and warfarin in water	Water	LC/MS/MS, ASTM D7644-11	NHSRC	SAP Method
Diisopropyl methylphosphonate, ethyl hydrogen dimethylamidophosphate, ethyl methylphosphonic acid, isopropyl methylphosphonic acid, methylphosphonic acid and pinacolyl methylphosphonic acid	Water	LC/MS/MS, ASTM 7597-09	NHSRC	SAP Method
DIMP, EMPA, IMPA, MPA, PMPA	Soil	LC/MS/MS, ASTM WK34580	NHSRC	SAP Method
Corrosivity by pH	Hazardous Waste	SW846 1110	RCRA	Waste characterization
Particle Size	Soil/Sediment	Particle size analyzer provides continuum of sizes-CRL SOP	GLNPO, Water- Sediment	For modelling and soil migration calcs.
Water Content	Hazardous waste	SW846 -	RCRA, Superfund	Support for flash-point
Paint Filter Test	Paints and coatings		RCRA, Superfund	
Specific Gravity	Soil/Sediment	Appendix IV of the Corps of Engineers Engineering Manual (F10-F22)	Sediment	

Regional Laboratories Unique Capabilities -- FY2016

REGION 6				
ANALYTE / GROUP	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	SUPPORTED PRO-	COMMENTS
Ammonia	Air (passive coat-	IC	CAA	Ogawa passive air
Ozone	Air (passive coat-	IC	CAA	Ogawa passive air
NOx	Air (passive coat-ed filter)	IC	CAA	Ogawa passive air collection device
SOx	Air (passive coat-	IC	CAA	Ogawa passive air
Trace level Hex Chrom	Water	IC/UV	Water	
Perchlorate	Water	IC/MS/MS	Water	
Metals by X-Ray Fluo-rescence	Soil	portable XRF	Superfund, RCRA	field screening
Incidental PCBs	Water	GC/MS; Method 680 Homo-	TSCA, RCRA	grouped by number
	Soil/Sediment	GC/MS; Method 680 Homo-	TSCA, RCRA	grouped by number
	Waste	GC/MS; Method 680 Homo-	TSCA, RCRA	grouped by number
Expanded 8270 list by GC/QQQ	Liquid	GC/QQQ; Method 8270	Superfun, RCRA	
Chemical Warfare	Water/Solid/Wipe	GC/MS	Emergency Re-	
PAMS (C2s and C3s identified)	Air	GC/MS/FID (split)	CAA	C2s and C3s are individually quanti-tated
PCBs (Aroclor)	Electrical Cable	GC; Separation, extraction, analysis of individual compo-nents. Mod of program specific technique.	TSCA	Toluene is extrac-tion solvent
PAHs (trace)	Water/Solid/Oil	GC/QQQ	RCRA, Superfund	
Chemical Warfare Agents- Degradation products	Water	LC/MS/MS	Emergency Re-sponse	
VOCs by OVM	AIR	GC/MS	CAA	passive air monitor-ing
Alcohols by headspace	Water	GC/MS	RCRA/Superfund	
Light Hydrocarbons (dissolved gases)	Water	GC/MS	RCRA/Superfund	
Organophosphorous Pesticides (OPPs)	Water	GC/NPD	CWA, RCRA, Super-fund	
	Soil/Sediment	GC/NPD	RCRA, Superfund	
	Waste	GC/NPD	RCRA, Superfund	
Corrosivity by pH	Waste	Method 1110 - Corrosivity To-	RCRA	

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Regional Laboratories Unique Capabilities -- FY2016

