

Water Contamination Incident Remediation Plan (WaterCIRP)

Guide and Template for Drinking Water and Wastewater Utilities

[Department/Agency Name]

[Department/Agency Address (Street, City, State, Zip Code)]

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Water Contamination Incident Remediation Plan (WaterCIRP) Guide and Template

This guide, and accompanying template, describe the components needed to develop a comprehensive Water Contamination Incident Remediation Plan (WaterCIRP). A WaterCIRP can be used by drinking water and wastewater utilities to detail how remediation actions will be implemented, monitored, and evaluated for effectiveness during water contamination incidents (refer to the red box in Figure 1 from *EPA's Distribution System Contamination Incident Action Checklist*). Given the variability among the potential contamination incidents, the template is formatted to enable water systems flexibility to modify and adapt their WaterCIRP, as needed.





This guide and template assume that: 1) initial site characterization has been completed and contamination has been confirmed, 2) the contaminant has been identified, 3) the extent of contamination has been characterized, and 4) remediation actions such as water treatment and infrastructure decontamination are required. However, where there is a confirmed contamination incident without a complete characterization of the substance(s), this guide and template can still be used in tandem with other response documentation.

This a living document and will be updated as additional information becomes available and to document operational strategies based on lessons learned and best practices of remediation efforts. This document is intended to guide remediation actions to respond to contamination emergencies, it would not typically be used when addressing routine localized aesthetic, taste, or odor issues.

If there are multiple remediation activities, or if different remediation plans are needed to address each portion of the contaminated areas (i.e., source water, distribution system, etc.), Section 2.0 Remediation Plan(s) may be replicated for each remediation plan.

Remediation activities described within this guide are dependent on the type and extent of contamination as well as the utility's resources and jurisdictions. This guide does not supplant any individual federal, state, and local regulatory and/or reporting requirements. Water incident response and recovery activities and decisions are not always performed solely by a water utility; a variety of organizations may be involved. Remediation decisions should be made in conjunction with the appropriate and required response and/or regulatory organizations that possess jurisdiction over aspects of the incident. Technical assistance through industry and/or partner organizations may also be necessary to inform remediation actions, operational responses, and risk communication activities.

During a contamination incident, remediation action decision-making and/or response objectives may be informed or guided by federal, state, local, tribal, or territorial (SLTT) public health and/or environmental organizations as part of an Incident Command or Unified Command (IC/UC). Incident Command System (ICS) resources can be found via the following <u>EPA link</u> and/or <u>FEMA link</u>. Utilize relevant ICS and National Incident Management System (NIMS) documentation and command management structures to support the WaterCIRP and its facilitation during an incident. Relevant <u>ICS</u> forms can be used to develop a common operating picture and an Incident Action Plan. This Water Contamination Incident Remediation plan would be attached to the incident management team plan or IC/UC full incident action plan to represent the strategies and tactics being implemented for contamination remediation.

During response activities, it is critical to ensure consistent coordination and updating/issuing risk communication/public notification with the public information officer as remediation actions are implemented. <u>Public notifications</u> should constantly be assessed during remediation to ensure the public is aware of progress toward clearing the system for normal use. The drinking water and wastewater utility should coordinate issuing notices with the primacy/regulatory agency and public health authorities and keep customers informed of activities that could impact them.

In addition to the development of a WaterCIRP, incident-specific documents including the Health and Safety Plan (HASP), Sampling and Analysis Plan (SAP), Quality Assurance Project Plan (QAPP), and Waste Management Plan (WMP) may need to be developed. As remediation progresses, the WaterCIRP, HASP, SAP, and WMP should be reviewed and updated as needed. The appendix contains additional information on the HASP, SAP, QAPP, and WMP.

1.0 Incident Description

This section describes background information about the incident and contamination information, determined during characterization, that is used to develop and implement remediation actions.

1.1 Incident Background

- Provide a <u>description of the incident</u>. Include (1) name of contaminant(s) that entered the system, (2) how much contaminant entered the system (if known), (3) time and date contamination was detected, (4) how and when the contaminant was detected, (5) number and types of customer complaints, (6) initial water quality analytical results, (7) if known, how the contaminant was introduced into the system, (8) system operations since the beginning and during the contamination incident, (9) operational responses to limit the movement of contaminated water or wastewater (such as closed valves, isolated tanks, or other actions to hydraulically isolate areas of the system), (10) other response actions taken including implementation of the Incident Management System and coordination with response partners, (11) risk communication measures and public notifications regarding contamination such as "Do Not Drink" or "Do Not Use Order") orders, and (12) measures taken to provide an emergency water source (e.g., bottled water, tanker trucks).
- List/identify the <u>roles, responsibilities, and contact information</u> for utility staff and external partner organizations (e.g., primacy agencies, federal, SLTT public health and/or environmental organizations, emergency responders, contractors, technical assistance providers) involved in/consulted on the response to this point.

