Drinking Water Compliance Monitoring Data Strategic Plan

SDWA 1414, as amended by Section 2011 of America's Water Infrastructure Act

United States Environmental Protection Agency

Office of Ground Water and Drinking Water

Drinking Water Protection Division

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1. AWIA Section 2011: IMPROVED ACCURACY AND AVAILABILITY OF COMPLIANCE MONITORING DATA

On October 23, 2018, America's Water Infrastructure Act (AWIA) was signed into law (P.L. 115-270) (U.S. Congress, 2018). AWIA amended Safe Drinking Water Act (SDWA) Section 1414 to direct the U.S. Environmental Protection Agency (EPA) to develop and provide to Congress a strategic plan for improving the accuracy and availability of monitoring data collected to demonstrate compliance with National Primary Drinking Water Regulations (NPDWRs) and submitted by public water systems (PWSs) to states, or by states to the EPA. EPA is directed to evaluate any challenges faced in ensuring the accuracy and integrity of submitted data; faced by states and water systems in implementing electronic submission of data; and faced by users in being able to access the data. Finally, EPA is directed to include a summary of findings and recommendations on practicable, cost-effective methods and means that can be employed to improve the accuracy and availability of submitted data.

To meet this statutory requirement, EPA coordinated with states, PWSs, and other interested stakeholders to inform this effort. These discussions included staff from state drinking water programs, PWSs, and state laboratories, as well as staff from relevant offices at EPA.

This document highlights actions and tools developed by EPA and the drinking water community to support improved data quality and increased electronic reporting. It also identifies a plan for further actions. Based on feedback EPA has received from state programs, electronic reporting of drinking water data has both improved data quality and reduced overall burden. The Agency intends to continue to work with stakeholders to expand use of electronic reporting and to improve the accessibility of drinking water data.

2. DATA REQUIREMENTS UNDER THE SDWA: HOW THE DATA ARE USED BY WATER SYSTEMS, STATES, EPA, AND THE PUBLIC

EPA is committed to improving the accuracy and availability of drinking water data that states, EPA, and the public receive to inform public health actions. Access to drinking water compliance monitoring data can empower communities to take needed action. It also provides a more complete picture of water quality than simple violation information, and this can improve consumer confidence or identify a potential problem.

Public health protection relies on accurate and complete data. PWSs, primacy agencies,* the EPA, and consumers all need accurate, timely, and accessible drinking water data to make informed decisions. State and federal regulators need data of known and documented quality and completeness to develop effective and appropriate policy decisions, provide training and technical assistance, and conduct oversight. Accurate and timely monitoring data, along with resultant state enforcement information, also allows EPA to conduct its enforcement oversight responsibility. Consumers want access to reported monitoring data from the water system that supplies their home. PWSs use the monitoring results to make changes in treatment or other operational decisions.

*The terms state and 'primacy agency' are both used in this document and are defined as the agency with primary responsibility for implementing the SDWA. The U.S. territories, the Navajo Nation, and all states except Wyoming have been approved to exercise primary responsibility in their jurisdictions. EPA implements the SDWA in Wyoming, Washington,DC, and on all other tribal lands.

PWSs regulated under the SDWA must conduct compliance monitoring in accordance with 40 CFR 141 Subpart C to show that the water is meeting health standards.

The EPA's and states' primary method of monitoring PWS compliance with the SDWA and its implementing regulations is the review and evaluation of analytical results of water samples and operating reports collected by PWSs. These monitoring results and reports provide the water systems and regulators with the data they need to ensure that drinking water monitoring is ongoing, that treatment processes are working, and that the drinking water standards are being met. In some cases, monitoring is done to determine if specific contaminants such as arsenic are present at levels higher than the public health standard. In other cases, water systems are required to conduct indicator monitoring to assess for contamination and to ensure treatment is effective. Indicator monitoring is performed when it is not feasible to measure the contaminants of concern and there are other measures that have been associated with the presence of these contaminants in drinking water. For example, it is not feasible to measure for all waterborne pathogens that could be in drinking water; therefore, coliform and *E. coli* are monitored as an indicator of fecal contamination and turbidity is monitored as an indicator of the removal of pathogens by filtration. Monitoring requirements vary based on the size of the water system, the water source, and previous monitoring results.

EPA is required to ensure that primacy agencies are properly implementing the Public Water System Supervision program, including conducting monitoring and collecting data as EPA requires by regulation to protect human health. The primacy agencies report violation information quarterly to EPA. EPA uses the violation information, along with annual reviews of primacy programs and other interactions, to oversee the national program and to provide information to the public.

EPA does not currently receive all water system compliance monitoring data except in Wyoming, Washington, D.C., and tribal lands other than the Navajo Nation. This limits EPA's ability to determine the completeness of the data received by the Agency and hinders the development of national training, technical assistance, and oversight. For its oversight, EPA has identified additional data needs such as having consistent access to compliance monitoring data, along with system inventory and violations data, to ensure data quality and national consistency. This report focuses on ongoing and potential future steps to address the data needs.

> EPA and states define monitoring periods for the water systems based on the National Primary Drinking Water Regulations.

How Compliance Monitoring Data Are Transmitted to Primacy Agencies

Drinking water monitoring requirements are based on the health effects of the contaminant, the type of system, the size of system, and other water system characteristics for each regulation. In most cases the water system is responsible for conducting monitoring.

Each primacy agency receives compliance monitoring data directly from the laboratory conducting the analyses or from the PWSs. The laboratory will report the analytical results either electronically or by mailed hardcopy. When the laboratory results are only received by the PWS, the system then sends the results to the primacy agency either electronically or via mailed hardcopy. The paper results are, generally, manually entered by the primacy agency into an electronic system to be used for compliance determinations.
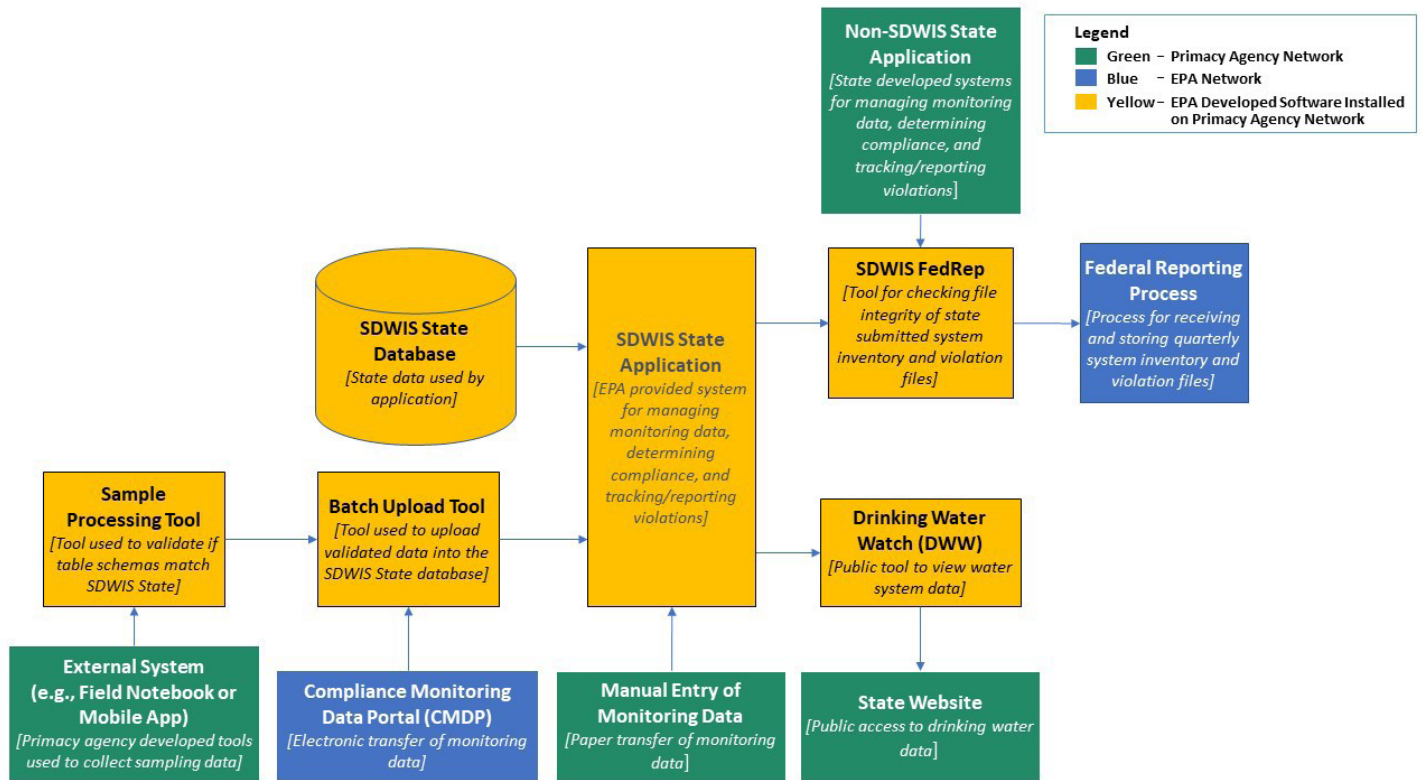
Safe Drinking Water Information System State

Most drinking water primacy agencies store compliance monitoring data in the Safe Drinking Water Information System (SDWIS) State. SDWIS State is a software package developed and maintained by the EPA and provided to the primacy agencies for installation and operation in their local computing environments to manage their Public Water System Supervision Programs. SDWIS State houses compliance data and makes automated initial compliance determinations on the data as it is entered into the system. This allows primacy agency staff to determine follow up actions, including training, technical assistance, or enforcement. SDWIS State is delivered as a set of software components (Figure 1) that consist of separate software configuration management items and optional add-on components, such as a public access portal. Many primacy agencies use the add-ons, but many others have developed their own components that replicate many of the features of the EPA-distributed add-ons.