REGION 7				
ANALYTE / GROUP	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	SUPPORTED PRO-	COMMENTS
CO	Air	40 CFR Part 58	Air	OAQPS Protocol Gas Verification Program
NOx	Air	40 CFR Part 58	Air	OAQPS Protocol Gas Verification Program
SO_2	Air	40 CFR Part 58	Air	OAQPS Protocol Gas Verification Program
O_3	Air	40 CFR Part 58	Air	NIST Standard Reference Photometer
In-vitro Bioassessibility Assays for Arsenic and Lead in Soil	Soil	ICP-MS / ICP-AES	Superfund / RCRA	SUPR Exposure / Toxicity Assessment
Chlordane	Air (PUF)	GC/ECD (EPA Method TO-4A)	Special Project	
Herbicides	Water, Soil/	GC/ECD	Water	Use Attainability
Herbicides	Water	LCMSMS	Water	Dicamba analysis
Pesticides	Water, Soil/	GC/ECD	Water	Use Attainability
SVOCs, Pesticides, Emerging Contaminants	Water	Twister GC/MS Stir Bar Sorbtive Extraction (solventless extraction)	Water	Low MDL for water monitoring
VOCs	Air Canister	GC/MS (EPA Method TO-14 & TO-15)	Air / Superfund	Air Toxics
VOCs	Air Sorbent Tube	GC/MS (EPA Method TO-17)	Air / Superfund	Air Toxics
VOCs	Water	GC/MS	Superfund / ORD	In-Situ Chemical Oxidation Site Support
PCBs	Soil/Sediment,	GC/ECD	Superfund / ORD	Rapid Site Screen-
Pharmaceuticals and Personal Care Products (PPCPs)	Water	LC/MS/MS	Water	Endocrine disruptors
PAHs, Pesticides, Herbicides	Water	Twister GC/MS Stir Bar Sorbtive Extraction (solventless extraction)	Water	Use Attainability Analysis (UAA)
VOCs	Water, Soil, Air	GC/MS Mobile Laboratory	Superfund	Rapid Site Characterization
VOCs from In-situ Chemical Oxidation Sites	Water	GC/MS	Superfund	Improed Precision of VOC Samples from In-situ Chemical Oxidation Sites
E. coli	Water (drinking/ waste/ambient)	qPCR	Water	2008 NFWA
Enterococci	Water	qPCR	Water	
Heterotrophic Bacteria	Water	Plate Count - Standard Meth-	Water	Heterotrophic Bacte-
Chlorophyll a	Ambient water	EPA 445.0	Ambient monitoring	
Invertebrate Taxonomy	Invertebrates	EPA EMAP Protocols	Water	
Marine/Estuarine Benthic Taxonomy	Benthic Organisms		Water	Organisms identified to species or lowest toxonomy possible

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Regional Laboratories Unique Capabilities -- FY2016

REGION 8				
ANALYTE / GROUP	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	SUPPORTED PRO-	COMMENTS
Silica	Water	Colorimetric	Water/Superfund	
Gadilinium	Water	ICP-MS	Water/Superfund	Wastewater Indica-tor
Algal Toxins	Water	LC/MS/MS	Water/Superfund	Monitoring for States and Tribes
Alcohols	Water	GC/FID	Water/Superfund	
Chlorophyll	Water	HPLC	Water/Superfund	
Endothall	Water	GC/MS	Water/Superfund	
TPH (VOA & BNA)	Water, Soil/ Sediment	GC/MS or GC/FID	Water/Superfund	
LC/MS/MS Pesticides	Water	LC/MS/MS	Water/Superfund	Monitoring for States and Tribes
Low Level Pesticides/	Water	GC/MS	Water/Superfund	Monitoring for
Pharmaceuticals and Personal Care Products (PPCPs)	Water	LC/MS/MS	Water/Superfund	Endocrine disrup-tors
Waste Indicator Com-	Water	GC/MS	Water/Superfund	Monitoring for
Total Petroleum Hydro-carbons-Diesel Range Organics	Water, Soil	GC/FID	Water/Superfund	Hydro-Fracking
Bacteria (Arsenic-Reducing)	Water, Sediment	MPN	Water/Superfund	
Bacteria (Iron-Reducing)	Water, Sediment	MPN	Water/Superfund	
Bacteria (Sulfate-Reducing)	Water, Sediment	MPN	Water/Superfund	
Bacteria (*Clostridium perfringens)*	Water	Membrane Filtration	Water/Superfund	
Bacteria (*Clostridium perfringens)*	Water	Membrane Filtration	Water/Superfund	