The incident background can be entered into the template, and, if needed, supplemental information (e.g., map of contaminated area) can be attached to the WaterCIRP.

1.2 Contaminant Characteristics and System Components Affected

- Describe <u>contaminant characteristics</u> and possible interactions with infrastructure materials.
 Include information such as (1) the Maximum Contaminant Level, if one exists, and (2) health impacts.
 - This information may be provided by the responsible party (i.e., entity that created the contamination) or appropriate regulatory body that has oversight of the facility.
 - → A helpful resource includes EPA's <u>Water Contaminant Information Tool (WCIT</u>), a database with information on over 800 drinking water and wastewater contaminants, including pathogens, pesticides, and toxic industrial chemicals. WCIT users must register and be approved for a WCIT account.

Attach the contaminant's **Safety Data Sheet** and other relevant background information as an appendix to the WaterCIRP.

List **public health and environmental risks** of the contaminant at concentrations detected.

Identify any <u>statutory and regulatory requirements</u> surrounding the contaminants and any aesthetic levels (taste, odor, color) that might make the water undesirable for use.

- This information should come from the appropriate regulatory body.
- List changes in water use restrictions (i.e., a change from "Do Not Use" to "Do Not Drink" or allowing use for fire suppression only).
- Describe approximate boundaries or **areas of contamination/system components affected** and, if applicable, prioritization of affected areas. Include maps and/or hydraulic models of impacted area and pictures, if available. This can include:
 - Drinking Water source water; raw water transmission pipe; treatment facilities; water within the distribution system; distribution system pipes; pumping facilities; finished water storage; premise plumbing; interconnections with other water systems, etc.
 - Wastewater wastewater within the effluent collection system; sewage collection system pipes; collection system overflows; lift stations; treatment facilities; meter vaults; combined sewer and storm water storage facilities, etc.
- List the potential **<u>number and types of customers impacted</u>**.
- List/identify the **roles, responsibilities, and contact information** for utility staff and external partner organizations (e.g., primacy agencies, federal, SLTT public health and/or environmental organizations, emergency responders, contractors, technical assistance providers) involved in/ consulted in the decision-making process.

2.0 Remediation Plan(s)

This section describes the determination, development, implementation, and evaluation of remediation actions for treatment of the water and decontamination of the system, including infrastructure and disposal options. It may be necessary to identify and implement multiple remediation actions and methods to address each of the contaminated areas. In addition, the sampling and analysis approach may change based on the goal of the sampling (e.g., determining extent of contamination versus efficacy of the remediation actions).

2.1 Remediation Objectives

Determine remediation objectives – the intent of the actions used to remediate the system, and state what the cleanup will accomplish, including whether the intent is for the water to be safe to drink/use (for drinking water) or to meet environmental standards (for wastewater). Describe system constraints that may affect the remediation objectives. Incidents can involve multiple contaminants of concern that may be difficult to evaluate using a single method.

 Consider what will serve as the indicator(s) of contamination when developing objectives. Consult with the appropriate entities such as primacy agencies, federal, SLTT public health and/or environmental organizations, emergency responders, contractors, technical assistance providers, and consider the following resources and requirements when determining what the objectives should achieve:

- → <u>Safe Drinking Water Act (SDWA)</u> requirements including <u>Maximum Contaminant Levels</u> (MCLs).
- → <u>National Pollution Discharge Elimination System (NDPES)</u> Permit Requirements.
- → <u>Radiation Protective Action Guides (PAGs)</u>.
- → Agency for Toxic Substances and Disease Registry (ATSDR).
- \rightarrow Public health and regulatory agency requirements for <u>unregulated contaminants</u>.
- → Federal, state, local, tribal, or territorial public health and/or environmental regulatory requirements.
- \rightarrow Any other applicable federal, SLTT regulatory requirements.
- Determine the <u>clearance goals</u> for each contaminant (i.e., contaminant concentration at which the system may be returned to normal service and advisories removed). Consider:
 - Public health and environmental risks
 - Regulatory levels
 - Aesthetic concerns
 - Public perception
- □ Identify tentative timelines for <u>near-term (i.e., hours and/or days) and long-term goals</u>.