Compliance monitoring data can be entered into SDWIS State or a primacy agency's separate database in several ways. In addition to state staff hand entering data from the lab reports into the system, there are electronic systems available to facilitate the process. Examples of these types of systems are: SDWIS Migrate to State, SDWIS XML Sampling, and the Compliance Monitoring Data Portal (CMDP). Descriptions of these systems can be found in Section 3 in this document.

Figure 1: SDWIS STATE PROCESS

Safe Drinking Water Information System Federal Version

EPA does not receive most compliance monitoring data provided to primacy agencies. All primacy agencies submit a subset of drinking water data to EPA through the Safe Drinking Water Information System Federal Version (SDWIS Fed). SDWIS Fed is the EPA's national database that manages and collects PWS information from primacy agencies, which includes violations of drinking water health-based standards, reporting and monitoring violations, and other basic inventory information, such as water system location, type, and population served. SDWIS Fed is primarily used for EPA oversight of primacy agencies, for national implementation efforts, and for informing the public about the reported compliance status of their PWSs, and, indirectly, the safety of their drinking water.The EPA uses the information in SDWIS Fed to perform various analyses that support programmatic decisions and identify trends, problems, and opportunities for improvement in the states' implementation of rules as well as their program oversight. Consequently, the utility of SDWIS Fed information for these purposes highly depends on the quality, completeness, and timeliness of the data provided by primacy agencies.
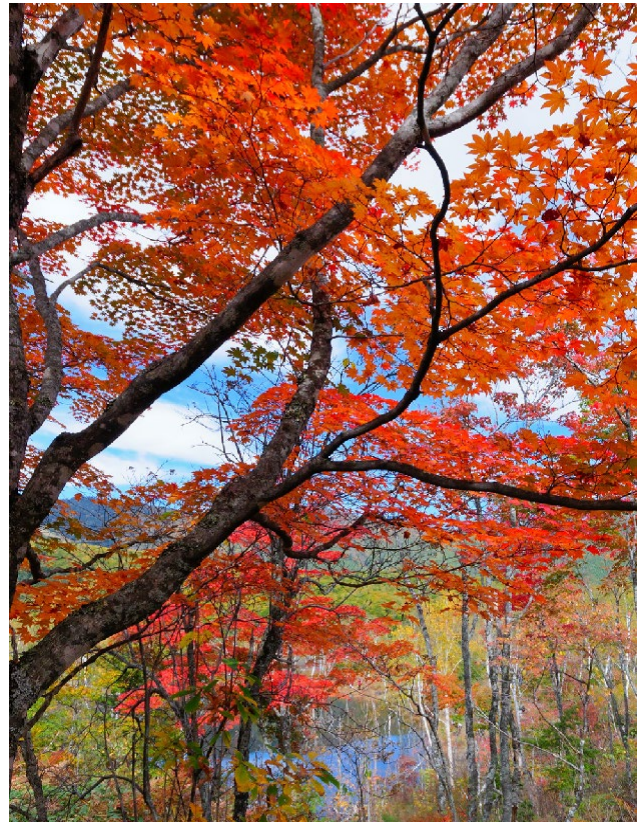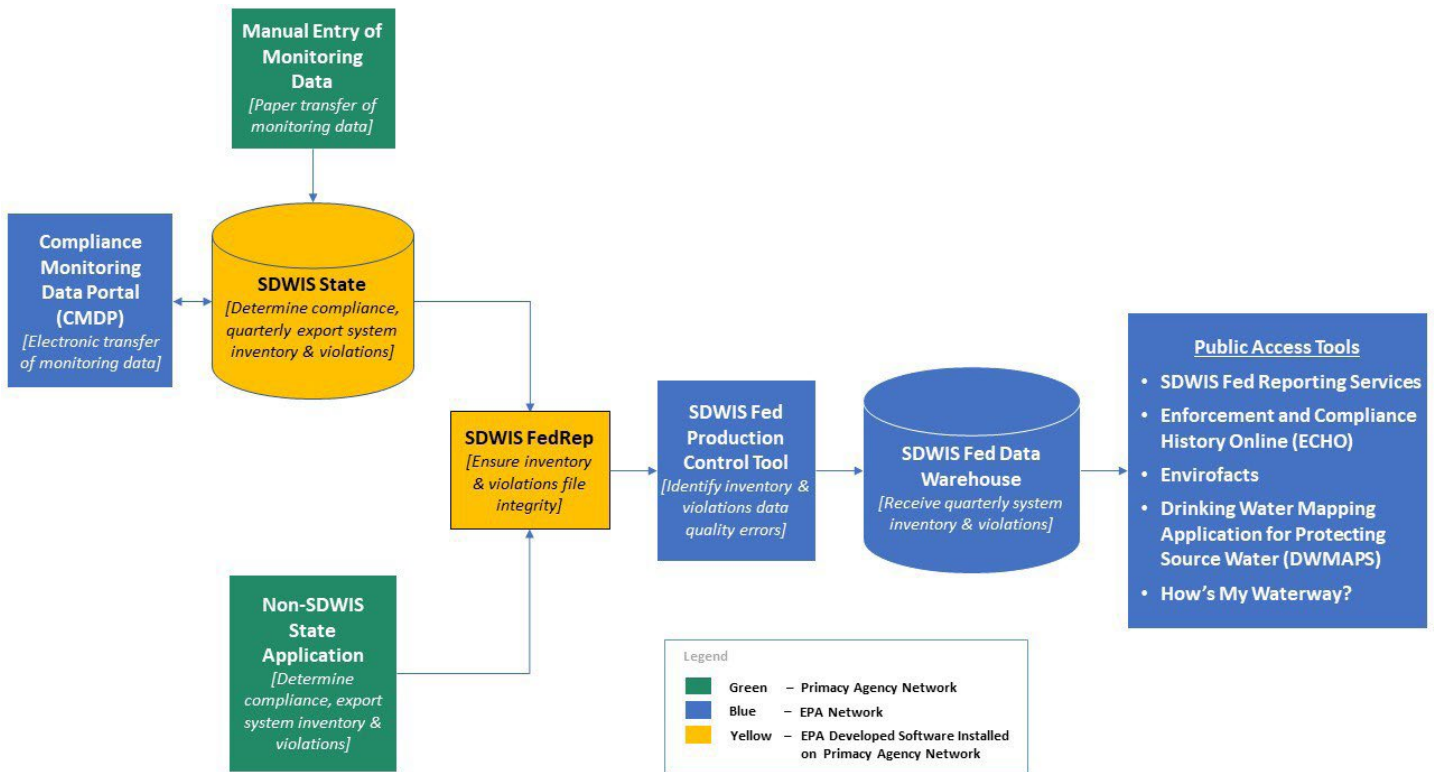
Figure 2 shows the way data enters SDWIS Fed.

Figure 2: CURRENT FEDERAL REPORTING PROCESS

Data accuracy includes both the accurate recording of the sample result and the completeness of the set of samples provided to the primacy agency and EPA. The SDWA requires PWSs to routinely monitor and report compliance monitoring samples and other data to primacy agencies to show water quality and the effectiveness of treatment. If a system does not monitor and report the quality of its water in a complete and accurate way, consumers and primacy agencies cannot know whether the water meets health-based standards. If the EPA does not receive complete, timely, and accurate data from primacy agencies, then the Agency cannot conduct its statutorily required oversight and support of state programs. EPA currently receives information from states related to violations and inventory and provides this information to the public through various EPA internet data access tools. EPA does not receive from states all compliance monitoring data that states collect from drinking water systems and labs. As the demands for state and EPA drinking water activity have increased significantly in recent years, EPA's limited access to compliance monitoring data is hampering efforts to support state responses to systems in violation and identification of systems at risk of violation. Because EPA only receives information when the state determines a violation and sends that violation information to EPA, the lack of violation information in EPA's database may mean there was no violation, or that the state incorrectly or inadvertently determined no violation, or that no data was submitted by the primacy agency.

