



Next Generation Cleanup Compendium of Examples

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Introduction to Next Generation Compliance

Next Generation Compliance is an integrated strategy to increase compliance with environmental programs by using five interconnected components: more effective regulations and permits, advanced monitoring, electronic reporting, expanded transparency, and innovative enforcement. Next Generation Compliance concepts and best practices can be used to build compliance drivers into rules, permits, orders, and enforcement settlements, resulting in better environmental performance, while also enabling regulators to more easily monitor and ensure compliance. For more information about Next Generation Compliance in general, see <http://www.epa.gov/compliance/next-generation-compliance>.

Cleanup Programs and Next Generation Compliance

The purpose of this Compendium is to expand how Next Generation Compliance approaches have been used to improve environmental cleanup performance under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund), the Resource Conservation and Recovery Act (RCRA), and state cleanup authorities. The Superfund, RCRA Corrective Action and Leaking Underground Storage Tank (LUST), and state cleanup programs have used innovative practices by incorporating Next Generation Compliance concepts throughout the cleanup process. These concepts include advanced monitoring, electronic reporting of geospatial information for online mapping, and transparency. These creative and innovative approaches illustrate how technological and behavioral advancements and efficiencies can be leveraged to improve compliance rates, increase transparency, and improve environmental performance.

There are opportunities for federal, state, and tribal cleanup enforcement programs to expand use of Next Generation Compliance practices into orders and consent decrees (CDs). For example, EPA is exploring how to incorporate requirements for monitoring and information technology; expand transparency; and apply innovative enforcement in orders and CDs to address operation and maintenance, five year reviews, and compliance with institutional controls (ICs).

Format and Use of Examples Included in this Compendium

This Compendium focuses on cleanup programs and includes Superfund, RCRA, and state cleanup program examples grouped into the following five components of Next Generation Compliance:

- Effective Rules
- Transparency
- Electronic Reporting
- Advanced Monitoring
- Innovative Enforcement (including Settlements and Orders)

Each section provides an introduction to a Next Generation Compliance component and explains how that component has been used to help advance the goals of the cleanup program. It then describes considerations related to use of that Next Generation Compliance component in cleanup programs and enforcement mechanisms. Finally, each section lists examples from the cleanup program which illustrate use of that Next Generation Compliance component.

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Effective Rules in the Cleanup Programs

The first component of Next Generation Compliance is designing effective regulations and permits. Effective regulations and permits are easier for government agencies to implement, promote routine high compliance among those regulated, and are more likely to deliver their intended health and environmental benefits.¹ Although federal, state, and tribal cleanup programs often rely on enforcement settlements and orders, components of Next Generation Compliance, such as transparency, electronic reporting, and advanced monitoring, have been incorporated as regulatory requirements by states.

Example of Regulation that Promotes Transparency Measures

- New Jersey requires responsible parties to post signs at cleanups carried out under New Jersey authorities. The New Jersey Department of Environmental Protection (NJDEP) Technical Requirements for Site Remediation (N.J.A.C.) requires responsible parties (RPs) to perform public notification and outreach beginning at the onset of the remedial investigation phase. N.J.A.C. 7:26C-1.7 provides two options for public notification: posting a notification sign at the site or sending periodic notification letters to owners and tenants within 200 feet of the site boundary. In both cases, the notification is required to summarize site conditions and describe the activities that are to take place to remediate the site, and must account for non-English speaking populations near the site. In addition, notification must include contact information for the RP and the name and telephone number for the Licensed Site Remediation Professional (LSRP) of record for the site. It also includes the NJDEP Preferred Identification number for the site. The RP is also required to submit a photograph of the notification sign to the municipal clerk of each municipality in which the site is located, as well as the county health department and the local health agency. See http://www.nj.gov/dep/srp/guidance/public_notification and http://www.nj.gov/dep/srp/guidance/public_notification/signsguide.htm.

Example of Regulation Requiring Electronic Reporting at Cleanup Sites

- California State Water Board regulations require electronic submittal of information for soil, vapor, and groundwater data from cleanup sites overseen by the State Water Board. Cleanup sites include leaking Underground Storage Tanks (USTs) sites, Military sites, Land Disposal (Landfill) sites, and Site Cleanup Program sites with uses as diverse as rail yards, ports, fuel transfer pipelines, pesticide and fertilizer facilities, manufacturing sites, and dry cleaners among others. See http://waterboards.ca.gov/ust/electronic_submittal/index.shtml.