2.2 Remediation Action(s) Identification and Development Phase

- □ Identify and select possible <u>remediation action(s) and strategies</u> to be taken based on established objectives. Remediation is the process of removing or limiting the effect of a contaminant that has entered the drinking water or wastewater system. Remediation actions may include:
 - Water treatment, the addition of chemicals, physical removal such as filtration or adsorption conducted to remove the contaminant from drinking water and wastewater or to decrease the concentration to an acceptable level.
 - Removal, transportation, and disposal of contaminated water from within the system.
 - Distribution system flushing, the discharge of water out of the entire drinking water or wastewater system or part of the system. Routine flushing is recognized as a best management practice to maintain distribution system water quality. During remediation, flushing may be considered to discharge contaminated water.
 - Infrastructure decontamination, the removal or treatment of contaminants that are adhered to physical infrastructure.
 - Infrastructure replacement, the removal, disposal, and replacement of some portion of the utility's physical infrastructure that was affected by the contaminant(s).
 - Premise plumbing should also be evaluated and addressed in parallel with remediation of the water system.

Resources that could be used when selecting remediation actions include:

→ EPA's <u>Science Models and Research Tools (SMaRT</u>), a searchable inventory of models, tools, and databases from EPA's Office of Research and Development.

- → EPA's <u>Water Treatability Database</u>, a searchable database containing referenced information gathered from thousands of literature sources on the treatment of over 120 individual drinking water contaminants.
- → Consultation with regulatory agencies or subject matter experts (i.e., American Water Works Association [AWWA], Water Environment Federation [WEF], Water Information Sharing & Analysis Center [WaterISAC]).
- □ Identify the **benefits and feasibility** of each potential remediation action.
- Coordinate with the appropriate entities such as primacy agencies, federal, SLTT public health and/or environmental organizations, emergency responders, contractors, technical assistance providers to ensure that remediation action will be in compliance with **applicable regulations** and/or will not incur enforcement actions.
- Develop and document the **remediation strategies**. Consider the following:
 - Processes and procedures necessary for implementation.
 - Monitoring and evaluation criteria to assess the success of each remedial action.
 - Operational constraints.
 - Potential limitations of the remedial action(s).
 - Near-term and long-term actions.
 - Evaluate remediation actions and approaches using tools/resources (e.g., modeling).
 - Confer with subject matter experts and regulatory entities.
 - Identify contingencies.
 - Document signatories on the final strategies.
 - Develop a Clearance strategy to confirm overall success of remediation actions (refer to Section 3.0 Clearance/Return to Service).

Attach the final *remediation strategies and supporting data* as an appendix to the WaterCIRP.

□ List **roles and responsibilities and contact information** for utility staff and external partner organizations involved (e.g., primacy agencies, federal, SLTT public health and/or environmental organizations, emergency responders, contractors, technical assistance providers, industrial hygienists, health and safety personnel, laboratories).

2.3 Sampling and Analytical Approach

- Describe worker <u>safety measures</u> and practices, such as use of appropriate PPE (e.g., safety gear), monitoring, and other safety controls. EPA provides an outline on the four levels of PPE.
- Determine and provide an overview of <u>sampling and analysis approaches for both the</u> remediation and clearance phases including:
 - Sampling procedures for both field and laboratory analysis.
 - Field analytical methods.
 - Laboratory analytical methods.
 - Laboratories providing analytical support.
 - → More than one laboratory may be required to support sampling and analysis. EPA's <u>Water Laboratory Alliance</u> provides a nationwide network of laboratories designed to provide analytical support during contamination incidents that may exceed utility laboratory capability and capacity.
 - → Laboratory certification for analysis of unregulated contaminants is generally not available through the state. Therefore, it may be necessary to work with laboratories

that are qualified but not certified. For additional information, EPA provides the <u>Sampling Guidance for Unknown Contaminants in Drinking Water</u>.

- If applicable, evaluate the need for expedited sampling support. Describe the <u>availability</u> and immediate support for lab analysis to provide timely results for decision making <u>needs</u>. This could include potential expedited escorts, air transportation, or on-site analysis that may assist with timely sample results.
- QA/QC details for the selected sampling and analysis approaches and updates to the incident QAPP with the requirements. Inform any laboratories receiving samples of the requirements. Include a reference to the QAPP in the WaterCIRP.
- Describe shipping and <u>Chain-of-Custody form requirements</u>. This may include (1) conditions for transportation and storage of samples, (2) tracking numbers, (3) how to maintain and manage Chain-of-Custody requirements, (4) where to deliver or ship samples, and (5) instructions for sample and records retention.
- Attach the following **<u>sample collection forms</u>**, as appropriate:
 - Map with sampling locations identified, if available.
 - Chain-of-Custody form.

• Site characterization form (e.g., field measurements).

List **roles and responsibilities and contact information** for utility staff and external partner organizations involved (e.g., primacy agencies, federal, SLTT public health and/or environmental organizations, emergency responders, contractors, technical assistance providers, industrial hygienists, health and safety personnel, laboratories).

The sampling and analytical approach section of the WaterCIRP will provide high-level information. Additional details will be provided in the incident-specific HASP and SAP. Refer to the Appendix for additional guidance on developing the HASP and SAP.