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Regional Laboratories Unique Capabilities -- FY2016

REGION 9				
ANALYTE / GROUP	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	SUPPORTED PRO-	COMMENTS
Ferrous Iron	Water	Titration with Dichromate	Superfund	
Mercury, Vapor, Particu-	Ambient Air	Cold Vapor Atomic Fluores-	Air, Water (TMDL)	Mobile laboratory
Methyl mercury	Water	CVAF (EPA 1630)	Water	
Metals (with mercury)	Dust wipes, Ghost wipes	ICP, ICPMS, CVAA	Tribal Program	
Metals (SPLP)	Soil, Sediment, Solid, Waste, Tissue	SW846 1312: ICP, GFAA, CVAA, ICP/MS	Superfund, RCRA	
Low level hexavalent	Drinking Water	IC with post column reaction/	Water	
Metals	Soil	Portable XRF	Superfund, Criminal Investigation	
Platinum Group Metals	Catalytic convert-	Portable XRF	Enforcement, Air	
Lead (Pb) in Air	TSP High-Volume filters	FEM EQL-0710-192, ICP/MS	Air	New Pb NAAQS
Perchlorate	Water, Soil	LC/MS/MS (EPA Method 331.0)	Superfund / Water	
In vitro bioassessibility assays for arsenic and lead in soil	Soil	EPA 9200.1-86	Superfund	
Diazinon	Water	ELISA	WQM	
1,4-Dioxane	Water, Soil, Sediment	GC/MS	Superfund, RCRA	
EDB/DBCP	Water	GC (EPA 504.1)	Superfund, RCRA	
Methane, Ethane, Eth-	Water	GC/FID (RSK-175)	Superfund, RCRA	
Benthic Taxonomic Iden-	Sediment	Taxonomic Identification	Water, WQM	
Chlorophyll/Pheophytin	Water/Periphyton	Standard Method 10200 H, Procedure 2b	Water, WQM	
Enterococci	Water	Enterolert	Water, NPDES, WQM	
Heterotrophic Bacteria	Water	Plate Count - Standard Meth-	Water, NPDES,	
Microcystin	Water	Immunoassay	Water	
Toxicity Test, Red Abalone (*Haliotis rufescens*) *Larval Development*	Water	EPA/600/R-95/136	NPDES	
Toxicity Test, Sea Urchin Fertilization *[Stronglyocentrotus purpuratus]*	Water	EPA/600/R-95/136	Water, NPDES	

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Regional Laboratories Unique Capabilities -- FY2016

REGION 10				
ANALYTE / GROUP	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	SUPPORTED PRO-	COMMENTS
Asbestos, Bulk	Solids	EPA 600/R93/116 - XRD	Superfund	
Low Level Mercury	Water	CVAF, Method 1631E	Water, Superfund	0.2 to 0.5 ng/L re-porting limits
Methyl Mercury	Water	GC/CVAFS, Method 1630	Water, Superfund	
Metals	Air filters	ICP/MS, ICP	CAA	
Metals	Blood	ICP/MS	Superfund	
Metals	Soil	Portable XRF	Superfund, Criminal	Screening results for metals
Metals	Paint	Portable XRF	TSCA, Criminal	Lead in paint
Metals	Solid	X-Ray Diffractometer (XRD)	Superfund	Characterizes the form metals exist in sample
Metals - Arsenic specia-tion	Fish/shellfish/ seaweed	IC/ICP/MS	Superfund, Water	Speciation data needed for risk as-sessment
Metals (TAL) + Total	Small mammals,	Microwave Digestion, ICP/AES,	Superfund, RCRA	Biomonitoring pro-
Metals (SPLP)	Soil/Waste	ICP/AES, ICP/MS	Superfund	
Chlorophyll a	Water	SM 1002H	Water	
In-vitro Bioassessibility Assays for Lead in Soil	Soil	Leachates by Method 1340, ICP/AES	Superfund	
Percent Water	Liquid Waste	Karl Fischer titration	RCRA	
Perchlorate	Produce (fruits, milk)	IC/MS	Superfund	
Acidity	Water	SM2320b	Superfund	
BNA (Selected)	Tissue	SW846 Methods	Superfund	
Butyl tins	Soil/Sediment	GC/MS	Superfund, Criminal	WDOE method
1,4-Dioxane	Water	EPA Method 8270D SIM/ Method 522	Superfund	
Explosives (Nitroaromatics & Ni-troamines)	Water, Soil, fish/ shellfish	EPA Method 8330 / HPLC	Superfund	
Hydrocarbon Identifica-	Water, Soil/	NWTPH-HCID	Superfund, Criminal	
N-Nitrosodimethylamine	Water, Soil	Method 521	Superfund	
Herbicides	Water, Soil/ Sediment	GC/MS	Superfund	
Polybrominated diphenyl	Water	GC/MS Low Resolution	Water	
Polybrominated diphenyl ethers (PBDEs)	Sediment/bio sol-ids	GC/MS Low Resolution	Superfund, Water	
Polybrominated diphenyl	Tissue (fish)	GC/MS Low Resolution	Superfund	

