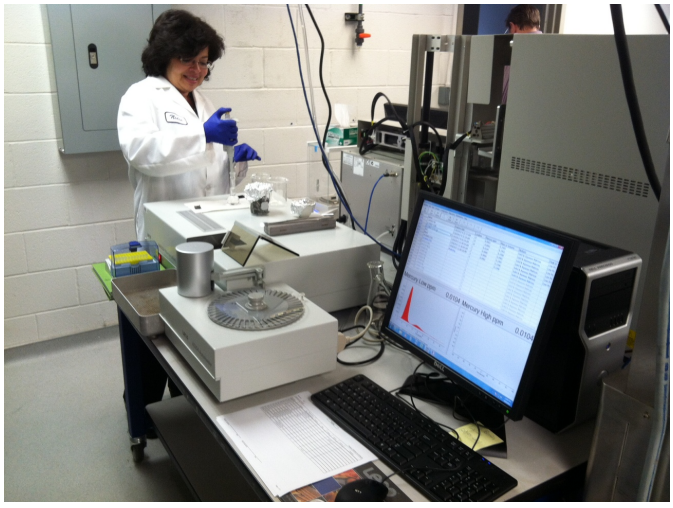
EPA
United States
Environmental Protection
Agency

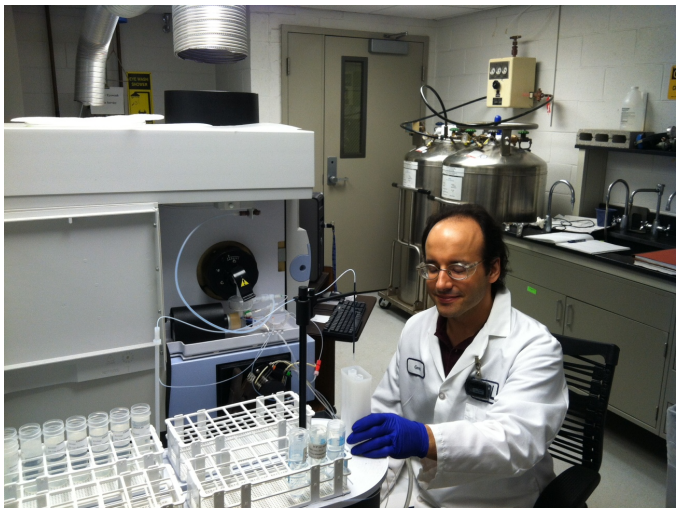
REGIONAL LABORATORY NETWORK

2017 Annual Report

Acknowledgements

Thanks to the laboratory managers, chiefs and scientists in all 10 regions 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.





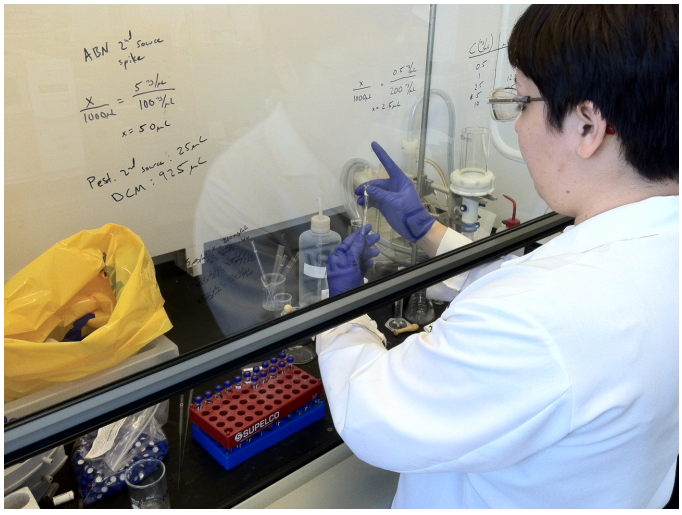


Table of Contents

Photo 1. Acting EPA Administrator Andrew Wheeler (right) is welcomed to the Region 7 Laboratory by Margie StGermain, Lab Director (center left).

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.

Regional laboratories are responsive to specific regional needs. Services and expertise provided by each regional laboratory are tailored to meet the needs of their state, local and tribal partners to address complex and emerging environmental issues. Scientific communication and collaboration across the regional laboratory network leverages regional expertise and methods across the nation thereby maximizing efficiency and flexibility while assuring responsiveness.

In Fiscal Year 2017, Regional Laboratories performed over 142,561 analyses for 1,080 projects/sites to support agency priorities and to solve emerging environmental issues. Of these analyses, 5,879 were time-critical samples for Emergency Response efforts to environmental disasters, hazardous materials releases, priority contaminant removals, and other threats to human health and/or the environment. In keeping with prior years, the Superfund Program continued to be the largest volume requestor of analytical services (47%), followed by the Water Program (34%), then the Air Program (8%), and a combination of programs accounted for the remaining 11%.

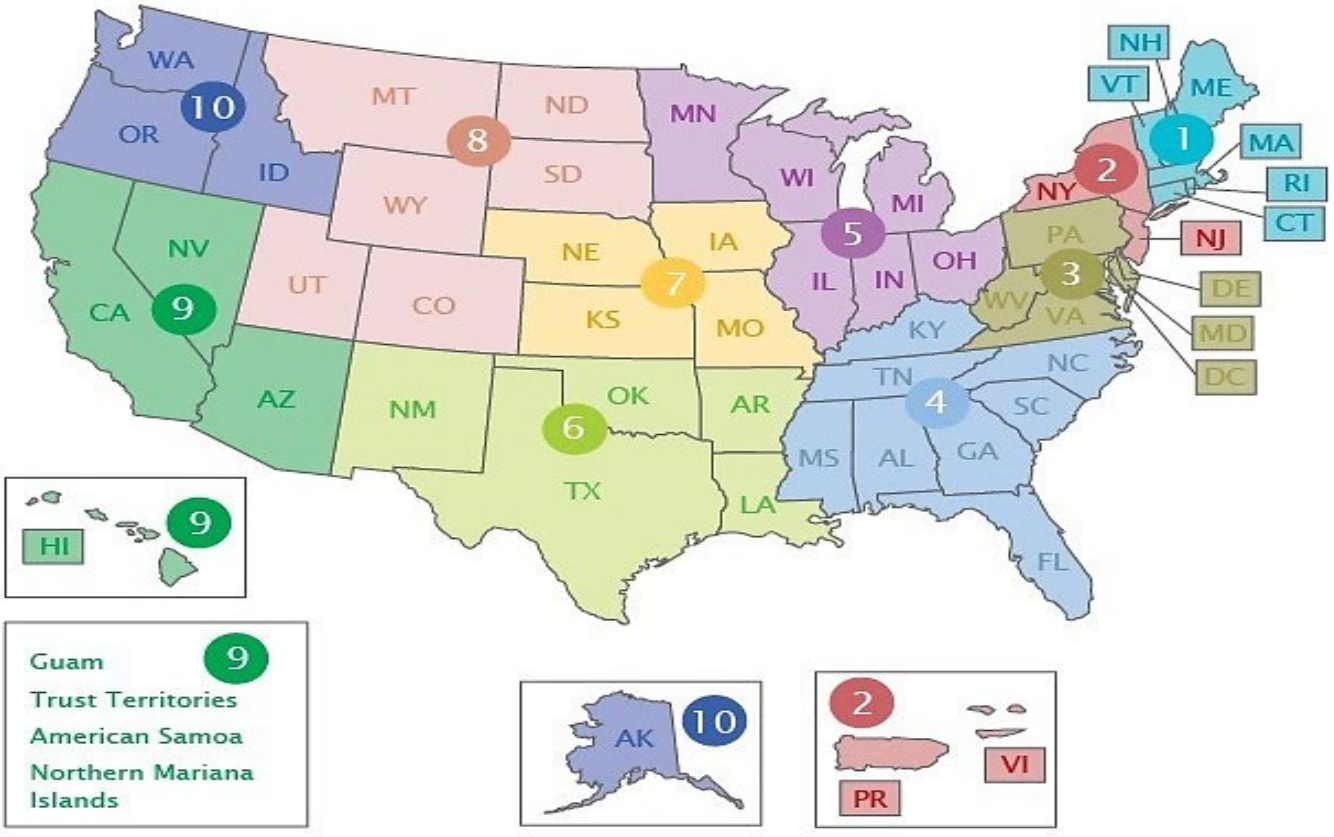
Accomplishments presented in this report capture only a few of the overall activities provided by the Regional Laboratories. These accomplishments underscore the commitment of the RLN to be an integral part in protecting human health and the environment. This report highlights the diversity of support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

Introduction

The Environmental Protection Agency's (EPA's) mission is to protect public health and the environment, and the agency is fully committed to delivering real results to the American people, enhancing shared governance with States, Tribes and local governments, and providing the technical support needed to meet statutory requirements.

To ensure the most efficient and highly responsive means of addressing complex and emerging environmental issues across the nation, EPA has a main office and a full service environmental laboratory in each of its ten regions (Figure 1). These offices and laboratories are responsible for overseeing and responding to the environmental needs of the States, Tribes and local governments within their respective region.

Figure 1. Map showing the 10 EPA Regions.



Regional laboratory locations, directors and contact information are shown in List 1. Each regional laboratory is fully committed to providing quality analytical services, and many offer additional quality assurance, field sampling and technical support services. These laboratories follow EPA administrative directives for high-performing organizations and are accredited by National or International Accreditation programs for ensuring effective quality systems, improved performance, and defensible data. Services and expertise provided by each regional laboratory are tailored to meet the needs of their respective regions (Appendix A).

To assure that the EPA's mission is supported across the Nation in the most efficient, effective and consistent manner, EPA Regional Laboratories collaborate with each other to form the **Regional Laboratory Network (RLN)**. Maximizing partnerships across the RLN provides more effective communication among scientists for identifying emerging contaminants, developing methods to address emerging contaminants, responding to national emergencies and meeting program needs.

Purpose

The purpose of this report is to present RLN resources available agency-wide and share 2017 progress summaries as well as a few success stories that demonstrate how RLN services and products are used by programs, states and tribes to implement EPA's overall mission.

List 1 - Regional Laboratory Locations, Directors, and Contact Information

Region 1
New England Regional Laboratory Investigation & Analysis Branch
Ernest Waterman, Director
Waterman.Ernest@epa.gov
11 Technology Drive
N. Chelmsford, MA 01863-2431
Phone: 617-918-8632

Region 2
Division of Environmental Science and Assessment Laboratory Branch
John Bourbon, Director
Bourbon.John@epa.gov
2890 Woodbridge Ave.
Edison, NJ 08837
Phone: 732-321-6706

Region 3
Environmental Science Center Laboratory Branch
Cynthia Caporale, Manager
Caporale.Cynthia@epa.gov
701 Mapes Road
Ft. Meade, MD 20755-5350
Phone: 410-305-2732

Region 4
Analytical Support Branch
Sandra Aker, Director
Aker.Sandra@epa.gov
980 College Station Road
Athens, GA 30605-2720
Phone: 706-355-8772

Region 5
U.S. EPA Region 5 Laboratory, Chicago Regional Laboratory
George Schupp, Director
Schupp.George@epa.gov
77 West Jackson Blvd.
Chicago, IL 60604
Phone: 312-353-1226

Region 6
Environmental Services Branch
Wes McQuiddy, Director
Mcquiddy.David@epa.gov
10625 Fallstone Road
Houston, Texas 77099
Phone: 214-665-6722

Region 7
Regional Science & Technology Center
Margie St. Germain, Director
Stgermain.Margie@epa.gov
300 Minnesota Ave.
Kansas City, KS 66101
Phone: 913-551-5154

Region 8
U.S. EPA Region 8 Laboratory
Mark Burkhardt, Director
Burkhardt.Mark@epa.gov
16194 West 45th Drive
Golden, CO 80403
Phone: 303-312-7799

Region 9
U.S. EPA Region 9 Laboratory
Pete Husby, Director
Husby.Peter@epa.gov
1337 S. 46th Street, Bldg. 201
Richmond, CA 94804-4698
Phone: 510-412-2311

Region 10
Manchester Environmental Laboratory
Barry Pepich, Director
Pepich.Barry@epa.gov
7411 Beach Drive East
Port Orchard, WA 98366
Phone: 360-871-8701

Overview

Each of the RLN laboratories are state-of-the-art full-service environmental laboratories that produce high quality and reliable analytical results, and offers expert technical assistance to States, Territories, Tribes, and Regional Offices. The RLN laboratories support project-specific objectives, achieve quality management goals, provide analytical expertise, and produce high quality defensible data for Agency decision making. Some of the core and specialized capabilities that span the RLN are:

- Regional Laboratories are capable of analyzing samples suspected to contain a variety of chemical constituents, including emerging contaminants as well as having microbiological/biological capabilities. Lists of core and unique laboratory capabilities that span the RLN are provided in Appendix A and B.
- 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;
- Regional Laboratories provide analytical support to emergency response events;
- The regional laboratories have the capability to support special or non-routine analytical needs that cannot be readily obtained from other sources, which fill a gap between basic research and commercially available analyses;
- While the regional laboratories generally provide routine data needed daily for supporting the Regional programs, they have the flexibility to quickly focus regional resources and capacity on the agency's highest priorities at any time;
- Contracting mechanisms are used within the RLN to provide additional procurement of analytical services. The Contract Laboratory Program (CLP) provides standard analytical methods supporting the Superfund Program; and,
- Each laboratory uses an Environmental Services Assistance Team (ESAT), which is a national contract to support laboratory functions.