2.4 Water Remediation Actions

- Describe worker <u>safety measures</u> and practices, such as use of appropriate PPE (e.g., safety gear), monitoring, and other safety controls. EPA provides an <u>outline on the four levels of PPE</u>.
- Describe <u>remediation action(s)</u> that will be used. Include rationale that supports the selected remediation action(s), uncertainties or contingency measures with selected action(s), and any consultation or comments from regulatory agencies or subject matter experts (i.e., utility consultants, AWWA, WEF). Consider:
 - Potential public health and environmental impacts associated with remediation activities.
 - Compliance with applicable regulations.
 - Whether remediation actions will potentially incur enforcement actions.
 - Benefits and consequences of each remediation action.
- Identify parameters that will be measured to monitor and assess removal efficacy and the impact of the remediation action(s) on water quality:
 - Contaminant or surrogate concentrations.
 - Byproduct levels.
 - Water quality parameters (e.g., pH, total organic carbon, turbidity, chlorine residual, dissolved oxygen).
- List **remediation action sequence of operations**. Consider the following:
 - Site preparation and permitting (what is needed, applicable permits from which agencies).

- Evaluate the availability of resources (e.g., equipment, personnel), if necessary, request resources from neighboring utilities and mutual aid organizations (e.g., WARN).
- Establish site security, access control, and considerations for neighborhood/impacted area.
- Consideration for power, communications, and monitoring needs.
- Timing and means of equipment delivery.
- Implementation requirements (pumps, piping, bypass equipment, sampling devices, and the need for off-site disposal facility and transport).
- List <u>roles and responsibilities and contact information</u> for utility staff and external partner organizations (e.g., primacy agencies, federal, SLTT public health and/or environmental organizations, emergency responders, contractors, technical assistance providers, industrial hygienists, health, and safety personnel).

2.5 Infrastructure Decontamination Procedures

- Describe worker <u>safety measures</u> and practices, such as use of appropriate PPE (e.g., safety gear), monitoring, and other safety controls. EPA provides an outline on the four levels of PPE.
- Describe infrastructure decontamination method(s) and/or removal/replacement approach(es). Consider:
 - Whether infrastructure decontamination generates water that must be treated and/or or removed from the system. Refer to Section 2.6 for management of any wastewater produced as part of the decontamination process.
 - If infrastructure decontamination is not effective and removal/replacement is necessary.
 - System limitations and operating conditions (such as maintaining system within a specific pressure).
- Provide the **infrastructure decontamination sequence of operations**. Determine prioritization of infrastructure, if applicable. Consider the order in which areas of the distribution system will be decontaminated and if or when customers/locations will be affected, along with any other use restrictions. Consider developing and attaching a process flow chart that depicts the order of remediation actions needed to clear each system component affected by the contamination.
- Provide the **infrastructure removal/replacement sequence of operations**. Determine prioritization of infrastructure, if applicable, and consider developing and attaching a process flow chart that depicts the order of infrastructure removal/replacement and if or when customers/locations will be affected.
- List **roles and responsibilities and contact information** for utility staff and external partner organizations (e.g., primacy agencies, federal, SLTT public health and/or environmental organizations, emergency responders, contractors, technical assistance providers, industrial hygienists, health, and safety personnel).

2.6 Waste Management and Disposal

- Describe worker <u>safety measures</u> and practices, such as use of appropriate PPE (e.g., safety gear), monitoring, and other safety controls. EPA provides an <u>outline on the four levels of PPE</u>.
- Describe <u>waste management activities</u>. Include all waste materials and liquid wastes, or byproducts generated during decontamination activities, and detail the waste management procedures used during response activities. Determine volume of waste and its feasibility to be stored, hauled, and/or treated. Waste management can include:

- In-situ containment of the water during treatment.
- Temporary storage of water (including applicable regulations, contracts, or permits).
- Transportation of the water off-site (including applicable regulations, contracts, or permits).
- Source reduction or other actions to minimize/control the volume of waste material generated.

Explain <u>waste disposal procedures</u>. Ensure the selected water treatment methods are adequate to treat water to levels acceptable for the disposal option (this includes any byproducts generated during decontamination activities). Consult destination jurisdiction and regulatory oversight agencies for protocols and sample requirements. Include:

- Final disposal locations (i.e., a water reclamation facility, groundwater or surface water discharge, solids disposal facility) and include any related disposal permits.
- Volume of material to be transferred.
- The request and receipt(s) from waste carriers and/or the disposal facility, indicating pertinent information (e.g., time, date, facility location, and volume and classification of the disposed material). Include record/document management procedures (e.g., retention requirements) for receipts from waste carriers and/or waste disposal facilities.
- List <u>roles and responsibilities and contact information</u> for utility staff and external partner organizations (e.g., primacy agencies, federal, SLTT public health and/or environmental organizations, emergency responders, contractors, technical assistance providers, industrial hygienists, health, and safety personnel).