Example of Rule Requiring Advanced Monitoring at Cleanup Sites

- Massachusetts Department of Environmental Protection requires use of remote monitoring technology at vapor intrusion sites to provide immediate notification to both the State and the owners and operators of the building upon failure of the vapor intrusion mitigation system as the result of loss of power, mechanical failure or other significant disruption of the effectiveness of the system (pursuant to 310 CMR 40.1025(3)(d) and 40.1026(3)(d), respectively). The system

¹ Hindin, D. and Silberman, J., Designing More Effective Rules and Permits, George Washington Journal of Energy & Environmental Law (Spring 2016), available at https://gwu.jeel.files.wordpress.com/2016/05/completed_jeel_vol7_issue2_designingmoreeffectiverulesandpermits.pdf.

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must be able to: communicate via text or email and immediately communicate system shutdown and restart. Each remote monitoring system must be registered. The registration process involves a system shutdown and restart communication test conducted by the State. See <http://www.mass.gov/eea/agencies/massdep/cleanup/regulations/remote-telemetry-information.html>.

Transparency in the Cleanup Programs

Transparency means making cleanup progress more visible to the public. Making information public in this way can create an added incentive for responsible parties and facilities to meet their response obligations according to the agreed upon schedule. It can also improve the accountability and performance of regulators by fostering public understanding of site progress and make regulatory decisions more visible and accessible, and can also make regulators more efficient as they can better access information to use and share. Transparency also serves to increase public awareness, strengthening the role of the public in identifying concerns and potential violations that should be addressed by regulators or through direct stakeholder action.

Transparency is not a new idea, but it has gained much more efficacy with the development of technologies that make it possible to collect and widely disseminate large amounts of information. Monitoring data can be uploaded and reported quickly on a public website, so what was once available only to parties carrying out response activities and their government overseers can be communicated to a much larger audience. Where there are opportunities to communicate information to the affected public, it is important to convey that information clearly and with the appropriate context. Consider who needs to be able to access the information or data being made transparent. For instance, is English the appropriate language for the target audience? Washington State Department of Ecology uses EPA's EJ Screen: Environmental Justice Screening and Mapping Tool² and other tools to identify linguistically-isolated populations near hazardous waste Treatment Storage and Disposal facilities. The State uses this information to provide basic information in the most widely spoken languages near facilities and has translated information into: Spanish, Korean, Vietnamese, Tagalog, Punjabi, and Russian. Non-English speakers can also call the State to ask for an interpreter when speaking to site managers.

EPA has long promoted transparency in environmental cleanup programs.³ All Superfund National Priorities List (NPL) sites and sites with Superfund alternative approach agreements have dedicated web pages with background information, links to enforcement and technical documents, cleanup status, and contact information. Some sites go further, with links to site data and community engagement opportunities. The Superfund Community Involvement Handbook provides guidance to EPA staff on implementing community involvement activities at Superfund sites.⁴ In addition, EPA's Technical Assistance Services for Communities (TASC) contract⁵ can be used to hire an expert to provide educational and technical assistance to community groups in reviewing the proposed remedies or to

² Available at <https://www.epa.gov/ejscreen>.

³ EPA, *Making Superfund Documents Available to the Public Throughout the Cleanup Process, and Discussing Site Findings and Decisions as They are Developed*, OSWER Directive #9230.0-16 (Nov. 5, 1990), available at <https://semspub.epa.gov/work/HQ/174057.pdf>.

⁴ Available at <https://semspub.epa.gov/work/11/100000070.pdf>. See also, <https://www.epa.gov/superfund/community-involvement-tools-and-resources>.

⁵ Available at <https://www.epa.gov/superfund/technical-assistance-services-communities-tasc-program>.

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hire a facilitator to establish a Community Advisory Group (CAG). In 2014, EPA issued a report titled "Community Engagement Initiative: Compilation of EPA's Activities Encouraging Community Engagement in Superfund Enforcement."⁶ It lists activities that can be considered for use, as appropriate, for more meaningful involvement of communities in the Superfund enforcement process. The report documents examples, provided by EPA Regional offices, of activities they have used in the past or other ideas to engage communities in enforcement cases.

The following examples are of Superfund transparency. There are also examples of EPA- or state-run websites designed to provide information about Superfund and RCRA cleanups to the public.

Examples of Innovative Transparency Practices at Superfund and RCRA Cleanup Sites