2017 Progress Summary

Regional Laboratories directly support analytical requests from the programs, states, and tribes. During FY 2017, the Regional Laboratory Network (RLN) conducted more than 142,561 analyses (Table 1) for more than 1080 projects/sites. Of these analyses, 5,879 were time-critical samples for Emergency Response efforts to environmental disasters, hazardous materials releases, priority contaminant removals, and other threats to human health and/or the environment. Direct support to these programs aids timely and cost-effective decision-making in the field to provide the American people with clean air, land, and water. These totals exclude Quality Control (QC) samples, which add an additional 20%.

Table 1: Analytical Support to Programs

Program	Analysis
Superfund	66,825
Water	48,285
Air	11,573
RCRA	4,229
Emergency Response	5,849
LUST	630
Pesticides	166
TSCA	156
Brownfields	509
External Orgs. Enforcement	4,309
Total	**142,561**

In keeping with prior years, the Superfund Program continued to be the largest volume requester, followed by the Water Program (34%), then the Air Program (8%), and a combination of programs accounted for the remaining 11% (Table 1 and Figure 2).

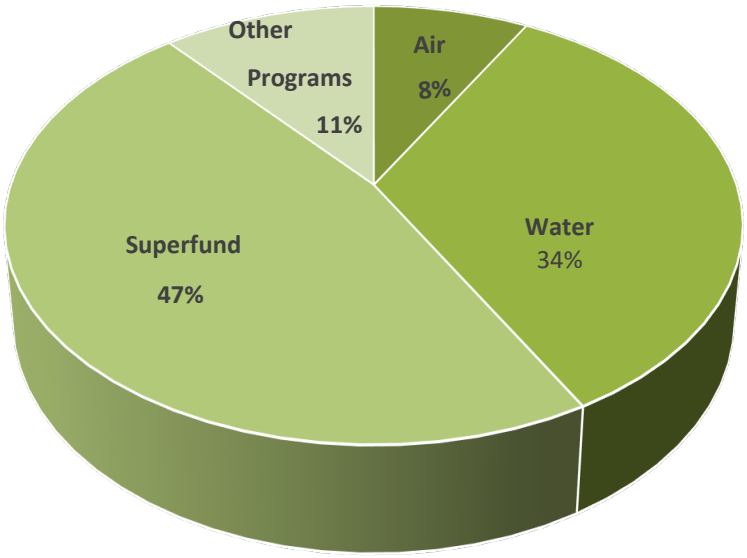


Figure 2. Analytical Support to EPA Programs FY2017

In addition to analytical support, the RLN provides quality assurance and technical support services (Table 2). In 2017, scientists in the RLN reviewed more than 1,821 quality management & technical documents and validated more than 38,964 Contract Laboratory Program (CLP) analyses. RLN scientists in each region are also certification officers for the Drinking Water Laboratory Certification Programs and they participate in drinking water laboratory and other program/laboratory audits. Some RLN scientists specialize in air quality and provide support to the States as part of the Particulate Matter (PM2.5) program.

Table 2. Quantity of Completed Quality Assurance Services

Reviews	
Quality Management Plans (QMP) Reviewed	1,024
Quality Assurance Technical Documents Reviewed	797
Contract Lab Program (CLP) Analyses Validated	38,964
Audits	
Drinking Water Laboratories Audited	41
Drinking Water Certification Programs Audited	20
Other Audits	20
PM 2.5 Support to States	
Number of filters weighed	7,055
Number of PM2.5 Audits	298
Number of Through-the-Probe Audits	185
Other Air Audits	89

As mentioned earlier in this report, regional laboratories are full service analytical laboratories that support an extensive suite of core and unique capabilities (Appendix A and B). These laboratories also have the capability to support special or non-routine analytical needs that cannot be readily obtained from other sources, which fill a gap between basic research and commercially available analyses. Methods initiated, developed, or on-going in 2017 are shown in Table 3 and described in more detail in Appendix C.

This brief summary highlights the RLN's diversity of support and capabilities, all of which reinforce EPA's mission and ongoing priorities. The next section presents some examples of projects that show how this data is used by project leaders in the programs, states and tribes.

Table 3. Method Development for EPA Programs

Method Title	Status	Program Supported
EPA Method 537 (14 PFAS Compounds)	Completed	SF, Water
Mercury by Method 200.8	Completed	SF, Water
Ammonia by Diffusion	On-going	All
Additional PFCs to ASTM D7979	Completed	OW, LCD, SF, ORD, GLNPO
Additional PFCs to ASTM D7968	Completed	OW, LCD, SF, ORD, GLNPO
Determination of Anions, Cations, OA in High TDS Water	On-going	Waste, Water
Anions and Oxylhalides by IC	On-going	SF, RCRA, CWA
Pharmaceuticals & Personal Care Products	On-going	CWA
Herbicide LCTQ Direct Injection	On-going	Pesticide
GCTQ Direct Injection	On-going	Pesticide
Herbicide LCTQ soil/plant/water analysis	On-going	Pesticide, Tribal
Pesticide/PCB Twister	Completed	Pesticide, CWA
Pharmaceuticals	On-going	Water
Pesticide & Pesticide Metabolites	On-going	Water
Individual Algal Toxins **Audits**	On-going	Water
Acidity by Titration based on SM 2310B	Completed	SF
Ferrous Iron in Water by Colorimetric Analysis based on SM 3500-Fe B	Completed	SF
Microcystins	On-going	Water
Microplastics Identification Method	On-going	Water
PFAS Isotope Dilution Method	Initiated	SF

Success Stories

This section provides a few examples of projects that demonstrate how the Regional Laboratory Network (RLN) services and products are used by programs, states, and tribes to implement EPA's overall mission to protect public health and the environment. These projects are grouped based on the current agency goals and objectives with which they most closely align, however, each project has components that cross over and support multiple goals and objectives. Projects are presented on the following pages.

Providing for Clean and Safe Water

EPA works with states, tribes, territories, and local communities to better safeguard human health; maintain, restore, and improve water quality; and make America's water systems sustainable and secure, supporting new technology and innovation wherever possible.

Regional Labs Provide States and Tribes "Boots on the Ground" Assistance on Harmful Algal Blooms

Harmful algal blooms (HABs) pose serious public health and environmental risks due to their ability to spread rapidly in surface, drinking, and recreational waters. HAB events in the U.S. are expanding in both prevalence and duration, driving a need for a better understanding of the conditions that lead to HABs in order to inform best management practices to minimize HAB occurrence. EPA regional scientists at 9 regional laboratories are the "boots on the ground" for EPA as we collaborate with our state, federal and tribal partners right in our backyards. Many regions hold regular workgroup calls and meetings with the states to share data and methods. Currently, EPA Region 7 and 8, are the only regional labs providing cyanotoxin analysis other than microcystin such as cylindrospermopsin and anatoxin-a for states/tribes that are dealing with a toxin-producing bloom. EPA R4, R9 and R10 are in the process of increasing their laboratory capacity to respond to requests for assistance. Below is a snapshot of the many diverse projects being carried out in collaboration with each other, ORD, states and tribes. For details, visit EPA Regional Lab capacities 2018.xlsx.

REGION 1

- Cyanobacteria Monitoring Collaborative: Mobile lab activities.
- ELISA being added to broaden capabilities supporting states and tribes
- Collaboration with ORD and United States Coast Guard: Bloomwatch and Cyanoscope surveillance

REGION 2

- Funding HABS monitoring projects in selected states
- Joint sensor deployment with New York and New Jersey
- RARE proposal to evaluate sediment diatom index is being added to lead to derivation of bio-criteria for lakes

REGION 3

- Response and follow-up to the 2015 Ohio River HAB event which affected 700 miles
- Collaboration with Interstate River Basin Commission and Regions 3, 4, and 5 to develop a technical support and response document
- Respond to HAB events with fish kills

REGION 4

- Lake Okeechobee problems with cyanobacterial algal blooms
- Gulf of Mexico with red tides
- Capable of measuring chlorophyll and AGPTs
- Validating handheld fluorometer methods using AlgaeTorch and BenthoTorch
- Developing rapid field test for cyanotoxins (dip stick method)
- Adding ELISA for microcystins

REGION 5

- Provide monitoring assistance through the National Aquatic Resource Surveys (NARS) for lakes/reservoirs, rivers/streams, wetlands, & coastal/Great Lakes.
- Developing capacity for LC/MS/MS (EPA Method 544).
- Participate in ORD Research project on HABs with Ohio EPA.
- Collaborate on HAB treatment optimization project with OH EPA & OGWDW TSC.
- Participate in UCMR4 monitoring for 10 potential cyanotoxins of treated DW.

REGION 7

- Project lead for using Next-generation molecular tools such a phylochip
- Collaboration with ORD, states and other regions to analyze samples to better understand microbial conditions leading to HABS
- Analyses include Phylochip, ELISA, and qPCR/RT-Qpcr
- Weekly sampling of 5 lakes in Kansas, Missouri and Iowa
- Mobile lab for response to large scale HABs events
- Collaborate with Kansas Legislative Research team on HABs
- Provided technical assistance to other regions running anatoxin and sazitoxin analysis for drinking water systems

Photo 2: Deanna Collier, Environmental Sciences and Technology Division, carefully takes sampling equipment onto Perry Lake for collection of water samples. She collected water at depths of 1/3 meter, 2/3 meter, and 1 meter. She also ran and recorded information from the monitoring device that collects certain physical and chemical data, such as temperature, pH, and dissolved oxygen.

REGION 8

- Monthly analytical services to state and tribes targeting lakes and reservoirs experiencing HABs events
- Analyses include ELISA, LCMSMS
- Provided technical support to state, cities, and regions
- Limited field support including total algae sensors and long-term buoy deployment
- Participate in the phytoplankton Monitoring Network,

REGION 9

- Analytical support to states and tribes providing ELISA-Microcystin technique for surface waters
- Validating method for ELISA-Anatoxin analysis
- Cyanotoxin analysis is growing with over 800 samples in 2017
- Respond to golden algae blooms causing fish kills

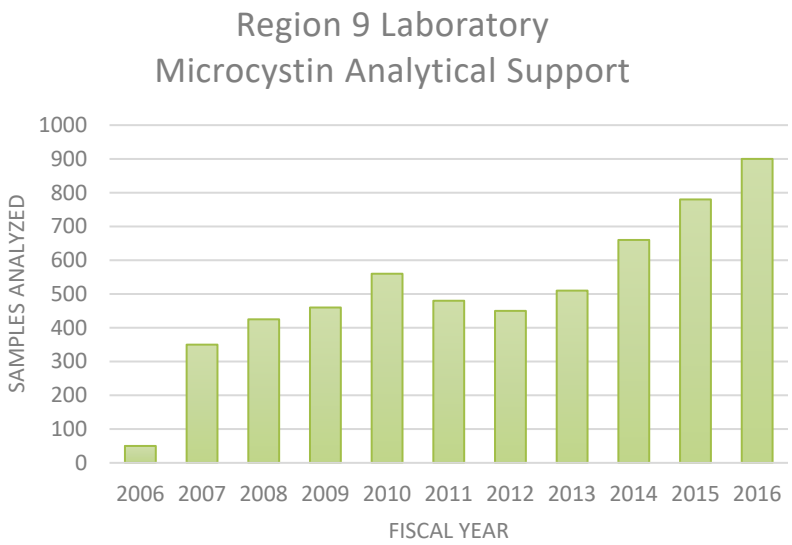


Figure 3: Region 9 Microcystin Analytical Support trends. Cyanotoxin analysis is growing with over 800 samples in 2017.