Data quality management involves the entire lifecycle of a point of data from collection to documentation and to submission. The shorter the distance from the beginning of the lifecycle to the end use in analysis the better, since an error can be introduced into the data flow each time the data changes hands. This is particularly true for those systems and labs using manual entry of compliance data into paper spreadsheets. Copy/paste errors, misinterpreted handwriting, and the loss of physical copies reduces the quality and completeness of data. This is also the case for the manual entering of data into electronic systems.

The EPA evaluates state and EPA direct implementation programs in part by conducting primacy agency file review audits for each primacy agency approximately once every four years. The file review audits evaluate primacy agency compliance decisions and reporting to SDWIS Fed. These reviews specifically include the assessment of monitoring and reporting issues. The data quality challenges relate to both those data submitted to SDWIS Fed as well as those data cataloged and submitted via labs to primacy agencies.

In 2009, the Office of Ground Water and Drinking Water (OGWDW) conducted an analysis of data quality in SDWIS Fed that demonstrated that data quality was an ongoing and significant issue requiring the attention of EPA and primacy agencies. Data quality for health-based violations was 61 percent, and data quality for monitoring violations was as low as 21 percent. This meant that the health-based violation shown for a system or the lack of identified violation could be incorrect nearly one third of the time. The reasons for low data quality were both incorrect compliance determinations and correct information not flowing to EPA's database. Following this analysis, the EPA initiated a dialogue with primacy agency officials regarding corrective measures to be taken.

In 2011, the U.S. Government Accountability Office (GAO) also found that the data states reported to the EPA for measuring compliance with health and monitoring requirements of the SDWA did not reliably reflect the number of health-based and monitoring violations that community water systems have committed or the status of enforcement actions.

Since then, the EPA has implemented a suite of automated data quality and analytics tools to protect the integrity of drinking water data and improve dataset interoperability and analysis capabilities. The EPA and primacy agency staff have had an ongoing data management committee to discuss and address issues in data reporting, and this has improved data quality. The EPA's Office of the Inspector General (IG) published a report in 2017 which determined that the EPA is taking actions to improve

oversight tools used to determine whether PWSs are monitoring and reporting drinking water quality in accordance with the SDWA.

Throughout the entire SDWIS suite of software there are edit checks and data validations to increase the accuracy of compliance monitoring data. The following are examples of how data quality and data integrity checks have been implemented with the SDWIS software.

Core SDWIS State

The core SDWIS State component supports the functions necessary for effective management of a primacy agency Public Water System Supervision Program:

- *Sample Result System* for storing results of all compliance monitoring.
- *Compliance Determination System* for evaluating sampling results against schedules and federal standards and identifying and accepting or rejecting candidate violations.
- *Enforcement Management System* for managing enforcement actions associated with violations.
- *PWS Inventory Management System* for maintaining information characterizing water systems relevant to EPA oversight and maintaining engineering data relevant to the primacy agency.

SDWIS State includes basic information on each system such as the type of system (community, transient, non-transient non-community), source of water (ground or surface), and the population served by the system. This is the main tool that primacy agency staff will use to enter/update data. Every screen in SDWIS State has built-in edit checks that will verify that the data being saved will meet federal and state needs for data integrity.

SDWIS XML Sampling

SDWIS XML Sampling is the product for processing and transferring compliance monitoring data to a SDWIS State database. This application has edit checks that verify the sample and result information being migrated into SDWIS State meets data quality and completeness criteria, such as accurate system identification and locational information.

SDWIS Migration to State

SDWIS Migration to State is the product that supports batch insert and, in some cases, update of SDWIS State data. This application has edit checks that verify that the data being migrated into SDWIS State meets data quality and completeness criteria.

SDWIS FedRep

SDWIS FedRep is an integrated set of tools that assist the EPA and primacy agencies with the extraction, formatting, validation, and preparation of federally reportable drinking water data. When SDWIS FedRep processes data that will be submitted to the federal data system, the data are first

reviewed by SDWIS FedRep to ensure they are complete and accurate. SDWIS FedRep has over 500 data quality checks that it will apply as appropriate when validating violations, and other federally reportable drinking water data, to ensure the data are complete and accurate. This is the last set of edit checks before the data reach the federal data system.

The systems, tools, and procedures the EPA developed for data accuracy include:

- **Data Quality Matrix** – One of the secure reports accessible through Central Data Exchange (CDX) is the Data Quality Report. These reports generate data quality scores based on criteria including locational data, timeliness of violations reporting, and updated software use. The EPA delivers data quality awards to primacy agencies based on those scores in the data quality matrix. These awards, delivered annually, serve as a baseline for successful data quality as well as performance metrics for state drinking water programmatic staff.

- **Production Control Tool** – For state data submitted to SDWIS Fed. This tool provides validation of the data submitted to the EPA by the primacy agencies so that the data meet data quality requirements. This tool provides a way for primacy agencies and the EPA to review the data they are submitting and review any errors or issues with the submissions prior to the EPA approving and processing the data into the operational data store and quarterly processing into the Safe Drinking Water Data Warehouse (SFDW). It also includes a summary of any issues with the data identified by the SDWIS FedRep tool (described in the previous section) prior to submittal to the EPA

- **SDWIS Data Quality Check Tool** – This tool allows primacy agencies to check the data quality of their entire SDWIS State data set. The checks include the SDWIS FedRep data validations and many others that are meant to check other SDWIS State data and not just the data to be submitted to the EPA.

STATE AND EPA ACTIONS IMPLEMENTING ELECTRONIC REPORTING

Electronic reporting has proven to be a very successful tool for improved data quality. Several states and the EPA have experience successfully utilizing electronic reporting to improve and modernize data reporting in multiple programs and across different environmental media.

The motivation behind a move to e-reporting of any data is ease of use, burden reduction, and increased data accuracy. Utilizing web-based platforms for data submission and processing provides real and immediate burden reduction through streamlining of resources in both materials and staff. For instance, Utah reported that it has experienced a burden reduction of approximately 80 percent by moving to e-reporting. The move from hand-entered analog data to digital web-based systems also supports adaptable and centralized data quality controls. Kentucky reported that it currently has 82 percent of its laboratories reporting via an electronic portal and has seen as much as a 40 percent reduction in reporting errors.
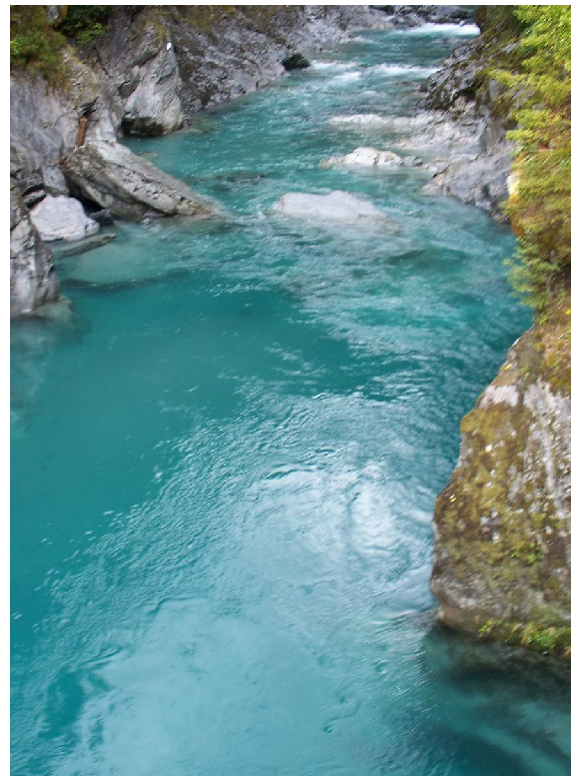
Building on state efforts to support electronic reporting of drinking water data, in October 2016 the EPA launched software allowing water laboratories and PWSs to electronically share drinking water data with their states and tribal agencies (U.S. EPA, 2016). The Compliance Monitoring Data Portal (CMDP) allows primacy agencies to replace paper-based processes, leading to more timely and higher-quality monitoring data by incorporating data validations and quality checks at the initial point of entry. By reducing the hours previously spent manually entering data from lab reports, identifying data-entry errors, and issuing data resubmittal requests, states and tribes are now able to free up more time to focus on preventing and responding to public health issues in their communities. In one example of burden reduction, Utah drinking water staff indicated they went from approximately a 20 percent error rate in submitted files to approximately 0.4 percent once they began using CMDP.

