CRITICAL INFRASTRUCTURE PARTNERSHIP ADVISORY COUNCIL

WATER SECTOR DECONTAMINATION WORKING GROUP

RECOMMENDATIONS AND PROPOSED STRATEGIC PLAN

WATER SECTOR DECONTAMINATION PRIORITIES

FINAL REPORT

AUGUST 2008

Critical Infrastructure Partnership Advisory Council
Water Sector Decontamination Working Group

June 30, 2008

Members of the Water Sector Coordinating Council and Government Coordinating Council:

On behalf of the CIPAC Water Sector Decontamination Working Group, we are pleased to submit the results of the group's deliberations: *Recommendations and Proposed Strategic Plan: Water Sector Decontamination Priorities* to the members of the Water Sector Coordinating Council (SCC) and Government Coordinating Council (GCC). This letter serves as our official transmittal of the Work Group's final product. As the Co-Chairs representing the GCC and SCC on this working group, we would like to thank you for the opportunity to serve as leaders of this esteemed group of professionals.

The attached recommendations and proposed plan are the result of 6 months of structured, facilitated discussions among the Working Group members representing the GCC and SCC, aided by subject matter experts, EPA staff, and a facilitation team. These discussions—and the resulting report—were conducted in compliance with the Working Group's charter, as approved by the GCC and SCC.

As indicated in the report, the Working Group identified and prioritized key issues for the water sector in addressing the decontamination of water systems, and provided recommendations to address these issues. These recommendations serve as the backbone of the strategic plan embedded in the report. The Working Group believes that implementation of these recommendations will improve the water sector's ability to meet decontamination challenges.

As specified in the approved charter, the Working Group proposed lead organizations to take action on each recommendation and proposed a time frame for completion based on relative priority and complexity of the effort. These proposed organizations, in particular, are intended for consideration by the GCC and SCC, and should not be considered to be inflexible. Similarly, the issues and recommendations documented by the Working Group should not be viewed as exhaustive; they reflect those that the Working Group believed were the most pressing for the Water Sector. It should be noted that asset and financial resources necessary to carry out these recommendations were not addressed by this Working Group. No assumption should be made that the suggested coordinating organizations have the people or funding to implement the Working Group's recommended actions.

As the CIPAC Water Sector Decontamination Working Group Co-Chairs, we would like to recognize all of the Working Group members for their hard work and thoughtful perspectives throughout the 6 months of deliberations. Looking forward, we greatly appreciate the efforts of the organizations that will embrace the challenge of taking action on these recommendations, which we consider critical to improving water sector decontamination and recovery capabilities.

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DISCLAIMER

This document is a report recommending the water sector's proposed decontamination strategy. This is not a U.S. Environmental Protection Agency (EPA) report. The recommendations and views expressed do not necessarily reflect those of the EPA. This report does not establish EPA policy and does not obligate the federal government to take any actions.

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EXECUTIVE SUMMARY

This report presents the recommendations of the Critical Infrastructure Partnership Advisory Council (CIPAC) Water Sector Decontamination Working Group. This Working Group was convened by the Water Sector Coordinating Council (SCC) and Government Coordinating Council (GCC) to develop a strategy and plan that supports priorities for water sector decontamination and recovery for the purpose of water security. The Working Group was composed of seven SCC representatives and seven GCC representatives. Five subject matter experts and eight representatives of the U.S. Environmental Protection Agency (EPA) also supported the Working Group in their discussions, but were not involved in decision making.

The Working Group's charter established seven objectives to meet this goal:

- Identify decontamination issues and needs to support drinking water and wastewater utilities and other stakeholders
- Prioritize the decontamination issues and needs, as related to water security
- Provide recommendations to address the identified needs
- Identify appropriate parties to implement these recommendations
- Provide recommendations for EPA priorities in water sector decontamination and recovery
- Identify data gaps related to decontamination of drinking water and wastewater systems needed to help restore systems to service
- Develop a strategy for water sector decontamination that identifies directions and plans for the next 3 to 5 years

The Working Group identified 16 decontamination issue categories, and ranked these issue categories in order of priority, as related to water security. The results of this process are shown in **Table E-1** below.

Table E-1: Prioritized List of Decontamination Issue Categories Identified by the Working Group

Priority	Issue Categories Raised by CIPAC Working Group
1	Containing and/or disposing of large amounts of contaminated water
2	Near-term practical solutions
3	Decontamination procedures for infrastructure in treatment plants
4	Decision-making frameworks for decontamination
5	Decontamination procedures for distribution and collection systems
6	Outreach and training to utilities, partners, and stakeholders
7	Utility communications to public officials, responders, the public and others on decontamination
8	Cleanup levels
9	Treatment procedures for contaminated drinking water and wastewater
10	Agent fate and transport
11	Clarifying roles and responsibilities for decontamination and treatment
12	Process for regulatory waivers/suspensions
13	Resources and assets for decontamination and treatment
14	Laboratory analysis
15	Health and safety assessment for drinking water and wastewater treatment plant and field staff
16	Overarching decontamination needs

The Working Group deliberated over all of these issue categories except one to provide recommendations and a strategy. In their discussions, the Working Group acknowledged that the "overarching decontamination needs" issue category contained overall needs to be considered when addressing other issue categories and recommendations.

After prioritizing the issue categories, the Working Group developed recommendations on how to address water sector needs in each category. These recommendations were not only intended to respond to the issues that were identified, but also to fill existing data gaps that prevent the water sector decontamination needs from being met. A total of 35 recommendations were identified across the 15 issue categories; these recommendations fell into four general functional categories:

- Recommendations on supporting information and capabilities
- Recommendations on decontamination and treatment methods and technologies
- Recommendations on policy decisions
- Recommendations on outreach and communications

There are substantial interrelationships and linkages among the identified recommendations. Some recommendations were necessary precursors to others; some address policy aspects of issues that other recommendations address through additional research; and some recommendations are for near-term measures to enhance decontamination capabilities while other, longer term recommendations are fulfilled.

These recommendations, organized by the issues they address, are presented in **Figure E-1**. This figure also summarizes aspects of the proposed decontamination strategic plan developed by the Working Group.

Using the recommendations, the Working Group developed a proposed water sector decontamination strategic plan for the next 5 years. The Working Group's deliberations on this planning aspect yielded the following for each recommendation:

- Specific information that the group believed should be considered when taking action on the recommendation and addressing the data gaps identified by the Working Group
- Prospective identification of the coordinating organizations that the group believed were the most appropriate to address the recommendation based on the Working Group's understanding of the roles, mission and capabilities of the identified organizations
- Prospective supporting organizations that the group believed should support the implementation of the recommendation
- The time frame the Working Group believed was appropriate for fully addressing the recommendation – Short term projects can be completed in 1 year, mid term in 3 years, and long term in 5 years

The issues, recommendations, and proposed decontamination strategic plan resulting from the CIPAC Water Sector Decontamination Working Group, and documented in this report, are intended for consideration by the members of the SCC and GCC. The recommendations on decontamination and treatment methods and technologies, in particular, are also intended for consideration by research organizations to further the state of the science in decontamination. It is the Working Group's intention that these recommendations be used as a guide to help focus the efforts of the water sector in addressing decontamination needs. It is important to note that asset and financial resource needs necessary to implement the proposed decontamination strategic plan recommendations were not taken into consideration by this Working Group. Also, when implementing the recommendations, the coordinating agencies may identify additional supporting organizations not identified by the Working Group.

Figure E-1: Prioritized Decontamination Issues, Recommendations, Appropriate Parties and Time Frame for Completion

PRIORITY ISSUE	RECOMMENDATION TO ADDRESS ISSUE	COORDINATING ORGANIZATION*	TIME FRAME FOR COMPLETION*
PRIORITY ISSUE 1 Containing and/or Disposing of Large Amounts of Contaminated Water	1. Develop a decision-making framework regarding containing or purging contaminated water	*EPA OW and ASDWA*	MID TERM
	2. Revise existing guidance or develop new guidance for containment and disposal of decontamination waste including large amounts of water and associated solid wastes	*EPA OW (WSD), NACWA and WEF*	SHORT TERM

PRIORITY ISSUE	RECOMMENDATION TO ADDRESS ISSUE	COORDINATING ORGANIZATION*	TIME FRAME FOR COMPLETION*
PRIORITY ISSUE 2 Near-Term Practical Solutions	1. Provide information on using traditional techniques (i.e., those in routine use by utilities) for non-traditional contaminants	*EPA ORD (NHSRC) (Research) and EPA OW (WSD) (Outreach)*	MID TERM
	2. Provide information on the efficacy of pipe cleaning aids, such as NSF-60-certified products, on the decontamination of infrastructure	*EPA ORD (NHSRC)*	LONG TERM
	3. Provide operational steps to minimize impact of decontamination	*AWWA (Drinking Water), NACWA and WEF (Wastewater)*	SHORT TERM
	4. Use existing information services and Web-based databases to disseminate near-term practical decontamination solutions to utilities	*EPA*	SHORT TERM

ASDWA – Association of State Drinking Water Administrators; AWWA – American Water Works Association; EPA – Environmental Protection Agency; OW – Office of Water; WSD – Water Security Division; NHSRC – National Homeland Security Research Center; NACWA - National Association of Clean Water Agencies; WEF – Water Environment Federation

* The proposed coordinating organizations and time frames assigned for each recommendation acknowledge practical considerations necessary to complete the associated activities, but do not consider the availability of resources needed to address the recommendation in the associated time frame.

Figure E-1: Prioritized Decontamination Issues, Recommendations, Appropriate Parties and Time Frame for Completion, cont.

PRIORITY ISSUE	RECOMMENDATION TO ADDRESS ISSUE	COORDINATING ORGANIZATION*	TIME FRAME FOR COMPLETION*
PRIORITY ISSUE 3 Decontamination Procedures for Infrastructure in Treatment Plants	1. Identify existing decontamination techniques (or develop new procedures) for CBR agents in treatment plant infrastructure	*EPA ORD (NHSRC)*	LONG TERM
PRIORITY ISSUE	**RECOMMENDATION TO ADDRESS ISSUE**	**COORDINATING ORGANIZATION***	**TIME FRAME FOR COMPLETION***
PRIORITY ISSUE 4 Decision-Making Frameworks for Decontamination	1. Develop a decision-making framework for the decontamination of CBR agents in water systems specifically to be used by utilities, responders, and other decision makers	*EPA and DHS*	SHORT TERM
PRIORITY ISSUE	**RECOMMENDATION TO ADDRESS ISSUE**	**COORDINATING ORGANIZATION***	**TIME FRAME FOR COMPLETION***
PRIORITY ISSUE 5 Decontamination Procedures for Distribution and Collection Systems	1. Identify existing decontamination techniques, and/or develop new procedures for CBR agents in utility distribution and collection systems	*EPA ORD (NHSRC)*	LONG TERM
	2. Identify existing decontamination techniques and/or develop new decontamination methods for CBR agents in private plumbing	*EPA ORD (NHSRC)*	MID TERM

CBR – Chemical, biological, and radiological; DHS – Department of Homeland Security

* The proposed coordinating organizations and time frames assigned for each recommendation acknowledge practical considerations necessary to complete the associated activities, but do not consider the availability of resources needed to address the recommendation in the associated time frame.

Figure E-1: Prioritized Decontamination Issues, Recommendations, Appropriate Parties and Time Frame for Completion, cont.

PRIORITY ISSUE	RECOMMENDATION TO ADDRESS ISSUE	COORDINATING ORGANIZATION*	TIME FRAME FOR COMPLETION*
PRIORITY ISSUE 6 Outreach and Training to Utilities, Partners, and Stakeholders	1. Identify the current state of decontamination and recovery knowledge for CBR agents and develop a preferred/vetted guidance to reconcile any conflicting information	*EPA*	SHORT TERM
	2. Populate and update WCIT to include additional fate and transport information	*EPA OW (WSD)*	LONG TERM
	3. Develop a Web-based information clearinghouse to share and disseminate decontamination and recovery information specific to the water sector	*EPA*	LONG TERM
	4. Develop and provide two types, one each for drinking water and wastewater, of facility-based, decontamination training programs from "ground up" for water sector stakeholders and national response teams	*EPA (Develop) and SCC Associations (Distribute)*	MID TERM

PRIORITY ISSUE	RECOMMENDATION TO ADDRESS ISSUE	COORDINATING ORGANIZATION*	TIME FRAME FOR COMPLETION*
PRIORITY ISSUE 7 Utility Communications to Public Officials, Responders, the Public and Others on Decontamination	1. Develop guidance to help utilities prepare outreach materials to educate utility personnel, law makers and response agencies on decontamination and recovery processes before an incident	*SCC Organizations*	SHORT TERM
	2. Develop guidelines for risk communication activities during decontamination and recovery phases	*SCC Organizations*	SHORT TERM

SCC – Sector Coordinating Council; WCIT – Water Contamination Information tool

* The proposed coordinating organizations and time frames assigned for each recommendation acknowledge practical considerations necessary to complete the associated activities, but do not consider the availability of resources needed to address the recommendation in the associated time frame.

Figure E-1: Prioritized Decontamination Issues, Recommendations, Appropriate Parties and Time Frame for Completion, cont.

PRIORITY ISSUE	RECOMMENDATION TO ADDRESS ISSUE	COORDINATING ORGANIZATION*	TIME FRAME FOR COMPLETION*
PRIORITY ISSUE 8 Cleanup Levels	1. Develop transparent process for establishing target cleanup levels that can be used on an incident-specific basis	*EPA*	SHORT TERM
	2. Pre-establish information needs to determine target cleanup levels for contaminants that address multiple water uses	*EPA ORD (NHSRC)*	LONG TERM
	3. Establish measurement process for cleanup and clearance that addresses extent of sampling	*EPA*	SHORT TERM

PRIORITY ISSUE	RECOMMENDATION TO ADDRESS ISSUE	COORDINATING ORGANIZATION*	TIME FRAME FOR COMPLETION*
PRIORITY ISSUE 9 Treatment Procedures for Contaminated Drinking Water and Wastewater	1. Provide information on the treatment of drinking water and wastewater contaminated with CBR agents	*EPA ORD (NHSRC)*	LONG TERM

* The proposed coordinating organizations and time frames assigned for each recommendation acknowledge practical considerations necessary to complete the associated activities, but do not consider the availability of resources needed to address the recommendation in the associated time frame.

Figure E-1: Prioritized Decontamination Issues, Recommendations, Appropriate Parties and Time Frame for Completion, cont.