REGION 10

- Respond to major marine events impacting Pacific Northwest estuaries
- Assisting state with monitoring networks
- Identified saxitoxin and anatoxins in fresh waterbodies
- Implementing CAAS ELISA analysis, LCMSMS
- Submitted an innovation project proposal for for high throughput qPCR analyses of toxin-producers

Palmer River Water Quality Assessment

Region 1 Laboratory field and lab staff have played a key role in an ongoing study of agricultural nutrient impacts on the Palmer River in Massachusetts and Rhode Island. The river starts in the town of Rehoboth in southeastern Massachusetts before flowing south into Rhode Island where it eventually enters Narragansett Bay. The watershed drains approximately 132 km^2 and is mainly forested, but with substantial agricultural and recent developed land uses. The Palmer River, like many watersheds, also faces the ever-increasing pressure of rapid suburbanization. The watershed has a TMDL in place for bacterial contamination due to threats

to shellfish fisheries, but also presents high levels nutrients (nitrogen and phosphorus). Since 2012, investments have been made in improving the water quality of the Palmer River Watershed through the installation of Best Management Practices (BMPs), as the Palmer was selected for the Natural Resources Conservation Service's (NRCS) National Water Quality Initiative (NWQI).

Lab staff have worked cooperatively for seven years with the Massachusetts Department of Environmental Protection (MADEP), the Rhode Island Department of Environmental Management (RIDEM), and Region 1's Office of Environmental Protection to collect monthly water quality samples from April through November each year at twelve fixed stations in the lower Palmer watershed. The sites were selected in coordination with NRCS to best monitor BMPs in the watershed. The stations were selected to represent areas of the watershed with numerous farms, and thus the potential for agricultural water quality impacts, but where farmers have been or are open to employing BMPs. The focus of these sampling events has been to collect information on enterococci, E.coli, TSS, total nitrogen, nitrate + nitrite, phosphorus, and orthophosphate. The regional lab has conducted the analyses for most samples. Ultimately, the goal of the sampling program is to assess water quality trends over time in correlation with ongoing installation of agricultural BMPs. Additionally, during the 2017 sampling season, water samples were collected for PhyloChip (DNA Microarray) analysis to determine fecal contamination sources.

Potomac River Sheen Discharge

The **Region 3** Laboratory provided rapid analysis of hydrocarbons in support of the Potomac River Sheen Discharge event. In December 2016, an oil spill from an unknown source was discovered in the Potomac River near Montgomery Co., MD, which caused concern for intake contamination for downstream water utilities. Region 3 Laboratory was successful in identifying the contaminant as "lube oil" and results were confirmed by the United States Coast Guard (USCG). This event was later used by the Water Protection Division in training its staff on emergency response procedures.

Flint and Galesburg Lead Drinking Water Task Force Project

As a part of EPA's lead strategy efforts to eliminate lead poisoning as a public health problem, a project was initiated by the Office of Research and Development, **Region 5** Chicago Regional Laboratory (CRL), and the EPA Flint Task Force to establish a relatively simple water sampling protocol that would provide convenient, rapid and cost-effective way to identify and verify lead service lines. This project is tied to the current Lead and Copper Rule regulatory requirements, and the sampling protocol can be used for assessment, risk evaluation, implementation of a lead service line replacement program, and evaluation of remediation effectiveness that directly impact public health. The field test sampling for this project was performed in Flint, MI and Galesburg, IL. The study was carried out by collecting flushed water samples under different flowrates from approximately twenty homes in each community. Water samples were collected from homes with lead service lines and homes that never had a lead service line in place. The homes with lead service lines were resampled after the lead service line was replaced. Sequential sampling was also performed at each home to verify lead sources within the plumbing. In 2017, CRL **performed 788 metals analysis** in support of this project. This project will result in faster identification of potential lead issues in drinking water and verify the effectiveness of service line replacement, leading to both faster and improved protection of public health.

Corpus Christi Drinking Water Incident

The Corpus Christi Drinking Water Incident – The **Region 6** Houston Environmental Laboratory developed two new, time critical, analytical chemistry methods, utilizing a liquid chromatography/mass spectrograph (LCMS) and a gas chromatography/mass spectrograph (GCMS), to detect Indulin AA-86 that was suspected of contaminating Corpus Christi's drinking water distribution system. Additionally, the Team provided 'around the clock' analysis services for over 200 drinking water samples collected during the incident, from confirmatory sampling sites as well as complaint verification sampling.

On December 15, 2016, the Team was notified about a warning issued to Corpus Christi's 320,000 residents to not drink or use tap water following a back-flow incident at an asphalt terminal operated by Ergon Asphalts & Emulsions on the property of Valero Energy Corporation. Subsequently, EPA Regional leadership alerted the Team to standby to perform emergency analytical services. Also, on December 15, the City of Corpus Christi provided a news release that identified the chemical of concern as asphalt emulsifier, Indulin AA-86, and that City officials estimated the amount of the product involved in the back-flow incident from 3 to 24 gallons.

Initial samples from Corpus Christi's drinking water system were collected by the Texas Commission on Environmental Quality (TCEQ) and sent for analysis to the Department of State Health Services (DSHS) laboratory in Austin. Upon learning the chemical nature of the asphalt emulsifier, DSHS determined that they had neither the expertise or equipment to analyze for Indulin AA-86. Therefore, the Team was tasked with the emergency capability development of an analytical method(s) for Indulin AA-86 in drinking water, and for developing the capacity to analyze numerous and recurring daily samples from the City's drinking water system, as well as, citizen health complaint derived samples on demand.

The **Region 6** Team expeditiously and successfully, within 24 hours, developed not one, but two methods to detect Indulin AA-86 in drinking water, one utilizing a LCMS technique and one utilizing a GCMS technique, with method detection levels of 0.05 mg/l for LCMS and 0.28 mg/l for GCMS.

The Team was able to develop the two analytical methods, calibrate instrumentation, establish detection levels, analyze initial samples, and begin providing analytical results, all within 72 hours of notification of the incident. This herculean effort, and all negative test results, enabled TCEQ to lift the Corpus Christi drinking water advisory on December 18.

Of worthy note, the entire Team of highly qualified and dedicated professionals worked long hours, well past normal work hours and on weekends, to accomplish this emergency mission. None of the over 200 drinking water samples collected from across the City of Corpus Christi water supply system tested positive for the presence of Indulin AA-86 in drinking water at method detection levels.

Cooperative Protection of Groundwater at the Red Hill Fuel Storage Facility

The Navy's Red Hill Bulk Fuel Storage Facility provides fuel for military operations in the Pacific. The Facility was constructed in the 1940s and is located near Pearl Harbor on the island of Oahu in the state of Hawaii. This facility is unlike any other in the United States and consists of 20 concrete tanks each with a steel liner, built into cavities that were mined inside a volcanic mountain ridge. The cavity in which the tanks are built lied under approximately 100 feet of rock. The facility can store up to 250 million gallons of fuel. A fuel release of roughly 27,000 gallons in January 2014 led to a comprehensive plan to minimize the threat of future leaks and protect groundwater resources around the facility. In 2015 EPA, the State of Hawaii and Navy and Defense Logistics Agency reached a comprehensive enforceable agreement, or Administrative Order on Consent, requiring the Navy to perform environmental and infrastructure work.

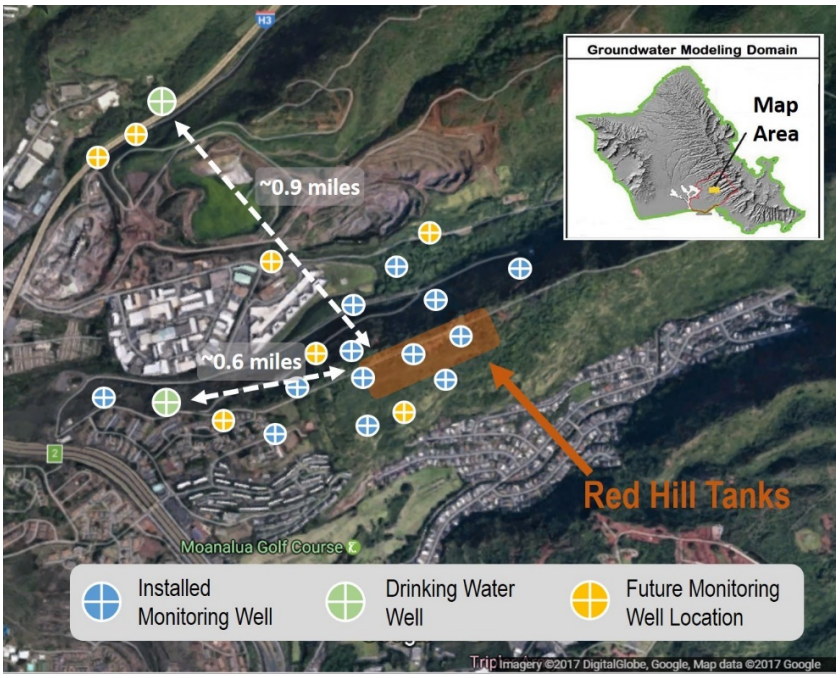


Figure 4: An aerial view of the Red Hill Bulk Fuel Storage Facility in Oahu, Hawaii.

In 2017, the **Region 9** Laboratory performed 559 analyses of split samples from the Red Hill groundwater monitoring network which currently consists of 13 sampling locations. Historically the tanks at the facility have stored multiple fuel types including gasoline, aviation fuel and marine diesel. Analyses performed by the lab included volatile organic compounds, semi-volatile organic compounds, extractable and purgeable total petroleum hydrocarbons, low level phenols and polycyclic aromatic hydrocarbons as well as metals (including lead) and anions. The data from groundwater sampling and analysis will support environmental assessments including contaminate transport modeling monitoring as well as inform expansion of the monitoring well network, ultimately ensuring the protection of groundwater.

Algal Bloom Impact on Tribal Drinking Water System

A **Region 7** tribe's drinking water supply was adversely impacted by a harmful algal bloom. The Kickapoo Reservation's drinking water supply inlet is located on the Delaware River and an algal bloom was detected upstream. A multi-agency response ensued that included the Kickapoo Tribe, the Kansas Department of Health & Environment, US Army Corps of Engineers, and EPA Region 7.

Region 7 and tribal professionals collected microcystin samples from the Delaware River both upstream and at the Kickapoo drinking water inlet. Additional samples were collected from the finished drinking water plant. Region 7's analysis confirmed microcystin concentrations above health-based criteria upstream of the tribe's drinking water inlet and detected concentrations below health-based criteria at the drinking water inlet with non-detects in the finished drinking water. Region 7 supported continued monitoring of the Delaware River and drinking water system components until the threat from the algal bloom had subsided. This coordinated multi-agency response was successful at preserving the integrity of the Kickapoo tribe's drinking water supply and the health of its customers.

Algal Toxins

The occurrence, fate, and transport of cyanotoxins 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 (Colorado, Wyoming, North and South Dakota, Utah and Montana), local municipalities (Cities of Denver, CO. and Sioux Falls, SD), and other USEPA regions (Region 6, Lake Pontchartrain, LA). Additionally, Region 8 scientists are collaborating with the National Oceanic and Atmospheric Administration and 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.