The waste management and disposal section of the WaterCIRP will provide high-level information. Additional details will be provided in the incident-specific WMP. Refer to the Appendix for additional guidance on developing the WMP.

3.0 Clearance/Return to Service

To achieve clearance goals and return the system to normal operations, the following actions may be taken:

- Document the <u>clearance strategy</u> to confirm the overall success of the remediation actions at removing the contamination and to clear the system for normal operation. Perform additional sampling and analysis throughout the contaminated areas to verify that clearance goals and remediation objectives have been achieved.
 - Samples should be collected from across all portions of the contaminated area and include large and small diameter water mains, service lines, different pressure zones, and major system components such as storage tanks and pump facilities.
 - Depending on the incident, different sections of the system may be cleared at different times or clearance may occur gradually by allowing different uses of the water (e.g., toilet flushing, bathing, drinking).
 - Include the primacy/regulatory agency, as well as any SMEs or other stakeholders, when making final clearance decisions.
 - If sampling indicated clearance goals have not been achieved, the strategy should return to the remediation development to reassess the actions and strategies selected.
- List **roles and responsibilities and contact information** for utility staff and external partner organizations (e.g., primacy agencies, federal, SLTT public health and/or environmental organizations, emergency responders, contractors, technical assistance providers, industrial hygienists, health, and safety personnel).

Appendix: Supplemental Reference Information

Key Terms

- Characterization: Determining the extent of contamination and infrastructure affected by the • incident.
- Water Treatment: Any activity conducted to remove the contaminant from drinking water and wastewater or to decrease the concentration to an acceptable level.
- Infrastructure Decontamination: The inactivation or elimination of contaminants on surfaces.
- Clearance: The process of determining if the clearance goal(s) and remediation objectives have been • met.
- Operational Responses: Actions and strategies taken by the utility in response to a contamination incident to isolate, mitigate, treat, or remove the contaminant from the system and/or infrastructure.
- Risk Communication: Communications with response partners and the public during a water • contamination event.
- Recovery: When clearance goals and remediation objectives have been met, a water or wastewater utility may implement a long-term monitoring plan to ensure the remediation actions taken are effective in the long-term. This may include limited sampling and analysis within the affected areas and development of additional actions or strategies to further implement full return to normal and long-term recovery needs.

Health and Safety Plan

In the context of this guide, the purpose of a Health and Safety Plan (HASP) is to ensure maximum protection to workers in a way that is consistent with requirements needed to safely perform sample collection and operational efforts during remediation of a water contamination incident. Each contamination incident poses specific health hazards, and an incident-specific HASP should be available to sample collectors. For PPE guidelines, refer to OSHA 29 CFR 1910.120 Appendix B. HASPs should, at a minimum, include instructions and guidelines in accordance with OSHA regarding:

- Names, positions, and contact information of key personnel and health and safety personnel
- Site- or incident-specific risk assessment addressing sample collection activities
- Training requirements •
- Personal protective equipment (PPE) on-site and usage requirements
 - Medical screening requirements (maintain confidential documents properly and

- Site or incident control •
- Emergency response plan, containing offsite emergency contact information such as local hazardous materials response teams or additional trained rescue personnel
- Entry and egress procedures
- Spill containment •
- Personnel decontamination procedures
- securely)

An EPA On-Scene Coordinator Health and Safety Plan template can be downloaded here.

Sampling and Analysis Plan

The purpose of the Sampling and Analysis Plan (SAP) is to guide the collection of water and surface samples that will be analyzed to determine if the remediation actions are reducing the contaminant concentrations in the water and on affected system components to meet the established clearance goals. A typical SAP should include the following elements:

- Description of the system (including maps)
- Required personal protective equipment (PPE)
- Sampling objectives
- Data quality objectives
- Sampling sites and number of samples

- Laboratories to perform analysis
- Sample collection
 procedures
- Sample preservation and holding time requirements
- Field parameter testing

- Chain-of-custody
 protocol
- Laboratory analytical methods
- Quality control analyses
- Data reporting
- Sample disposal

The SAP guide and template can be accessed by clicking on this link. [To be developed]

Quality Assurance Project Plan

A Quality Assurance Project Plan, or QAPP, is a written document outlining the procedures a monitoring project will use to ensure the data it collects and analyzes meets project requirements. Typical QAPP elements that may be included when conducting sampling and analysis during remediation of water contamination may include:

• Instrument/equipment

- Sampling process design
- Sampling methods
- Sampling handling and custody
- Analytical methods
- Quality control