STATE-SPECIFIC EXPERIENCE WITH ELECTRONIC REPORTING

EPA has garnered feedback from many of the states with e-reporting rules and/or experience implementing their own e-reporting online portals. The examples below outline the experience of a few of those states as programmatic case studies:

Alaska

Alaska's drinking water program has been accepting electronically reported compliance monitoring data from laboratories in the state since 2005, before EPA released the CMDP. In 2005, Alaska implemented its own online portal for capturing electronic compliance monitoring data. The state mandated that all laboratories submit their sampling data via an online e-reporting portal. Some smaller systems were given more time to implement the practice since there are large areas in Alaska with broadband accessibility issues. Many of Alaska's drinking water systems, both small and large, expressed concern when this e-reporting rule was implemented in 2005. Yet, the overwhelming majority of users transitioned without issue and acknowledged the process was helpful once it was implemented. There were no technical obstacles in the way of transitioning to e-reporting. Technical support and ongoing trainings were (and are) available to portal users.

Alaska drinking water managers identified early in the e-reporting process the benefits of data accuracy improvements. Alaska's own proprietary portal allowed the drinking water program staff to create their own targeted data quality checks, which are captured on both the "data-in" (user interface) side during data entry as well as the "data-out" side (database population and reporting).

Alaska had a head start in transitioning to CMDP in 2017, having already set up its own data portal. The IT infrastructure required for data management, storage, and flow was built so that potential technical barriers and challenges were reduced. This contrasts with primacy agencies that plan to transition or have transitioned to CMDP directly from paper reporting.

The success of Alaska's adoption of CMDP is amplified by the data quality improvements realized through the additional utilization of a state-derived data validation tool. During the first six months after adopting CMDP, 14,395 sample records were submitted to the state. Of those, only 224 records were rejected by the state data validation tool. Alaska credits the training and documentation they provided to the labs before moving to CMDP as the reason they experienced a relatively low percentage of errors with the tool. The software for this validation tool is available for other states to adapt and utilize.

Ohio

Ohio EPA's Division of Drinking and Ground Waters (DDAGW) has been accepting electronically reported compliance data from both laboratories and PWSs since 1998. DDAGW's first e-reporting solution was called DrinkWare and was a stand-alone application that was installed on the customer's computer. It could be used for reporting laboratory results as well as PWS monthly operational reporting (MOR) data. Data was entered and transmitted to the Agency through email loaded into DDAGW's legacy system (DRINKs). Use of DrinkWare was voluntary.

In 2006 DDAGW purchased from Enfotech e-Drinking Water Reports (eDWR). The new eDWR application is web based and therefore unlike the previous DrinkWare application does not require any software installation. Enfotech was hired to customize eDWR to work in Ohio EPA's public portal. During implementation, DDAGW consolidated 19 forms to just four. Use was still voluntary when eDWR was released in 2008. In 2010 Ohio EPA required all laboratories to submit sample data electronically using eDWR. In 2012 Ohio EPA updated their rules to require water systems to submit MOR data electronically using eDWR.

Water systems were phased in using a three-tier approach:

- Water systems with a population of 3,301 and greater by July 1, 2012.
- Water systems with a population of 501 - 3,300 by July 1, 2013.
- Water systems with a population of 500 or fewer by July 1, 2014.

DDAGW realized the greatest benefits once laboratories and water systems were required to submit data electronically:

- Data quality vastly improved because of data validation by eDWR and XML Sampling.
- The number of full-time equivalents (FTEs) needed to support data entry has been greatly reduced to about half an FTE from a high of six or seven FTEs back in 1998.
- DDAGW can better ensure water quality because data that once took months to be entered into the database is now loaded in hours once received from customers.
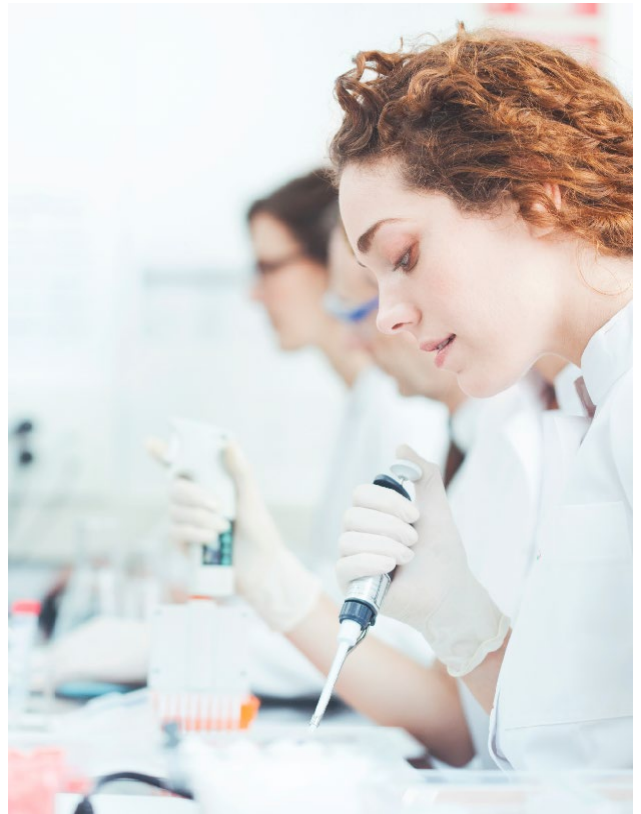
eDWR by the numbers:

- Annually DDAGW receives around 22,300 Plant Distributions MORs and 1,696 Surface Water MORs.
- Over 5,190 chemical submissions are received annually for a total of over 187,000 sample results.
- Over 10,000 Total Coliform Rule (TCR) submissions are received annually for a total of over 160,000 sample results.
- There are over 2,470 registered users submitting MOR data from 1,918 PWSs and over 770 registered users submitting sample data from 237 laboratories.

Utah

The Utah Division of Drinking Water (DDW) was involved in the early testing stage of the CMDP through the 2016 calendar year. In February of 2017, Utah was the first state in the nation to have a laboratory begin submitting electronic data through the CMDP production environment. Within six months, four laboratory organizations were registered and actively implementing the new portal. Currently, thirteen laboratories are active.

Utah's approach for training each lab involves a walkthrough of the submittal process, as well as identifying and understanding validation errors. This is either completed through conference calls with a DDW staff member, or they visit onsite to provide the training in person.

When a lab is new to the CMDP, Utah encourages the organization to focus on submitting routine total coliform data through the portal. As competency solidifies, more sample types and categories are introduced until they no longer rely on paper reporting.

EPA EXPERIENCE WITH ELECTRONIC REPORTING

The EPA published the National Pollutant Discharge Elimination System (NPDES) Electronic Reporting Rule (eRule) in 2015. The EPA's Office of Air and Radiation (OAR) also developed an Electronic Reporting Tool (ERT) for emissions source test data in 2014. Additionally, and most programmatically relevant to this strategic plan, the Office of Water has been using electronic data submission for the Unregulated Contaminant Monitoring Rule (UCMR) since 2001 via the Safe Drinking Water Accession and Review System (SDWARS). The EPA also established a policy in 2013 that it will start new regulations with the assumption that reporting would be electronic and not paper-based (U.S. EPA, 2013).

### NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM ELECTRONIC REPORTING RULE

The most recent example of large-scale e-rule implementation was when the EPA signed the NPDES eRule on September 24, 2015, and published it in the *Federal Register* on October 22, 2015 (40 CFR 127) (U.S. EPA, 2015). This rule modernizes the Clean Water Act (CWA) reporting for municipalities, industries, and other facilities. The rule replaces most paper-based NPDES reporting requirements with e-reporting (U.S. EPA, 2018a).

The NPDES Permit Program regulates point sources that discharge pollutants to a water of the United States. This requires regulated entities to report information via reports to the EPA. The data that these regulatory authorities share with the EPA include permit, compliance monitoring (e.g., inspection), violation determination, and enforcement action data.

The rule also requires the EPA to assess the progress each authorized state is making in implementing NPDES e-reporting and to repeat these assessments annually. Figure 3 illustrates the dashboard that tracks this progress.

The NPDES eRule sets a start date for all regulated municipalities, industries, and facilities to report their required data electronically by the dates set forth in 40 CFR 127.16. Discharge Monitoring Reports and Biosolids Reports, a significant component for adherence to CWA regulations, were set for implementation a year after rule passage (December 21, 2016). An additional four years was provided for other entities to report electronically by December 21, 2020 (e.g., general permit and program reports).