- Model Remedial Design/Remedial Activities (RD/RA) Statement of Work (SOW): EPA's Model RD/RA SOW has a provision which states that, "[i]f requested by EPA, [Settling Defendants] shall support EPA's community involvement activities. This may include providing online access to initial submissions and updates of deliverables to (1) Community Advisory Groups, (2) Technical Assistance Grant recipients and their advisors, and (3) other entities to provide them with a reasonable opportunity for review and comment."
 - See <https://www.epa.gov/enforcement/guidance-2014-cercla-rdra-cd-and-sow>.
- Gowanus Canal Superfund Site: EPA Region 2 provides cleanup documents to the public and PRPs at no charge. The Gowanus digital administrative record in the Superfund Enterprise Management System (SEMS) has been slated to be one of the first available through EPA's website. EPA holds monthly community outreach meetings and developed a Gowanus TEDx talk discussing the issues at the site.
 - Region 2 maintains a Facebook group page that provides updates on the site. <https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0206222> and <https://www.facebook.com/groups/195975002808/>.
- Diamond Alkali Superfund Site: EPA Region 2 has taken the following steps to keep the public informed about the investigation and cleanup of this complex multi-operable unit site and maintain meaningful public dialogue:
 - Opened CAG meetings to the public.
 - Activated a listserv, or electronic information distribution system, to quickly provide the public with timely information on project developments and news.
 - Created project websites containing project background information, frequently asked questions, project updates and news, as well as a digital library project documents and links to the partner agencies. See www.ourpassaic.org and www.ourn Newarkbay.org.
 - Established a toll-free hotline available to the public to provide recorded project information in both English and Spanish and provide connection to the appropriate partner agency representative. See: <https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0200613>.
- Tittabawassee River Superfund Site: EPA Region 5 took several steps to inform the community about the negotiation process at this site:

⁶ Available at <https://www.epa.gov/enforcement/report-encouraging-community-engagement-superfund-enforcement>.

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- Held a public meeting before the initial negotiation and outlined what was/wasn't going to be negotiated.
 - Handed out (and later posted) a summary of what was open for negotiation.
 - Posted a summary on the Site's webpage after every major negotiation outlining what had been discussed.
 - Held a public meeting after the negotiations ended to present details of the proposed settlement.
 - Used EPA's TASC contract to hire an expert to provide educational and technical assistance to community groups in reviewing the proposed agreement and to hire a facilitator to establish a CAG that would broadly represent the varied community voices.
 - EPA continues to maintain a listserv for special notice to the community and other stakeholders on activities at the site. See <https://cumulis.epa.gov/supercpad/cursites/csinfo.cfm?id=0503250>.
- **BoRit Asbestos Superfund Site:** EPA Region 3, along with partner agencies (Agency for Toxic Substances and Disease Registry, Federal Emergency Management Agency, Army Corps of Engineers, Pennsylvania Department of Environmental Protection, Pennsylvania Department of Health, Whitpain Township, Ambler Borough, Upper Dublin, Wissahickon Valley Water Association) involved in this cleanup and restoration took the following steps to engage the communities impacted by the site:
 - Shared near final site plans with the CAG for comment.
 - Established an on-line Q&A document that is periodically updated.
Held public meetings and multi-agency open house sessions. Created a 16-page newspaper insert detailing the history of EPA's work and future redevelopment plans, which is also available digitally.
 - Created project websites containing project background information, frequently asked questions, project updates and news, as well as a digital library project documents and links to the partner agencies. See <http://boritcag.org/>.
 - See <https://www.epa.gov/ambler> and <https://cumulis.epa.gov/supercpad/cursites/csinfo.cfm?id=0301842>
- **Lower Darby Creek Superfund Site:** EPA Region 3, along with partner agencies (Agency for Toxic Substances and Disease Registry, Federal Emergency Management Agency, Army Corps of Engineers, Pennsylvania Department of Environmental Protection, Pennsylvania Department of Health) involved in this cleanup and restoration took the following steps to engage the communities impacted by the site:
 - Established the Eastwick/Lower Darby CAG which meets monthly and is open to the public.
 - Shared near final site plans with the CAG for comment.
 - Provided technical support to the community using the Technical Assistance for Communities contract.
 - Held public meetings and multi-agency open house sessions.
 - Created in-the-moment videos for the community showing different aspects of the investigation.
 - See https://cumulis.epa.gov/supercpad/cursites/dsp_ssppSiteData2.cfm?id=0305521.