There were no methods that could measure these compounds in the environment at the concentrations required. The need to measure these compounds in an environmentally safe way resulted in the development of two separate analytical methods that use minimal sample preparation or none at all. One of the developed methods use direct injection of the sample into the high-performance liquid chromatography/ mass spectrometer /mass spectrometer (LC/MS/MS) without any sample preparation other than filtering the sample. This technique allows sample volumes to be reduced from 1 liter per analysis to 1 milliliter per analysis. This resulted in significant reduction in shipping and analyst exposure. The second method developed uses ELISA based immunoassay cartridges that allowed the rapid screening of water bodies for the algal toxins and only 2 microliters of sample. This sample and analyst exposure reduction exceeds the Agencies environmental and safety and health stewardship goals. The methodology has been shared with other Regional Laboratories (2, 6, 7, and 10) in order to allow these labs the ability to provide this type of analysis to the other regions

Photo 3: Liquid Chromatography-MassSpectrometry (LCMS) instrument, Region 7 Laboratory.

and their partners. The Team also deployed for the first time in the region, a continuous monitoring buoy on Canyon Ferry Reservoir in Montana. This system provided valuable depth profile, meteorological, and chemical data and helped the Region to start to understand the causes and issues associated with algal blooms.

The data set is archived on the Region 8 Laboratory Information Management System. It contains ELISA and LC/MS/MS data for each sample requested. The five years of data is readily accessible from this system and may be requested through the Region 8 Laboratory.

Improving Air Quality

EPA works with states, tribes and local governments to accurately measure air quality and ensure that more Americans are living and working in areas that meet high air quality standards.

Region 7 Builds Low Cost Air Sensors

Region 7 scientists worked collaboratively with ORD scientists to design and build an updated version of ORD's Air Mapper device for use by citizen scientists during the Kansas City Transportation Local-Scale Air Quality Study (KC-TRAQS). The Air Mapper was originally designed by ORD for use by citizens to perform air quality surveys in the neighborhoods where they live. The hand held, battery powered, device collects air monitoring data and simultaneous GPS locational data so that concentration and location information can be plotted on a map using EPA's Real Time Geospatial Data Viewer (RETIGO) software package.

Region 7 scientists adapted the original design to include manufacture of monitor case materials and sub-assemblies using 3-dimensional printing technology, upgrading sensor technology and modifying sensor operational code to improve overall monitor performance. All seven regionally designed and manufactured devices have recently been granted approvals by Underwriters Laboratory for public use. The Air Mapper simultaneously collects and logs atmospheric concentration data on particulate matter, carbon monoxide, noise, temperature, relative humidity, and location at one second intervals for subsequent upload to RETIGO (Real Time Geospatial Data Viewer) software for data visualization. Region 7's Air Mapper devices have been used by local schools and citizens to improve their understanding of local pollution sources and their potential impact on air quality.

Revitalizing Land and Preventing Contamination

EPA collaborates with other federal agencies, industry, states, tribes, and local communities to enhance the livability and economic vitality of neighborhoods.

Raymark Superfund Site Remedial Design

The Raymark Superfund Site, located in Stratford, Connecticut, is a technically challenging Superfund site; encompassing hundreds of acres, and dozens of commercial properties still impacted by the historic disposal of "Raymark Waste" (a mixture of lead, copper, PCBs, and asbestos). In 2017, initiating and advancing the Remedial Design(s) in a timely fashion was (and is) of utmost importance.

The **Region 1** lab supported on an unprecedented team effort to collect a substantial amount of new data ahead of the remedy's implementation. These data reduced (and in some cases eliminated) the need to conduct any post-excavation confirmatory analyses. Having the extent of Raymark waste needing to be removed clearly delineated in advance will allow for EPA, and its clean up contractor, to minimize the remedy's disruption of community businesses while simultaneously accomplishing our goal to protect human health and the environment.

In partnership with staff from the regional Superfund program the Regional lab fixed lab, mobile lab and field sampling staff provided all of the following activities: overseeing third-party drill rigs, processing third party soil cores, collecting soil borings using regionally-available equipment, processing and logging samples, and analyzing (in nearly real time) hundreds of samples for lead, copper, asbestos and PCBs. One of the benefits of having real-time data is that it allowed for additional samples to be collected during the same mobilization (at a significant cost and time savings versus an additional mobilization).

In addition to the multiple week-long mobilizations in support of EPA's consolidation remedy (described above), the Raymark team was called upon to assess the condition at the Housatonic Boat Club (OU5).

The effort was immensely successful with more than 3 dozen soil borings collected in one week, and nearly 100 samples analyzed on site for Raymark constituents.

Regional lab staff also EPA contractors in updating prior (2001) risk assessments at Lower Ferry Creek (OU7) and Beacon Point Wetlands (OU8). These assessments required surface water and sediment samples to be collected using specialized equipment; equipment that EPA's contractor had little-to-no experience using. Members of the Raymark team made themselves available to contractors prior to mobilization to orient contractors on the equipment and its proper use. During the sampling event, the Raymark team provided oversight that was invaluable. The input and guidance decreased the time needed to complete the investigation.

The dollar value of the services provided by the Raymark team at the many Raymark operable units can be easily quantified if one were to assume that a contractor was solicited to conduct this work, and the environmental samples were analyzed at a traditional commercial laboratory. The Raymark team contributed no less than 100 field days. Using standard assumptions for length of day and hourly rate for contractors, this equates to roughly a $200,000 effort! With regard to the field analysis of samples, as compared to traditional fixed laboratory, over 300 samples were collected. Using an estimate of $200 for the corresponding fix laboratory cost per sample (to determine three disparate Raymark constituents), is another $60,000. The combined project savings of roughly $260,000 is conservatively low given the cost to prepare for fieldwork and the cost of equipment and facilities.

Leaded Glass

A recycling site was identified in **Region 7** which was potentially contaminated with lead from recycled leaded glass and lead dust from crushing operations. The owner sold the property which was rented/leased, and EPA needed to collect evidence of unlawful operations. The lessor abandoned the waste on the property leaving several bins containing broken glass as well as a large stockpile of glass, some which was lead coated glass panes.

On short notice, the RCRA project manager received assistance from the laboratory staff to develop a QAPP and a Sampling Plan. Ten samples of glass panes ranging in size from 4 inches to greater than 20

inches in length were collected in zip-lock baggies, double-bagged. Additional soil samples were collected to determine the area needed for clean-up. Because of the unusual size and shape of the glass samples, the chemists had to devise a way to reduce the particle size to meet the Toxicity Characteristic Leaching Procedure (TCLP) criteria. The glass samples were placed inside plastic bags which in turn were placed between two aluminum plates. The force to break the glass was achieved by dropping a 10-pound sledge hammer from a distance of twelve inches on the top aluminum plate. After several blows the crushed glass was sieved though a plastic container with 0.375" holes drilled in it. Larger pieces of glass that did not pass through the holes were resubmitted to the crushing procedure. To ensure safe operations, specialized Kevlar gloves were ordered for the four chemists performing the particle size reduction.

As the samples were collected in the field, field analyses were performed using XRF. The samples sent to the laboratory were confirmatory samples which were analyzed for RCRA metals (lead, mercury, arsenic, barium, cadmium, chromium, selenium, and silver). The results provided to the project manager was vital to their case which resulted in a Consent Agreement to clean up the site. The assistance in developing the QAPP and sampling plan as well as the development of the sample preparation for these unusual samples was instrumental for EPA to move forward on the case in less than two months.

International Geophysical Investigations

In FY 16 and 17, US AID was notified about soil contamination issues with potential impacts on communities in Honduras and El Salvador. Investigation of these issues required expertise not available within these countries Ministries of the Environment. Based on expertise and experience with geophysical investigations, Brian Striggow and Jon Vail of the Region 4 Science and Ecosystem Support Division were called on to conduct an investigation in each country.

In Honduras, the Ministry was concerned with potential lead contamination from a battery recycling facility. In El Salvador, the Ministry expressed concern that waste drums may have been buried at four specific sites leaving potential pesticides in the soil. At both locations, there were significant concerns raised by the public. Investigation of the sites required experience with deployment and interpretation of ground penetrating radar and magnetometer measurements.

In both cases, the potential public health concern resulted in a need for a swift response. Moving quickly in advance of the survey, the team conducted site evaluation using available satellite photography and maps to determine potential sources and focus the study area ensuring the most efficient use of available time on site. Brian and Jon also overcame significant logistical challenges in preparing for the survey posed by requirements for international shipping of equient. For these efforts they successfully completed GPR and magnetometer measurements at hundreds of stations covering the entire areas of interest through a sampling network they established on site. While conducting these measurements, Jon and Brian also provided on-the-job training in these methods to Ministry staff.

Photo 4: Potential Waste burial site in El Salvador.

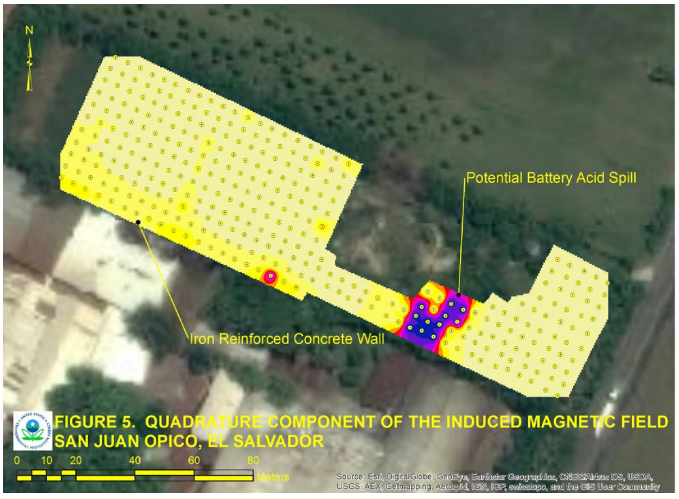


Figure 5: Ground Penetrating Radar (GPR) survey results. Purple color indicated potential waste burial site for this survey.

Through extensive expertise and flexibility, the team was able to successfully complete the monitoringeffort in the field as well as conduct the data evaluation needed to provide the Ministries with their critical information needs this year. Specifically, the team determined that no drums were buried at the study sites in either country; however, magnetometer measurements revealed very high conductivity at the El Salvador site indicating a potential acid plume allowing the Ministry to focus additional study efforts.

Ensuring Safety of Chemicals

Chemicals and pesticides released into the environment as a result of their manufacture, processing, use, or disposal can threaten human health and the environment. EPA gathers and assesses information about the risks associated with chemicals and pesticides to allow more rapid and accurate assessment.

Dicamba Overspray

The **Region 7** chemists have developed new analyses for dicamba to support overspray responses at requests from the Department of Environmental Quality and Department of Agriculture in the states of Missouri, Kansas, Iowa, Nebraska, Arkansas, Tennessee, Illinois, and Indiana. The heaviest damage continues to be in Missouri which reported 300,000 acres damaged in 2017 alone. The Region 7 chemists worked with chemists from OPPS and Indiana University in developing an analytical method for the detection of dicamba and its degradants on soil and foliage. They also worked with FDA chemists to share knowledge and resources to develop comparable methods, allowing the results to be similar in both agencies.

Photo 5: Daniel Dorn, Region 7 Chemist, giving a tour of the Liquid Chromatography/Triple Quadrupole (LCTQ)/ pesticide laboratory.

The Region 7 Laboratory sent a technical expert to attend teleconferences addressing concerns raised by the R7 states. During these calls, requests were made by Nebraska and Missouri to verify that there was no cross contamination of the Dicamba with other off-label herbicides, requiring the lab to develop analyses for pesticide formulations. After these initial analyses were complete, requests concerning analyses of full Producing Establishment Inspections were made by Nebraska and Missouri. To date, the chemists have developed methods for 8 active ingredients and are developing methods for glyphosate and glufosinate for pesticide formulation analysis to support FIFRA in Missouri and Nebraska. Within the first

two years, the chemists have analyzed pesticide formulations for two of the regional states with plans to expand this capability to the other two states within Region 7 and expand the list of pesticides.

Cooperative Federalism

EPA understands that improvements to protecting human health and the environment cannot be achieved by any agency acting alone, but only when the states, tribes, communities and the federal government work together in a spirit of trust, collaboration, and partnership.