PRIORITY ISSUE	RECOMMENDATION TO ADDRESS ISSUE	COORDINATING ORGANIZATION*	TIME FRAME FOR COMPLETION*
PRIORITY ISSUE 10 Agent Fate and Transport	1. Create a transparent and scientifically defensible process for estimating the fate and transport of contaminants in drinking water and wastewater systems in the absence of information on a specific contaminant	*EPA ORD (NHSRC)*	MID TERM
	2. Determine the persistence and interaction of CBR agents in drinking water and wastewater and on pipe materials, and how chlorination affects contaminant persistence and interaction	*EPA ORD (NHSRC)*	LONG TERM
	3. Integrate fate and transport information into hydraulic models	*EPA ORD (NHSRC)*	LONG TERM
	4. Determine the fate and transport of decontamination agents in drinking water and wastewater systems and persistence in pipe materials	*EPA ORD (NHSRC) and USACE*	MID TERM
	5. Determine fate and transport of CBR agents, residuals, decontamination agents and solid discharge in the environment including if discharged to water body or after wastewater treatment (fertilizer or the sludge application to agricultural land, landfill, etc.)	*EPA ORD (NHSRC)*	LONG TERM
	6. Assess the aerosolization or volatilization of contaminants released from drinking water and wastewater systems	*EPA ORD (NHSRC)*	LONG TERM
	7. Determine the risk that an aerosolized attack of CBR agents will result in concentrations of concern to drinking water or wastewater systems	*DHS and EPA*	LONG TERM

USACE – U.S. Army Corps of Engineers

* The proposed coordinating organizations and time frames assigned for each recommendation acknowledge practical considerations necessary to complete the associated activities, but do not consider the availability of resources needed to address the recommendation in the associated time frame.

Figure E-1: Prioritized Decontamination Issues, Recommendations, Appropriate Parties and Time Frame for Completion, cont.

PRIORITY ISSUE	RECOMMENDATION TO ADDRESS ISSUE	COORDINATING ORGANIZATION*	TIME FRAME FOR COMPLETION*
PRIORITY ISSUE 11 Clarifying Roles and Responsibilities for Decon and Treatment	1. Develop a flowchart to show progression of roles and decision making authority to be used by the utilities and responding/ coordinating agencies during decontamination, treatment and recovery	*EPA and DHS*	SHORT TERM

PRIORITY ISSUE	RECOMMENDATION TO ADDRESS ISSUE	COORDINATING ORGANIZATION*	TIME FRAME FOR COMPLETION*
PRIORITY ISSUE 12 Process for Regulatory Waivers/Suspensions	1. Provide guidance on regulatory waiver process for discharge/ disposal, decontamination/treatment and return to service activities during CBR incidents	*ASDWA, ASIWPCA and EPA*	SHORT TERM

PRIORITY ISSUE	RECOMMENDATION TO ADDRESS ISSUE	COORDINATING ORGANIZATION*	TIME FRAME FOR COMPLETION*
PRIORITY ISSUE 13 Resources and Assets for Decontamination and Treatment	1. Develop information guidelines for utilities on allocating and acquiring decontamination and treatment financial resources	*AWWA (Drinking Water) NACWA and WEF (Wastewater)*	SHORT TERM
	2. Provide utilities with information on decontamination factors to be considered when making capital improvement decisions through best practices development organizations advising the water sector	*AWWA (Drinking Water) NACWA and WEF (Wastewater)*	MID TERM
	3. Inform utilities of the critical assets available to the water sector to aid decontamination, treatment and recovery from CBR contamination	*EPA (Develop) SCC Organizations (Distribute)*	SHORT TERM

ASIWPCA – Association of State and Interstate Water Pollution Control Administrators

* The proposed coordinating organizations and time frames assigned for each recommendation acknowledge practical considerations necessary to complete the associated activities, but do not consider the availability of resources needed to address the recommendation in the associated time frame.

Figure E-1: Prioritized Decontamination Issues, Recommendations, Appropriate Parties and Time Frame for Completion, cont.

PRIORITY ISSUE	RECOMMENDATION TO ADDRESS ISSUE	COORDINATING ORGANIZATION*	TIME FRAME FOR COMPLETION*
PRIORITY ISSUE 14 Laboratory Analysis	1. Provide surface (in situ) and water analysis methods specific for CBR agents to be used during decontamination and clearance steps through existing efforts	*EPA*	LONG TERM
	2. Leverage existing efforts to identify laboratory capabilities and laboratory capacities specific to CBR agent decontamination needs	*EPA OW (WSD)*	SHORT TERM

PRIORITY ISSUE	RECOMMENDATION TO ADDRESS ISSUE	COORDINATING ORGANIZATION*	TIME FRAME FOR COMPLETION*
PRIORITY ISSUE 15 Health and Safety Assessment for Drinking Water and Wastewater Treatment Plant and Field Staff	1. Develop detailed, risk-based frameworks for health assessments of drinking water and wastewater treatment plant and field staff that are consistent in approach across all EPA regions and states	*OSHA and CDC*	MID TERM

PRIORITY ISSUE	RECOMMENDATION TO ADDRESS ISSUE	COORDINATING ORGANIZATION*	TIME FRAME FOR COMPLETION*
PRIORITY ISSUE 16 Overarching Decontamination Needs	Not Addressed	*NA*	NA

CDC - Centers for Disease Control and Prevention; OSHA – Occupational Safety and Health Administration

* The proposed coordinating organizations and time frames assigned for each recommendation acknowledge practical considerations necessary to complete the associated activities, but do not consider the availability of resources needed to address the recommendation in the associated time frame.

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ACEIH	American Council of Education on Industrial Hygiene
AMWA	Association of Metropolitan Water Agencies
ANSI	American National Standards Institute
ASDWA	Association of State Drinking Water Administrators
ASIWPCA	Association of State and Interstate Water Pollution Control Administrators
ATSDR	Agency for Toxic Substances and Disease Registry
AWWA	American Water Works Association
AwwaRF	American Water Works Association Research Foundation
CBR	Chemical, Biological and Radiological
CDC	Centers for Disease Control and Prevention
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CIPAC	Critical Infrastructure Partnership Advisory Council
CMPG	Consequence Management Plan Guidance
COG	Council of Governments
DHS	Department of Homeland Security
DOE	Department of Energy
ECC	Environmental Clearance Committee
EPA	U.S. Environmental Protection Agency
ERLN	Environmental Response Laboratory Network
FDA	U.S. Food and Drug Administration
FERN	Food Emergency Response Network
FIFRA	Federal Insecticide, Fungicide and Rodenticide Act
GCC	Government Coordinating Council
HA	Health Advisory
HIPAA	Health Insurance Portability and Accountability Act
HSIN	Homeland Security Information Network
ICLN	Integrated Consortium of Laboratory Networks
ICS	Incident Command System
IRIS	Integrated Risk Information System
LRN	Laboratory Response Network
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MOP	Manual of Practice

NACWA	National Association of Clean Water Agencies
NAWC	National Association of Water Companies
NDT	National Decontamination Team
NEMI-CBR	National Environmental Methods Index for Chemical, Biological, and Radiological Methods
NHSRC	National Homeland Security Research Center
NIMS	National Incident Management System
NIOSH	National Institute for Occupational Safety and Health
NOAA	National Oceanic and Atmospheric Administration
NPDWR	National Primary Drinking Water Regulations
NRF	National Response Framework
NRWA	National Rural Water Association
NSF	NSF International (formerly National Sanitation Foundation)
OECA	Office of Enforcement and Compliance Assurance
OEM	Office of Emergency Management
OGWDW	Office of Ground Water and Drinking Water
OSHA	Occupational Health and Safety Administration
OSTP	Office of Science and Technology Policy
OSWER	Office of Solid Waste and Emergency Response
OW	Office of Water
OWM	Office of Wastewater Management
PHG	Public Health Goal
PPE	Personal Protective Equipment
QSAR	Quantitative Structure and Activity Relationships
RCRA	Resource Conservation and Recovery Act
RED	Registration Eligibility Decision
RPTB	Response Protocol Toolbox
R/R	Remediation and Recovery
SAM	Standardized Analytical Methods for Environmental Restoration following Homeland Security Events
SCC	Sector Coordinating Council
SDWA	Safe Drinking Water Act
S.O.K.	State of Knowledge
TCAD	Threat and Consequence Analysis Division
TLV	Threshold Limit Value

UIC	Underground Injection Control
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
WARN	Water/Wastewater Agency Response Network
WaterISAC	Water Information Sharing and Analysis Center
WCIT	Water Contaminant Information Tool
WEF	Water Environment Federation
WERF	Water Environment Research Foundation
WLA	Water Laboratory Alliance
WSD	Water Security Division
WSI	Water Security Initiative
WWRPTB	Wastewater RPTB

DEFINITIONS

CBR agents – All chemical, biological and radiological agents that may contaminate a drinking water or wastewater system including but not limited to weaponized agents

Decontamination – Within the scope of this report, decontamination means the reduction or removal of contaminants from surfaces by physical means, chemical neutralization, detoxification, disinfection, or sterilization (versus treatment of contaminated water or wastewater)

Decontamination assets – Any equipment, personnel, technique, and chemical used for decontamination during a contamination event

Decontamination financial resources – The financial means to fund the necessary work to complete decontamination activities

Drinking water system – A utility, its components, personnel, and assets that are involved in providing drinking water to its customers

Partners – Agencies, associations, or entities that are involved in the development or implementation of the efforts outlined in this report

Platform – A means to disseminate information

Private plumbing – The plumbing and water infrastructure of all customers of a utility that are not the responsibility of the utility

Re-evaluate – Used in this document to describe the review of available information pertinent to a recommendation

SCC Associations – The associations that serve as a policy, strategy, coordination mechanism and recommend actions to reduce and eliminate significant homeland security vulnerabilities to the water sector through interactions with the federal government and other critical infrastructure. These associations include:

- AWWA – America Water Works Association
- AwwaRF – American Water Works Association Research Foundation
- AMWA – Association of Metropolitan Water Agencies
- NACWA – National Association of Clean Water Agencies
- NAWC – National Association of Water Companies
- NRWA – National Rural Water Association
- WEF – Water Environment Federation
- WERF – Water Environment Research Foundation

Stakeholders – Utilities, responders, agencies, associations, or entities that may be the end users of a product or have an interest in the event and its outcome

Transparent – Easily seen through; evident; obvious; easily understood

Treatment – Within the scope of this report, treatment means the removal of contaminants from water or wastewater (versus decontamination of contaminated surfaces)

Wastewater system – A utility, its components, personnel, and assets that are involved in the handling, collecting and treating of wastewater

Wastewater treatment system – A treatment system that may consist of physical, biological, chemical, and mechanical processes for the purpose of removing and/or reducing contaminants in the wastewater

Water distribution system – System consisting of pipe, pumps, control valves and storage facilities designed to provide potable drinking water to homes, businesses, hospitals, government facilities, etc.

Water sector – Critical infrastructure sector identified by the federal government for protection that provides drinking water and wastewater treatment through approximately 170,000 public water systems. These systems depend on reservoirs, dams, wells, treatment facilities, pumping stations, and transmission lines.

Weaponized agent – An agent designed or used for inflicting bodily harm or physical damage.

1 INTRODUCTION

1.1 Purpose

The Critical Infrastructure Partnership Advisory Council (CIPAC) Water Sector Decontamination Working Group was convened in 2007 by the Water Sector Coordinating Council (SCC) and Government Coordinating Council (GCC) to develop a strategy and plan that supports priorities for water sector decontamination and recovery for the purpose of water security. The water sector lacks adequate information and guidance on the decontamination of water facilities, especially if they were contaminated with chemical, biological and radiological (CBR) agents through an accidental, intentional, or natural event. As part of the process of developing a proposed strategy, the CIPAC Water Sector Decontamination Working Group was charged to identify and prioritize decontamination and recovery issues and needs, encompassing an all-hazards approach, for returning both the drinking water and wastewater systems to service after a contamination event. With this report, the CIPAC Water Sector Decontamination Working Group communicates to the Councils its issues, priorities and recommendations for a water sector decontamination strategy. This report describes a list of priority water sector decontamination issue categories identified by the Working Group (Chapter 2), recommendations to address these decontamination issues (Chapter 3), and a proposed strategic plan to address the key water sector decontamination issues (Chapter 4). This report is the result of a 6-month deliberation period and does not contain an exhaustive list of all recommendations for water sector decontamination needs. Some of the identified recommendations include data gaps that need to be addressed.

1.2 Objectives and Scope

The CIPAC Water Sector Decontamination Working Group identified and prioritized water sector decontamination issues and needs, as related to water security, and provided recommendations to address these needs. The Working Group's charter established seven objectives to meet this goal:

- Identify decontamination issues and needs to support drinking water and wastewater utilities and other stakeholders
- Prioritize the decontamination issues and needs, as related to water security
- Provide recommendations to address the identified needs
- Identify the appropriate parties to implement these recommendations
- Provide recommendations for U.S. Environmental Protection Agency (EPA) priorities in water sector decontamination and recovery
- Identify data gaps related to decontamination of drinking water and wastewater systems needed to help restore systems to service
- Develop a strategy for water sector decontamination that identifies directions and plans for the next 3 to 5 years

In accordance with its charter, the CIPAC Water Sector Decontamination Working Group focused on how to address decontamination and recovery issues concerning activities needed to return a drinking water or wastewater system to service following a contamination incident. An all-hazards approach for drinking water and wastewater systems was examined to cover CBR agents of concern to water systems. In the context of this report, CBR agents include all chemical, biological, and radiological agents that may

contaminate a drinking water or wastewater system and are not exclusive to weaponized agents. The scope of Working Group's activities included the examination of treatment plant contamination, finished water storage tank contamination, water distribution system contamination, and residential and non-residential property water system contamination events along with wastewater utility components such as collection systems and treatment plant contamination. Existing information and ongoing activities on water sector decontamination were reviewed, but the Working Group did not re-analyze the efficacy of existing, established decontamination and treatment procedures. Decontamination and treatment topics within the context of other national "products" such as National Response Framework (NRF), National Infrastructure Protection Plan (NIPP), National Preparedness Goal (NPG), and applicable Homeland Security Presidential Directives (HSPDs) were also examined.

The Working Group focused primarily on decontamination and treatment activities during the recovery phase, while identifying links to the consequence management phase of a response to avoid gaps. In addition, the Working Group looked at critical interdependencies between decontamination and other phases of response and recovery. To this end, aspects of the initial response (prior to decontamination) were considered only when the Working Group believed that these aspects had a significant effect on decontamination and treatment activities.

1.3 Working Group Deliberative Process

The charter for the CIPAC Water Sector Decontamination Working Group was established by the Co-Chairs, approved by the SCC and GCC, and reviewed by the Working Group members during the first meeting in August 2007. The charter governed group activities, including the following:

- How the membership was to be constructed
- The activities of the subject matter experts
- The activities of the facilitation team
- Operating procedures and ground rules
- The objectives of the Working Group
- The scope of the effort
- The schedule and duration of the Working Group

A schedule was also approved during the first meeting. The Working Group deliberated periodically over 6 months, with an effective stop date of February 28, 2008. The schedule of Working Group meetings is provided in **Table 1-1**.