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- Watson Johnson Superfund Site: EPA Region 3 took the following steps to engage the communities impacted by the site:
 - Established a Facebook page to keep residents updated about site work. See https://www.facebook.com/EPAwlandfill/about/?tab=page_info.
 - Held public meetings and open house sessions.
 - See <https://cumulis.epa.gov/supercpad/cursites/csinfo.cfm?id=0301517>.
- EPA piloted community engagement efforts at federal facilities by posting and providing access to cleanup schedules and the administrative record for two sites (Fort Ord in EPA Region 9 and TVA Kingston in EPA Region 4). The current Fort Ord EPA site has a link to a website maintained by U.S. Army which has up-to-date documents with cleanup schedules. See:
 - <https://yosemite.epa.gov/r9/sfund/r9sfdocw.nsf/ViewByEPAID/ca7210020676?OpenDocument> (EPA Fort Ord Site),
 - <http://fortordcleanup.com/> (Army Fort Ord Site), and
 - <http://fortordcleanup.com/reference-documents/ffa/> (list of document schedules).
- Titanium Metals Corporation (TIMET) RCRA and TSCA CD requires TIMET, one of the world's largest producers of titanium parts for jet engines and other industrial applications, to submit all required plans, reports, or documents under the CD electronically and allow Nevada Division of Environmental Protection (NDEP) to post these documents on NDEP's website related to the cleanup of the Black Mountain Industrial Complex. See <http://www2.epa.gov/sites/production/files/2014-05/documents/timet-cd.pdf> for the CD and <http://ndep.nv.gov/bmi/timet.htm> for the NDEP website.
- Washington State's first-of-its-kind app to warn emergency responders. The new smartphone app developed and piloted by Washington allows emergency responders to access Community Right-to-Know data on what chemicals are stored at a facility and in what quantity. The app proved vital in responding to a recent wildfire that burned a warehouse containing toxic chemicals. See <http://www.ecy.wa.gov/news/2015/147.html>
- Washington State Department of Ecology (WECY) has staff regularly meet with local Tribes, neighborhood associations, and citizen groups at cleanup sites. For instance, the corrective action team for the Occidental Chemical Corporation site has met with the Puyallup Tribe, local governments, and a local environmental advocacy group before, during, and after major milestones like the completion of the draft Remedial Investigation and associated public comment period. For more information about this site, see <https://fortress.wa.gov/ecy/gsp/Sitepage.aspx?csid=4326>. At the PSC Georgetown site, before off-site remediation work was completed, WECY worked with the owner/operator and contractors to develop informational fliers in English and Spanish and distributed them to homes and businesses near the work site. The state also had the fliers available while the work was being completed in case anyone stopped by to ask about the project. For more information about this site, see <https://fortress.wa.gov/ecy/gsp/Sitepage.aspx?csid=2622>.

Examples of State and EPA Websites Providing Information about Engineering Controls (ECs) and Institutional Controls (ICs)

- EPA Region 3's RCRA Corrective Action Long-Term Stewardship (LTS) approach relies on existing guidance with the goal to assess the long term effectiveness of completed remedies. A key

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element of Region 3's LTS approach is to heighten and refresh the local community awareness of the elements of remedies and progress towards meeting performance standards. Region 3 utilizes the following approaches to encourage transparency: mapping the extent of ICs and ECs selected as part of corrective action final remedies, providing maps and information on a public website, recording maps and information into national databases, EC/IC assurance monitoring, and remaining in contact with local officials to update them on the status of the remedies and progress towards performance standards. See

<https://www.epa.gov/hwcorrectiveactionsites/corrective-action-programs-around-nation#>.

- EPA Region 1's IC/Activity and Use Limitation (AUL) Boundary Map on GeoPlatform displays Superfund NPL and RCRA CA point locations and site/facility and AUL boundaries when available in Region 1. This effort started with the goal of providing IC/AUL information to the public. Region 1 has created a boundary layer for display on the GeoPlatform. Site Profile Pages. Among other features, this map provides: the site boundary, the IC/AUL boundary, and links to Site Profile Pages with access to actual site-specific IC information and documents (decision documents, IC instruments, etc). The pilot mapping layer includes Region 1 RCRA and NPL non-federal facilities sites.
- Florida Department of Environmental Protection ICs Registry assists with tracking and enforcement of ICs by using Geographic Information System (GIS) tools to provide interactive web-based maps. See <http://dep.state.fl.us/waste/categories/brownfields/pages/ICR.htm>.

Examples of State and EPA Websites Providing Information about Superfund and RCRA Cleanups

- EPA's Cleanups in My Community Site allows communities to map and list hazardous waste cleanup locations and grant areas. Communities are able to get details about those cleanups and grants and other related information. See <https://www.epa.gov/cleanups/cleanups-my-community>.
- EPA Region 5's Disaster Debris Recovery Database Interactive Mapping Tool EPA Region 5 has developed a database of 12 types of recyclers that may manage disaster debris. This interactive map provides information and locations of over 3800 facilities throughout Region 5 capable of managing different materials which may be found in disaster debris. See https://www3.epa.gov/region5/waste/solidwaste/debris/disaster_debris_resources.html.
- California Department of Toxic Substances Control (DTSC) EnviroStor system provides all existing information on permits and corrective action at hazardous waste facilities, as well as site cleanup projects. EnviroStor allows searches for information on completed facility inspection and enforcement actions, in addition to site investigation, site cleanup, permitting, and planned, current, or completed corrective actions under DTSC's oversight. See http://www.envirostor.dtsc.ca.gov/public/mandated_reports.asp.
- Missouri Department of Natural Resources (DNR) maintains the Missouri Environmental Site Tracking and Research Tool (E-START), a public database and locator map that allows users to conduct a web-based search for hazardous substance investigations and cleanups within a specific area or by site name. Users may click on a point or area to review a site information summary which contains site history, activity limitations, and links to important site documents

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from department files. Downloadable data layers contain all displayed information, and are available for environmental professionals, local governments, and utilities to incorporate into permitting, planning and development activities. The map currently contains Superfund, federal facilities, RCRA corrective action, and brownfields/voluntary cleanup program sites. See <https://www.dnr.mo.gov/molts/gov>. ICs are uploaded by DNR through the State's Site Management and Reporting System and are exported into the E-START to be publically mapped. <http://dnr.mo.gov/env/hwp/lts.htm>.