Upper Columbia River Macroinvertebrate Split Samples Tissue Study

Region 10 has been studying contamination in the Columbia River from the U.S./Canada border to the Grand Coulee Dam and surrounding upland areas. Past studies by federal and state agencies have shown increased levels of heavy metals such as arsenic, lead, cadmium, copper, mercury and zinc, and other contaminants like dioxins and furans. In August 1999, the Colville Confederated Tribes petitioned EPA to conduct an assessment of environmental contamination in the Upper Columbia River (UCR). The petition expressed concerns about risks to people's health and the environment from contamination in the river. In 2001, Region 10 collected samples of river sediment to learn more about the types and amounts of pollution that exists. The results showed that contamination is present in the lake and river sediments, and that a more detailed investigation is needed to evaluate possible risks to human health and the environment. A large mining corporation was identified as the potentially responsible party (PRP). Over several years the Region 10 Laboratory has supported various investigations of the Upper Columbia River area.

The primary objective of the Macroinvertebrate Tissue Study is to characterize the concentrations of chemicals in the tissues of macroinvertebrates sampled from the UCR site. Mussels and crayfish were selected as representative macroinvertebrates because they are commonly found in the UCR and are consumed by both people and wildlife. Data collection efforts focused on obtaining information that informed the exposure assessments for humans and wildlife receptors that consume these organisms from the Site. Chemistry data for mussels (soft body tissue) and crayfish (the whole body and shell, minus the

carapace and stomach) was used in the human health risk assessment to evaluate exposures of people who consume shellfish. Chemistry data for mussels (soft body tissue) and crayfish (all body parts, including the shell) was used in the in the baseline ecological risk assessment to evaluate the exposure of aquatic-dependent, invertebrate-feeding fish and wildlife that forage for mussels and crayfish in nearshore waters. In 2017, the Region 10 Laboratory received split samples from the macroinvertebrate tissue sampling effort. The split samples were obtained from a subset of the composited mussel and crayfish samples following processing at the PRP's contract laboratory. The samples were analyzed for selected metals which are the primary contaminants of interest. The purpose of the split sample analyses was to evaluate the total metals analytical data provided by the Region 10 Laboratory and the PRP's contract laboratory for precision, variability and comparability. Tissue matrices are more complex for trace level analyses and it is a common role for the Region 10 Laboratory to be a reference laboratory to evaluate data quality.

Warmhouse Beach Dump Remedial Investigation/Feasibility Study

The Warmhouse Beach Dump (WBD) site is located on the Makah Indian Reservation northwest of Neah Bay in Clallam County, WA. The Site is an inactive dump that was used by the Makah Air Force Station, the Makah Tribe and tribal members, other local and non-local residents, and other entities such as the Indian Health Service, U.S. Coast Guard and Cape Flattery School District, to dispose of municipal solid and hazardous wastes. Drainage from WBD flow into the Makah Tribe's ancestral waters, which now contain the Olympic Coast National Marine Sanctuary along the Strait of Juan de Fuca. Warmhouse Beach was the site of historical fishing camps and traditionally was used for cultural and religious ceremonies and contains a designated archeological site of cultural significance to the Makah people. The beaches and the headlands provided subsistence harvest of shellfish, seaweed, and berries (i.e., salmonberry, blackberry). The Makah Tribe referred the Site to EPA due to concerns about hazardous substances leaching from the waste and contaminated soil to surface water and to shell fishing beaches on the reservation. A Preliminary Assessment reported that semi-volatile organic compounds, pesticides, diesel, motor oil, metals, dioxin/furans, and other organic chemicals were present at significant concentrations in soil at the dump. A Site Inspection indicated that polychlorinated biphenyls and perchlorate are also present in soil and that sediment and mussels at East Beach and Warmhouse Beach may also have been impacted by releases from the

dump. The **Region 10** Laboratory provided analysis support to the Superfund program toward further characterization of WBD and the surrounding area to define the nature and extent of contamination, assess risk and evaluate potential remedial options for the site. The Incremental Sampling Methodology (ISM) was applied for soil and sediment collections which the Region 10 Laboratory then processed for analyses. ISM sample processing is a unique capability of the Region 10 Laboratory as this requires specialized equipment and techniques developed on-site. The ISM aliquots were analyzed for various metals, polybrominated diphenyl ethers, perchlorate and total organic carbon. Aliquots were also prepared for other laboratories analyzing for different parameters. Support to WBD events has been on-going since 2011.

Tri-State Mining District Risk Assessment

In 2017, the **Region 7** chemists provided data to support a multi-jurisdictional activity coordinated by **Region 6** program staff. Region 7 supported the Tri-State Mining District Risk Assessment with field sampling and analysis of samples associated with the Cherokee County – Tar Creek Watershed Superfund site located in Ottawa County, Oklahoma. One of the priorities of these sampling events was to fill in data gaps associated with a human health risk assessment of exposure to sediment and surface water for tribal use scenarios. The sampling events were a coordinated effort in which EPA Region 6 led and involved sampling conducted by Region 7, Oklahoma State agencies, tribal members, and others.

Photo 6: Alisha Claycamp, Chemist in the Region 7 Laboratory, holds tissue samples collected to fill in data gaps for a human health risk assessment.

The Region 7 Laboratory received the samples from June until November. Over these six months, the laboratory staff worked with the sampling team to coordinate sample delivery to the Region 7 Science and Technology Center on a routine basis. The Region 7 laboratory accommodated short notice changes to the analytical requests seamlessly; these changes

included changing sample delivery dates and an increase of samples. The laboratory analyzed samples for seventeen separate analytical methods, with a focus on metals (lead) and mercury including 400 tissue samples (plant, various mammals, fish, frogs, and mussels). The analytical laboratory staff worked together to grind all 400 tissue samples before metals analyses were possible. This provided a necessary service to the sampling team.

The analytical services performed by the Region 7 laboratory resulted in a $104,700 commercial value per year, and the data transmitted to the project managers provided the risk data for the states and tribes. Additionally, the data will be incorporated into a final Human Health Risk Assessment, then to a Remedial Investigation and further into remedy decisions for two watersheds and the four Superfund sites of the Tri-State Mining District (covering two EPA regions, three states, and several tribes).

Photo 7: Harvey Fries and Sam Porter, Chemists in the Region 7 Laboratory, process tissue samples in support of human health risk assessment.

Red Lake Band of Chippewa Closed Landfills Monitoring

Red Lake Band of Chippewa (Tribe) has four landfills that were closed in the early 1990s, and the Tribe was concerned about leaching from the landfills into ground water. Previously, the Tribe had been using GAP funds to monitor the ground water at the closed municipal solid waste landfills, but the sample and analysis costs became too high. In 2013, Red Lake Band of Chippewa requested EPA assistance in analyzing the samples so that monitoring could be resumed. Both Chicago Regional Laboratory (CRL) and Land and Chemical Division (LCD) worked with the Tribe to develop the Quality Assurance Project Plan (QAPP), and sampling procedures. Sampling and analysis began in 2016 through 2017. In 2017 alone the project had **183 samples, with 1063 analyses** done by CRL in support of the program work. LCD and CRL then provided the Tribe, summarized data from the sampling events, organized by well and parameter, and continue to support the Tribe in reviewing and understanding the data collected. The

project has resulted in the Tribe's ability to continue to monitor ground water and ensure protection of public health, without imposing prohibitive costs of analysis.

Water Laboratory Alliance (WLA) Security Summit, Sugar Land, TX

The **Region 6** Houston Environmental Laboratory, with the Office of Water's Water Security Division and Association of Public Health Laboratories, planned and conducted the 2017 WLA Security Summit held at the Marriott Town Square hotel in Sugar Land, Texas. WLA is a nationwide network that helps drinking water and waste water utilities and laboratories respond to water contamination events involving chemical, biological and radiochemical contaminants. The summit provided opportunities for utilities and laboratories to learn more about the WLA, WLA response plan and tools, and benefits available to WLA members. Representatives of drinking and wastewater utilities, laboratories, and other stakeholders heard keynote addresses by Region 6 Assistant Regional Administrator, James McDonald, and by Region 6 Water Division Director, Bill Honker. The centerpiece of the summit was a Tabletop Exercise "*The Unexpected Storm: Hurricane Watt*" that demonstrated elements of the WLA Response Plan.

Prioritizing Robust Science

EPA will apply the best available science to address current and future environmental hazards, develop new approaches, and improve the scientific foundation for environmental protection decisions.

Development of EPA Method 537 for Perfluoroalkyl Substances (PFAS) in drinking water, ground water, and surface water

PFAS are part of a broader class of compounds the Agency considers contaminants of emerging concern. PFOA and PFOS, two common PFAS compounds, have established health advisory criteria. The EPA Office of Water Method 537 is becoming the "defacto" approved method for the analysis for PFCs in water samples. The method was required under the Office of Water's Unregulated Contaminant Monitoring Rule #3 in 2014 and 2015 monitoring and has widely been used in support of the Hoosick Falls Site.

To address analytical support for PFAS in water, the **Region 2** Laboratory completed a fairly intensive method development of EPA Method 537 for the determination of 14 PFAS in water matrices that spanned over six months. The method development was divided into two distinct phases: Phase I - instrument method optimization; Phase II - sample preparation method optimization. Nick worked over four months to optimize and establish the instrument method parameters/conditions on the LC/MS/MS, including proper peak resolution, retention time, sensitivity, key quantitation ions and linearity of response - across a robust concentration range. Once he competed optimizing the instrument method, he optimized the sample preparation method - solid-phase extraction (SPE). This phase involved setting up the SPE and then conducting a series of testing of QC samples including Laboratory Control Standards at different concentrations and Method Blanks. The key goal was to obtain acceptable analyte recovery while minimizing analyte contamination.

The Laboratory now has the capability to analyze surface, groundwater and drinking water samples for the measurement of commonly requested PFCs, including PFOA and PFOS, at low reporting limits, ranging from 5 to 10 ng/L. The Laboratory is ready to address program needs for the determination of PFAS in water, including the Superfund Program. Up to now, any analysis for PFAS in water were addressed through use of commercial laboratories at a cost of $200-$300 per sample, placing a strain on project budgets. The involvement of the Regional Laboratory could lead to a relevant cost savings for the regional programs.

EPA Cross-Agency Per- and Polyfluoroalkyl Substances (PFAS) Methods Workgroup

PFAS are part of a broader class of compounds the Agency considers contaminants of emerging concern. As part of the Office of Water's Unregulated Contaminant Monitoring Rule (UCMR 3), PFAS were included as part of the UCMR 3 Assessment Monitoring efforts and used EPA Method 537 for 6 PFAS in drinking water. To provide additional methods for other water matrices, a cross-agency methods validation workgroup was formed in 2016 to explore validating a direct inject method and an isotope dilution method for groundwater, surface water, and influent/effluent waste water. During 2017, Regional laboratories participated on this workgroup as part of the internal multi-laboratory validation study for the direct inject method. The workgroup's efforts provided a draft method for

non-drinking water matrices, which isundergoing an external multi-laboratory validation study with expect completion of a new SW-846 Method 8237 by 2019.

Region 3 Laboratory Gains PFAS Method 537 Accreditation and Supports Agency Method Validation Efforts

Per- and polyfluoroalkyl substances (PFAS), are emerged chemicals of concern. They were manufactured and used for decades. Health advisories are now in place for PFOA, PFOS and four other PFAS via the UCMR3 list. Advisory limits for drinking water are in the parts per trillion (ng/L) range. Monitoring for PFAS is increasingly being requested at Superfund remedial and removal sites.

The **Region 3** Laboratory provided support to numerous regional clients with the analysis of PFAS in aqueous matrices by EPA Method 537 and is accredited under ISO 17025. Method 537 is a drinking water method and most analytical requests are for more complex aqueous matrices. To meet the need to of having a more appropriate method to match sample matrices, the lab participated in a validation study of a Region 5 lab method for analysis of a suite of 24 PFAS including PFOS and PFOA in non-potable water by direct injection, Liquid Chromatography-Tandem Mass Spectrometry. This method will expand the analyte list beyond those listed in Method 537 and simplify and streamline the analysis.