Figure 3: NPDES ERULE IMPLEMENTATION PROGRESS DASHBOARD [JUNE 25, 2019]
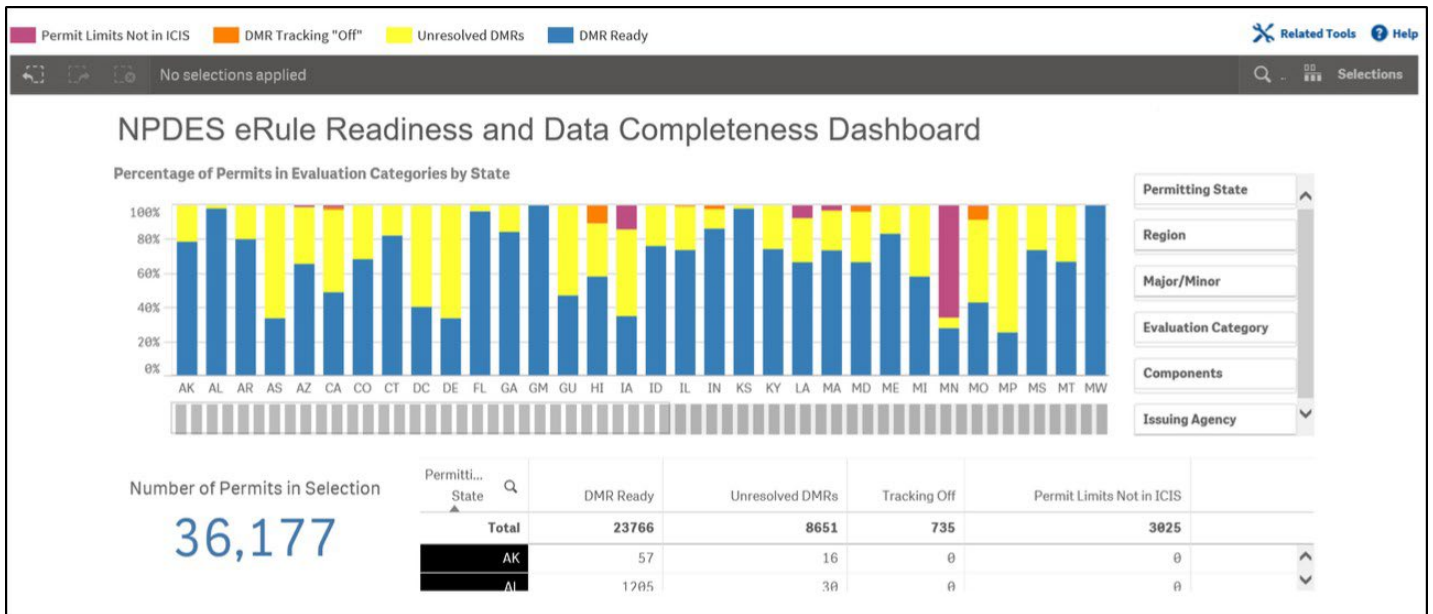
Data submission methods (paper vs. electronic) were completely up to the states prior to the NPDES 2015 eRule. In 2009, approximately 24 facilities were starting to migrate to digital data submission and more followed over the years; by 2015, approximately 10,000 users were submitting data digitally to the EPA's national NPDES data system (Integrated Compliance Information System (ICIS)). In the past three years since the passage of the mandatory eRule, the NPDES Program has more than tripled that number to more than 37,000 facilities that have submitted discharge monitoring reports (DMRs) through NetDMR (EPA's e-reporting tool for DMRs).

The burden imposed on regulated entities and states is minimal due to the flexibilities built into the rule. States could use the EPA NetDMR e-reporting tool, or they could use their own online portal for data submission. There are also three separate waivers available to permittees and issued by the states. These waivers to e-reporting are granted on either a temporary or emergency basis and provide the flexibility to states, regions, and biosolids programs. These are mainly employed due to a lack of broadband internet access or the staff level expertise necessary to conduct electronic data entry. The result, however, is that states have a built-in incentive to discourage widespread waiver use because, if they do grant a waiver, they themselves must perform the necessary data entry using the hard copy submissions.

One additional, and challenging, aspect of implementing any e-reporting rule is the need for digital security in an increasingly digital United States government. The EPA's Cross-Media Electronic Reporting Rule (CROMERR) provides the legal framework for e-reporting under the EPA's regulatory

programs. It provides performance-based, technology-neutral system standards and a uniform process for the EPA review and approval of e-reporting. Additionally, the CROMERR program ensures the enforceability and security of regulatory information collected electronically by the EPA and the EPA's state, tribal, and local government partners (U.S. EPA, 2019a). In the case of the NPDES eRule, the EPA's CDX website provides the digitally secure framework from which to verify the identity of users submitting data and hosting those data on a secure web-based platform. Granting users access to CDX is an additional step in the electronic data submission process and is an additional hurdle for some users to navigate as well as the EPA to support. Information technology security is a major consideration that should be discussed early and often when designing data reporting workflow.

EPA ELECTRONIC REPORTING OF AIR EMISSIONS DATA

Other environmental programs also use electronic reporting. The EPA's OAR developed an ERT used by affected industrial facilities to electronically create stationary source sampling test plans and reports that are submitted regularly to the EPA (U.S. EPA, 2017a). In January 2012, OAR released the Compliance and Emissions Data Reporting Interface (CEDRI) where affected facilities submit files containing emissions source test data (or Performance Test Reports/Performance Evaluation Reports) to CDX via CEDRI. As with other EPA systems, the use of CDX allows the program to comply with CROMERR requirements and security identification standards. The CDX Web is the application used by EPA programs and various stakeholders to manage environmental data transmitted to EPA in order to meet EPA's electronic reporting requirements. The EPA regulations codified in 40 CFR Parts 60, 62, and 63 require affected sources to electronically submit performance test reports, notification reports, and periodic reports to the EPA.

The CEDRI program application was developed in response to the EPA promulgating rules with e-reporting requirements that require affected sources to electronically submit source test results, emissions monitoring data, compliance reports, and emissions reports to the EPA. The CEDRI program service supports the submittal of four reporting types: Performance Test Reports (including Performance Evaluation Reports), Notification Reports (i.e., Notification of Compliance Status (NOCS) Reports), Periodic Reports, and Information Collection Requests (used to gather information that will help the agency review of rules).

The ERT provides a format that:

- highlights the need to document the key information and procedures required by the existing EPA federal test methods;
- facilitates coordination among the source, the test contractor, and the regulatory agency in planning and preparing for the emissions test;
- provides for consistent criteria to quantitatively characterize the quality of the data collected during the emissions test;

- standardizes the reports; and

- provides for future capabilities to electronically exchange information in the reports with facility, state, or federal data systems.

CEDRI supports submission of multiple reports at one time. The source then certifies and signs the package using the CDX CROMERR service. The reports are stored in the CDX CROMERR archive and are available to industry submitters and authorized EPA, regional, state, local, and tribal reviewers immediately upon submission. A copy of the report(s) is also sent to WebFIRE after a 30 or 60-day processing period where the report is available for public access.

EPA DRINKING WATER UNREGULATED CONTAMINANT MONITORING RULE REPORTING

EPA has been accepting electronically reported drinking water monitoring data under the UCMR since 2001 (U.S. EPA, 2018c). The system designed to capture these data is the SDWARS. These data ultimately reside in the EPA's National Contaminant Occurrence Database (NCOD) and on UCMR's online occurrence data page (U.S. EPA, 2019d). The SDWA, as amended in 1996, requires EPA to design and implement a program under which PWSs monitor a new set of unregulated contaminants every five years. EPA identifies contaminants and specifies validated drinking water analytical methods for monitoring. Laboratories apply and are approved to analyze UCMR samples. Approved labs are required to report results to SDWARS, which must be updated every UCMR cycle to support the changes in monitoring requirements. The PWSs that are subject to UCMR are required to report inventory, contacts, zip codes, and other additional data to SDWARS prior to and during monitoring. In recent UCMR cycles, EPA has used SDWARS to manage approximately one million sample results per cycle. In the next cycle, the volume of sample results will approximately double, as the scope is expanded to include all PWSs serving 3,300-10,000 people.

The 1996 SDWA amendments required all systems serving populations over 10,000 people, and a nationally representative set of smaller systems, to report monitoring data from various locations at the PWSs (depending on the contaminant monitored) including the entry points to the drinking water distribution system and, for some UCMR cycles, locations within the distribution system. The 1996 SDWA amendments also established requirements for the EPA to pay for the sampling and analysis costs for systems serving 10,000 or fewer individuals. These small system samples are analyzed via multiple award contracts with analytical laboratories. In past UCMR cycles, 800 water systems serving 10,000 or fewer people were randomly selected for monitoring as part of the nationally representative small-system array within each five-year cycle. Until recently, large systems exclusively reported through SDWARS and EPA directly received electronic data deliverable files from the contract labs that included not only field sample results but comprehensive quality control data, which were loaded into a MS Access database for review. Starting with UCMR 4, all monitoring results, inventory, contacts, and data elements are reported through SDWARS from both large and small systems, including comprehensive laboratory quality control data. In addition, EPA's small-system data management was integrated into SDWARS (e.g., kit tracking, schedules, data review, compliance assistance, and invoicing). SDWARS also provides a centralized location for various user groups (laboratories, PWSs, states, Regions, EPA staff, and contractors) to review, edit and review the information reported to SDWARS.