- NJDEP's Office of Community Relations (OCR) maintains site summaries for the public. Summaries for many sites where cleanups are carried out under New Jersey authorities are available and are updated periodically when new information becomes available. The OCR staff acts as a liaison for the various involved entities to address public inquiries regarding contaminated sites in neighborhoods. OCR also maintains lists of "active" and "inactive" sites, the former are those where communication is currently ongoing with members of a community during particular phase(s) of a remediation project. See <http://www.nj.gov/dep/srp/community>.
- Wisconsin's Contaminated Lands Environmental Action Network (CLEAN) is an inter-linked system providing information on different contaminated land activities in the State to assist with the investigation, cleanup, and eventual re-use of those lands. CLEAN includes an online database of contaminated properties as well as a web-based mapping system that allows a user to view different layers of contamination data using a GIS tool. See <http://dnr.wi.gov/topic/Brownfields/clean.html>.
- Washington State Department of Ecology RCRA CA program has developed webpages for each of its RCRA CA sites. The webpages provide clear and concise information with online repositories for draft and final documents. Each webpage has the same format so the public can easily find the information they need. The site's webpage provides critical site information including: what's new at the site, site background, site contamination, cleanup status, and additional resources. See <https://data.wa.gov/Natural-Resources-Environment/Washington-State-RCRA-Corrective-Action-sites/gmzz-5mvp/alt>.
- Washington's Department of Ecology's Toxics Cleanup Program Web Reporting Portal provides a selection of reports and datasets, including a repository of information about facilities that have regulated USTs on their premises. See <https://fortress.wa.gov/ecy/tcpwebreporting/Default.aspx>.

Examples of State and EPA Websites Providing Information about USTs

- EPA's Indian Country LUST Map Service: Region 9's UST Section and GIS Team created a public map service that displays every LUST cleanup site in Region 9 Indian Country, making closure letters and other key information about nearly 300 cleanups on tribal land accessible. For more information, see http://geopub.epa.gov/R9_Tribal_Leaking_UST.
- California State Water Board's GeoTracker system provides all existing information on LUST cleanups, as well as additional site cleanup projects overseen by the State Water Regional Control Board (State Water Board). GeoTracker allows searches for information on site investigation, site cleanup, site contaminant levels, enforcement actions, deed restrictions, and

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land use covenants overseen by the State Water Board or one of California's nine Regional Water Boards. See <http://geotracker.waterboards.ca.gov>.

- Missouri DNR provides an online access database of current UST data maintained by the State. The database is searchable by facility, owner, or remediation. See <http://dnr.mo.gov/env/hwp/downloads/hwpet.htm>.

Electronic Reporting in the Cleanup Programs

In 2013, EPA issued a policy statement on electronic reporting providing:

“We are establishing a new Agency-wide policy on e-reporting that specifies in developing new regulations that we will start with the assumption that reporting will be electronic and not paper based. And we will use shared services to do this to the maximum extent possible. This Policy Statement is one important step forward in the Agency's larger E-Enterprise for the Environment Initiative.”⁷

Parties subject to cleanup orders, permits or settlements have many requirements to report information to regulators. Increasingly, this reporting is being done electronically. Electronic reporting (e-reporting) typically entails use of an electronic “smart” form or web tool that guides the regulated entity through the reporting process (simply emailing reports is not true electronic reporting).

E-reporting creates many new opportunities beyond simply streamlining the transfer of information. E-reporting reduces costs associated with paper reporting and provides regulators with more complete and timely data, allowing more effective prioritization of monitoring and enforcement actions. The websites through which reporting is done can provide feedback to reporting parties (e.g., flagging data that appear to be erroneous) and can be used as a vehicle for providing compliance information or other assistance.

In 2008, EPA's Superfund program adopted a standardized electronic data deliverable (EDD) format to streamline all new and historical environmental sampling data reported under CERCLA settlements and orders. By using EDD, EPA can minimize the amount of effort involved in inputting information and maximizing the ability to document remedy progress. EPA requires all Superfund sites to submit the environmental sampling data using EDD. For more information, see <https://www.epa.gov/superfund/epa-superfund-electronic-data-submission-multi-regions-edd>.