As replacements for PFOS and PFOA were discovered and evaluated, the lab worked with other regional labs, NEIC and ORD to develop new methods for analysis of well-known PFAS as well as newer compounds such as GenX. New SW-846 methods are in development and draft SOPs were evaluated by the R3 lab. Method validation is slated for FY18. The Lab Technical Information Group (LTIG) has been vital for knowledge transfer, training and fostering communication between scientists at EPA labs in this fast-moving issue.

Suisun Marsh Managed Wetlands Study

Healthy wetlands and streams are key to the vitality of California communities and its economy. The Suisun Marsh in California is the largest contiguous brackish water marsh remaining on the west coast of North America. It is part of the San Francisco Bay-Sacramento/San Joaquin River Delta estuary ecosystem and includes 52,000 acres of managed wetlands, 27,700 acres of upland grasses, 6,300 acres of tidal wetlands, and 30,000 acres of bays and sloughs.

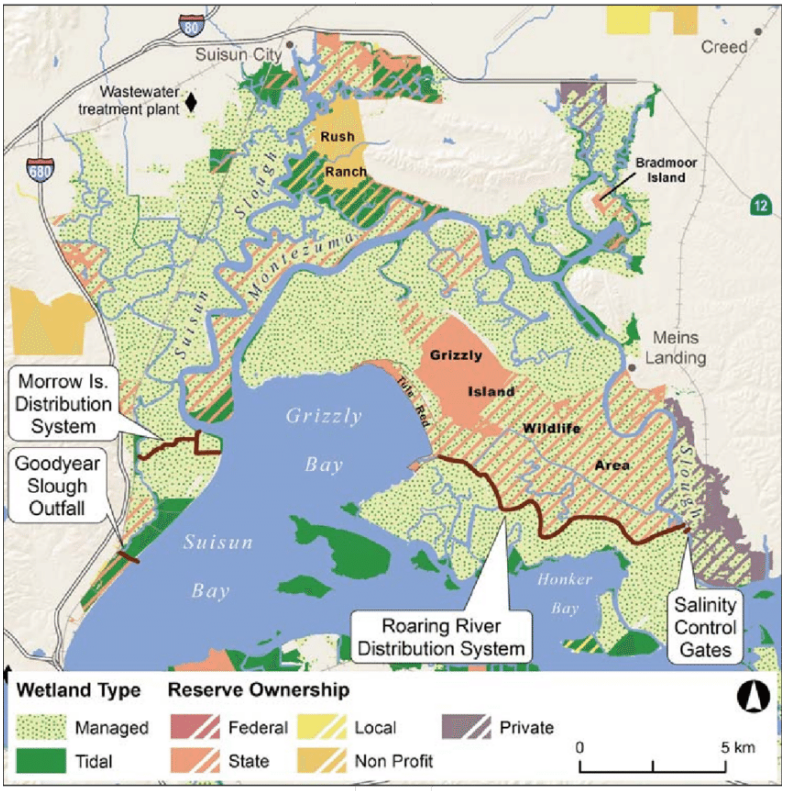


Figure 6: Map of Suisun Marsh, California and surrounding areas.

In FY2017, the **Region 9** Laboratory analyzed water samples for methyl mercury to support the Suisun Marsh Managed Wetlands Study. The study represents a partnership between several public, private and non-profit organizations. The data provided by the laboratory was needed to support the characterization of methylmercury in managed wetland discharges and to support characterization of mercury levels in small fish for wildlife consumption and larger sportfish, following the period of flooding and discharge.

Analysis of methyl mercury is an elaborate procedure. There are three major steps associated with methyl mercury analysis in water: distillation, derivatization and analysis. Water samples are distilled under argon (or nitrogen) flow and the distillate is treated with Sodium tetraethyl borate ($NaBEt_4$) to produce the ethyl analog of methyl mercury, methylethyl mercury ($CH_3CH_3CH_2Hg$). Volatile methylethyl mercury is separated from the aqueous solution by in-vial purge with high purity argon. The purged methyl ethyl mercury enters the analytical system and after the purge cycle is complete, mercury species are thermally desorbed from the Tenax trap and carried via high-purity argon into a capillary GC column for separation. Upon exiting the GC column, the sample passes through a pyrolytic decomposition column in which all mercury species are oxidized to the elemental state (Hg^0). Elemental mercury continues into the cold-vapor atomic fluorescence spectrometer for detection. Quantitation is achieved by comparison of sample response to a standard curve. Data quality is ensured through testing of the distillation and ethylation procedures.

Photo 8: Analytical instrumentation used in the Region 9 Laboratory as part of the methyl mercury analysis process.

Improving Efficiency and Effectiveness

EPA is working to modernize and improve business processes and operations to promote transparency, efficiency, and effectiveness, and improve the capabilities and cost-effectiveness of its information technology and information management systems.

Streamlining Data Review and Delivery

Environmental laboratories produce large volumes of data and records documenting every aspect of the chemical and/or biological analysis of environmental samples, including instrument calibration records,

raw instrument output from sample analysis, sample custody documentation, and much more. Customarily these records have been saved as hard copy "data packages". Data packages combine documents from many sources so gathering, combining, and collating these documents into a single electronic file is a challenge. These records can be thousands of pages long and must be saved and shared for quality assurance purposes, to assure legal defensibility of the test results and to comply with records retention requirements.

At the EPA **Region 9** Laboratory, a goal of minimizing the use of paper and streamlining the data review process has stimulated efforts to switch approximately 95% of the analytical process to "paperless." The Region 9 Laboratory has been working with their Laboratory Information Management System (LIMS) vendor and others to accomplish this task. The effort eliminates the need to print hard copy data for internal data review and for raw data documentation packages and has reduced paper usage at the Region 9 Lab by 74%. In addition, the whole process flow for internal data review and approval and reporting was reevaluated and reworked with the objective of performing review earlier (to catch errors when they can still be corrected) and eliminate redundant reviews to streamline the delivery of electronic reports and data to laboratory clients.

These efforts will ensure that the Region 9 Laboratory is prepared for the transition of Federal recordkeeping to a fully-electronic environment. The National Archives and Records Administration (NARA) is responsible for preserving government records and will no longer accept transfers of permanent or temporary paper records after December 31, 2022.

Environmental Science Center: Home of the Region 3 Laboratory gains LEED Certification

EPA's Environmental Science Center (ESC) at Fort Meade, Maryland received certification for Leadership in Energy and Environmental Design (LEED) in December 2016, making it the first EPA laboratory nation-wide to achieve LEED certification. The U.S. Green Building Council designates LEED certification to buildings that demonstrate outstanding performance in energy efficiency and environmental sustainability. The ESC earned LEED certification in the existing building operation and maintenance category, with rating as exceptional in both on-site storm water management and natural habitat. Excellence was also noted in green cleaning, indoor air quality, and water conservation. Both the **Region 3** Laboratory and EPA's Office of Pesticide and Pollutants Laboratory are located at the ESC.

Appendix A

Regional Laboratories Core Capabilities Summary

EPA Regional Laboratories Inorganic Chemistry Core Capabilities Summary

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

ANALYTE / GROUP NAME	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	REGIONAL CAPABILITY									
INORGANIC CHEMISTRY			1	2	3	4	5	6	7	8	9	10
	Tissue (fish &/or plant)	Direct Hg Analysis	•					•	•		•	•
	Waste (oil, drum, etc..)	CVAA	•	•	•	•	•	•		•	•	•
	Waste (oil, drum, etc..)	Direct Hg Analysis							•			
Mercury (TCLP)	Soil/Waste (oil, drum, etc..)	CVAA		•	•	•	•	•		•	•	•
	Soil/Waste (oil, drum, etc..)	Direct Hg Analysis					•		•			
Metals, Total	Water	ICP /AES	•	•	•	•	•	•	•	•	•	•
	Soil /Sediment	ICP /AES	•	•	•	•	•	•	•	•	•	•
	Tissue (fish &/or plant)	ICP /AES	•	•	•	•			•	•	•	•
	Waste (oil, drum, etc..)	ICP /AES	•	•	•	•	•	•	•	•	•	•
Metals (TCLP)	Soil/Waste (oil, drum, etc..)	ICP /AES		•	•	•	•	•	•	•	•	•
Metals, Total	Water	ICP/MS	•	•	•	•	•	•	•	•	•	•
	Soil/Sediment	ICP/MS	•	•	•	•	•	•	•	•		•
	Tissue (Fish &/or plant)	ICP/MS		•	•	•			•	•	•	•
	Waste (oil, drum, etc..)	ICP/MS			•	•		•	•	•		
Metals (TCLP)	Soil/Waste (oil, drum, etc..)	ICP/MS				•		•	•	•		•
Nitrogen (Ammonia)	Water	Colorimetric	•	•	•	•	•	•	•	•	•	•
	Soil/Sediment	Colorimetric	•		•	•	•		•			
	Water	Electrode		•								
Nitrogen (NO3 &/or NO2)	Water	Colorimetric	•	•	•	•	•	•	•	•	•	•
	Soil	Colorimetric	•			•	•		•			•
	Water	IC	•	•	•	•	•	•	•	•	•	•
	Soil	IC	•		•	•	•		•		•	•
Nitrogen, Total Kjeldahl	Water	Colorimetric		•	•	•	•	•	•		•	•
	Soil	Colorimetric			•	•	•	•	•			
Perchlorate	Water	IC					•		•		•	

ANALYTE / GROUP NAME	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	REGIONAL CAPABILITY									
			1	2	3	4	5	6	7	8	9	10
INORGANIC CHEMISTRY												
	Soil	IC							•		•	
	Water	IC with LC/MS confirmation			•		•					•
	Water, Soil/Sediment	LC/MS			•							•
	Water	LC/MS/MS	•					•		•	•	
Phosphorus, Ortho	Water	Colorimetric	•	•		•		•		•		•
	Water	IC	•	•	•	•	•	•	•	•	•	•
Phosphorus, Total	Water	Colorimetric	•	•	•	•	•	•	•	•	•	•
	Soil	Colorimetric	•		•	•	•					•
Sulfate	Water	IC	•	•	•	•	•	•	•	•	•	•
	Soil	IC	•		•	•	•		•	•	•	
	Water	Turbidimetric	•	•								
	Soil	Turbidimetric	•									
Sulfide	Water	Colorimetric		•					•			
	Soil	Colorimetric										
	Water	IC, Turbidimetric						•				
	Water	Titrimetric		•							•	

EPA Regional Laboratories Organic Chemistry Core Capabilities Summary

ANALYTE / GROUP NAME	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	REGIONAL CAPABILITY									
ORGANIC CHEMISTRY			1	2	3	4	5	6	7	8	9	10
BNA	Water	GC/MS	•	•	•	•	•	•	•	•	•	•
	Soil/Sediment	GC/MS	•	•	•	•	•	•	•	•	•	•
	Waste (oil, drum, etc..)	GC/MS	•	•	•	•	•	•	•	•	•	•
	Tissue (fish &/or plant)	GC/MS				•						•
BNA (TCLP)	Solid/Waste	GC/MS		•	•	•	•	•	•	•	•	•
BNA (TPH)	Water	GC/MS or GC					•	•	•	•	•	•
	Soil/Sediment	GC/MS or GC					•	•	•	•	•	•
BOD	Water	Membrane Electrode		•	•	•	•	•	•	•	•	•
COD	Water	Photometric			•			•				
	Water	Colorimetric		•	•		•		•	•		
EDB & DBCP	Water	GC/ECD	•				•	•		•	•	
EDB & DBCP	Water - GC/MS					•						
EDB & DBCP	LC/MS/MS					•						
Herbicides	Water	GC/ECD; GC/NPD				•		•	•			
	Soil/Sediment	GC/ECD; GC/NPD						•	•			
	Waste (oil, drum, etc..)	GC/ECD; GC/NPD							•			
	Tissue (fish &/or plant)	GC/ECD; GC/NPD							•			
Herbicides (TCLP)	Solid/Waste	GC/ECD						•	•			
	Solid/Waste	HPLC/UV Detection										
Oil & Grease	Water	Gravimetric		•	•		•		•			•
	Soil/Sediment	Gravimetric							•	•		
Pesticides / PCBs	Water	GC/ECD	•	•	•	•	•	•	•	•	•	•
	Soil/Sediment	GC/ECD	•	•	•	•	•	•	•	•	•	•
Pesticides / PCBs	Water, Soil, Waste	GC/MS/MS				•					•	
Pesticides / PCBs	Tissue (fish &/or plant)	GC/ECD	•	•		•			•	•		•
Pesticides (TCLP)	Solid/Waste	GC/ECD		•	•	•	•	•	•	•	•	
Pesticides (TCLP)	Solid Waste	GC/MS/MS				•			•			