The advancement of the UCMR program, along with the expanding scope for what is reported, presents ongoing data management challenges. One example is managing the complete array of method quality control data with all field sample results. Labs continue to work with the program to implement these changes and continue to benefit from the advantages SDWARS provides.

COMPLIANCE MONITORING DATA PORTAL (CMDP)

EPA released the CMDP in 2016 to support electronic reporting of drinking water data. CMDP enables drinking water utilities and laboratories to report data electronically to primacy agencies with fewer errors and in a more efficient manner. The portal increases data accuracy and completeness and can potentially decrease the overall reporting burden for primacy agencies by hundreds of thousands of hours.

Drinking water primacy agencies can use the portal-reported data to make more informed decisions about water system compliance and focus their limited resources on preventing and responding to public health problems. Primacy agencies, water systems, and laboratories will continue to report data to EPA based on the content and schedule outlined in the current regulations.

Water system and legal entity information is loaded into the CMDP from a primacy agency's SDWIS State system (or other compliance determination system) from the Data Synchronization Engine (DSE) installed within the primacy agency environment. Sample data are transferred after certification through the DSE to the primacy agency for compliance determination.

As of September 2021, 19 primacy agencies are using the CMDP. Ten additional primacy agencies are currently moving toward CMDP adoption.

While CMDP was initially envisioned to support only federally regulated contaminants, it has been expanded to support state regulated contaminants and other contaminants of interest as well. This support provides a platform for more consistent water data collection across primacy agencies and greater sharing opportunities.
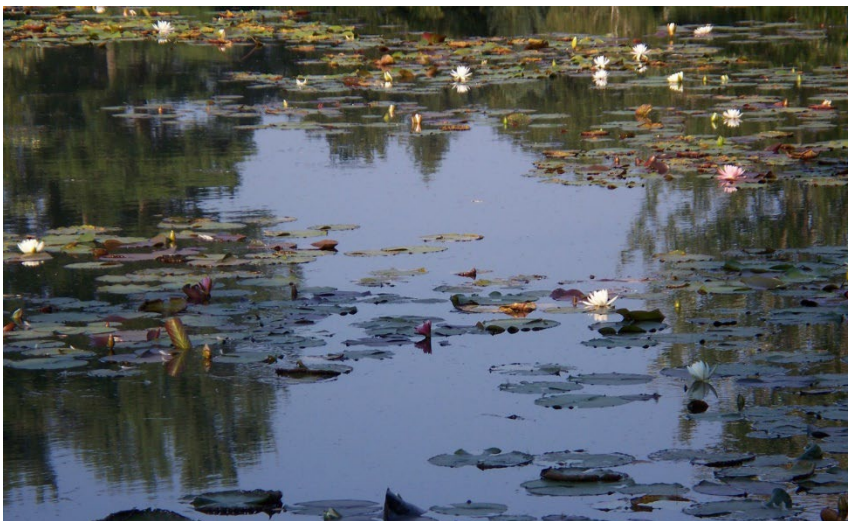
The use case highlighted below from a utility in Louisiana provides a look at CMDP implementation from a laboratory perspective.

Lafayette Utilities System (LUS) Drinking Water Laboratory

Serving approximately 145.000 people, LUS has a dedicated drinking water laboratory that processes all the municipality's own raw data and samples. Louisiana adopted CMDP in 2016 and LUS began electronically reporting their data. Just one individual staff member is able to sample and process lab data via their current procedures. There are both mid-level and final quality assurance checks completed as the data moves through the process and before the data are batch uploaded to CMDP. Additionally, LUS has had success due to the data validation checks via CMDP. Even in the narrative text fields within the lab results, there are error flags thrown within CMDP that allow errors to be rectified by the user. The submitted results are then certified by the state. The LUS Drinking Water Laboratory is a relatively small operation without extensive IT expertise; however, it has built a successful electronic reporting process using CMDP. State drinking water managers have visited to see how they can recreate their successes elsewhere in the state. LUS also works with other municipalities, has developed resource materials to aide in CMDP adoption, and works with others if technical problems arise.

EPA and many states and individual water utilities currently make drinking water data available to the public. The more access PWSs, primacy agencies, federal agencies, and regulated entities have to drinking water compliance monitoring data, the more effective program management can be. Providing access to a consumer's water system monitoring data can also empower the individual or community to take any necessary action. Data analysis, including environmental modeling efforts, would be improved dramatically by the increased availability and sharing of drinking water data. Currently there is no national access to compliance monitoring data. Some individual states make compliance monitoring data available online, but as noted previously EPA does not have access to most compliance monitoring data. EPA's publicly available national data primarily includes inventory and violations information.

The systems described below are examples of what the EPA and state agencies are producing to explore those data which are already publicly available.

Drinking Water Watch

Drinking Water Watch is a state-level web-based application of SDWIS State used by many state programs that allows the public to query and view compliance monitoring data and other information contained within a primacy agency's SDWIS State drinking water database. It allows the users to easily find information related to a specific water system such as violations, analytical results, contact information, and inspection findings. Figure 4 depicts the home page of the Indiana Drinking Water Watch web page.

Figure 4: Drinking Water Watch User Interface, Adapted by Indiana Department of Environmental Management

Connecticut's Drinking Water Health Dashboard

Connecticut's Healthy Connecticut 2020 Performance Dashboard displays in a simple visual format how the residents of Connecticut are faring in health improvement target areas such as heart disease, obesity, obtaining vaccinations, exposure to environmental risks, and many more as identified in Healthy Connecticut 2020 State Health Improvement Plan. Drinking water results and indicators (Figure 5) are from the Healthy Connecticut 2020 State Health Improvement Plan Focus Area 2 - Environmental Health. The plan is carried out by the Connecticut State Health Improvement Coalition and seven action teams (CT DPH, 2014).

Figure 5: Connecticut Public Health Data Explorer

Drinking Water Mapping Application to Protect Source Waters (DWMAPS)

EPA has developed DWMAPS to connect PWS information with other sources of data. DWMAPS uses an online mapping tool (Figure 6) that helps state and utility drinking water professionals in concert with other state and local mapping tools to update their source water assessments and protection plans. Watershed protection groups and source water collaboratives can also use DWMAPS to locate drinking water providers, potential sources of contamination, and polluted waterways, as well as information on protection projects and Source Water Collaborative initiatives in their area (U.S. EPA, 2019b).

Figure 6: DWMAPS Drinking Water Provider Tool Example Results
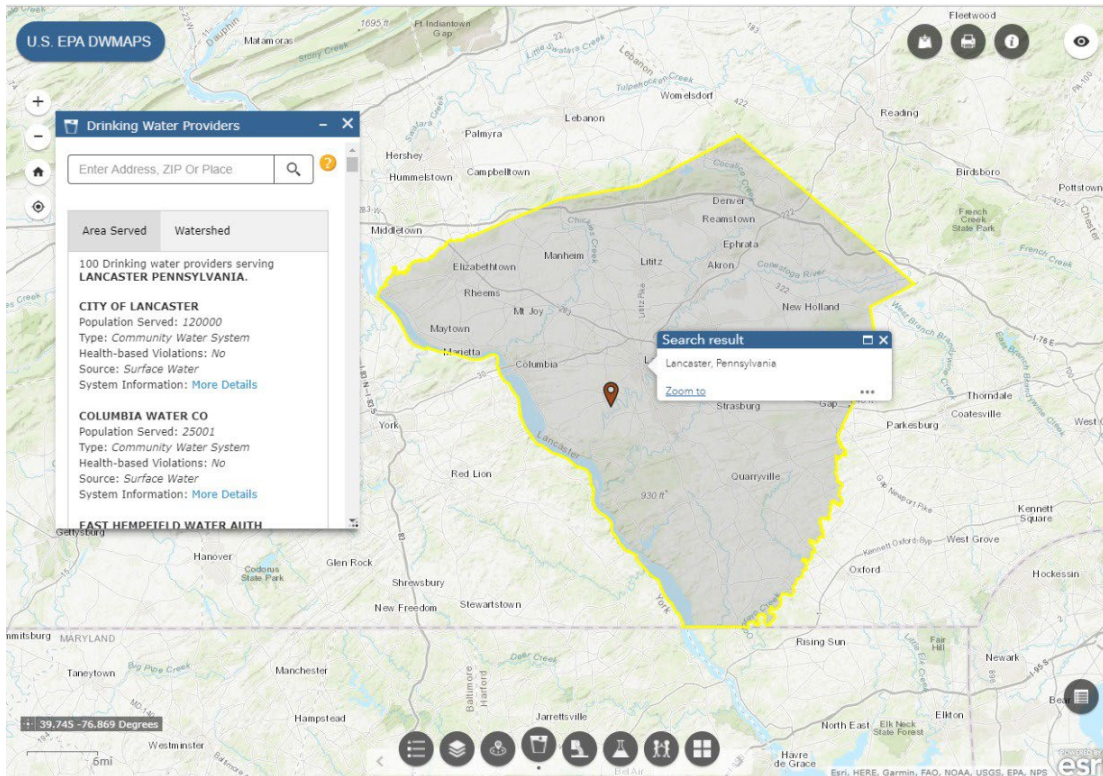
EPA Enforcement and Compliance History Online (ECHO)