Table 1-1: CIPAC Decontamination Working Group Schedule

Meeting	Date and Location	Meeting Topic
Face-to-Face Meeting	August 13–14, 2007 (Alexandria, VA)	• Identify decontamination issues and needs to support drinking water and wastewater utilities and other stakeholders • Prioritize decontamination issues and needs as related to water security • Provide recommendations to address identified issues and needs related to: - Containing and/or disposing of large amounts of contaminated water - Near-term practical solutions
Conference Call/Webcast	September 5, 2007	• Provide recommendations to address identified issues and needs related to: - Decision-making frameworks for decontamination - Process for regulatory waivers/suspensions - Health and safety assessment for drinking water and wastewater treatment plant staff
Conference Call/Webcast	September 26, 2007	• Provide recommendations to address identified issues and needs related to: - Outreach and training to utilities, partners, and stakeholders - Clarifying roles and responsibilities for decontamination and treatment - Utility communications to public officials, responders, the public, and others on decontamination
Conference Call/Webcast	October 18, 2007	• Provide recommendations to address identified issues and needs related to: - Resources and assets for decontamination and treatment - Laboratory analysis
Conference Call/Webcast	November 14, 2007	• Provide recommendations to address identified issues and needs related to: - Decontamination procedures for infrastructure in treatment plants - Decontamination procedures for distribution and collection systems - Cleanup levels
Conference Call/Webcast	December 5, 2007	• Provide recommendations to address identified issues and needs related to: - Agent fate and transport
Conference Call/Webcast	January 9, 2008	• Identify data gaps related to decontamination of drinking water and wastewater systems needed to help restore systems to service
Face-to-Face Meeting	February 6–7, 2008 (Lafayette, LA)	• Identify appropriate parties to implement recommendations • Provide recommendations for EPA priorities in water sector decontamination and recovery • Address issues unresolved during conference calls

To share information among members, a Homeland Security Information Network (HSIN) portal was established and used by the CIPAC Water Sector Decontamination Working Group.

1 INTRODUCTION

2 PRIORITY WATER SECTOR DECONTAMINATION ISSUES

By identifying and prioritizing decontamination and recovery issues, the water sector can begin to address those most critical to water security. After a review of existing information and ongoing activities on water sector decontamination, the Working Group identified and prioritized 16 key decontamination issues and needs into categories across the following areas of potential contamination:

- Water treatment plant contamination
- Finished water storage tank contamination
- Water distribution system contamination including pumps, boosters and other infrastructure used to distribute water throughout the system
- Residential and non-residential property water system contamination
- Collection system contamination
- Wastewater treatment plant contamination

The prioritized list is presented in **Table 2-1**.

Table 2-1: Prioritized List of Water Sector Decontamination Issues and Needs

Priority	Issue Categories Raised by CIPAC Working Group
1	Containing and/or disposing of large amounts of contaminated water
2	Near-term practical solutions*
3	Decontamination procedures for infrastructure in treatment plants
4	Decision-making frameworks for decontamination
5	Decontamination procedures for distribution and collection systems
6	Outreach and training to utilities, partners, and stakeholders
7	Utility communications to public officials, responders, the public and others on decontamination
8	Cleanup levels
9	Treatment procedures for contaminated drinking water and wastewater
10	Agent fate and transport
11	Clarifying roles and responsibilities for decontamination and treatment
12	Process for regulatory waivers/suspensions
13	Resources and assets for decontamination and treatment
14	Laboratory analysis
15	Health and safety assessment for drinking water and wastewater treatment plant staff
16	Overarching decontamination needs**

* Near-term practical solutions are currently available procedures and techniques whose efficacy needs to be proven in the decontamination of CBR agents

** Issue 16 contains overarching needs that were identified by the Working Group but not included in recommendations because these were seen to affect and be part of other issues

The prioritized list shown is meant to be used as a guide and not a definitive analysis of the importance of each issue category. Many of the issue categories were viewed as having similar priority or to be addressed through other efforts and the prioritization system is to be used for clarity when addressing and/or assigning a topic and to show its importance to the water sector.

A brief discussion on the rationale on each issue identified by the Working Group is provided below. Section 3 discusses the specific recommendations the Working Group proposed to address each issue;

Section 4 presents the strategic plan that the Working Group proposed for acting on these recommendations.

ISSUE 1: CONTAINING AND/OR DISPOSING OF LARGE AMOUNTS OF CONTAMINATED WATER

The water sector lacks clear guidance on containing and/or disposing of large amounts of water contaminated with CBR agents. The Working Group cited the following factors in identifying this as an issue to resolve in support of water sector decontamination:

- The decision to contain or immediately discharge contaminated water affects subsequent decontamination efforts. Moreover, the decision to contain or immediately discharge contaminated water raises significant public health concerns and environmental impact issues. The water sector lacks clear guidance for effectively navigating these issues.
- Environmentally sound procedures for the containment and disposal of both the liquid and the associated solid waste from a water system contamination incident are not available.
- Existing guidance regarding containing and then disposing of contaminated water is inconsistent.

ISSUE 2: NEAR-TERM PRACTICAL SOLUTIONS

The water sector has an immediate need for information on available methods to decontaminate drinking water and wastewater systems and treat contaminated drinking water and wastewater. More specifically, drinking water and wastewater systems require available techniques for treating CBR agents and information on the efficacy of those techniques, such as ozonation and hyper-chlorination.

ISSUE 3: DECONTAMINATION PROCEDURES FOR INFRASTRUCTURE IN TREATMENT PLANTS

Water and wastewater treatment plant infrastructure, including pumps, valves, filters, sediment basins, holding tanks, and pipes, present challenges during decontamination and recovery. The water sector needs procedures and guidance for decontaminating different types of infrastructure for CBR agents. If utilities are unable to decontaminate treatment plant infrastructure, they may be forced to abandon and seal in place at a high cost and with unknown impacts to the environment and the availability of water service to customers.

ISSUE 4: DECISION-MAKING FRAMEWORKS FOR DECONTAMINATION

In the event of CBR contamination at a water or wastewater system, many responders and decision makers lack guidance on making well-informed decisions on how to decontaminate and recover from the incident. The Working Group cited the following reasons for raising this as an issue:

- Current guidance does not provide the water sector with adequate information or decision-making tools to address regulatory requirements, balancing risks, determining whether decontamination is necessary, and selecting proper methodologies for measurements and treatment.
- Determining how to apply federal, state, and local regulations during discharge/disposal, decontamination/treatment, and return to service after a contamination incident may be confusing because the relevant issues are spread over different areas of the regulatory code and may vary from state to state.
- Neither the water sector nor responders nor other decision makers have guidance to make timely, effective, and targeted decisions on whether and how to decontaminate and recover from a CBR contamination.
- It is not clear whether analysis of pipe surfaces or water will be needed to demonstrate contaminant removal and clear a utility to resume service.

- Decontamination and recovery decisions may have a significant effect on public health and/or the environment, and these repercussions need to be included into guidance on the subject.

ISSUE 5: DECONTAMINATION PROCEDURES FOR DISTRIBUTION AND COLLECTION SYSTEMS

Distribution and collection systems offer the most direct link between a utility and its customers. Previous analysis and evaluations by different agencies, such as the Federal Bureau of Investigation (FBI) and EPA, have raised concerns that the distribution systems are the most vulnerable part of a water system because of the many potential locations of contaminant introduction. Contamination incidents that affect a distribution or collection system can pose a significant threat to human health and be difficult to remediate due to the following:

- Adherence of agents to pipe walls or pipe encrustations
- Formation of biofilms
- Reaction of agents with pipe walls or corrosion products
- Permeation through pipe walls
- Inaccessibility of infrastructure for physical cleaning and/or replacement

The Working Group cited the following in determining why it was essential to address this issue to support water sector decontamination activities:

- Lack of information on CBR agent decontamination, including the effects of both CBR contaminants and the efforts to decontaminate them on a distribution or collection system and associated private customer plumbing
- Lack of information on the impact that decontamination efforts may have on a distribution system or private plumbing

ISSUE 6: OUTREACH AND TRAINING TO UTILITIES, PARTNERS, AND STAKEHOLDERS

Without access to information on decontamination of CBR agents as well as the fate and transport of CBR agents, additional research and guidance will not benefit the water sector. This limitation is compounded by the relatively limited state of the knowledge in the area of water sector decontamination. Efforts to aggregate existing information and convey new information to the water sector through outreach and training is needed.

ISSUE 7: UTILITY COMMUNICATIONS TO PUBLIC OFFICIALS, RESPONDERS, THE PUBLIC AND OTHERS ON DECONTAMINATION

During decontamination, and prior to resumption of full service, drinking water and wastewater utilities need to be able to effectively communicate to the public, public officials and response agencies regarding status and limitations of use, in order to avoid confusion and further protect public health or minimize economic impacts. The water sector needs guidance on how to educate public officials and responders on decontamination issues prior to an incident to avoid decision-making delays and ineffective actions. In addition, the water sector also needs guidance on crisis communication and risk communication to meet this need; in particular, the water sector needs guidance on how to communicate to the public regarding decontamination if CBR agents are involved.

ISSUE 8: CLEANUP LEVELS

The ultimate goal of decontamination activities at a drinking water or wastewater system is to return the system to service. To achieve this goal, decision makers must verify that the water and infrastructure in a system are clear to return to service. This requires comparing contaminant levels in the system to

acceptable contaminant levels. For traditional contaminants, there are Maximum Contaminant Levels (MCLs) for contaminants regulated in water or Health Advisories (HAs), which are non-regulatory advisory values determined by EPA. Additionally, Maximum Contaminant Level Goals (MCLGs) and Public Health Goals (PHGs) may be used for determining appropriate cleanup levels. However, for most CBR contaminants, these levels do not exist.

ISSUE 9: TREATMENT PROCEDURES FOR CONTAMINATED DRINKING WATER AND WASTEWATER

In addition to decontaminating physical infrastructure, drinking water and wastewater utilities need to address how to treat contaminated drinking water and wastewater after CBR contamination. Utilities currently have limited information on drinking water and wastewater treatment techniques for CBR agents. Because system flushing may be an option, the water sector also needs information on compliance with the various regulatory requirements that may be imposed on a utility if this option is considered. Further, dialogue needs to be established among regulatory agencies and bodies on how to handle such waste, should flushing be necessary under these life or death situations. Understanding of the priorities should be emphasized to protect life, then property, then the environment. Also, consideration should be made on remediation and technologies to deal with any resulting releases.

ISSUE 10: AGENT FATE AND TRANSPORT

A thorough understanding of the fate and transport of both CBR agents and decontamination agents is necessary for drinking water and wastewater utilities to better prepare for, and limit the impacts of, contamination and subsequent recovery, in terms of public safety and environmental impacts. Understanding the potential of an agent to persist in a system or in the environment and what agent properties may dictate whether the contaminated water or wastewater is discharged or contained after a contamination incident are needed. Specifically at issue is whether some contaminants that can represent an inhalation risk under some circumstances, most notably anthrax, would represent a realistic threat as a “wetted” aerosol. This information would be needed to assess potential risk to wastewater utility workers and to firefighters, relative to the competing risk if the contaminant is not purged from the water system. Further, it should be examined how a contaminant should be remediated if released into the environment.

ISSUE 11: CLARIFYING ROLES AND RESPONSIBILITIES FOR DECONTAMINATION AND TREATMENT

The National Incident Management System (NIMS) is the national guidance for the prevention, preparation, response, recovery and mitigation of incidents regardless of size, location or complexity. NIMS coordinates emergency preparedness, response and incident management among various federal, state, and local agencies. A component of NIMS is the Incident Command System (ICS), which is a standardized, flexible, and scalable response organization structure that aids cooperation and decision-making processes during an emergency. Although utilities are aware of NIMS and ICS, and have implemented many of the preliminary steps to prepare for emergency management, considerable confusion remains on how the chain of command and decision-making authority changes as decontamination and recovery activities progress. In addition, confusion exists in the water sector regarding which agencies can provide guidance, response, and support during a contamination event (for instance, the National Decontamination Team). Building upon NIMS is the National Response Framework (NRF). The NRF is a guide on how an all-hazards response is to be handled at the national level.

ISSUE 12: PROCESS FOR REGULATORY WAIVERS/SUSPENSIONS

Water and wastewater utilities are responsible for following federal and state guidelines and regulations during regular operations and contamination events. In the event of a contamination incident involving a

CBR agent that poses substantial public health risk, both states and utilities need quick access to information on the regulatory waiver and suspension process, and need to understand what flexibility exists for various regulations. There needs to be clear dialogue with the regulatory agencies on this topic and on the solutions identified.

ISSUE 13: RESOURCES AND ASSETS FOR DECONTAMINATION AND TREATMENT

Recovery from CBR contamination may require deployment of resources and assets including specialized decontamination agent(s), equipment, and personnel. Drinking water and wastewater utilities need to be aware of the resources and assets that exist and how they may be accessed. In addition, drinking water and wastewater utilities need guidance on what consideration should be given to decontamination factors when making decisions on capital improvement projects to reduce consequences and improve decontamination and recovery efforts.

ISSUE 14: LABORATORY ANALYSIS

Laboratory analysis is a critical element during all phases of decontamination and recovery. Laboratories involved in decontamination and recovery analyses require methods for a variety of contaminants and measurement techniques. An evaluation of laboratory capabilities and capacities (i.e., techniques and methods the laboratories can execute and how many samples can be processed) could help the water sector address any gaps in laboratory preparedness. Existing methods may not include both in situ and water analyses for CBR agents. The Working Group considered this to be a critical issue for decontamination, but the group's acknowledgement that current efforts in the EPA Office of Water (OW), Office of Solid Waste and Emergency Response (OSWER), and Office of Research and Development (ORD) were addressing these needs, and so ranked this issue lower than other issues that required action. Its ranking does not indicate a lack of importance to the Working Group; rather, it is an indication that significant activities are currently underway to address this issue. Further, it was recognized that the laboratory community was aware of this need to address surge capacity and indeed that some states and EPA were forming mutual assistance groups or networks such as the Water Laboratory Alliance (WLA) and the Standardized Analytical Methods for Environmental Restoration following Homeland Security Events (SAM) Work Group.

ISSUE 15: HEALTH AND SAFETY ASSESSMENT FOR DRINKING WATER AND WASTEWATER TREATMENT PLANT AND FIELD STAFF

The health and safety of drinking water and wastewater plant and field staff are of critical concern during decontamination and recovery. To ensure health and safety before, during, and after decontamination, the risks of exposure to workers must first be evaluated. Without an accurate assessment of the risks involved, it is difficult to institute preventative safety measures, adjust plant operations, and/or create timelines for when it is safe for operators to work.

ISSUE 16: OVERARCHING DECONTAMINATION NEEDS

Several overarching decontamination and recovery needs were identified by the Working Group. While these needs were acknowledged in discussions, the group did not provide specific recommendations because these needs span multiple other issues. These needs included the following:

- Address the needs of drinking water and wastewater utilities of all sizes
- Leverage existing efforts
- Broaden assessment to international efforts
- Leverage Department of Homeland Security (DHS) national planning scenarios, where applicable

3 RECOMMENDATIONS TO ADDRESS KEY DECONTAMINATION ISSUES

Following the identification and prioritization of water sector decontamination issues, the Working Group provided recommendations on how to address the key issues. Each recommendation is intended to define the needs of one or more of the key issue categories and may be related to other recommendations as a supporting, preceding, or follow-on action. The recommendations were organized within the following four functional categories:

- Supporting Information and Capabilities
- Decontamination and Treatment Methods and Technologies
- Policy Decisions
- Outreach and Communications

The recommendations within the four functional categories were viewed as being supportive of either water sector planning and preparedness needs or four key decontamination and recovery activity stages:

1. Response
2. Characterization
3. Remediation and Cleanup
4. Clearance and Return to Service

Section 3.1 describes the Working Group's recommendations to address each priority issue with a brief summary of the background and rationale for each, while Section 3.2 describes the relationships between the Working Group's recommendations and further delineates them into functional categories. These deliberations include identifying specific data gaps, which, in large part, actually form the basis of the recommendation. These data gaps, along with the associated recommendation, are summarized in **Appendix B** and are reflected in the discussion of each recommendation below.