For more information on QAPPs, see:

consumables

•

- Non-direct measurements
- Data management

- EPA Requirements for Quality Assurance Project Plans
- Quality Assurance Project Plan Development Tool
- WLA-RP Appendices: Please see Appendix N: Short Form Quality Assurance Project Plan (QAPP) Template for Emergency Response Lab Services for Drinking Water Incidents

Waste Management Plan

The purpose of a Waste Management Plan (WMP) during remediation of a water contamination incident is to outline requirements and procedures for managing waste generated during remediation activities and sample collection. Ideally, a utility would develop or have a general WMP in place that can be used to prepare an incident-specific WMP. A WMP should be in place prior to initiation of any sample collection or remediation activities. This incident-specific plan should address federal, state, and local waste management requirements for the different waste streams. The plan should address waste characterization and waste acceptance sampling and analysis, identification of waste management facilities, on-site waste management and minimization strategies and tactics, off-site waste management, and waste transportation, health, and safety. In addition, it should address tracking and reporting of waste sampling results. State and local waste management officials should be contacted as early in the development process as possible.

maintenance Inspection/acceptability of supplies and consumables

testing, inspection, and

- For more information on WMPs, see <u>EPA's Waste Management Benefits</u>, <u>Planning and</u> <u>Mitigation Activities for Homeland Security Incidents</u>.
- Guidance on developing a pre-incident Waste Management Plan can be found at: <u>Pre-incident</u> <u>All-hazards Waste Management Plan Guidelines: Four-step Waste Management Planning</u> <u>Process</u>.
- Information on tools and other resources for managing sample collection waste can be found at <u>Managing Materials and Wastes for Homeland Security Incidents.</u>
- <u>Incident Waste Decision Support Tool</u> (I-Waste DST) provides access to technical information, regulations, and guidance to work through important disposal issues to assure safe and efficient removal, transport, treatment, and/or disposal of debris and waste materials.

Case Studies

The following highlights examples, for consideration, of real contamination incidents including the remediation responses/decisions made by the affected utility and incident responders.

In 2014, approximately 10,000 gallons of a mixture of 4-methylcyclohexanemethanol (MCHM) and propylene glycol phenyl ether (PPH) leaked from a chemical storage tank into <u>West Virginia's Elk River</u>, contaminating the potable water supply of about 300,000 West Virginia residents. Shortly after, West Virginia American Water (<u>WVAW</u>) reported contaminated water with a licorice odor had been discovered entering the distribution system. WVAW concurred with the West Virginia Bureau of Public Health, state officials, and West Virginia Governor's Office, and a do-not-use order was issued. The West Virginia Governor declared a state of emergency and requested a federal emergency declaration, along with guidance from the US Centers for Disease Control and Prevention (CDC) on a MCHM drinking water concentration that was safe for humans. CDC advised a "concentration of 1 mg/L was the appropriate screening level for a 14-day exposure." After the water treatment plant effluent MCHM concentration dropped below 1 mg/L and distribution system flushing by zone was begun, the do-not-use order began to be lifted, and the population was directed to flush the contaminated water out of their premise plumbing.

In January 2015, a damaged crude oil pipeline released approximately 31,000 gallons of Bakken crude oil into the Yellowstone River 6-7 miles upstream of <u>Glendive, MT</u>. When volatile organic compound (VOC) contamination at the water treatment plant was confirmed, the city issued a Do Not Consume advisory. Ice cover on the river caused VOC volatilization to not occur as anticipated and caused the VOCs to mix into the water, potentially reaching the depth of the water treatment plant intake. Plant operators began increasing the dosage of granular activated carbon to the water to aid treatment, added air strippers to the outside of the clear well, and covered the filter gallery to restrict VOC release within the facility. Once clean water was being produced, the WTP began filter backwashing and flushing the entire plant. Oil recovery from ice in the river was slow due to safety concerns. By the end of January, 45% of the oil had been recovered, with the remaining oil trapped in ice. To prepare for the future expected spike in VOCs in the source water in early spring due to ice melt, WTP operators prepared the presedimentation basins, clear well, and treatment units and maintained the finished water storage tanks to continuously ensure they could provide the city with treated water for up to 2.5 days.

The 2021 Marshall Fire in Colorado destroyed more than 1,000 homes and businesses, displaced over 40,000 people, and damaged six public drinking water systems. The fire caused all water systems to lose power. Boil water advisories were issued by the Colorado Department of Public Health and Environment

(CDPHE) within the first 24 hours. Each public drinking water system had varying distribution system infrastructure and experienced varying amounts of structural damage, and subsequently water pressure reductions and water loss. All water systems first focused on assessing damage to their systems, then flushing water to ground or storm drains, and re-pressurizing their water distribution systems. In two of the six water systems, system-wide flushing usually took four to six weeks; however, neighboring water systems provided mutual aid that enabled flushing to be completed within four, 24-hour working days. Additionally, the state drinking water primacy agency required coliform and disinfectant residual sampling, and when no coliform contamination was found, the boil water advisories were lifted and premise plumbing flushing guidance was given by CDPHE. Two weeks following the wildfires, VOC contamination was found in isolated parts of the distribution system at two water systems. VOC levels decreased during weeks of water main and service line flushing based on VOC surveillance monitoring.