ECHO extracts violations data from SDWIS Fed and the associated Enforcement Targeting Tool (ETT) (which is a points system to evaluate the relative severity of compliance problems at a PWS). EPA, state, tribal, and public users can access SDWIS and ETT data in a way that also links to other regulatory program data. For example, PWSs and publicly owned treatment works (POTWs) that are co-located can be viewed in an integrated report within ECHO. ECHO encourages improved data quality by making SDWIS data available to the public and drinking water systems and providing integrated error reporting that allows users to report errors to data stewards who are responsible for resolving them.

Figure 7: EPA Enforcement and Compliance History Online (ECHO) Drinking Water System Search
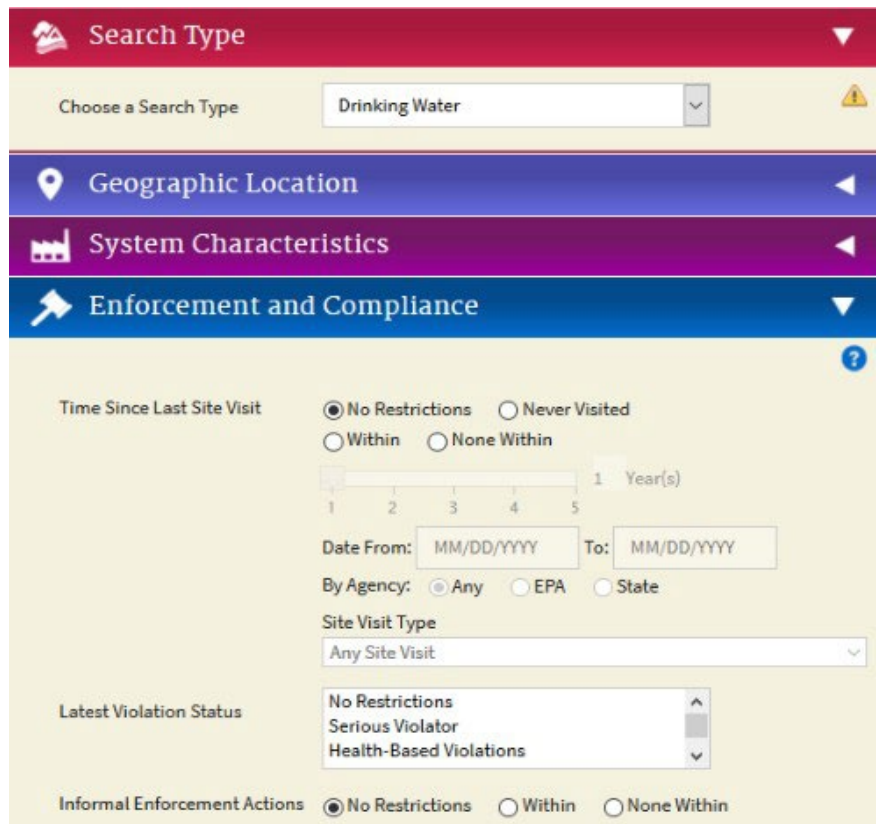
State programs, the EPA, and many water systems have effectively utilized technological advances over the past decade to improve both the accuracy and accessibility of drinking water data. State programs and the regulated community have successfully used electronic reporting to transmit compliance data to EPA. EPA has developed the CMDP to support electronic reporting of drinking water data, and several states have developed their own electronic portals for compliance monitoring data submissions. These electronic portals have proven to be effective at increasing data quality while reducing burden.

While EPA has facilitated electronic reporting of compliance monitoring data, there is no national requirement for electronic submission. Some states like Alaska and Ohio have mandated electronic reporting, as shown earlier in this report. Connecticut also has a mandatory drinking water data e-reporting rule in place which has streamlined the data submission process. Many states do not have this regulatory authority and have indicated they would follow the form and function of any future federal e-reporting requirements.

E-Reporting for Small Systems:

Targeted grants to small systems can help meet the growing data reporting needs. Additionally, flexibility for adapting e-reporting is required for small systems is necessary in areas where broadband is limited. Waivers for some small systems may be necessary. Most drinking water systems in the United States are small, serving fewer than 3,300 people. Increasing e-reporting and increasing the ability for the public to access the data would assist in identifying those systems in most need. These systems also do not generally carry proportionate funding when it comes to administration and resources. Removing barriers for small system adoption of e-reporting requires closing these financial and capacity gaps that small systems may experience.

Laboratories, which are generating the vast majority of compliance monitoring data, are almost all capable of e-reporting on behalf of their PWS clients and thus hardship waivers may not be necessary in these cases. In an e-reporting rule, wherever possible, providing timelines years away from the implementation of a rule will allow entities to find solutions to a mandatory e-reporting requirement.

Data Access:

EPA has developed a structure and the relevant funding mechanisms to support sharing and reporting of data. E-Enterprise for the Environment is a model for collaborative leadership among environmental co-regulators. Working together, environmental leaders at the EPA, states, and tribes are utilizing the E-Enterprise model to simplify, streamline, and modernize the implementation of environmental programs (U.S. EPA, 2019c). In July 2019, the EPA drafted an Interim E-Enterprise Digital Strategy which represents a shared vision among E-Enterprise partners to better coordinate their IT systems, information, and services. The Digital Strategy incorporates a broad range of input from government practitioners, the public, and private-sector experts. Implementation of the Strategy will result in increased collaboration in environmental data and system sharing among the EPA, states, and tribes to better achieve environmental protection benefits. Programs like this encapsulate the need for increased collaboration among drinking water stakeholders to maximize the utilization of modern IT infrastructure.

Exchange Network (EN) Grants are the main avenue for financial support from the EPA to states for the development of drinking water data shared services in the primacy agencies. The cumulative effect of EN Grants provides greater advantages from one grant recipient to the next. The impetus behind them is for the products of each of the grant projects to be held and available for the next recipients to use to further their programs via subsequent IT development projects. Those projects that clearly define the improvement to information/data sharing and demonstrate to the EPA that they are most helpful in this way are the most likely to be funded (e.g., tools for e-reporting). An example of an EN Grant funded project is SDWIS Drinking Water Watch. This application was initially developed by the State of Indiana using an EN Grant and, after its completion, Indiana provided the EPA the source code to the application allowing the EPA to incorporate it into the SDWIS Suite of applications for all states' benefit. Additionally, EN Grant proposals for the 2022 funding cycle will likely contain provisions for upgrades to SDWIS State 3.4 and continued support transitioning to CMDP.

States can use the Drinking Water State Revolving Fund (DWSRF) to provide financial assistance to publicly-owned and privately-owned community water systems, as well as non-profit non-community water systems, for drinking water infrastructure projects. Projects must either facilitate the system's compliance with national primary drinking water regulations or significantly further the health protection objectives of the SDWA. Set-aside funding can be used for an array of activities related to migrating, maintaining, and updating the state's SDWIS data system.

Many stakeholders acknowledged that, whether the state is managing their data through paper submissions or through an e-reporting system, there are still management challenges and burdens to bear. However, the inherent benefits to e-reporting are only achieved through online data submission via flexible and well-funded IT platforms and effective stakeholder partnerships.

EPA will promote improved accuracy and availability of compliance monitoring data through continued support of the CMDP for electronic reporting of data, through SDWIS modernization and stakeholder discussions, and through the research and analysis under the Drinking Water Learning Agenda. In coordination with primacy agencies, PWSs, and laboratories, the EPA will continue to document emerging issues, operational requirements, and barriers related to electronically reporting drinking water data on an ongoing basis. The outlined actions below are focused on removing identified barriers to adopting electronic reporting solutions and on identifying additional ways of making compliance monitoring data more accurate and accessible and are based on feedback received to date in support of this document, as well as EPA drinking water programmatic goals.

The planned actions below will be conducted in support of the E-Enterprise framework of vital common goals published in May of 2019 (U.S. EPA, 2019c):

- Improving environmental protection by enhancing program performance, streamlining, and modernizing environmental programs, and deploying advanced technologies.