ANALYTE / GROUP NAME	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	REGIONAL CAPABILITY									
ORGANIC CHEMISTRY			1	2	3	4	5	6	7	8	9	10
Phenolics	Water	Colorimetric		•	•				•	•		
	Soil/Sediment	Colorimetric			•				•	•		
PAHs	Water	GC/MS	•	•	•	•	•	•	•	•	•	•
	Soil/Sediment	GC/MS	•	•	•	•	•	•	•	•	•	•
	Air	GC/MS	•						•			
	Tissue (fish &/or plant)	GC/MS	•			•			•			•
	Waste (oil, drum, etc..)	GC/MS	•	•	•	•		•	•	•		•
TOC	Water	Combustion / IR		•	•	•	•		•	•		•
	Soil	Combustion / IR		•	•	•	•		•	•		•
	Water	UV/Persulfate						•		•	•	
VOA	Water	GC/MS	•	•	•	•	•	•	•	•	•	•
	Soil/Sediment	GC/MS	•	•	•	•	•	•	•	•	•	•
	Air	GC/MS	•		•	•	•	•	•	•	•	
	Waste (oil, drum, etc..)	GC/MS	•	•	•	•		•	•	•	•	•
	Water	GC				•				•		
	Soil/Sediment	GC				•				•		
	Waste (oil, drum, etc..)	GC	•			•	•			•		
VOA (TCLP)	Solid/Waste	GC/MS		•		•	•	•	•	•		•
VOA (TPH)	Water	GC/MS or GC					•	•	•	•	•	•
	Soil/Sediment	GC/MS or GC					•	•	•	•	•	•

EPA Regional Laboratories Biology/Microbiology Core Capabilities Summary

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

EPA Regional Laboratories Physical & Other Determinations Core Capabilities Summary

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

EPA Regional Laboratories Core Capabilities Summary

ABBREVIATIONS

BNA	Base/Neutrals and Acids Extractable Organics
BOD	Biological Oxygen Demand
COD	Chemical Oxygen Demand
CVAA	Cold Vapor Atomic Absorption Spectrometry
DBCP	Dibromochloroproprane
EDB	Ethylene dibromide
EDC	Endocrine Disrupting Chemicals
GC	Gas Chromatography
GC/ECD	GC/Electron Capture Detector
GC/NPD	GC/Nitrogen - Phosphorus Detector
GC/MS	GC/Mass Spectrometry
GFAA	Graphic Furnace Atomic Absorption Spectrometry
IC	Ion Chromatography
ICP	Inductively Coupled (Argon) Plasma
ICP/AES	ICP/Atomic Emission Spectrometry
ICP/MS	ICP/Mass Spectrometry
IR	Infrared
ISE	Ion Selective Electrode
LC/MS	Liquid Chromatography/Mass Spectrometry - Liquid Chromatography/Dual MS
NO_3	Nitrate
NO_2	Nitrite
PAHs	Polynuclear Aromatic Hydrocarbons
PCBs	Polychlorinated biphenyls
PLM	Polarized Light Microscopy
TCLP	Toxicity Characteristic Leaching Procedure
TOC	Total Organic Carbon
VOA	Volatile Organic Analytes/Analyses

Appendix B

Regional Laboratories Unique Capabilities Summary

Region 1 Summary Tables

Region 1 Laboratory Summary of Inorganic Chemistry Unique Capabilities

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	

Region 1 Laboratory Summary of Organic Chemistry Unique Capabilities

ANALYTE / GROUP NAME	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	SUPPORTED PROGRAM(S)	COMMENTS
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	

ANALYTE / GROUP NAME	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	SUPPORTED PROGRAM(S)	COMMENTS
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
Poly Fluoroalkyl Substances (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

Region 1 Laboratory Summary of Physical and Other Determinations Unique Capabilities

ANALYTE / GROUP NAME	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	SUPPORTED PROGRAM(S)	COMMENTS
Grain Size	Soil, Sediment	Sieve (Modified ASTM)	Superfund, Water	Region 1 SOP
Loss on Ignition (LOI)	Sediment		Water	
Percent Lipids	Tissue	Gravimetric		

Region 1 Laboratory Summary of Biology / Microbiology Unique Capabilities

ANALYTE / GROUP NAME	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	SUPPORTED PROGRAM(S)	COMMENTS
Enterococci	Ambient water	Enterolert/ EPA Method 1600	Ambient monitoring	
Chlorophyll a	Ambient water	EPA 445.0	Ambient monitoring	

Region 2 Summary Tables

Region 2 Laboratory Summary of Inorganic Chemistry Unique Capabilities

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	

Region 2 Laboratory Summary of Organic Chemistry Unique Capabilities

ANALYTE / GROUP NAME	**SAMPLE MEDIA**	**ANALYTICAL TECHNIQUE**	**SUPPORTED PROGRAM(S)**	**COMMENTS**
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	
Poly Fluoroalkyl Substances (PFAS)	Water	LC/MS/MS	Superfund, Water	EPA Method 537 (14 PFAS compounds plus GenX)
PCB Aroclors	PUF	GC/ECD	Air	EPA Method TO-10A
Total Petroleum Hydrocarbons	Water	HeXane EXtraction (EPA Method 1664)	Water	

Region 2 Laboratory Summary of Physical and Other Determinations Unique Capabilities

ANALYTE / GROUP NAME	**SAMPLE MEDIA**	**ANALYTICAL TECHNIQUE**	**SUPPORTED PROGRAM(S)**	**COMMENTS**
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	

Region 2 Laboratory Summary of Biology / Microbiology Unique Capabilities

ANALYTE / GROUP NAME	**SAMPLE MEDIA**	**ANALYTICAL TECHNIQUE**	**SUPPORTED PROGRAM(S)**	**COMMENTS**
Cryptosporidium	Water	Fluorescent Microscopy (EPA Method 1623)	Water	
Giardia	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	
mColiblue24	Water	MF/Hach	Water	
Enterolert w/ Quantitray	Water	Defined Substrate Technology	Water	
Colilert 18/Colilert w/Quantitray	Water	Defined Substrate Technology	Water	

Region 3 Summary Tables

Region 3 Laboratory Summary of Organic Chemistry Unique Capabilities

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

Region 3 Laboratory Summary of Biology / Microbiology Unique Capabilities

ANALYTE / GROUP NAME	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	SUPPORTED PROGRAM(S)	COMMENTS
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

Region 3 Laboratory Summary of Physical and Other Determination Unique Capabilities

ANALYTE / GROUP NAME	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	SUPPORTED PROGRAM(S)	COMMENTS
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

Region 4 Summary Tables

Region 4 Laboratory Summary of Inorganic Chemistry Unique Capabilities

ANALYTE / GROUP NAME	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	SUPPORTED PROGRAM(S)	COMMENTS
Chromium (+6)	Soil/Sediment	Std Method 3500 CrD	Superfund	
	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	"

Region 4 Laboratory Summary of Organic Chemistry Unique Capabilities

ANALYTE / GROUP NAME	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	SUPPORTED PROGRAM(S)	COMMENTS
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 breakdown products

Region 4 Laboratory Summary of Biology / Microbiology Unique Capabilities

ANALYTE / GROUP NAME	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	SUPPORTED PROGRAM(S)	COMMENTS
Chlorophyll	Water		Water	

Region 5 Summary Tables

Region 5 Laboratory Summary of Inorganic Chemistry Unique Capabilities

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	

Region 5 Laboratory Summary of Organic Chemistry Unique Capabilities

ANALYTE / GROUP NAME	**SAMPLE MEDIA**	**ANALYTICAL TECHNIQUE**	**SUPPORTED PROGRAM(S)**	**COMMENTS**
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

ANALYTE / GROUP NAME	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	SUPPORTED PROGRAM(S)	COMMENTS
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
Low Level Purgeable 1,4-DioXane	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 2,000 analytes
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	Water	LC/MS/MS, ASTM D7599-09	NHSRC	SAP Method

ANALYTE / GROUP NAME	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	SUPPORTED PROGRAM(S)	COMMENTS
methyldiethanolamine				
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

Region 5 Laboratory Summary of Physical and Other Determinations Unique Capabilities

ANALYTE / GROUP NAME	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	SUPPORTED PROGRAM(S)	COMMENTS
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 flashpoint
Paint Filter Test	Paints and coatings		RCRA, Superfund	
Specific Gravity	Soil/Sediment	AppendiX IV of the Corps of Engineers Engineering Manual (F10-F22)	Sediment	

Region 6 Summary Tables

Region 6 Laboratory Summary of Inorganic Chemistry Unique Capabilities

ANALYTE / GROUP NAME	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	SUPPORTED PROGRAM(S)	COMMENTS
Ammonia	Air (passive coated filter)	IC	CAA	Ogawa passive air collection device
Ozone	Air (passive coated filter)	IC	CAA	Ogawa passive air collection device
NOX	Air (passive coated filter)	IC	CAA	Ogawa passive air collection device
SOX	Air (passive coated filter)	IC	CAA	Ogawa passive air collection device
Trace level HeX Chrom	Water	IC/UV	Water	
Perchlorate	Water	IC/MS/MS	Water	
Metals by X-Ray Fluorescence	Soil	portable XRF	Superfund, RCRA	field screening

Region 6 Laboratory Summary of Organic Chemistry Unique Capabilities

ANALYTE / GROUP NAME	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	SUPPORTED PROGRAM(S)	COMMENTS
Incidental PCBs	Water	GC/MS; Method 680 Homologue Series	TSCA, RCRA	grouped by number of chlorine
	Soil/Sediment	GC/MS; Method 680 Homologue Series	TSCA, RCRA	grouped by number of chlorine
	Waste	GC/MS; Method 680 Homologue Series	TSCA, RCRA	grouped by number of chlorine
EXpanded 8270 list by GC/QQQ	Liquid	GC/QQQ; Method 8270	Superfun, RCRA	
Chemical Warfare Agents	Water/Solid/Wipe	GC/MS	Emergency Response	
PAMS (C2s and C3s identified)	Air	GC/MS/FID (split)	CAA	C2s and C3s are individually quantitated
PCBs (Aroclor)	Electrical Cable	GC; Separation, eXtraction, analysis of individual components. Mod	TSCA	Toluene is eXtraction solvent

ANALYTE / GROUP NAME	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	SUPPORTED PROGRAM(S)	COMMENTS
		of program specific technique.		
PAHs (trace)	Water/Solid/Oil	GC/QQQ	RCRA, Superfund	
Chemical Warfare Agents- Degradation products	Water	LC/MS/MS	Emergency Response	
VOCs by OVM	AIR	GC/MS	CAA	passive air monitoring
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, Superfund	
	Soil/Sediment	GC/NPD	RCRA, Superfund	
	Waste	GC/NPD	RCRA, Superfund	

Region 6 Laboratory Summary of Physical and Other Determinations Unique Capabilities

ANALYTE / GROUP NAME	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	SUPPORTED PROGRAM(S)	COMMENTS
Corrosivity by pH	Waste	Method 1110 - Corrosivity Toward Steel	RCRA	

Region 7 Summary Tables

Region 7 Laboratory Summary of Inorganic Chemistry Unique Capabilities

ANALYTE / GROUP NAME	**SAMPLE MEDIA**	**ANALYTICAL TECHNIQUE**	**SUPPORTED PROGRAM(S)**	**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
???	Air		Air	Community Outreach
In-vitro Bioassessibility Assays for Arsenic and Lead in Soil	Soil	ICP-MS / ICP-AES	Superfund / RCRA	SUPR Exposure / Toxicity Assessment