3.1 Recommendations for the Key Decontamination Issues

In this report, the Working Group provides 35 recommendations for addressing 15 of the 16 key issues that were identified. Issue 16 contains overarching considerations that were not addressed individually by the Working Group. Multiple recommendations are provided to address the needs within most of the issue categories. The Working Group noted that these recommendations do not necessarily represent the universe of all recommendations needed to address each issue. Instead, the recommendations represent the Working Group's deliberations on these issues during the 6-month period the group convened.

ISSUE 1: CONTAINING AND/OR DISPOSING OF LARGE AMOUNTS OF CONTAMINATED WATER

To respond to the lack of clear guidance on containing and/or disposing of large amounts of water contaminated with CBR agents, the Working Group provided two recommendations. Recommendation 1 focuses on the immediate response to a contamination event, specifically on decisions to contain or immediately discharge contaminated water. Recommendation 2 addresses the need for consistent guidance on disposal of contaminated drinking water and wastewater.

Recommendation 1: Develop a decision-making framework regarding containing or purging contaminated water. When responding to a water contamination incident, the primary objective of water utilities and public health authorities is to ensure the safety of the public served by the water system and prevent exposure to the contaminant, particularly through ingestion. Current public notification systems

designed to warn the public of a health risk in the water supply may not reach all customers in a timely manner, increasing the potential risk if contaminated water is not purged from the system immediately. To this end, the decision on whether to immediately discharge should be made quickly, but with careful understanding of the relative risks between potential exposure of the population via the water system (if the water is contained) versus impact on the wastewater system or receiving water body (if the water is immediately discharged) or potential downstream exposure to the public from discharged contaminated water. To increase the protection of the public, it may also be necessary to improve the communication aspect within the decision-making framework to ensure that any warnings against water consumption are made quickly enough, widely enough, and clearly enough to result in successful receipt and understanding of the message by the public.

This recommendation is linked to several other recommendations identified by the Working Group (**Figure 3-1**):

- Issue 1, Recommendation 2: Revise existing guidance or develop new guidance for containment and disposal of decontamination waste including large amounts of water and associated solid wastes
- Issue 6, Recommendation 2: Populate and update WCIT to include additional fate and transport information
- Issue 12, Recommendation 1: Provide guidance on regulatory waiver process for discharge/disposal, decontamination/treatment, and return to service activities during CBR incidents

Recommendation 2: Revise existing guidance or develop new guidance for containment and disposal of decontamination waste including large amounts of water and associated solid wastes. While Recommendation 1 called for a new framework to help decide whether to contain or immediately discharge contaminated water, the goal of this recommendation is to consolidate existing guidance documents and information on the disposal and handling of decontamination waste including any waste generated by the decontamination agents themselves.

Current guidance on the containment and disposal of decontamination waste recommends retention and treatment before disposal. For example, EPA's Response Protocol Toolbox (RPTB) (particularly Modules 2 [EPA 817-D-03-002], and 6 [EPA 817-D-03-006]), the most current and directly applicable guidance on initial incident response, implies that discharge of the contaminated water to wastewater systems or to the environment, via storm sewers, is not a viable option. Further, the RPTB indicates that, until arrangements for pretreatment can be made, the contaminated water should remain in the water system, with reliance on public notification to avoid dangers to the consumers. These materials do not provide adequate guidance to the utilities.

This recommendation is closely linked to several other recommendations identified by the Working Group (**Figure 3-1**):

- Issue 1, Recommendation 1: Develop a decision-making framework regarding containing or purging contaminated water
- Issue 12, Recommendation 1: Provide guidance on regulatory waiver process for discharge/disposal, decontamination/treatment, and return to service activities during CBR incidents

ISSUE 2: NEAR-TERM PRACTICAL SOLUTIONS

Pending the outcome of research into new decontamination technologies, the Working Group provided recommendations on near-term practical solutions based on currently available decontamination methods.

Recommendation 1: Provide information on using traditional techniques (i.e., those in routine use by utilities) for non-traditional contaminants. Treatment techniques already in routine use by drinking water and wastewater utilities may be effective in treating non-traditional contaminants. These techniques include chlorination and ozonation. Utility personnel will have familiarity and experience with these traditional techniques and assets required, thereby limiting the need for new training and assets to implement new techniques. The Working Group recommended that current information on the efficacy of these traditional techniques on CBR agents be compiled for use by the water sector. Published literature may provide insight into the basic science of using traditional techniques for some biological agents and aid in the selection of these techniques for decontamination.

This recommendation is closely linked to another recommendation identified by the Working Group (**Figure 3-2**):

- Issue 2, Recommendation 4: Use existing information services and Web-based databases to disseminate near-term practical decontamination solutions to utilities

Recommendation 2: Provide information on the efficacy of pipe cleaning aids, such as NSF-60-certified products, on the decontamination of infrastructure. Several research agencies and organizations (including EPA's National Homeland Security Research Center, the American Water Works Association Research Foundation [AwwaRF], U.S. Army Edgewood Chemical Biological Center, and Battelle Memorial Institute) have conducted (or are conducting) research on infrastructure decontamination. Most experiments have focused on the effectiveness of chemicals to either neutralize or remove target contaminants that were shown to adhere to the interior of water pipe surfaces.

Commercial products that are already certified as safe for use in potable water systems as "pipe cleaning aids" under NSF International (formerly National Sanitation Foundation) (NSF)/American National Standards Institute (ANSI) Standard 60 have not yet been adequately tested for their ability to neutralize or remove target contaminants from infrastructure. Use of these chemicals for decontamination in the near-term may have an advantage over other chemicals undergoing research for three reasons: (1) the manufacturers would have documented procedures for the application of the chemical to water infrastructure, (2) the chemicals themselves have been tested and certified against a health effects standard recognized by EPA and nearly all state regulatory agencies, and (3) the system operators may have familiarity with the chemicals. For these reasons, the Working Group recommended that these certified commercial products be prioritized for decontamination efficacy evaluations.

This recommendation is closely linked to another recommendation identified by the Working Group (**Figure 3-2**):

- Issue 2, Recommendation 4: Use existing information services and Web-based databases to disseminate near-term practical decontamination solutions to utilities

Recommendation 3: Provide operational steps to minimize impact of decontamination. In addition to treatment techniques and decontamination agents, the Working Group recommended that efforts be expended to document the effectiveness of operational steps as immediately implementable, cost effective techniques for decontamination. This recommendation includes the assessment and dissemination of current operational procedures that may minimize the impact of decontamination.

Recommendation 4: Use existing information services and Web-based databases to disseminate near-term practical decontamination solutions to utilities. Although the Working Group identified the need for a dedicated portal or clearinghouse for decontamination information (see Issue 6, Recommendation 3), the Working Group recommended that existing vehicles be used now to quickly disseminate near-term practical decontamination solutions to the water sector.

This recommendation is closely linked to several other recommendations identified by the Working Group (**Figure 3-2**):

- Issue 2, Recommendation 1: Provide information on using traditional techniques (i.e., those in routine use by utilities) for non-traditional contaminants
- Issue 2, Recommendation 2: Provide information on the efficacy of pipe cleaning aids, such as NSF-60-certified products, on the decontamination of infrastructure
- Issue 3, Recommendation 1: Identify existing decontamination techniques (or develop new procedures) for CBR agents in treatment plant infrastructure
- Issue 5, Recommendation 1: Identify existing decontamination techniques, and/or develop new procedures for CBR agents in utility distribution and collection systems
- Issue 5, Recommendation 2: Identify existing decontamination techniques and/or develop new decontamination methods for CBR agents in private plumbing
- Issue 9, Recommendation 1: Provide information on the treatment of drinking water and wastewater contaminated with CBR agents

ISSUE 3: DECONTAMINATION PROCEDURES FOR INFRASTRUCTURE IN TREATMENT PLANTS

The Working Group identified one recommendation to address the need of decontamination procedures for infrastructure in treatment plants.

Recommendation 1: Identify existing decontamination techniques (or develop new procedures) for CBR agents in treatment plant infrastructure. The differences in equipment and fixed infrastructure in drinking water and wastewater utility treatment plants require the identification or development of in situ techniques. In situ techniques will allow utilities to decontaminate the affected equipment and infrastructure in place without the need to abandon or seal in place. Abandonment and seal-in-place measures were not seen as feasible because of the cost to replace infrastructure.

Opportunities exist to leverage information available to other critical sectors on decontaminating CBR agents. For example, information on the decontamination of radiologicals from infrastructure could be leveraged from the nuclear sector. Recommendations examining the decontamination of distribution and collection systems (Issue 5) and the treatment of drinking water and wastewater (Issue 9) may also be leveraged.

This recommendation is closely linked to several other recommendations identified by the Working Group (**Figure 3-2**):

- Issue 2, Recommendation 4: Use existing information services and Web-based databases to disseminate near-term practical decontamination solutions to utilities
- Issue 5, Recommendation 1: Identify existing decontamination techniques, and/or develop new procedures for CBR agents in utility distribution and collection systems
- Issue 5, Recommendation 2: Identify existing decontamination techniques and/or develop new decontamination methods for CBR agents in private plumbing

ISSUE 4: DECISION-MAKING FRAMEWORKS FOR DECONTAMINATION

The Working Group identified one recommendation to address the need for a decision-making framework for decontamination.

Recommendation 1: Develop a decision-making framework for the decontamination of CBR agents in water systems specifically to be used by utilities, responders, and other decision makers. Detailed risk-informed decision-making frameworks with corresponding flowcharts will provide utilities, responders, and other decision makers critical information needed to guide decontamination decisions:

1. Addressing regulatory requirements
2. Balancing public safety with decontamination goals
3. Determining whether to use surface measurements or water analyses or both
4. Determining whether to treat the water and/or decontaminate the infrastructure
5. Determining whether to replace or decontaminate the infrastructure
6. Determining whether to seal and abandon in-place or remove the infrastructure
7. Determining acceptable limits for alternate use of contaminated water such as for firefighting

ISSUE 5: DECONTAMINATION PROCEDURES FOR DISTRIBUTION AND COLLECTION SYSTEMS

While there is information on the disinfection of plant infrastructure and utility distribution and collection systems, such as those developed by AWWA, there is only limited information on the decontamination of CBR agents in distribution systems. Some published literature may provide insight into the basic science and aid in the selection of decontamination methods for biological agents in distribution systems. To account for the variations between utility distribution and collection systems and private plumbing, the Working Group identified two separate recommendations to address the two major system types, utility-owned and private. Additionally, considerable crossover effects may occur between utility-owned and privately owned systems due to decontamination or lack of decontamination activities.

Recommendation 1: Identify existing decontamination techniques, and/or develop new procedures for CBR agents in utility distribution and collection systems. Distribution and collection systems consist of variable designs and material compositions. Separate areas of the same system can be made of completely different materials and utilize different pumping and collection systems. Information on how specific system variables impact the decontamination of CBR agents and what decontamination techniques in distribution and collection systems are available to mitigate these impacts should be leveraged from other sectors or by conducting new research.

This recommendation is closely linked to several other recommendations identified by the Working Group (**Figure 3-2**):

- Issue 2, Recommendation 4: Use existing information services and Web-based databases to disseminate near-term practical decontamination solutions to utilities
- Issue 3, Recommendation 1: Identify existing decontamination techniques (or develop new procedures) for CBR agents in treatment plant infrastructure
- Issue 5, Recommendation 2: Identify existing decontamination techniques, and/or develop new decontamination methods for CBR agents in private plumbing

Recommendation 2: Identify existing decontamination techniques and/or develop new decontamination methods for CBR agents in private plumbing. A CBR agent incident in a utility's distribution or collection system could impact and contaminate the private plumbing of the end users. Therefore, decontamination procedures that adequately address the variability and unique considerations in private plumbing need to be identified and/or developed to aid the water sector in responding to a contamination event.

The recommendation will have significant crossover in both research and technology development with Issue 5, Recommendation 1. This recommendation is also closely linked to several other recommendations identified by the Working Group (**Figure 3-2**):

- Issue 2, Recommendation 4: Use existing information services and Web-based databases to disseminate near-term practical decontamination solutions to utilities
- Issue 3, Recommendation 1: Identify existing decontamination techniques (or develop new procedures) for CBR agents in treatment plant infrastructure
- Issue 5, Recommendation 1: Identify existing decontamination techniques, and/or develop new procedures for CBR agents in utility distribution and collection systems

ISSUE 6: OUTREACH AND TRAINING TO UTILITIES, PARTNERS, AND STAKEHOLDERS

The Working Group provided four recommendations to address key water sector outreach and training needs to better prepare utilities and response agencies.

Recommendation 1: Identify the current state of decontamination and recovery knowledge for CBR agents and develop a preferred/vetted guidance to reconcile any conflicting information. This involves evaluating current information on CBR agent decontamination and identifying the current state of knowledge on water sector decontamination. This will provide the water sector with information on the most up to date tools, techniques and information needed to respond to a contamination event. The sources for existing and emerging knowledge and the possible mechanisms to update this knowledge should be explored.

Recommendation 2: Populate and update WCIT to include additional fate and transport information. The Water Contaminant Information Tool (WCIT) contains information on the fate and transport of some contaminants, but the tool should be updated to include the following:

- Fate and transport of CBR agents, residuals, and decontamination agents in the environment
- Fate and transport of CBR agents, residuals, and decontamination agents in chlorinated drinking water and wastewater systems
- Empirical data for current expert judgments in WCIT on fate and transport

This recommendation is closely linked to several other recommendations identified by the Working Group (**Figure 3-1**):

- Issue 1, Recommendation 1: Develop a decision-making framework regarding containing or purging contaminated water
- Issue 10, Recommendation 2: Determine the persistence and interaction of CBR agents in drinking water and wastewater and on pipe materials, and how chlorination affects contaminant persistence and interaction
- Issue 10, Recommendation 4: Determine the fate and transport of decontamination agents in drinking water and wastewater systems and persistence in pipe materials
- Issue 10, Recommendation 5: Determine fate and transport of CBR agents, residuals, decontamination agents and solid discharge in the environment including if discharged to water body or after wastewater treatment (fertilizer or the sludge application to agricultural land, landfill, etc.)
- Issue 10, Recommendation 6: Assess the aerosolization or volatilization of contaminants released from drinking water and wastewater systems

- Issue 10, Recommendation 7: Determine the risk that an aerosolized attack of CBR agents will result in concentrations of concern to drinking water or wastewater systems

Recommendation 3: Develop a Web-based information clearinghouse to share and disseminate decontamination and recovery information specific to the water sector. Currently, information related to decontamination in drinking water and wastewater is limited and spread out through many different sources. Drinking water and wastewater utilities require practical and useful information, not necessarily research publications. Small utilities, in particular, do not have access to decontamination information due to technical limitations and minimal staffing. A central repository to identify up-to-date and comprehensive decontamination information, developed and maintained through a Web-based information clearinghouse, will provide the water sector an avenue for obtaining current decontamination information.