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Regional Laboratories Unique Capabilities -- FY2016

REGION 10				
ANALYTE / GROUP NAME	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	SUPPORTED PROGRAM(S)	COMMENTS
Total Petroleum Hydrocarbons-Gasoline Range Organics	Water, Soil	NWTPH-Gx	Superfund, RCRA	
Total Petroleum Hydrocarbons-Diesel Range Organics	Water, Soil	NWTPH-Dx	Superfund, RCRA	
VOA and SVOA	Industrial wastes, Solids, Tissues	Vacuum distillation, Methol 8261A	Superfund, RCRA	
Low Level Polyaromatic Hydrocarbons and Other Neutral Organics	Soil, Sediments	GC/MS-MS	Superfund, Brownfields, Water	
PCB aroclors	Wipes	GC/ECD	Brownfields, RCRA	
Low Level Polyaromatic Hydrocarbons	Shellfish, Water	GC/MS-MS	Superfund, Brownfields	
Formaldehyde	Water	Method 1667A/HPLC	Enforcement	
Multi=Increment Sampling (MIS) Preparation of Soil Samples for Organic and Inorganic Analyses	Soil	Described in Method 8330B Appendix	Superfund	
Variety of water quality tests	Water	Various probe-type measurements	Superfund	Flow thru cell system; performed in the field
Aeromonas spp	Drinking Water	EPA Method 1605	SDWA - Unregulated Contaminant Monitoring Rule (UCMR)	EPA Approved
Cryptosporidium and *Giardia*	Water	EPA Method 1623 (Filtration/IMS/Staining)	SDWA, Water, Ambient Monitoring Rule - recreational waters	On approval list for LT-2 regulation
Enterococci	Ambient Water	EPA Method 1600	Ambient Monitoring Rule	
Microbial Source Tracking	Water	PCR	Water	
Microscopic testing	Drinking/Source Water	Microscopic particulate analysis	Surface Water Treatment Rule	Microscopic technique used to establish GWUDI characteristics of a drinking water

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LABORATORY SUMMARY OF DEVELOPING CAPABILITIES

PROJECT / METHOD	DEVELOPMENTAL NEED	STATUS	PROJECTED COMPLETION
Region 1			
PFAS in water by Method 537	Support to States in Region, regional Superfund and Drinking Water programs.	SOP in place. Will bring any new EPA methods for PFAS in other matrices on-line in FY17/18	Completed FY2016
Region 2			
Perfluorinated Alkyl Substances in water by Method 537	Need for capability to support to regional Superfund and Drinking Water programs.	Completed	Completed-FY17
PCB Aroclors in air (PUF media) by Method TO-10A	Need for capability to support to regional indoor Air Programs.	Completed	Completed-FY17
Region 3			
PFAS in water by Method 537	Need for capability to support to regional Superfund and Drinking Water programs.	In-progress.	FY2016
SIM Analysis for Volatiles in	Need for capability to achieve	In-progress.	FY2018
Microplastics in Water	Need for standard method for extracting microplastics from water and fish tissue	In-progress.	FY2018
Dissolved Gases in Air by GC	Need for capability to support to regional Superfund programs.	On hold	FY2018
Semi-volatiles in Drinking Wa-	Need capability to support	Complete	FY 2018
Long Chain Alcohols by GC	Capability needed to support specific Superfund project request	In-progress.	FY2017
Region 4			
EPA Method 8261	VOCs in difficult matrices	Initial investigation	Unknown
Internal Method - GC/MS/MS	Low Level Pesticides w/MS	ITMEs in process	42005
Mercury by 200.8	Laboratory Efficiency	Complete	42948
Herbicide by 8321	Herbicides by better extraction method	Complete	42994