- Enhancing services to stakeholders by reducing transaction costs and burdens and improving the transparency of environmental conditions and performance.

- Operating as a transformative model of shared governance, in which the partnering environmental agencies jointly identify priorities, define and solve problems, and implement and improve regulatory programs.

1. *Continue Stakeholder Discussions on Electronic Reporting of and Access to Compliance Monitoring Data*

AWIA Section 2011 allows EPA to continue the process of gathering input from and collaborating with labs, systems, primacy agencies, and other programmatic partners on compliance monitoring data sharing.

The EPA will extend discussions to additional categories of utilities (e.g., small systems, large systems) and additional laboratories responsible for processing the compliance monitoring samples data for the primacy agencies. Discussions will occur on a rolling basis over calendar year 2020 and beyond. The subgroups of SDWIS stakeholder groups described below provide platforms for stakeholder feedback in a format conducive to candid and constructive informal discussion.

The **Data Management Advisory Committee (DMAC)** consists of approximately 12 participants from state drinking water administrators, Association of State Drinking Water Administrators (ASDWA) association representation, and EPA OGWDW and Regional staff. This group meets monthly in an engaged committee that also sponsors and organizes quarterly "best practices" webinars open to the entire SDWIS User Community.

Additional **monthly** webinars are provided to the entire SDWIS community of stakeholders and hosted by ASDWA and EPA staff from OGWDW. SDWIS-related program updates are provided, questions from attendees are fielded, and discussions are facilitated in an online platform hosting approximately 100 attendees each month. Attendees are from states, utilities, and EPA Regions and are co-facilitated with drinking water association staff (ASDWA).

These workgroups and webinars are a key part of the outreach conducted by the EPA with its customers. Their regular associated meetings will be continued in their various capacities to ensure open and facilitated communication between SDWIS stakeholders and the EPA.

2. Explore Additional Improvements to Data Accuracy and Completeness Through the SDWIS Modernization Process

EPA is in the process of updating both SDWIS State and SDWIS Fed. To guide system development EPA has established the SDWIS Modernization Board that includes representatives from state drinking water and information technology programs. The Board will ensure that the modernized SDWIS database meets programmatic and data quality needs, including facilitation of electronic reporting of compliance monitoring data from water systems to primacy agencies. The Board will also look at ways to simplify the data flow from states to EPA and will explore tools such as Drinking Water Watch that can help make compliance monitoring data available and understandable.

3. Continue to Support Electronic Reporting of Compliance Monitoring Data Through Compliance Monitoring Data Portal Implementation and Improvements

Data Validations. Since the initial launch of the CMDP application, EPA has incorporated additional functionality and more robust data validations to prevent data deficiencies more comprehensively. CMDP project implementation staff at the EPA will continue to work with primacy agency and lab CMDP users to identify and prioritize additional data validation checks and will follow E-Enterprise principles in looking to promote and share additional validations already in use by primacy agencies. These additional validations will save time and money for labs, systems, states, and EPA by requiring less manual intervention for ensuring reliably excellent data quality.

Method/Analyte Code Updates. Over the past year, EPA has implemented a more efficient set of processes and tools for primacy agencies to update method/analyte code pairings in the CMDP. This has resulted in greater capabilities for additional labs, systems, and primacy agencies to use the CMDP to support primacy agency compliance monitoring data business needs more broadly, such as for state regulated contaminants. The CMDP implementation team will also use this process to ensure that new methods are promptly incorporated into the application to support reporting of emerging contaminants.

Continued Funding Mechanisms. The EPA will continue to target EN Grant proposals to enhance states' ability to support e-reporting activities. Specifically, as previously stated in this document, the 2022 funding cycle will likely contain provisions for upgrades to SDWIS State 3.4 and continued support transitioning to CMDP. Additionally, states will be able to continue utilizing the DWSRF set-asides to support transitioning to and implementing CMDP. They will also be able to use DWSRF set-aside funding for updating or replacing state applications for exchange of data with CMDP via web services.

4. Follow the Requirements of the Foundations of Evidence-Based Policymaking Act of 2018 to Create a Framework to Improve Drinking Water Data Quality and Availability

The Evidence Act, enacted in 2018, provides a framework for institutionalizing rigorous impact analysis in federal agencies and for the use and generation of evidence to support policy decisions. Under the Evidence Act EPA is looking at drinking water data quality and completeness in the Agency's initial implementation of this Act. Specifically, EPA will answer the question: "Does EPA have ready access to data to reliably and accurately measure drinking water compliance?" As EPA uses SDWIS data to calculate compliance rates, to conduct its statutory oversight responsibilities, and to support drinking water policy decisions, EPA will use the rigorous analysis processes and tools as described in the Evidence Act to closely examine the drinking water dataset for completeness and accuracy as it relates to informing drinking water policy and will explore options for improvement. This exploration will include compliance monitoring data. EPA will consult with stakeholders as it conducts this analysis in 2021 and 2022.

AA	Assistant Administrator		SDWARS	Safe Drinking Water Accession and Review System
ASDWA	Association of State Drinking Water Administrators		SDWIS	Safe Drinking Water Information System
AWIA	America's Water Infrastructure Act		SDWIS Fed	Safe Drinking Water Information System Federal Version
BPA	Blanket Purchase Agreement			
CDX	Central Data Exchange		SDWIS State	Safe Drinking Water Information System State Version
CEDRI	Compliance and Emissions Data Reporting Interface			
CFR	Code of Federal Regulation		SFDW	Safe Drinking Water Data Warehouse
CMDP	Compliance Monitoring Data Portal		STAG	State and Tribal Assistance Grants
CROMERR	Cross-Media Electronic Reporting Rule		TCR	Total Coliform Rule
CWA	Clean Water Act		UCMR	Unregulated Contaminant Monitoring Rule
DMR	Discharge Monitoring Report			
DMUC	Data Management Users Conference			
DSE	Data Synchronization Engine			
DWMAPS	Drinking Water Mapping Application to Protect Source Waters			
DWPD	Drinking Water Protection Division			
DWSRF	Drinking Water State Revolving Fund			
ECOS	Environmental Council of the States			
EN	Exchange Network			
EPA	U.S. Environmental Protection Agency			
e-reporting	Electronic Reporting			
ERT	Electronic Reporting Tool			
eRule	NPDES Electronic Reporting Rule			
FTE	Full-time Equivalent			
GAO	U.S. Government Accountability Office			
ICIS	NPDES Integrated Compliance Information System			
IWG	Implementation Work Group			
MOR	Monthly Operating Report			
MOU	Memorandum of Understanding			
NCOD	National Contaminant Occurrence Database			
NDWAC	National Drinking Water Advisory Council			
NOCS	Notification of Compliance Status			
NPDES	National Pollutant Discharge Elimination System			
NPDWR	National Primary Drinking Water Regulations			
OAR	Office of Air and Radiation			
OBI	Oracle Business Intelligence			
OCFO	Office of the Chief Financial Officer			
OGWDW	Office of Ground Water and Drinking Water			
OMB	Office of Management and Budget			
POTW	Publicly Owned Treatment Works			
PWS	Public Water System			
SDWA	Safe Drinking Water Act			

Community Water System (CWS)

A public water system that supplies water to the same population year-round.

National Primary Drinking Water Regulations (NPDWR)

Legally enforceable standards that apply to public water systems. These standards protect drinking water quality by limiting the levels of specific contaminants that can adversely affect public health and which are known or anticipated to occur in public water supplies.

Non-Transient Non-Community Water System (NTNCWS)

A public water system that regularly supplies water to at least 25 of the same people at least six months per year. Some examples are schools, factories, office buildings, and hospitals which have their own water systems.

Primacy

Primary enforcement authority for the drinking water program. Under the Safe Drinking Water Act, states, United States territories, and Indian tribes that meet certain requirements, including setting regulations that are at least as stringent as the EPA's, may apply for, and receive, primary enforcement authority, or primacy.

Public Water System

Any water system that provides water to at least 15 service connections or 25 people for at least 60 days annually.

Public Water System Supervision Program

Safe Drinking Water Act regulatory requirements for public water systems are implemented through the Public Water System Supervision (PWSS) program. States maintain PWSS programs in order to retain primacy over public water systems' compliance with the Safe Drinking Water Act (SDWA) and its amendments.

SDWIS Fed

The Safe Drinking Water Information System (SDWIS) contains information about public water systems and their violations of the EPA's drinking water regulations, as reported to the EPA by the states. The Safe Drinking Water Act (SDWA) requires states to report drinking water information periodically to the EPA. This information is maintained in a federal database, the SDWIS Fed Data Warehouse.

Transient Non-Community Water System (TNCWS)

A public water system that provides water in a place such as a gas station or campground where people do not remain for long periods of time.

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