Water Contamination Incident Remediation Plan (WaterCIRP)

for

[Site/Incident Name]

Prepared by:

[Name and Address of Organization/Utility]

Prepared for:

[Name and Address of Utility]

	Name/Position	Signature	Date
Prepared by:			
Reviewed by:			
Reviewed by:			
Reviewed by:			
Approved by:			

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1.1 Incident Background

Description of the incident:

Roles, responsibilities, and contact information:

Organization	Responsibilities	Primary Contact	Contact Information
[State Primacy Agency]			
[SLTT public health/			
environmental			
organizations]			
[Emergency Responders			
(e.g., HazMat)]			
[Contractors]			
[Technical Assistance			
Providers]			

[Note: To add additional text to a cell hit "enter". To add an additional table row hit "tab".]

1.2 Contaminant Characteristics and System Components Affected

Contaminant characteristics:

[Attach the contaminant's Safety Data Sheet and other relevant background information as an appendix.]

Public health and environmental risks:

Statutory and regulatory requirements:

Areas of contamination/system components affected:

[Include the potential number and list of critical customers impacted.]

Number and types of customers impacted:

Organization	Responsibilities	Primary Contact	Contact Information
[State Primacy Agency]			
[SLTT public health/			
environmental			
organizations]			
[Emergency Responders			
(e.g., HazMat)]			
[Contractors]			
[Technical Assistance			
Providers]			

Roles, responsibilities, and contact information:

[Note: To add additional text to a cell hit "enter". To add an additional table row hit "tab".]

2.0 Remediation Plan(s)

2.1 Remediation Objectives

Intent of the actions used to remediate the system (e.g., water safe to use/drink, or meeting environmental objectives):

Clearance goals:

Near-term (i.e., hours and/or days) and long-term goals:

2.2 Remediation Action(s) Identification and Development Phase Remediation action(s) and strategies:

Benefits and feasibility:

Applicable regulations:

Overview of selected remediation strategies:

[Attach final remediation design and supporting data as an appendix.]

Organization	Responsibilities	Primary Contact	Contact Information
[State Primacy Agency]			
[SLTT public health/			
environmental			
organizations]			
[Emergency Responders			
(e.g., HazMat)]			
[Contractors]			
[Technical Assistance			
Providers]			

Roles, responsibilities, and contact information:

[Note: To add additional text to a cell hit "enter". To add an additional table row hit "tab".]

Water Contamination Incident Remediation Plan Signatories

Signature:	Affiliation:	Date:
Signature:	Affiliation:	Date:
Signature:	Affiliation:	Date:

2.3 Sampling and Analytical Approach

Safety measures:

Personal Protective Equipment Level:					
🗆 Level A	🗆 Level B	🗆 Level C	🗌 Level D		
LIST THE ITEMS, EXC	ample: boots and inner and	outer cnemical-resistant (gioves. j		

Sampling and analytical approaches for decontamination and clearance phases:

Sampling procedures for both field and laboratory analysis:

Field analytical methods:

Laboratory analytical methods:

Laboratories providing analytical support:

Expedited availability and immediate support for lab analysis (if applicable):

QA/QC details for sampling and analysis approaches:

Chain-of-Custody requirements (see Appendix B):

Attach the following sample collection forms, as appropriate:

- □ Sample plan/Map with sampling locations
- □ Chain-of-custody (COC)
- □ Site characterization information/form

Roles, responsibilities, and contact information:

Organization	Responsibilities	Primary Contact	Contact Information
[State Primacy Agency]			
[SLTT public health/			
environmental			
organizationsj			
[Utility Operations]			
[Emergency Responders			
(e.g., HazMat)]			
[Contractors]			
[Laboratory(ies)]			
[Technical Assistance			
Providersj			

[Note: To add additional text to a cell hit "enter". To add an additional table row hit "tab".]

For additional details related to the sampling and analytical approach, refer to the attached Sampling and Analysis Plan and Health and Safety Plan.

2.4 Water Remediation Actions

Safety measures:

Personal Protective Equipment:				
Level A	□ Level B	□ Level C	Level D	
[List the items, example: boots and inner and outer chemical-resistant gloves.]				

Water remediation action(s):

Parameters measured to monitor and assess removal efficacy and impact of the remediation actions(s) to water quality:

Sample Location	Parameter	Treatment Objective (concentration)
[Include spatial indicators as needed (address, lat/long, photos, etc.)]		