Recommendation 4: Develop and provide two types, one each for drinking water and wastewater, of facility-based, decontamination training programs from the "ground up" for water sector stakeholders and national response teams. Training and exercises play an important role in preparing utilities and water sector stakeholders for incidents. It is also critical for utilities to understand the coordination among agencies such as national and regional response teams during a CBR incident. Since much of the decontamination information is new to utilities, training will help the water sector and local emergency responders understand and apply decontamination and recovery information in a practical manner. Training for decontamination can take several forms and should support current decontamination guidance, including advising utilities on the availability of resources and how best to access those resources.

ISSUE 7: UTILITY COMMUNICATIONS TO THE PUBLIC OFFICIALS, RESPONDERS, THE PUBLIC AND OTHERS ON DECONTAMINATION

Two recommendations were identified to address the needs of utilities for guidance on communications. Recommendation 1 calls for guidance on how to effectively educate public officials and decision makers on decontamination issues. Recommendation 2 calls for guidelines on how to implement decontamination and recovery-specific provisions into a utility's risk and crisis communication plans.

Recommendation 1: Develop guidance to help utilities prepare outreach materials to educate utility personnel, lawmakers, and response agencies on decontamination and recovery processes before an incident. The focus of this recommendation is on the preemptive education of lawmakers, response agencies, and the utility's own personnel on decontamination activities. This guidance should help utilities prepare the necessary officials and agencies for the activities during decontamination and how to service the community that may be impacted during the decontamination process until the system is restored.

Recommendation 2: Develop guidelines for risk communication activities during decontamination and recovery phases. Risk communication plans are already used by utilities to prepare for a contamination incident. However, these plans often do not address the decontamination and recovery phases of a contamination incident. Guidance is needed to help utilities adapt their current risk communication plans to include information on decontamination and recovery. These guidelines should show utilities how to implement the necessary amendments to their plans before a contamination incident occurs.

ISSUE 8: CLEANUP LEVELS

To address the need for cleanup levels for CBR agents, the Working Group identified three recommendations. Each of these recommendations is closely related and will leverage each other for information.

Recommendation 1: Develop transparent process for establishing target cleanup levels that can be used on an incident-specific basis. Cleanup levels do not currently exist for most CBR agents; moreover, incident-specific factors will likely influence the determination of cleanup levels during decontamination. In the absence of pre-established levels (which should be developed, as noted in Recommendation 2), and in recognition of the incident-specific nature of decontamination, the Working Group recommended that a standard process be developed to establish these levels. Developing a standard process beforehand will result in more informed, consistent decision making when levels need to be established. The group further recommended that this process feature transparency, so the parties involved in decontamination understand how the cleanup level was determined.

This recommendation is closely linked to another recommendation identified by the Working Group (**Figure 3-3**):

- Issue 8, Recommendation 2: Pre-establish information needs to determine target cleanup levels for contaminants that address multiple water uses

Recommendation 2: Pre-establish information needs to determine target cleanup levels for contaminants that address multiple water uses. Cleanup levels are needed to determine decontamination and clearance goals. Ideally, cleanup levels for CBR agents would be pre-established, similar to maximum contaminant levels in drinking water regulations or to Health Advisory levels. Where levels do exist for drinking water, the levels apply only to consumption, not to other, non-potable water uses. Efforts should be made to establish information needs to determine multiple cleanup levels for different water uses. Utilities already have provisions for issuing advisories on water that may be used by customers. “Do not drink,” “boil first,” and “not fit for any use” are just some of the possibilities. Developing information needed to determine cleanup levels to address multiple uses recognizes the use of water for firefighting during decontamination, for example, or allow for drinking the water after boiling.

This recommendation is closely linked to several other recommendations identified by the Working Group (**Figure 3-3**):

- Issue 8, Recommendation 1: Develop transparent process for establishing target cleanup levels that can be used on an incident-specific basis
- Issue 8, Recommendation 3: Establish measurement process for cleanup and clearance that addresses extent of sampling
- Issue 14, Recommendation 1: Provide surface (in situ) and water analysis methods specific for CBR agents to be used during decontamination and clearance steps through existing efforts

Recommendation 3: Establish measurement process for cleanup and clearance that addresses extent of sampling. To determine whether cleanup levels for CBR agents have been met during decontamination, extensive sampling and analysis needs to be conducted. Guidance is needed for developing a statistically valid sampling approach for decontamination purposes that considers sampling locations and frequency. Developing guidance for sampling beforehand will result in more informed, consistent, and effective sampling plans.

This recommendation is closely linked to several other recommendations identified by the Working Group (**Figure 3-3**):

- Issue 8, Recommendation 2: Pre-establish information needs to determine target cleanup levels for contaminants that address multiple water uses
- Issue 14, Recommendation 1: Provide surface (in situ) and water analysis methods specific for CBR agents to be used during decontamination and clearance steps through existing efforts

ISSUE 9: TREATMENT PROCEDURES FOR CONTAMINATED DRINKING WATER AND WASTEWATER

Current information on water treatment techniques is mostly limited to the use of traditional techniques for traditional contaminants. These techniques have not been approved for the treatment of CBR agents. To address this gap in knowledge, the Working Group recommended specifically addressing treatment procedures for CBR agents.

Recommendation 1: Provide information on the treatment of drinking water and wastewater contaminated with CBR agents. The overall goal when treating contaminated water is to contain the spread of any contamination while minimizing the threat to human health and the environment. Options for addressing this recommendation include the development of treatment techniques, including leveraging currently used techniques, developing new techniques effective against CBR agents or using natural treatment methods (releasing to the environment) if the situation can be safely mitigated without the use of decontamination agents.

This recommendation is closely linked to another recommendation identified by the Working Group (**Figure 3-2**):

- Issue 2, Recommendation 4: Use existing information services and Web-based databases to disseminate near-term practical decontamination solutions to utilities

ISSUE 10: AGENT FATE AND TRANSPORT

Understanding the fate and transport of CBR agents is a critical component during the decontamination and recovery process after a drinking water or wastewater utility incident. The persistence of an agent can determine whether it is immediately discharged or contained after a contamination incident.

Current information on fate and transport needs to be leveraged and expanded to include specific information on CBR agents and decontamination residuals, a process to estimate fate and transport in the absence of contaminant-specific information, integration of hydraulic models, and aerosolization risks involved with discharge and direct attack on water infrastructure. The Working Group identified seven recommendations to address the need for information and tools to understand the fate and transport of CBR agents.

Recommendation 1: Create a transparent and scientifically defensible process for estimating the fate and transport of CBR agents in drinking water and wastewater utilities, in the absence of information on a specific contaminant. In the absence of empirical data, a process is needed to estimate the fate and transport of CBR. This process for estimation should be transparent to the users of the resulting information.

Recommendation 2: Determine the persistence and interaction of CBR agents in drinking water and wastewater and on pipe materials, and how chlorination affects persistence and interaction. Knowledge of the behavior of specific contaminants will affect sample collection and analysis during

decontamination and verification. For example, contaminants known to interact with specific pipe material or biofilm will not be found dissolved in water at levels of fully soluble contaminants. The resulting models from this recommendation should allow for customized decontamination and verification plans, based on facility infrastructure. A utility's ability to assess the fate and transport of agents when in contact with pipes and other infrastructure materials will result in a more effective and focused decontamination strategy.

This recommendation is closely linked to several other recommendations identified by the Working Group (**Figure 3-1**):

- Issue 6, Recommendation 2: Populate and update WCIT to include additional fate and transport information
- Issue 13, Recommendation 2: Provide utilities with information on decontamination factors to be considered when making capital improvement decisions through best practices development organizations advising the water sector

Recommendation 3: Integrate fate and transport information into hydraulic models. The fate and transport of CBR agents have different persistence and interaction properties. As a result, the fate information should be incorporated into hydraulic models used when determining the transport of CBR agents within a distribution system.

Recommendation 4: Determine the fate and transport of decontamination agents in drinking water and wastewater utilities and persistence in pipe materials. In addition to the lack of information on CBR agent fate and transport, there is a similar lack of data on the fate and transport of decontamination agents that may be introduced into a drinking water or wastewater system. Removal of decontamination agents from the system may be required before restoration of service. Assessment of fate and transport of decontamination agents in drinking water and wastewater systems, including contact with pipe and other infrastructure materials, will aid in the selection of a decontamination strategy.

This recommendation is closely linked to several other recommendations identified by the Working Group (**Figure 3-1**):

- Issue 6, Recommendation 2: Populate and update WCIT to include additional fate and transport information
- Issue 13, Recommendation 2: Provide utilities with information on decontamination factors to be considered when making capital improvement decisions through best practices development organizations advising the water sector

Recommendation 5: Determine fate and transport of CBR agents, residuals, decontamination agents and solid discharge in the environment including if discharged to water body or after wastewater treatment (fertilizer or the sludge application to agricultural land, landfill, etc.). By understanding the impact (persistence and potential spread) of discharging decontamination waste into the environment, the water sector can maximize public safety by balancing the exposure risks associated with the discharged decontamination products with the risks associated with containing and further treating the contaminated materials.

This recommendation is closely linked to another recommendation identified by the Working Group (**Figure 3-1**):

- Issue 6, Recommendation 2: Populate and update WCIT to include additional fate and transport information

Recommendation 6: Assess the aerosolization or volatilization of contaminants released from drinking water and wastewater systems. Guidance on the management of intentionally contaminated water has sometimes included cautionary advice that such water should not be used for firefighting or discharged to wastewater systems. This advice has been based on conjecture that the contaminant may be hazardous as an aerosol, and therefore, pose a substantial health risk to firefighters and wastewater utility workers. A notable example of this conjecture is anthrax, which is known to be hazardous in some forms through ingestion, inhalation, and dermal contact. When anthrax is "weaponized," it is specially prepared to give it highly dispersive characteristics when airborne. However, when agents have been weaponized to maximize inhalational exposure, special preparation techniques are needed. The concern by the Working Group is that limitations on handling of the contaminated water may be needlessly restrictive and might interfere with emergency operations to remove the hazard from the water utility or to use the water for emergency fire suppression operations. The objectives of this recommendation are:

- Identify which suspected contaminants would, indeed, constitute an aerosol inhalation hazard once introduced into water
- Determine whether there would be safety measures that could be employed to effectively mitigate the risk to wastewater utility workers and firefighters

This recommendation is closely linked to several other recommendations identified by the Working Group (**Figure 3-1**):

- Issue 6, Recommendation 2: Populate and update WCIT to include additional fate and transport information
- Issue 15, Recommendation 1: Develop detailed, risk-based frameworks for health and safety assessments of drinking water and wastewater treatment plant and field staff that are consistent in approach across all EPA regions and states.

Recommendation 7: Determine the risk that an aerosolized attack of CBR agents will result in concentrations of concern to water or wastewater systems. Information is needed on the potential result of an aerosolized attack upon a water system. Although aerosolized particles (e.g., anthrax) can be prepared in size ranges optimal for suspending in an aerosol cloud, the risks of these particles being introduced to water and resulting in concentrations of concern in drinking water systems and wastewater systems need to be determined.

This recommendation is closely linked to another recommendation identified by the Working Group (**Figure 3-1**):

- Issue 6, Recommendation 2: Populate and update WCIT to include additional fate and transport information

ISSUE 11: CLARIFYING ROLES AND RESPONSIBILITIES FOR DECONTAMINATION AND TREATMENT

The Working Group made one recommendation to clarify the roles and responsibilities for decontamination.

Recommendation 1: Develop a flowchart to show progression of roles and decision-making authority to be used by the utilities and responding/coordinating agencies during decontamination, treatment, and recovery. The Working Group believed that there was uncertainty within the water sector on how roles and decision-making authority would progress during a contamination event. Of particular concern was how the federal, state, and local regulations could impact these roles. It is critical that

drinking water and wastewater utilities understand the progression of a utility's role and responsibilities, but also how the roles and decision-making authority progress in other response agencies and organizations that are involved in the effort. A flowchart was identified as the best way to ensure a clear understanding of this matter.

ISSUE 12: PROCESS FOR REGULATORY WAIVERS/SUSPENSION

To address the issue of regulatory compliance during a water contamination incident, the Working Group recommended that guidance be developed to assist utilities with the regulatory waivers or suspension process.

Recommendation 1: Provide guidance on regulatory waiver process for discharge/disposal, decontamination/treatment and return to service activities during CBR incidents. When responding to a water contamination incident, water utilities may face challenges regarding compliance with state and federal regulations. At times, the need to respond quickly to an incident and take actions to minimize the impact on public health and the disruption of water service may conflict with regulatory requirements. Guidance needs to be provided to the water utilities on the availability of regulatory waivers and suspensions, and on the process to receive them. During decontamination activities, utilities need to know what flexibility exists regarding regulatory compliance to assist them in making response decisions. The guidance needs to be set in advance of a contamination incident so utilities are informed of:

- The explicit steps required to initiate a waiver or suspension process
- The role of disaster declaration
- Any regulatory status changes due to population served

This recommendation is closely linked to several other recommendations identified by the Working Group (**Figure 3-1**):

- Issue 1, Recommendation 1: Develop a decision-making framework regarding containing or purging contaminated water
- Issue 1, Recommendation 2: Revise existing guidance or develop new guidance for containment and disposal of decontamination waste including large amounts of water and associated solid wastes

ISSUE 13: RESOURCES AND ASSETS FOR DECONTAMINATION AND TREATMENT

The Working Group provided three recommendations to address the issue that utilities may not have all the required resources and assets readily available to deal with a contamination incident. The first recommendation focuses on the development of guidelines for the allocation and acquisition of resources for decontamination and treatment. The second recommendation deals with identification of decontamination factors that should be taken into consideration when utilities make capital improvements. The third recommendation involves informing utilities of the availability of critical assets to aid decontamination and recovery of water systems from CBR incidents.

Recommendation 1: Develop information guidelines for utilities on allocating and acquiring decontamination and treatment financial resources. Water utilities may not be aware of the financial resources needed for response and recovery from a water contamination incident. Existing information on the acquisition and allocation of decontamination and treatment financial resources should be leveraged to assist utilities in quickly identifying potential financial resources to be used during an incident.

Recommendation 2: Provide utilities with information on decontamination factors to be considered when making capital improvement decisions through best practices development organizations advising the water sector. Decisions made regarding capital improvement should take into consideration how any change may affect the risk associated with a contamination incident and the level of difficulty associated with decontamination and recovery efforts. Capital improvements should be made in a way that minimizes the risk associated with contamination and facilitates decontamination and recovery efforts.

This recommendation is closely linked to several other recommendations identified by the Working Group (**Figure 3-1**):

- Issue 10, Recommendation 2: Determine the persistence and interaction of CBR agents in drinking water and wastewater and on pipe materials, and how chlorination affects persistence and interaction
- Issue 10, Recommendation 4: Determine the fate and transport of decontamination agents in drinking water and wastewater utilities and persistence in pipe materials

Recommendation 3: Inform utilities of the critical assets available to the water sector to aid decontamination, treatment and recovery from CBR contamination. Water utilities may not have access to all the assets they need for response and recovery from a water contamination incident. However, these critical assets, which may include treatment chemicals, adsorbents, equipment, materials and personnel, may be available from other utilities, agencies, etc. Utilities will need to be able to quickly access information regarding the availability of critical assets in order to effectively respond to CBR agents.