Region 7 Laboratory Summary of Organic Chemistry Unique Capabilities

ANALYTE / GROUP NAME	**SAMPLE MEDIA**	**ANALYTICAL TECHNIQUE**	**SUPPORTED PROGRAM(S)**	**COMMENTS**
Pesticide/PCB/Chlordane/Toxaphene	Water	Twister GC/MS Stir Bar Sorbtive Extraction (solventless extraction)	Water	Priority Pollutant List using Green Extraction Technique
Pesticide Formulation Analysis	Product	LCMSMS	FIFRA	Dicamba analysis
Acid Herbicides	Water	LCMSMS	Water	Dicamba analysis
Pesticides	Water, Soil/Sediment, Tissue	GC/ECD	Water	Use Attainability Analysis (UAA)
SVOCs, Pesticides, Emerging Contaminants	Water	Twister GC/MS Stir Bar Sorbtive Extraction (solventless extraction)	Water	Low MDL for water monitoring

ANALYTE / GROUP NAME	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	SUPPORTED PROGRAM(S)	COMMENTS
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, Waste	GC/ECD	Superfund / ORD	Rapid Site Screening
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	Improved Precision of VOC Samples from In-situ Chemical Oxidation Sites

Region 7 Laboratory Summary of Biology / Microbiology Unique Capabilities

ANALYTE / GROUP NAME	**SAMPLE MEDIA**	**ANALYTICAL TECHNIQUE**	**SUPPORTED PROGRAM(S)**	**COMMENTS**
E. coli	Water (drinking/waste/ambient)	qPCR	Water	2008 NFWA
Enterococci	Water	qPCR	Water	
Microcystin	Water	Immunoassay	Water	
Cylindrospermopsin	Water	Immunoassay	Water	
Saxitoxin	Water	Immunoassay	Water	
Anatoxin	Water	Immunoassay	Water	
Microbial Source Tracking	Water	qPCR, Microarray	Water	
Chlorophyll a	Ambient water	EPA 445.0	Ambient monitoring	
Invertebrate Taxonomy	Invertebrates	EPA EMAP Protocols	Water	
Marine/Estuarine Benthic Taxonomy	Benthic Organisims		Water	Organisms identified to species or lowest taxonomy possible

Region 8 Summary Tables

Region 8 Laboratory Summary of Inorganic Chemistry Unique Capabilities

ANALYTE / GROUP NAME	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	SUPPORTED PROGRAM(S)	COMMENTS
Silica	Water	Colorimetric	Water/Superfund	
Gadilinium	Water	ICP-MS	Water/Superfund	Wastewater Indicator

Region 8 Laboratory Summary of Organic Chemistry Unique Capabilities

ANALYTE / GROUP NAME	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	SUPPORTED PROGRAM(S)	COMMENTS
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/ CLLE	Water	GC/MS	Water/Superfund	Monitoring for States and Tribes
Pharmaceuticals and Personal Care Products (PPCPs)	Water	LC/MS/MS	Water/Superfund	Endocrine disruptors
Waste Indicator Compounds	Water	GC/MS	Water/Superfund	Monitoring for States and Tribes
Total Petroleum Hydrocarbons-Diesel Range Organics	Water, Soil	GC/FID	Water/Superfund	Hydro-Fracking

Region 8 Laboratory Summary of Biology / Microbiology Unique Capabilities

ANALYTE / GROUP NAME	**SAMPLE MEDIA**	**ANALYTICAL TECHNIQUE**	**SUPPORTED PROGRAM(S)**	**COMMENTS**
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	

Region 9 Summary Tables

Region 9 Laboratory Summary of Inorganic Chemistry Unique Capabilities

ANALYTE / GROUP NAME	**SAMPLE MEDIA**	**ANALYTICAL TECHNIQUE**	**SUPPORTED PROGRAM(S)**	**COMMENTS**
Acidity	Water	Titration	Superfund	
Ferrous Iron	Water	Colorimetric	Superfund	
Mercury, low level	Water	CVAF (Method 1631)	Superfund	
Mercury, Vapor, Particulate and Reactive	Ambient Air	Cold Vapor Atomic Fluorescence	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 chromium	Drinking Water	IC with post column reaction/UV detection	Water	
Metals	Soil	Portable XRF	Superfund, Criminal Investigation	
Platinum Group Metals	Catalytic converter washcoat	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	

Region 9 Laboratory Summary of Organic Chemistry Unique Capabilities

ANALYTE / GROUP NAME	**SAMPLE MEDIA**	**ANALYTICAL TECHNIQUE**	**SUPPORTED PROGRAM(S)**	**COMMENTS**
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, Ethene	Water	GC/FID (RSK-175)	Superfund, RCRA	

Region 9 Laboratory Summary of Biology / Microbiology Unique Capabilities

ANALYTE / GROUP NAME	**SAMPLE MEDIA**	**ANALYTICAL TECHNIQUE**	**SUPPORTED PROGRAM(S)**	**COMMENTS**
Benthic TaXonomic Identification	Sediment (Marine)	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 Methods	Water, NPDES, WQM	
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	

Region 10 Summary Tables

Region 10 Laboratory Summary of Inorganic Chemistry Unique Capabilities

ANALYTE / GROUP NAME	**SAMPLE MEDIA**	**ANALYTICAL TECHNIQUE**	**SUPPORTED PROGRAM(S)**	**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 reporting 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 speciation	Fish/shellfish/seaweed	IC/ICP/MS	Superfund, Water	Speciation data needed for risk assessment
Metals (TAL) + Total Uranium	Small mammals, invertebrates	Microwave Digestion, ICP/AES, ICP/MS	Superfund, RCRA	Biomonitoring projects
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	
Diffusive Thin-Film Gradient (DGT) preparation and Arsenic analysis	DGT	ICP/MS	Superfund	DGT samplers were used to mimic the uptake of arsenic by bivalves in sediment.
Acidity	water	SM2320b	Superfund	

Region 10 Laboratory Summary of Organic Chemistry Unique Capabilities

ANALYTE / GROUP NAME	SAMPLE MEDIA	ANALYTICAL TECHNIQUE	SUPPORTED PROGRAM(S)	COMMENTS
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 & Nitroamines)	Water, Soil, fish/shellfish	EPA Method 8330 / HPLC	Superfund	
Hydrocarbon Identification	Water, Soil/Sediment	NWTPH-HCID	Superfund, Criminal	
N-Nitrosodimethylamine	Water, Soil	Method 521	Superfund	
Herbicides	Water, Soil/Sediment	GC/MS	Superfund	
Polybrominated diphenyl ethers (PBDEs)	Water	GC/MS Low Resolution	Water	
Polybrominated diphenyl ethers (PBDEs)	Sediment/bio solids	GC/MS Low Resolution	Superfund, Water	
Polybrominated diphenyl ethers (PBDEs)	Tissue (fish)	GC/MS Low Resolution	Superfund	
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	

Region 10 Laboratory Summary of Physical and Other Determinations Unique Capabilities

ANALYTE / GROUP NAME	**SAMPLE MEDIA**	**ANALYTICAL TECHNIQUE**	**SUPPORTED PROGRAM(S)**	**COMMENTS**
Increment Sampling Methodology (ISM) 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
Fluidized Bed Asbestos Segregator (FBAS)	Soil	FBAS separates asbestos fibers from soil material for improved detection capability.	Superfund	

Region 10 Laboratory Summary of Biology / Microbiology Unique Capabilities

ANALYTE / GROUP NAME	**SAMPLE MEDIA**	**ANALYTICAL TECHNIQUE**	**SUPPORTED PROGRAM(S)**	**COMMENTS**
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	qPCR MST - Human, Canine, Ruminant, Cow, Avian	Water	Capability developed in 2017.
Microscopic testing	Drinking/Source Water	Microscopic particulate analysis	Surface Water Treatment Rule	Microscopic technique used to establish GWUDI characteristics of a drinking water

Appendix C

Regional Laboratories Methods in Development

Regional Laboratories Methods in Development

REGION	PROJECT / METHOD	DEVELOPMENTAL NEED	STATUS	PROJECTED COMPLETION
1	Cyanotoxins in water using modification of EPA Method 546: Determination of Total Microcystins and Nodularins in Drinking Water and Ambient Water by Adda Enzyme-Linked Immunosorbent Assay (ELISA)	To support State & Federal entities in the region, and drinking water and recreational programs	SOPs in development	Expect by September 2018
2	Developed EPA Method 537 for 14 PFAS and GenX. Currently expanding method to include a total of 25 PFAS compounds: 24 PFAS compounds listed in draft SW-846 Method plus GenX	Need for additional PFAS compound capability to support to regional Superfund and Drinking Water programs.	In progress	FY2018
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 Air	Need for capability to achieve lower reporting limits	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 Water by EPA 525.2	Need capability to support Drinking Water program	Complete	FY 2018
	Long Chain Alcohols by GC	Capability needed to support specific Superfund project request	In-progress	FY2017
4	Mercury by 200.8	Laboratory Efficiency	Complete	Aug-17

REGION	PROJECT / METHOD	DEVELOPMENTAL NEED	STATUS	PROJECTED COMPLETION
	Herbicide by 8321	Herbicides by better extraction method	Complete	Sep-17
5	GenX (water)	Support ORD and method development	Writing Method and SOP	FY2019
	Microcystin (water/drinking water)	Support drinking water program and states	In progress	FY2019
	PFAS Precursors (water/soil)	Support ORD and method development	In progress	FY2019
	TOP Assay PFAS	Support ORD and method development	In progress	FY2019
6	Anions and Oxyhalides by IC	Remove dependence on State Lab for this test.	Method developed, DOC/MDL, SOP Done; seeking ISO Accred.	December 2018
	Direct mercury analysis (CVAF - Milestone)	Clean Water Act, RCRA, Superfund	DOC/MDL; SOP preparation.	December 2018
	High Dissolved Solids /Modified Method/ Anion	Clean Water Act, RCRA, Superfund	Method being developed.	October 2018
	High Dissolved Solids /Modified Method/ Cation	Clean Water Act, RCRA, Superfund	Method being developed.	October 2018
	High Dissolved Solids /Modified Method/ OA	Clean Water Act, RCRA, Superfund	Method being developed.	October 2018
	PPCP analysis	Water	Method being developed.	October 2018
	Passive Formaldehyde	Clean Air Act	Method being developed.	ON HOLD
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. Complete list of over 50 analytes. Final	Completed

REGION	PROJECT / METHOD	DEVELOPMENTAL NEED	STATUS	PROJECTED COMPLETION
			screening method has over 60 analytes from multiple compound categories.	
	Pesticides by GC/MS/MS	Conformational 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	On hold
	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
	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.	Ongoing

REGION	PROJECT / METHOD	DEVELOPMENTAL NEED	STATUS	PROJECTED COMPLETION
			Limited use at this time.	
	Phylochip Microbial Community Analysis	TMDL, Water Program, Microbial Source Tracking	Joint effort with ORD, and several regions. Region 7 is the lead.	FY2020
	KC Air Mapper	Air Program, Community involvement	Joint effort with ORD for developing and testing portable air quality monitors with citizen science and educational purposes.	FY2020
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

REGION	PROJECT / METHOD	DEVELOPMENTAL NEED	STATUS	PROJECTED COMPLETION
	Pesticides by LC/MS/MS	Water	Progress continuing.	Ongoing
	Hormones and Steroids by LC/MS/MS	Water and ORD	Progress continuing.	Ongoing
9	Acidity in by SM2310b	Address a regional priority for mine related responses	Complete	Feb-17
	Determination of Ferrous Iron in Water Samples by Colorimetric Analysis - SM3500-Fe	An improved method of determining ferrous iron in samples	Complete	Sep-17
10	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. Extractio n studies of wipes were also initiated. The sampling schedule for the project was postponed to early CY2018.	FY 2018
	Develop Analysis Capability for Anatoxin-a and Cylindrospermopsin in Waters	Support Water program's need to monitor and measure harmful algal bloom substances (HABS).	LC/MS-MS conditions being optimized.	FY 2018
	Develop qPCR capability for human, canine, ruminant, cow, and avian	Support Water program need for microbial source tracking.	Initiated and completed.	FY 2017