Examples of Electronic Reporting Requirements for Regulated Entities

- EPA's Model Geospatial Data Language for Use in SOWs: EPA issued a guidance with model language for settlements and Unilateral Administrative Orders addressing the electronic submission of geospatial data and deliverables in CERCLA SOW documents and requires that sampling and monitoring data be submitted in standard regional EDD format. The use of geospatial data in models also promotes transparency by utilizing EPA's GeoPlatform to

⁷ “E-Reporting Policy Statement for EPA Regulations,” Memorandum from Deputy Administrator Robert Perciasepe to Assistant Administrators et al., dated September 30, 2013, available at <https://www.epa.gov/compliance/policy-statement-e-reporting-epa-regulations>.

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facilitate public access to geographic based environmental information. See <https://www.epa.gov/enforcement/guidance-model-geospatial-data-language-use-cercla-sows>.

- The EPA EDD format is being adopted by EPA regions including EPA Region 2, Region 3, Region 4, Region 5, Region 7 and Region 9. For an example of an EPA Regional system to provide for such electronic deliverable reporting, see <https://www.epa.gov/superfund/region-5-superfund-electronic-data-submission>.
- EPA Region 4 developed model permit language for corrective action permits which includes the requirement for regular evaluation and reporting (usually on an annual basis) of the effectiveness of source reduction and engineering controls implemented at RCRA corrective action facilities. This compels RCRA facilities to comply with corrective action requirements and allows EPA and the States to enforce compliance with cleanup goals. EPA Region 4's model permit language also requires submission of data electronically at more complex RCRA facilities. This allows EPA and the States to conduct independent reviews of the effectiveness of cleanup at facilities.

Advanced Monitoring in the Cleanup Programs

Advanced monitoring refers to a broad range of sampling and analytic equipment, systems, techniques, practices, and technologies for better detecting and measuring pollution. Advanced monitoring includes monitors that can measure discharges from a particular source and those that monitor pollutants in the ambient environment. Advanced monitoring at a cleanup site could refer to technologies such as remote sensors or monitors that send immediate real-time alerts of limit exceedances (groundwater, VOCs, particulate matter, etc.) to the potentially responsible party, EPA, and/or the public.

Advanced monitoring technology is generally defined by one or more of these factors:

- Not yet in widespread use in a particular sector or particular regulatory program;
- Monitors pollutants on a real-time or near real-time basis, often without lengthy lag times for laboratory analysis;
- Less expensive, easier to use, or more mobile compared to technologies currently in widespread use;
- Provides acceptable data quality that is more complete or easier to interpret and can meet a specific need; and/or
- Is an existing technology but used in a new way to provide better information on pollutants, pollution sources, or environmental conditions.

Advanced monitoring can provide communities and individuals with real-time information about pollution that affects them. Such technologies have been used by regulators and communities to better identify significant pollution and noncompliance problems. For instance, at many RCRA facilities throughout the U.S., remote monitoring is used to detect pollutant discharges and control corrective action systems operating in remote locations. The advanced monitoring examples below include such technologies as visualization software, remote water monitoring, and continuous air monitoring with automatic alarms.

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The Superfund program has resources that promote and identify technologies that can be used for cleanup. These resources include the Contaminated Site Cleanup Information website (Clu-IN) and the Superfund Technology Liaisons and the Technical Support Centers. Clu-IN includes a library of advanced monitoring technologies.⁸ It is organized by cleanup of individual contaminants and contaminant groups and emerging issues from federal cleanup programs. It includes information from state sources, universities, nonprofit organizations, peer-reviewed publications, and public-private partnerships. It has an ongoing series of internet seminars on technical topics related to hazardous waste characterization, monitoring, and remediation (with an archive library extending back 16 years).

The Superfund Technology Liaisons and the Technical Support Centers provide technical support for Superfund, RCRA, and brownfields site issues.⁹ The information provided includes field evaluation and demonstration of innovative technologies, verification of externally acquired data, and development and testing of management techniques and disposal practices. EPA's Office of Land and Emergency Management (OLEM) and the Office of Research and Development (ORD) jointly fund the various centers that provide most of this expertise.