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LABORATORY SUMMARY OF DEVLOPING CAPABILITIES

Region 5

PFOA/PFOS in Biosolids and Water	Water Division study - RMI	Initial work done, new instrument installed and standards run to set up instrument. SOP in draft.	Completed FY 2016
qPCR, Gene Sequencing Guar Gum	HF fluid screening tool - Region 3 support	Some samples sequenced, screening tool in process.	FY 2017
Glyphosate in Water by IC/MS	Pesticide program request for stream survey	.Method development completed, SOP in process.	Discontinued in FY 2016. Program completed the associated project.
Fluorotelemer Alcohols in Water by LC/MS/MS	Water	Initiated. SOP in draft.	Completed FY 2016

Region 6

Anions and Oxyhalides by IC	Remove dependence on State Lab for this test.	Method developed, DOC/MDL, SOP Done; seeking ISO Accred.	December 2017
Direct mercury analysis (CVAF - Milestone)	Clean Water Act, RCRA, Superfund	DOC/MDL; SOP preparation.	December 2016
High Dissolved Solids /Modified Method/ Anion	Clean Water Act, RCRA, Superfund	Method being developed.	October 2017
High Dissolved Solids /Modified Method/ Cation	Clean Water Act, RCRA, Superfund	Method being developed.	October 2017
High Dissolved Solids /Modified Method/ OA	Clean Water Act, RCRA, Superfund	Method being developed.	October 2017
PPCP analysis	Water	Method being developed.	October 2017
Passive Formaldehyde	Clean Air Act	Method being developed.	ON HOLD

Region 7

EPA Method 1694 for Pharmaceuticals and Personal Care Products by HPLC/MS/MS--Direct injection analysis.	Speciation data to be used for Risk Assessments in support of Clean Water Act and Superfund.	Performing method validation studies on surrogate compounds; developing SOP, expanded list of targets in 2015 and 2016. Com-	Ongoing
Pesticides by GC/MS/MS	Confirmational analysis of pesticide analytes previously performed by GC/ECD	Instrument installed, method development and validation pending	Ongoing
Microbial Source Tracking Using qPCR	TMDL and Stormwater	Non Human marker test completed. Pending additional technical method guidance from ORD	FY 2015
Arsenic Speciation for Water, Soil/Sediment & Tissue by IC or ICP/MS	Speciation data to be used for Risk Assessments in support of Clean Water Act and Superfund.	Method development currently underway. Participated in multi-lab study	FY2018
EPA Method 1694 for Pharmaceuticals and Personal Care Products by HPLC/MS/MS--Direct injection analysis.	Speciation data to be used for Risk Assessments in support of Clean Water Act and Superfund. Water Program	Sample analysis for Urban Stream Monitoring, continued improvements.	Ongoing
PAH/SVOC in Water by Stir Bar Sorbtive Extraction	Water Program	Sample analysis for Urban Stream Monitoring, continued improvements.	Ongoing

LABORATORY SUMMARY OF DEVELOPING CAPABILITIES

Region 7

Airborne VOC by Solid Sorbent Tube (EPA Method TO-17)	Air Program	Air sample monitoring for ongoing sites with regular re-evaluations. Use three phased sorbent tubes for low to moderate humidity. Limited use at this time.	Ongoing
Airborne VOC by Solid Sorbent Tube (EPA Method TO-17)	Air Program, Vapor Intrusion	Developing a single phase sorbent method for evaluating high humidity uses for vapor intrusion and cave air evaluations. This method will focus on a short list of chlorinated VOCs	FY2018