ISSUE 14: LABORATORY ANALYSIS

The Working Group made two recommendations on how to address the need for laboratory analyses to support water sector decontamination. The group also acknowledged that the efforts already underway in EPA to expand laboratory capability and capacity influenced how they ranked the priority of this issue, but stressed the need for the specific laboratory support articulated in the recommendations below.

Recommendation 1: Provide surface (in situ) and water analysis methods specific for CBR agents to be used during decontamination and clearance steps through existing efforts. Although analytical methods for water analysis are available for regulated contaminants, reliable methods are not available for analysis of many CBR agents in water. Methods for the detection of CBR agents in water need to be developed to support decontamination efforts. If laboratory analysis of bulk water samples is not adequate to detect CBR agents during decontamination, surface (in situ) methods for both regulated contaminants and CBR agents may be needed for analysis of infrastructure surfaces. Research should be undertaken to assess whether direct surface measurement is needed to support decontamination efforts and, if so, whether such methods could be applied to relatively inaccessible surfaces such as the interior of buried pipe.

This recommendation is closely linked to several other recommendations identified by the Working Group (**Figure 3-3**):

- Issue 8, Recommendation 2: Pre-establish information needs to determine target cleanup levels for contaminants that address multiple water uses
- Issue 8, Recommendation 3: Establish measurement process for cleanup and clearance that addresses extent of sampling
- Issue 14, Recommendation 2: Leverage existing efforts to identify laboratory capabilities and laboratory capacities specific to CBR agent decontamination needs

Recommendation 2: Leverage existing efforts to identify laboratory capabilities and laboratory capacities specific to CBR agent decontamination needs. Information is needed on the ability of the available laboratories to aid in the response to a contamination event. Utility laboratories will most likely not have the equipment or expertise required to analyze for CBR agents. Efforts such as the Water Laboratory Alliance and Environmental Response Laboratory Network should be leveraged in responding to this recommendation.

This recommendation is closely linked to another recommendation identified by the Working Group (**Figure 3-1**):

- Issue 14, Recommendation 1: Provide surface (in situ) and water analysis methods specific for CBR agents to be used during decontamination and clearance steps through existing efforts

ISSUE 15: HEALTH AND SAFETY ASSESSMENT FOR DRINKING WATER AND WASTEWATER TREATMENT PLANT AND FIELD STAFF

To address the health and safety risks that workers may be exposed to during a water contamination incident, the Working Group recommended that a risk-based framework be developed to assess the health and safety risks posed to personnel responding to an incident.

Recommendation 1: Develop detailed, risk-based frameworks for health and safety assessments of drinking water and wastewater treatment plant and field staff that are consistent in approach across all EPA regions and states. The health and safety of utility personnel—drinking water and wastewater plant and field staff—is of critical concern during decontamination and recovery. This recommendation will evaluate the health risks for plant and field staff, particularly identifying specific risks that can be mitigated by changing operating procedures. Without an accurate assessment of risks involved, it would be difficult to institute preventative safety measures, adjust procedural plant operations and/or create timelines for when it is considered safe for operators and field staff to work.

This recommendation is closely linked to another recommendation identified by the Working Group (**Figure 3-1**):

- Issue 10, Recommendation 6: Assess the aerosolization or volatilization of contaminants released from drinking water and wastewater systems

3.2 Recommendations by Functional Categories and Their Relationships

The 35 recommendations to address priority issues were organized within the following four color-coded functional categories (**Table 3-1**):

- Supporting Information and Capabilities – Blue
- Policy Decisions – Purple
- Decontamination and Treatment Technologies and Procedures – Green
- Outreach and Communications – Peach

Table 3-1: Working Group Recommendations Grouped by Functional Categories

Supporting Information and Capabilities	Develop a decision-making framework for the decontamination of CBR agents in water systems specifically to be used by utilities, responders, and other decision makers (ISSUE 4, REC 1)
	Create transparent and scientifically defensible process for estimating the fate and transport of contaminants in drinking water and wastewater systems in the absence of information on a specific contaminant (ISSUE 10, REC 1)
	Determine the persistence and interaction of CBR agents in drinking water and wastewater and on pipe materials, and how chlorination affects contaminant persistence and interaction (ISSUE 10, REC 2)
	Determine fate and transport of decontamination agents in drinking water and wastewater systems and persistence in pipe materials (ISSUE 10, REC 4)
	Determine fate and transport of CBR agents, residuals, decontamination agents and solid discharge in the environment including if discharged to water body or after wastewater treatment (fertilizer or the sludge application to agricultural land, landfill, etc.) (ISSUE 10, REC 5)
	Assess the aerosolization or volatilization of contaminants released from drinking water and wastewater systems (ISSUE 10, REC 6)
	Determine the risk that an aerosolized attack of CBR agents will result in concentrations of concern to drinking water and wastewater systems (ISSUE 10, REC 7)
	Develop flowchart to show progression of roles and decision-making authority to be used by the utilities and responding/coordinating agencies during decontamination, treatment, and recovery (ISSUE 11, REC 1)
	Develop information guidelines for utilities on allocating and acquiring decontamination and treatment financial resources (ISSUE 13, REC 1)
	Provide utilities with information on decontamination factors to be considered when making capital improvement decisions through best practices development organizations advising the water sector (ISSUE 13, REC 2)
	Inform utilities of the critical assets available to the water sector to aid decontamination, treatment, and recovery from CBR contamination (ISSUE 13, REC 3)
	Provide surface (in situ) and water analysis methods specific for CBR agents to be used during decontamination and clearance steps through existing efforts (ISSUE 14, REC 1)
	Leverage existing efforts to identify laboratory capabilities and laboratory capacities specific to CBR agent decontamination needs (ISSUE 14, REC 2)
	Develop detailed, risk-based frameworks for health and safety assessments of drinking water and wastewater treatment plant and field staff that are consistent in approach across all EPA regions and states (ISSUE 15, REC 1)
Policy	Develop a decision-making framework regarding containing or purging contaminated water (ISSUE 1, REC 1)
	Revise existing guidance or develop new guidance for containment and disposal of decontamination waste including large amounts of water and associated solid wastes (ISSUE 1, REC 2)
	Develop transparent process for establishing target cleanup levels that can be used on an incident-specific basis (ISSUE 8, REC 1)
	Pre-establish information needs to determine target cleanup levels for contaminants that address multiple water uses (ISSUE 8, REC 2)
	Provide guidance on regulatory waiver process for discharge/disposal, decontamination/treatment, and return to service activities during CBR incidents (ISSUE 12, REC 1)

Table 3-1: Working Group Recommendations Grouped by Functional Categories, cont.

Decontamination Technologies and Procedures	Provide information on using traditional techniques (i.e., those in routine use by utilities) for non-traditional contaminants (ISSUE 2, REC 1)
	Provide information on the efficacy of pipe cleaning aids, such as NSF-60-certified products, on the decontamination of infrastructure (ISSUE 2, REC 2)
	Provide operational steps to minimize impact of decontamination (ISSUE 2, REC 3)
	Identify existing decontamination techniques (or develop new procedures) for CBR agents in treatment plant infrastructure (ISSUE 3, REC 1)
	Identify existing decontamination techniques, and/or develop new procedures for CBR agents in utility distribution and collection systems (ISSUE 5, REC 1)
	Identify existing decontamination techniques and/or develop new decontamination methods for CBR agents in private plumbing (ISSUE 5, REC 2)
	Establish measurement process for cleanup and clearance that addresses extent of sampling (ISSUE 8, REC 3)
	Provide information on the treatment of drinking water and wastewater contaminated with CBR agents (ISSUE 9, REC 1)
	Integrate fate and transport information into hydraulic models (ISSUE 10, REC 3)
Outreach and Communications	Use existing information services and Web-based databases to disseminate near-term practical decontamination solutions to utilities (ISSUE 2, REC 4)
	Identify the current state of decontamination and recovery knowledge for CBR agents and develop a preferred/vetted guidance to reconcile any conflicting information (ISSUE 6, REC 1)
	Populate and update WCIT to include additional fate and transport information (ISSUE 6, REC 2)
	Develop a Web-based information clearinghouse to share and disseminate decontamination and recovery information specific to the water sector (ISSUE 6, REC 3)
	Develop and provide two types, one each for drinking water and wastewater, of facility-based, decontamination training programs from "ground up" for water sector stakeholders and national response teams (ISSUE 6, REC 4)
	Develop guidance to help utilities to prepare outreach materials to educate utility personnel, lawmakers, and response agencies on decontamination and recovery processes before an incident (ISSUE 7, REC 1)
	Develop guidelines for risk communication activities during decontamination and recovery phases (ISSUE 7, REC 2)

The recommendations were also viewed within the different decontamination and recovery stages (i.e., Response, Decontamination and Cleanup, Clearance, and Return to Service) to ensure that the Working Group's recommendations formed a tight continuum from initial response to decontamination and recovery activities without overlap. A single recommendation under Issue Category 1 "Develop a decision framework regarding containing or purging contaminated water," which would traditionally fall under the initial response phase of a contamination incident, was recommended by the Working Group due to its impact on decontamination activities.

The Working Group also recognized that each recommendation, although introduced within a specific issue category, was intended to address the needs of one or more of the key issue categories. **Figures 3.1 - 3.3** provide relationship diagrams showing those recommendations within issue categories that are related to each other as predecessors, dependents or linkages.