Examples of Advanced Monitoring Technologies, Programs, and Applications

- EPA's Environmental Response Team (ERT)'s Conceptual Site Models use direct sensing tools, information technology and visualization software, and distance collaboration platforms to make well informed decisions faster and cheaper. The direct sensing tools are able to rapidly capture remedial investigation objectives by using contaminant and matrix sensors. These sensors are able to identify spatial distribution, the nature and extent of the contamination, and ERT is able to capture, share, and evaluate data while the team is in the field. See <https://www.epa.gov/ert/environmental-response-team-ert-remediation>. For example, at the Wyckoff Harbor Site, ERT used this tool to reduce site cost estimates from \$200 million to \$80 million through high resolution characterization of borings on the site.
- Trace Atmospheric Gas Analyzer (TAGA) is a self-contained mobile laboratory capable of real-time analysis of indoor air vapor intrusion and outdoor air emissions. The instrumentation refers both to the analytical instrument and the mobile laboratory built around it. TAGA laboratories have supported the Agency on numerous and varied responses, projects, developments, preparedness activities and deployments including the Paulsboro train derailment, the Deepwater Horizon oil spill, and the Hart Senate Office Building anthrax fumigation. See <https://www.epa.gov/ert/environmental-response-team-trace-atmosphere-gas-analyzer-taga>.
- VIPER is a system that ERT developed and launched in 2011. VIPER was built to handle the unique volume and frequency inherent to sensor data utilizing federal standards. VIPER provides real time monitoring data. It can process data for comparison to human health benchmarks and immediately determine exceedances and then notify users of exceedances. ERT/Superfund program has the ability to place air monitors in a community after a release through its VIPER system. The monitors can be used by the project team to provide screening data on the types of pollutants a facility emits. ERT has deployed Viper on over 200 removal and remedial sites in the

⁸ See <https://clu-in.org/>.

⁹ See <https://www.epa.gov/superfund/superfund-technical-support-and-resource-centers> and <http://www.epa.gov/osp/regions/liasons.htm>.

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regions. ERT is adapting parts of the model for further implementation in the Remedial program and looking at opportunities to assist other programs. See <https://www.epa.gov/ert/environmental-response-team-ert-air-monitoring>.

- SNAPPER is a program developed by ERT to will allow air samples to be taken by remote triggering so responders can take a sample without being in harm's way. SNAPPER uses Summa sampling pumps which can be automatically triggered to take a lab-ready sample based on an exceedance shown by monitoring data or a nuisance complaint. See <https://www.epa.gov/ert/environmental-response-team-ert-air-monitoring>.

- EPA Region 9 laboratory staff have developed remote environmental monitoring capabilities to monitor water quality from a distance. Using off-the-shelf technology, staff use remote monitoring systems consisting of a multi-function water quality instrument, solar panels to power the system, and satellite telemetry hardware to transmit the data to a secure website. Water quality parameters may include pH, temperature, electrical conductivity, dissolved oxygen, oxygen-reduction potential, turbidity, chlorophyll, blue-green algae, ammonia, nitrate, and chloride. The parameters monitored depend on the specific needs of the project. These remote monitoring systems are currently deployed at several Superfund sites, two of which are described in more detail below.



Region 9 remote monitoring equipment at Sulphur Bank

- Sulphur Bank Mercury Mine Superfund Site in EPA Region 9: At the Site, the flooded Herman Impoundment is a 23-acre, 90-foot deep former open pit mercury mine separated from Clear Lake by an estimated 500,000 – 1,000,000 cubic yards of waste rock known as the Waste Rock Dam. During times of exceptionally high precipitation, the water level in the Herman Impoundment can rise high enough to overtop the Waste Rock Dam. EPA installed remote monitoring equipment and an automatic sampler to provide advance warning of water level rise and to collect a sample immediately if overflow begins. EPA worked with the Army Corps of Engineers to develop a sampling and response plan to establish baseline, pre-event, and overflow conditions, and will further model behavior of a potential overflow once current water quality data are collected from baseline sampling. Remote monitoring information is available at <http://stormcentral.waterlog.com/public/usepar9>.
- Leviathan Mine Superfund Site in EPA Region 9 is an abandoned open-pit sulfur mine south of Lake Tahoe with a history of acid mine drainage (AMD) into several mountain streams. At 7,000 feet in the Sierra Nevada and more than ten miles from paved roads or power lines, the area is nearly inaccessible for four to six months of winter. The acidic water mobilizes metals such as arsenic, nickel, zinc, chromium, and copper, which are harmful to aquatic life. Several collection and treatment systems treated nearly 40 million gallons of AMD in 2011, but some temporary systems cannot operate during winter months and break downs can occur throughout the year. Region 9's remote monitoring system is used at this Site to track water quality on an hourly

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basis year round in three streams impacted by the mine. The satellite telemetry hardware sends the water quality data to a secure website where users can download and evaluate the information. The primary water quality parameters monitored at Leviathan Mine are pH, a measure of acidity, and electrical conductivity, which is a broad measure of salt (metals) in the water. In addition to routine monitoring, the Leviathan Mine system sends an email alert to Region 9 Lab staff when threshold values for pH or electrical conductivity are exceeded. Remote monitoring information is available at <http://stormcentral.waterlog.com/public/usepar9>.