[Note: To add additional text to a cell hit "enter". To add an additional table row hit "tab".]

Remediation action sequence of operations:

Organization Responsibilities Primary Contact **Contact Information** [State Primacy Agency] [SLTT public health/ environmental organizations] [Utility Operations] [Contractors] [State and Federal Regulatory Agencies] [Treatment Technology/Method Vendor(s)] [Technical Assistance *Providers*] [Health and Safety Personnel]

Roles, responsibilities, and contact information:

[Note: To add additional text to a cell hit "enter". To add an additional table row hit "tab".]

2.5 Infrastructure Decontamination Procedures

Safety measures:

Personal Protective Equipment:				
🗆 Level A	Level B	🗆 Level C	Level D	
[List the items, example: boots and inner and outer chemical-resistant gloves.]				

Infrastructure decontamination method(s) and/or removal/replacement approach(es):

Infrastructure decontamination sequence of operations:

Infrastructure removal/replacement sequence of operations:

Organization	Responsibilities	Primary Contact	Contact Information
[State Primacy Agency]			
[SLI I public health/			
organizations			
[Utility Operations]			
[
[Contractors]			
[State and Federal			
Regulatory Agencies]			
[Treatment			
Technology/Method			
Vendor(s)]			
[Technical Assistance			
Providers]			
[Health and Safety			
Personnelj			

Roles, responsibilities, and contact information:

[Note: To add additional text to a cell hit "enter". To add an additional table row hit "tab".]

2.6 Waste Management and Disposal

Safety measures:

Personal Protective Equipment:									
🗆 Level A	🗆 Level B	🗌 Level C	🗌 Level D						
filiat that it areas and			-/1						
[List the items, example: boots and inner and outer chemical-resistant gloves.]									

Waste management activities:

Waste disposal procedures:

Sample Location	Parameter	Treatment Objective for Disposal (concentration)
[Include spatial indicators as		
needed (address, lat/long,		
photos, etc.)]		

[Note: To add additional text to a cell hit "enter". To add an additional table row hit "tab".]

Roles, responsibilities, and contact information:

Organization	Responsibilities	Primary Contact	Contact Information
[State Primacy Agency]			
[SLTT public health/			
environmental			
organizations]			
[Utility Operations]			
[Contractors]			
[State and Federal			
Regulatory Agencies]			
[Technical Assistance			
Providers]			
[Health and Safety			
Personnel]			

Organization	Responsibilities	Primary Contact	Contact Information
[Disposal Facility]			
[Waste Transport Vendor]			

[Note: To add additional text to a cell hit "enter". To add an additional table row hit "tab".]

For additional details related to waste management and disposal, refer to the attached Waste Management Plan.

3.0 Clearance/Return to Service

Clearance strategy:

Roles, responsibilities, and contact information:

Organization	Responsibilities	Primary Contact	Contact Information
[State Primacy Agency]			
[SLTT public health/			
environmental			
organizations]			
[Utility Operations]			
[Contractors]			
[State and Federal			
Regulatory Agencies]			
[Technical Assistance			
Providers]			

[Note: To add additional text to a cell hit "enter". To add an additional table row hit "tab".]

Water Contamination Incident Remediation Plan Signatories

Signature:	Affiliation:	Date:
Signature:	Affiliation:	Date:
Signature:	Affiliation:	Date:

Appendix A: Acronym List

EPA	Environmental Protection Agency
SAP	Sampling and Analysis Plan
HASP	Health and Safety Plan
WaterCIRP	Water Contamination Incident Remediation Plan
SDWA	Safe Drinking Water Act
WMP	Waste Management Plan

[Note: To add additional text to a cell hit "enter". To add an additional table row hit "tab".]

Appendix B: Example Chain-of-Custody Form

Chain-of-Custody							stody F	orm							
Site/Incident Name:					Laboratory:										
Field Sampling Team Lead Name:					Laborato	ry Cont	act Na	ame:							
Contact Info	Contact Information:				(Contact Information:									
Sample ID (location, description, etc.) Collection Date/Time (24 h) Matrix (drinking v untreated soil, etc.)		Matrix (drinking water, untreated water, soil, etc.)	Type (grab/ composite)	Preservative((s)	No./Type of Bottles		Analyses Requested				Comments			
				<u> </u>											
Samples Re	linquished E	Зу				Sam	nples Rec	eived I	Ву						
Date	Time	Name (print)		Signature		Dat	e	Time		Nam	e (print)		Signat	ure	
Method of S	Sample Tran	sport:													
Shipper: Phone No.:						Sh	nipper	's Tracking No	D.:						

[Note: To add additional text to a cell hit "enter". To add an additional table row hit "tab".]