Figure 3-1: Fate and Transport/ Discharge and Disposal

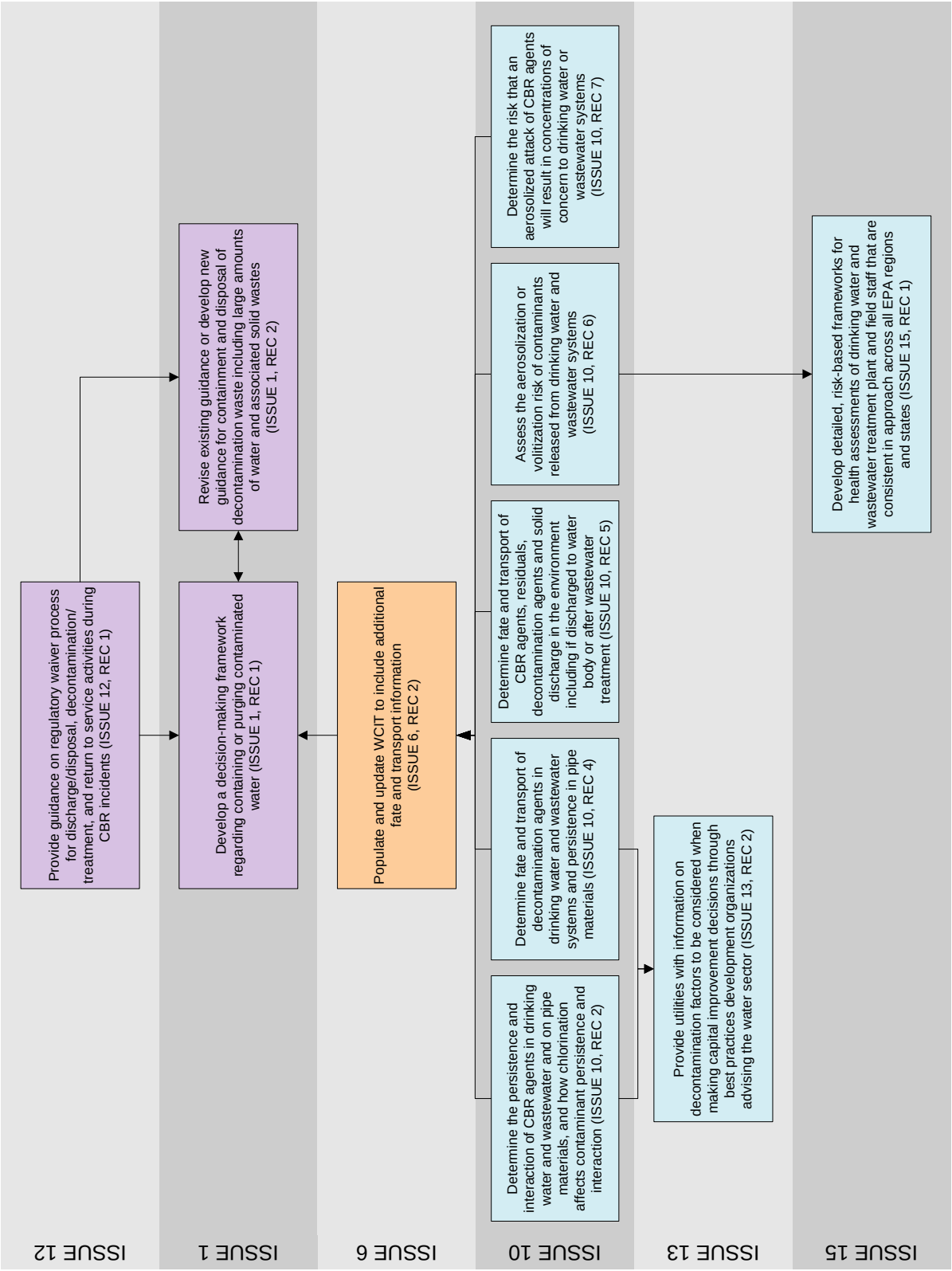


Figure 3-2: Decontamination and Treatment Technologies and Procedures

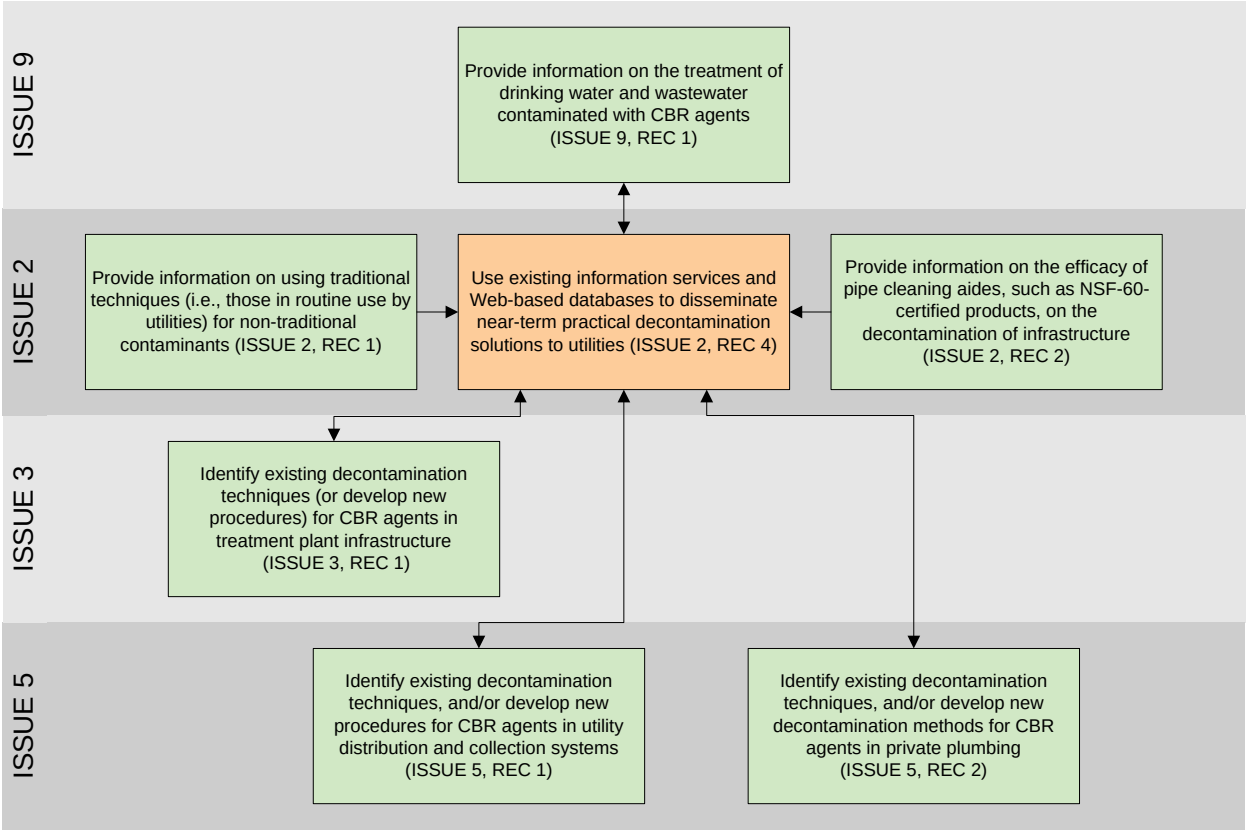
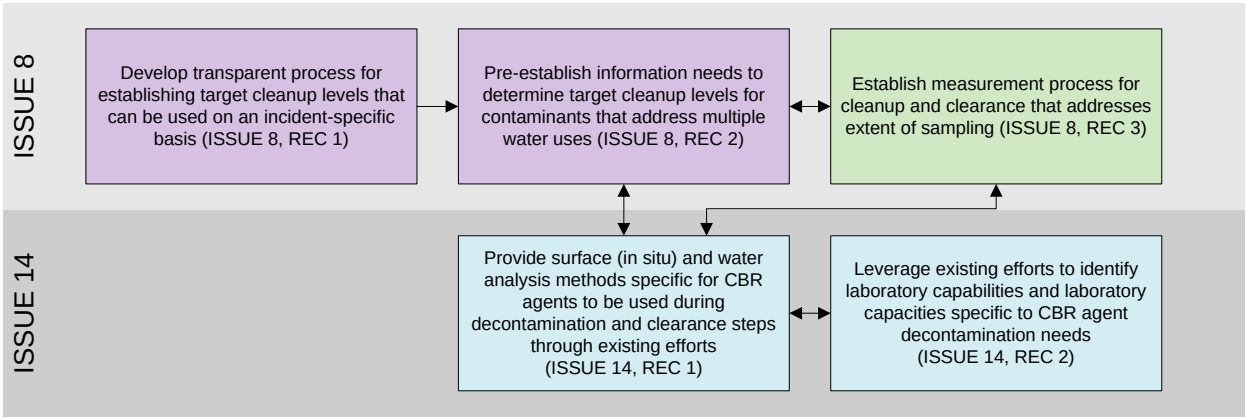


Figure 3-3: Cleanup and Clearance



4 STRATEGIC PLAN TO MEET KEY WATER SECTOR DECONTAMINATION ISSUES

This section presents the proposed strategic plan to address key water sector decontamination issues including which organization the Working Group proposes as lead for coordinating each recommendation and the factors these organizations should consider when pursuing these actions. Recommendations assume that sufficient funding and other resources are provided to complete the work and that the management of the lead coordinating organization approves associated projects.

4.1 Proposed Decontamination Strategic Plan

The recommendations needed to address the prioritized issues are grouped in this section based on their time frame for completion. The proposed time frames acknowledge the practical considerations necessary to complete the associated activities, but do not consider whether the identified organizations have the resources available to address the Working Group's recommendations in the time frames proposed.

Time frames for addressing recommendations include the following:

- Short term (within 1 year) – 14 recommendations were identified as short term actions
- Mid term (within 3 years) – 8 recommendations were identified as mid term actions
- Long term (within 5 years) – 13 recommendations were identified as long term actions

Although the Working Group identified completion timelines for each recommendation, these time frames do not dictate the priority in which the recommendations should be completed. It is the recommendation of the Working Group that these activities be completed in tandem. The short term, mid term, and long term action categorization merely represent the perceived time required to complete the action or actions. It may be helpful to the water sector to view short term actions as "low hanging fruit" and achievement of these actions could help maintain a positive momentum.

The Working Group identified organizations based on the recommendation, the steps or considerations to be taken when implementing the recommendation, and the gaps associated with each recommendation. The Working Group proposed "supporting organizations" for some recommendations where there were obvious benefits from related efforts by these organizations whose unique capabilities and roles were critical to successfully address the recommendation. As the recommendations are implemented, the coordinating agencies may also identify additional supporting organizations, such as the State Primacy Agencies, that were not identified by the Working Group.

Roles and responsibilities for organizations proposed to take the lead on each recommendation, based on the Working Group's understanding of the mandated roles, mission, and capabilities of the respective organizations, include the following:

- Conducting kickoff meetings with the CIPAC Water Sector Decontamination Working Group members to gain a full understanding of the recommendations and related issues
- Leveraging related work conducted by other parties
- Forming/involving recommendation-specific working groups as appropriate
- Coordinating with other organizations performing related work
- Compiling current information and releasing to the user community as appropriate

The Working Group stressed that representatives from utilities need to be consulted at key stages during implementation of recommendations. This collaboration will enhance the likelihood that implementation outputs meet the needs of the end users. In addition, coordination across the sectors will leverage ongoing efforts in other sectors that may be related to efforts in the water sector (e.g., radiological decontamination in the energy sector). Non-federal parties assigned to recommendations involving CBR agents will need to coordinate activities with the federal government when dealing with specific contaminants or contaminant classes. There is an established process for joint ownership of certain issues between DHS and EPA; the Working Group used this precedent for the multiple co-leads in the assignment of responsible parties below.

4.2 Short Term Actions

Revise existing guidance or develop new guidance for containment and disposal of decontamination waste including large amounts of water and associated solid wastes

(ISSUE 1, REC 2)

COORDINATING ORGANIZATIONS:
EPA OW (WSD);
NACWA AND WEF

Revise existing guidance documents or consolidate and update information on the disposal of decontamination waste to provide consistent, clear guidance for the water sector to use when handling a contamination incident. Regardless of the approach, the updated guidance should take into account the regulatory requirements for containing, handling, and disposing of contaminated water, wastewater, and solid waste resulting from decontamination efforts. This may require the review of several different areas of the regulatory code, and the regulations may vary from state to state. It is important that the implementers of this recommendation create guidance that will be usable across different states and take into account the minor differences that may be found.

The Working Group identified the following for consideration when developing guidance for the containment and disposal of decontamination wastes:

- Identify existing guidance and existing efforts, including ongoing research efforts on the containment and disposal of decontamination waste including large amounts of water and associated solid wastes
- Re-evaluate existing guidance on the containment and disposal of decontamination waste
- Rectify conflicting guidance
- Examine the potential use of underground injection control (UIC)

Provide operational steps to minimize impact of decontamination

(ISSUE 2, REC 3)

COORDINATING ORGANIZATIONS:
AWWA (DRINKING WATER);
NACWA AND WEF (WASTEWATER)

SUPPORTING ORGANIZATIONS:
SCC ORGANIZATIONS' RESEARCH ARMS

Assess and disseminate to utilities currently available information on operational steps that would minimize the impact of decontamination. Separate documents to identify current methods should be developed for:

- Drinking water systems identifying techniques and stages
- Wastewater systems identifying techniques and stages

The Working Group identified the following for consideration when providing operational steps to minimize impact of decontamination:

- Conduct review of existing guidance, techniques and literature on pre-scripted decontamination steps and their impact on a water system
- Conduct additional research on pre-scripted decontamination steps and their impact on a water system in areas not currently addressed by available information
  - Consider expanding existing EPA Office of Research and Development (ORD) National Homeland Security Research Center (NHSRC) projects identified by the Working Group
- Identify and leverage useful information from existing sources and ongoing efforts including:
  - RPTB/RPTB reference sources/RPTB Working Group

- AWWA standards/Manuals of Practice (MOPs)
- Water Environment Federation (WEF) MOPs
- EPA ORD (NHSRC) ongoing research
- EPA Office of Ground Water and Drinking Water (OGWDW) Wastewater RPTB (WWRPTB)

- Gaps identified by the Working Group provided in **Appendix B**

Use existing information services and Web-based databases to disseminate near-term practical decontamination solutions to utilities

(ISSUE 2, REC 4)

COORDINATING ORGANIZATION:
EPA

Create a temporary repository of information using existing information services that utilities may use to retrieve decontamination and treatment information while customized information platforms are developed.

The Working Group identified the following for consideration when developing information services and Web-based databases to disseminate information:

- Identify and leverage existing information services such as WCIT and Water Information Sharing and Analysis Center (WaterISAC) for methods to disseminate near-term practical solution information
- Identify and implement the steps needed to maintain classification protection while providing information to those that need it
- Some information may be sensitive and will have to remain protected under a "need to know" basis
- Utilities will need this information quickly during a contamination incident so the created services must be easily accessed and used by the appropriate parties
- Gaps identified by the Working Group provided in **Appendix B**

Develop a decision-making framework for the decontamination of CBR agents in water systems specifically to be used by utilities, responders, and other decision makers

(ISSUE 4, REC 1)

COORDINATING ORGANIZATIONS:
EPA AND DHS

SUPPORTING ORGANIZATION:
EPA ORD (NHSRC)

Develop an overarching risk informed decision-making framework that can be used by utilities, responders, and other decision makers to support decontamination decisions by including detailed modules for:

- Addressing regulatory requirements
- Balancing public safety with decontamination goals
- Determining whether to use surface measurements or water analyses to verify that cleanup levels have been met
- Determining whether to treat water and/or decontaminate infrastructure
- Determining whether to replace or decontaminate infrastructure
- Determining whether to seal and abandon in place or remove infrastructure
- Determining acceptable limits for alternate use of contaminated water such as firefighting

The Working Group identified the following for consideration when developing the decision-making framework:

- Establishment of a working group consisting of stakeholders, partners, and members of the scientific community to advise in the development of frameworks for decision making
- Leverage existing cleanup decision-making frameworks for biological and chemical agents, such as the Chemical and Biological Incident Response and Decision Process for Civilian Facilities by the Lawrence Livermore National Laboratory
- Create a decision tree/flowchart for each decontamination decision area based on current level of knowledge and with flexibility to revise as new information becomes available. Each of these decision trees or flowcharts should include:
  - Walking the user through the process
  - Supplemental/backup documentation and/or guidance
  - Acknowledgement of likely and "best case" decision versus the practicality of implementing the decision
- Draft frameworks should be vetted through local and state health departments and agencies, emergency personnel and utility personnel, to ensure that the frameworks are practical in the steps they recommend

In addition to the overall considerations, each of the specific decision-making flowcharts should include or take into consideration the following:

- Considerations for addressing regulatory requirements
  - The applicability of federal, state and local regulations during decontamination, discharge, or disposal, and return to service
  - To address the variability of regulations among states and among local jurisdictions, a method to walk responders and decision makers through the regulations applicable to each situation and location needs to be created
  - Regulations are fluid; therefore, the decision-making frameworks must be updated periodically
- Considerations for balancing decontamination goals with other aspects of public safety
  - Identify who will be involved in the decision-making process and what situational information is needed before a strategic approach can be established
  - Identify the public health, safety, and environmental risks posed by a decontamination process and/or the contaminant
  - The level of coordination needed with local health care organizations, local public health, and emergency management and responders
- Considerations for determining whether to use surface measurements or water analyses or both
  - Identify the information needed to decide between surface measurements and/or water analysis
  - The decision tree or flowchart should consider contaminant or contaminant class-specific information to guide utilities
- Considerations for determining whether to treat the drinking water/wastewater and/or decontaminate infrastructure
  - Identify appropriate treatment and decontamination procedures
  - Provide information on treating or decontaminating contaminant classes instead of specific contaminants
  - Examine the effect of the proposed treatment or decontamination procedures on the water
- Considerations for determining whether to replace or decontaminate infrastructure
  - Develop cost-effective modeling

  - Consider time frames
  - Weigh associated risks of each option
- Considerations for determining whether to abandon in place or remove infrastructure
  - Cost effectiveness of decisions needs to be included
  - Relative time frames for each option
  - Risks of each option
- Considerations for determining acceptable limits for alternate use of contaminated water, such as firefighting
  - Identify what potential alternative use classifications exist—leverage previous experiences where alternative use classifications have been used
  - Identify the health risks for alternative uses
  - Any regulatory requirements that will need to be addressed

Identify the current state of decontamination and recovery knowledge for CBR agents and develop preferred/vetted guidance to reconcile any conflicting information

(ISSUE 6, REC 1)

COORDINATING ORGANIZATION:
EPA

Evaluate the current state of decontamination knowledge and identify the key categories of information needed for CBR agents, the knowledge available for each information category and the sources of existing and emerging knowledge. In addition, develop guidance for reconciling any conflicting decontamination information or guidance when identifying the most reliable and current decontamination information.

The Working Group identified the following for consideration when identifying the current state of decontamination knowledge for CBR agents and developing preferred/vetted guidance to reconcile any conflicting information:

- Existing information and ongoing research efforts on the decontamination of CBR agents
- Ongoing efforts of EPA Office of Water (OW) Water Security Division (WSD) and EPA ORD NHSRC to collect decontamination information sources
- The need for public vetting of any guidance developed for reconciliation of conflicting information/guidance on decontamination
- The need for proper distribution of decontamination knowledge to make the information readily available to the water sector

Develop guidance to help utilities to prepare outreach materials to educate utility personnel, lawmakers, and response agencies on decontamination and recovery processes before an incident

(ISSUE 7, REC 1)

COORDINATING ORGANIZATIONS:
SCC ORGANIZATIONS

The Working Group recommends developing guidance for utilities to educate those agencies, responders and decision makers involved in the response to a contamination incident and help facilitate decision making related to subsequent decontamination. When developing this guidance, the coordinating agency needs to consider the intended audience of the communications, and ensure that adequate information is provided to the appropriate parties.

The Working Group identified the following for consideration when developing utility guidance:

- Identify steps needed to be taken when educating public officials on decontamination issues
  - Incorporate stages of resumption of service to address different uses
  - Educate utility personnel on how to communicate with public officials and which officials are to be involved during a contamination
  - Develop relationships with public officials prior to an incident to deal with the political pressures on the utility manager during a contamination incident
  - Provide awareness to law enforcement of the potential conflict between decontamination needs versus preservation of evidence
- Identify steps that should be taken when educating response agencies on decontamination issues
  - Consider how specific CBR agents may require different communications
  - Provide maps and specific directions to the utility and protocol for entrance to the site
  - Education should be provided so that response agencies have the information in advance of an incident so they may respond correctly to specific decontamination scenarios
  - Education should include what decontamination resources and assets will be needed by response agencies so that a utility may incorporate them into the utility response plans
  - Identify contaminants, such as radiological agents, that could trigger a national response
  - Provide utility incident command structure
- Expectations on the time frame for decontamination and recovery processes
- Develop a feedback mechanism to assess the usability and effectiveness of communication
- Leverage existing guidance on drafting public announcements and other communications
- Examine the effectiveness, usability, and role of message mapping

Develop guidelines for risk communication activities during decontamination and recovery phases

(ISSUE 7, REC 2)

COORDINATING ORGANIZATIONS:
SCC ORGANIZATIONS

The Working Group recommends developing guidelines utilities can use to develop and implement risk and crisis communication plans that encompass decontamination and recovery.