- Standard Chlorine Superfund Site in EPA Region 3: At this Site, the Region relocated a pile of contaminated soil with high levels of volatile organic compounds (VOCs) and a strong mothball-like odor. In a coordinated effort with ERT, the Region obtained five AreaRAE--transportable, wireless multi-gas monitors—designed to monitor VOC levels at the perimeter fence line to ensure unsafe levels did not leave the Site. The AreaRAEs transmitted data in real time to a central database managed by ERT, and ERT's VIPER was used to send automated notifications to Site personnel in the event of a VOC alarm level exceedance. The alarm levels were set lower than the VOC exceedance level. These notifications allowed personnel to take appropriate action to reduce the VOC levels. The Remedial Project Manager (RPM) and other site personnel were able to monitor the VOC levels in real time using their smartphones and laptops regardless of location, allowing the RPM to respond immediately to questions from the local community and provide data upon request. See <https://cumulis.epa.gov/supercpad/cursites/csinfo.cfm?id=0300058>.
- Harbor Point (former Allied Signal RCRA facility) in Baltimore, MD. Construction for Phase I of the RCRA redevelopment project included 24/7 air monitoring with information sent to a public website. The website also showed any response actions deemed necessary due to the air monitoring results (<http://harborpointbaltimore.info>). The real-time monitors were set to sound an audible alarm in the event the Total Particulate Matter action level was exceeded, providing immediate feedback to workers as to when dust levels might require additional controls. A report describing this project is available at http://mde.maryland.gov/programs/Land/RecyclingandOperationsprogram/CountyCoordinatorResources/Documents/HPD_Air%20Monitoring%20QAPP_FINAL_2014-03-04_APPROVED.pdf.
- The Supervisory Control and Data Acquisition system, which operates using signals over communication channels to monitor and control corrective action systems, is being evaluated for use at the Reichhold facility in Gulfport, Mississippi, a closed RCRA facility with an operating corrective action system. Utilization of remote monitoring and control at this facility would allow enhanced monitoring of contaminant discharges and operational variables (such as diffuser air flow and hydraulic pumping rate), ultimately reducing response time and saving money.
- In the Matter of: Unified Grocers (Seattle, WA) On September 23, 2015, EPA Region 10 and Unified Grocers, Inc., entered into an administrative settlement to resolve numerous violations at the company's ammonia refrigeration warehouse and distribution facility of chemical release reporting violations under the CERCLA and Emergency Planning and Community Right to Know Act (EPCRA) and Clean Air Act (CAA) Section 112(r) Risk Management Program. The settlement required Unified Grocers to pay an \$110,200 penalty and spend more than \$180,000 on a Supplemental Environmental Project to install an enhanced ammonia detection system at the

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facility. The system includes numerous ammonia sensors and warning devices and uses modern information technology to provide for emergency notification to offsite personnel to make information about pollutant releases available to the personnel closer to real time.

<https://www.epa.gov/newsreleases/unified-grocers-settles-epa-claims-delayed-reporting-ammonia-release-risk-management>.

Innovative Cleanup Enforcement

Innovative enforcement techniques can use Superfund and RCRA cleanup authorities and policies to prevent future Superfund sites from developing. Innovative enforcement combines the lessons learned in implementing Next Generation Compliance to more effectively and efficiently track compliance with settlements while supporting new approaches to improve compliance. The examples of cleanup settlements and orders throughout this document demonstrate how Next Generation Compliance can be incorporated into enforcement, usually demonstrated by one or more of these key features: (1) use of a practice or requirement that is not yet commonly included in most settlements; (2) use of modern information technology and/or advanced technology so that information about pollutants and their qualitative levels is available closer to real time, is more accessible, and is more complete; and (3) use of approaches to provide an effective structure for the settling party to comply with settlement requirements without increasing the EPA's oversight burden.

In addition, EPA's Office of Site Remediation Enforcement (OSRE) and EPA regions have developed model settlements and UAOs to support Superfund and RCRA cleanup enforcement staff. The models are used in conjunction with Agency policy and guidance documents and are intended to assist EPA employees by identifying basic legal and factual provisions necessary for settlement. The models incorporate Next Generation components such as electronic reporting and transparency, as described in the sections above.

Additional Resources

For additional information about Next Generation Compliance, see the following documents:

- Cynthia Giles, *Next Generation Compliance*, The Env'tl. Forum, Sept.-Oct. 2013, at 22, available at <http://www2.epa.gov/sites/production/files/2014-09/documents/giles-next-gen-article-forum-eli-sept-oct-2013.pdf>.
- U.S. EPA, *NPDES, CAA, and RCRA Compendia of Next Generation Compliance Examples* (September 2016), available at <https://www.epa.gov/compliance/next-generation-compliance>.
- U.S. EPA, Office of Enforcement and Compliance Assurance, *Use of Next Generation Compliance Tools in Civil Enforcement Settlements* (January 2015), available at <http://www2.epa.gov/sites/production/files/2015-01/documents/memo-nextgen-useinenfsettlements.pdf>.