Region 8

Algal Toxins	Need for analysis of individual algal toxins in algal blooms.	In Progress	Utah Lake, Cherry Creek Reservoir, Ongoing
Asbestos / Electron Microscope	Need for capabilities to analyze water and soils for asbestos contamination at Superfund sites.	Instrument operational and running samples.	Ongoing
Endocrine Disrupter Studies / LC/MS/MS	Emerging needs for the Water program and ORD.	Performing method validation.	Ongoing
Macroinvertebrate - Freshwater Benthic / Manual Enumeration	Redevelop capability for Water program support due to loss of staff.	Planning to hire replacement staff.	Ongoing
Microbial Source Tracking by PCR	Develop capabilities in this technology for use in projects and emerging needs for the Water, Enforcement programs and ORD.	Instruments and sample processing, ESAT staff training and/or assessing methods.	Ongoing
Toxicity - Acute & Chronic in Mobile Lab	On-site assessment for potential needs by the Water program.	Mobile lab available; team lead initiating discussion of projects and team development.	Ongoing
Pharmaceuticals by LC/MS/MS	Water and ORD	Progress continuing.	Ongoing
Pesticides by LC/MS/MS	Water	Progress continuing.	Ongoing
Hormones and Steroids by LC/MS/MS	Water and ORD	Progress continuing.	Ongoing

Region 9

Low level total mercury in water (EPA 1631E)	Address regional priority.	Completed, receiving samples.	Early FY 2016
Acidity in by SM2310b	Address a regional priority for mine related responses	In development	Early FY2017
Determination of Ferrous Iron in Water Samples by Colorimetric Analysis - SM3500-Fe	An improved method of determining ferrous iron in samples	In development	FY2017

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LABORATORY SUMMARY OF DEVELOPING CAPABILITIES

Region 10

Fluidized Bed Asbestos Segregator (FBAS)	Being able to measure asbestos fibers at low levels in soils is possible with this technology. The fibers are better separated from the soil matrix using the FBAS and so are detected easier.	The FBAS has been developed and is undergoing method validation including interlaboratory studies.	Unknown due to uncertainty in funding.
Develop Formaldehyde Analysis Capability for Aquaculture Water Samples	The Office of Compliance and Enforcement planned to conduct a survey of formaldehyde use and discharges from several aquaculture facilities in Washington and Idaho. This capability was needed to analyze the samples collected.	The capability was developed in time for the sampling schedule.	Completed.
Develop Methyl Mercury Analysis Capability for Sediment Samples	Methyl mercury data needed to support regional mercury strategy toward characterizing levels in the environment and evaluate public health risks.	Some initial testing on instrument conducted. Based on the effort needed to develop the water method, capability for sediment analyses will likely require much experimentation with the Brooks-Rand instrument to acquire the needed accuracy and sensitivity for sediments.	Progress delayed due to workloads and program needs are uncertain.
Develop Acidity Analysis Capability	Acidity analyses are needed to support mining sites remediation activities.	The capability development was completed this period. Previously Region 5 was able to provide this analytical support when needed for Region 10 Superfund sites.	Completed.
Develop Diffusive Thin-Film Gradient (DGT) Preparation and Arsenic Analysis Capability	The DGT disks are being tested at a Superfund site to determine if the material can effectively mimick arsenic uptake of bivalves in marine sediment. The DGTs require special conditioning at the laboratory and the arsenic analysis method needed to be de-	The development of the methods were initiated in 2015. Actual use of the disks and comparisons to actual data of clams are scheduled for early 2015.	Completed.
Develop Pesticides Analysis Capability for Wipe Samples	Wipe samples are planned to be collected at various tribal childcare facilities in OR to test for pesticides during CY 2016.	GC/MS conditions are being developed. Extraction studies of wipes were also initiated. The sampling schedule for the project was postponed to early CY2018.	FY 2018