The Working Group identified the following for consideration when developing guidelines for risk and crisis communications plans:

- Identify existing information and guidance on drafting communication plans:

  - Water Security Initiative (WSI) Consequence Management Plan and forthcoming guidance
  - WSI Risk and Crisis Communication Plans
- Identify any conflicting information
- Consider that crisis communication may be ongoing during decontamination if the lack of water disrupts the economy and infrastructure
- Risk communication considerations:
  - How to convey to the public the risks associated with exposure during the decontamination effort
  - How to convey to the consumer that decontamination has been effective, and in the case of drinking water, water is safe to drink, and in the case of wastewater, the utility will resume discharging to the receiving water body
  - The threat to public health is not eliminated if water is not being consumed; customers may use water in other ways (bathing, washing dishes, etc.) that can also pose a threat to the public
  - Recognize the difference between water system decontamination and building decontamination
  - Use of message mapping

Develop transparent process for establishing target cleanup levels that can be used on an incident-specific basis

(ISSUE 8, REC 1)

COORDINATING ORGANIZATION:
EPA

Develop a standard process to establish cleanup levels on an incident-specific basis. This process should feature transparency, so that all parties involved in decontamination understand how the cleanup level was determined by the appropriate party.

The Working Group identified the following for consideration when developing a transparent process for establishing cleanup levels for decontamination:

- Coordinate with the interagency (EPA, DHS, and Centers for Disease Control and Prevention [CDC]) efforts under the leadership of the Office of Science and Technology Policy (OSTP), within the Executive Office of the President, on cleanup decision making
- Existing processes for determining contaminant levels and other sources available for leveraging information:
  - OSTP
  - Water regulations
  - Health Advisories
  - WCIT
  - Washington area Council of Governments (COG) research
  - EPA ORD NHSRC's Threat and Consequence Analysis Division (TCAD) efforts
- Determining which aspects can be applied to time-sensitive decision making on an incident-specific basis; adapting the results into flexible guidance or framework
- Incorporating guidance to pre-identify critical operations and users dependent on water and determining how different users may be able to use water at various cleanup levels. Key water users include:
  - Hospitals and healthcare facilities
  - Dialysis clinics
  - Daycare in schools
  - Other critical sectors (e.g., power, agriculture, nuclear)

- Identifying a "critical reference list" for quickly accessing the toxicity and infectivity information needed to feed into this process to establish cleanup levels. The list should include:
  - WCIT
  - CDC, Coordinating Center for Environmental Health and Injury Prevention (CCEHIP) (Note: the Agency for Toxic Substances and Disease Registry [ATSDR] is now a Center level functional group within the CCEHIP)
  - CDC, Coordinating Center for Infectious Diseases
  - Integrated Risk Information System (IRIS)
  - Office of Pesticide Programs Registration Eligibility Decision (RED) documents
  - EPA ORD (NHSRC) TCAD for determining health risk levels
- Identifying who will have decision making authority during an incident for establishing cleanup levels
  - Examine roles and responsibilities under NIMS, ICS and the Environmental Clearance Committee (ECC)
- Encouraging communication and cross-training among agencies regarding the intended meaning and implications associated with different uses and cleanup levels (e.g., "do not use" vs. "do not drink")
- Circulating draft process to water sector for review prior to finalization and making the process available to water sector to maximize transparency
- Gaps identified by the Working Group provided in **Appendix B**

Establish measurement process for cleanup and clearance that addresses extent of sampling

(ISSUE 8, REC 3)

COORDINATING ORGANIZATION: EPA

Develop an approach to designing statistically valid sampling plans to monitor decontamination efforts and support decisions to resume drinking water or wastewater service.

The Working Group identified the following for consideration when developing a measurement process for cleanup after a contamination event:

- Identify system variables that will need to be considered when developing sampling plan to support decontamination monitoring
- Identify potential sampling locations and the limitations of certain measurement types and locations
- Identify practical limitations for measuring pipe surfaces
- Consider increasing sampling frequencies over and above what the Safe Drinking Water Act (SDWA) and National Primary Drinking Water Regulations (NPDWR) require
- Address unregulated contaminants differently than regulated ones, due to lack of applicability of SDWA/NPDWR
- Consider persistence in infrastructure and biofilms; contaminant may be present even after sampling of water shows no contamination, and leaching from these sources may affect sampling duration and frequency
- Identify contaminant class characteristics that will need to be considered when developing sampling plan

- Identify statistical considerations—and associated sampling and analysis uncertainties—that will need to be considered when developing sampling plan
- Determine how each clearance aspect should be addressed in an effective sampling plan, and develop this into a flexible guidance or framework
- Gaps identified by the Working Group provided in **Appendix B**

Develop flowchart to show progression of roles and decision-making authority to be used by the utilities and responding/coordinating agencies during decontamination, treatment, and recovery

(ISSUE 11, REC 1)

COORDINATING ORGANIZATIONS:
DHS AND EPA

SUPPORTING ORGANIZATIONS:
SCC ORGANIZATIONS

The objective of this recommendation is the development of a flowchart to show the progression of roles and decision-making authority that includes the drinking water and wastewater utility and the other organizations involved in decontamination and clearance. The flowchart should not only account for changes in the roles and decision-making authority of personnel as the scope and circumstances of contamination incident vary but also how variability in state and federal regulations may impact these roles. The flowchart should answer the following questions:

- For the utility:
  - Who would the utility be dealing with in different situations?
  - When would responders/others be helping?
  - When would responders/others be overseeing?
  - When would responders/others take over?
  - What are the financial obligations of utilities in various scenarios?
  - What administrative responsibilities are required in these various scenarios?
  - Who is available to help determine how to proceed?
  - Is a plan needed and, if so, who approves it?
- For the responding and coordinating agencies at the local, state, and federal levels:
  - Who makes decontamination versus evidence preservation decisions?
  - How do decisions get made?
  - How are decisions communicated?
  - How does responsibility change depending on what type of CBR contaminant or contaminant class is involved?
  - Who is the ultimate decision maker?

The Working Group identified the following for consideration when developing a flowchart to show the progression of roles and decision-making authority during decontamination and recovery:

- Identify existing guidance on roles and responsibilities of utility personnel and support agencies during decontamination and recovery activities in response to CBR agent contamination:
  - Under national guidance plans (e.g., NIMS, the National Response Framework [NRF])
  - Under state and federal regulations
  - At the utility level (case studies of response plans)
- Provide links to preceding activities during the initial response phase
- Develop protocols for evidence preservation versus decontamination
- Identify any exemptions related to CBR agents

- Create a flowchart/decision tree that categorizes specific situations and indicates who would be responsible for each category:
  - Must recognize differences between public and private utilities
  - Account for the differences between a national level incident and an isolated local incident
  - Most of this information is available, but utilities may need clarification on NIMS procedures and on how the roles and decision-making authority evolves

Provide guidance on regulatory waiver process for discharge/disposal, decontamination/treatment, and return to service activities during CBR incidents

(ISSUE 12, REC 1)

COORDINATING ORGANIZATIONS:
ASDWA, ASIWPCA, AND EPA

Develop guidance in advance of a contamination incident that will provide the process to receive regulatory waivers and suspensions consistent in approach across all EPA regions and all states. Utilities need to be informed on what waivers and suspensions are available and how to receive them. The guidance should take into account potential regulatory issues that may apply to discharge/disposal, decontamination, treatment, and return to service. Waivers and variances should be pre-identified so that they can be built into the regulatory process for CBR agents.

The Working Group identified the following for consideration when developing guidance on the regulatory waiver process:

- Leverage the lessons learned from the Hurricane Katrina aftermath including the Health Insurance Portability and Accountability Act (HIPAA) law suspension
- Leverage lessons learned from the 2001 anthrax attacks including the acquisition of crisis exemptions
- Reference the Office of Enforcement and Compliance Assurance (OECA) Web page for waiver examples
- Determine who will be the decision makers at the local, state, and federal levels and how this may change depending on the circumstances and if there is a federal declaration issued
- Determine how changes in populations served (increases or decreases) related to a national level incident impacts the regulatory waiver and suspension process taken by a utility

Develop information guidelines for utilities on allocating and acquiring decontamination and treatment financial resources

(ISSUE 13, REC 1)

COORDINATING ORGANIZATIONS:
AWWA (DRINKING WATER)
NACWA AND WEF (WASTEWATER)

Develop guidance to assist utilities in the allocation and acquisition of financial resources for decontamination and treatment. Utilities may need guidance regarding how to allocate their available financial resources to prepare for and respond to contamination incidents. Utilities may not have sufficient financial resources of their own to address decontamination and treatment needs. Therefore, utilities may need assistance in identifying additional financial resources to meet these needs.

The Working Group identified the following for consideration when developing the guidance for allocating and acquiring decontamination and treatment financial resources:

- Survey other organizations and large utilities to evaluate decontamination preparedness:
  - Look specifically to lessons learned from large utilities and their organization/efforts to prepare for decontamination (e.g., Charlotte Mecklenburg Utilities decontamination task force)
- Create guidelines for utilities to plan and prepare for decontamination, including:
  - How to prioritize resources/funding and planning activities for decontamination
  - How to determine resources for supporting decontamination
  - How to acquire resources from state and federal agencies
  - How to leverage aid (e.g., Water/Wastewater Agency Response Networks [WARNs])
  - How to acquire resources for decontamination at the utility level (e.g., revolving fund-type initiative, self insurance, regional pooling, stratification of funding based on risk)

Inform utilities of the critical assets available to the water sector to aid decontamination, treatment, and recovery from CBR contamination

(ISSUE 13, REC 3)

COORDINATING ORGANIZATIONS:
EPA (DEVELOP) AND
SCC ORGANIZATIONS
(DISTRIBUTE)

Provide utilities with a resource to help identify asset availability and capability during the pre-incident planning process. During a decontamination and recovery process, following a CBR incident, a drinking water or wastewater utility will require assets, including specially trained personnel to effectively complete the recovery activities in a safe and timely fashion. The pre-identification of asset availability and capability are critical information needed by utilities during the pre-incident planning process. A platform, or means to disseminate information, is needed to inform water utilities of the availability of critical assets to aid in decontamination and recovery from CBR agents.

The Working Group identified the following for consideration when developing guidance for the water sector on critical assets available to aid decontamination, treatment, and recovery:

- Identify critical asset categories for decontamination of drinking water and wastewater systems
- Identify resource typing databases for critical decontamination assets through existing efforts and provide information to utilities
  - AWWA Resource Typing Initiative
  - National Integration Center's Resource Typing Initiative
  - WARN efforts

Leverage existing efforts to identify laboratory capabilities and laboratory capacities specific to CBR agent decontamination needs

(ISSUE 14, REC 2)

COORDINATING ORGANIZATION:
EPA OW (WSD)

Provide utilities with information on the capabilities and capacities of laboratories that may be called upon during a contamination event. If necessary, expand laboratory capabilities (to accommodate water samples for analysis of CBR agents) and expand laboratory capacities (to support the high sample analysis demand that would be needed to support decontamination efforts and final clearance decisions).

The Working Group identified the following for consideration when identifying laboratory capabilities and capacities for decontamination sample analysis:

- Identify what laboratory capabilities and capacities are needed specifically for CBR agent decontamination
- Leverage the following, existing efforts to expand laboratory capabilities and capacity:
  - Water Laboratory Alliance (WLA)
  - Environmental Response Laboratory Network (ERLN), particularly the ERLN's role in supporting environmental decontamination efforts
  - Other laboratory network members of DHS's Integrated Consortium of Laboratory Networks (ICLN) such as CDC's Laboratory Response Network, the U.S. Department of Agriculture (USDA) and U.S. Food and Drug Administration (FDA) Food Emergency Response Network (FERN), and the "emerging" members of the ICLN

4.3 Mid Term Actions

Develop a decision-making framework regarding containing or purging contaminated water
(ISSUE 1, REC 1)

COORDINATING ORGANIZATIONS:
EPA OW AND ASDWA

SUPPORTING ORGANIZATIONS:
CDC, EPA ORD (NHSRC), AND STATE-LEVEL ORGANIZATIONS OF ASDWA AND ASIWPCA

Develop a decision-making framework to help determine whether to contain or immediately discharge contaminated water in the immediate aftermath of a confirmed detection of a contaminant that poses a public health threat. The framework should weigh the adverse effects of containing contaminated water in a water system versus purging it and address any regulatory requirements, highlighting differences between drinking water and wastewater systems. The limitations of current emergency notification technologies should be considered as well. For example, it would not be safe to assume that all potentially impacted persons receive a reverse-911 message instructing people not to use the water.

The Working Group identified the following for consideration when developing a decision framework regarding containing or purging contaminated water:

- Re-evaluate existing guidance on treating and discharging contaminated drinking water/wastewater based on:
  - Public safety risks associated with exposure to contaminated water remaining in the distribution system versus environmental exposure if purged
  - New research indicating an increase in decontamination difficulty due to increased retention times of contaminated water
- Identify existing guidance or efforts, including ongoing research on treating and discharging contaminated drinking water and wastewater
- Identify regulatory restrictions and allowances for the discharge of contaminated water
- Identify key steps and participants in the decision-making process when deciding to contain or purge a contaminated drinking water or wastewater system
- The different disposal and notification requirements for drinking water and wastewater utilities
- The limitations of current emergency notification systems designed to warn the public of a health risk in a timely manner
- Review of the issue paper written by Working Group member Greg Welter (**Appendix C**) – Note this paper is not the opinion of the entire Working Group but that of one member who has conducted related research separate from the rest of the Working Group

Provide information on using traditional techniques (i.e., those in routine use by utilities) for non-traditional contaminants

(ISSUE 2, REC 1)

COORDINATING ORGANIZATIONS:
EPA ORD (NHSRC) (RESEARCH) AND EPA OW (WSD) (OUTREACH)

Assess the use of traditional treatment techniques, such as hyper-chlorination and ozonation for the decontamination of non-traditional contaminants.

The Working Group identified the following for consideration when assessing the use of traditional techniques for non-traditional contaminants:

- Identify published literature that may provide insight into the basic science of using traditional techniques
- Identify and leverage existing efforts on the effectiveness of traditional techniques on non-traditional contaminants

- Conduct additional research on the effectiveness of traditional techniques on non-traditional contaminants for use in the:
  - Treatment of drinking water and wastewater
  - Decontamination of drinking water and wastewater system infrastructure
- Gaps identified by the Working Group provided in **Appendix B**

Identify existing decontamination techniques and/or develop new decontamination methods for CBR agents in private plumbing

(ISSUE 5, REC 2)

COORDINATING ORGANIZATION:
EPA ORD (NHSRC)

Identify or develop decontamination procedures for private plumbing to aid a utility in responding to a contamination event. The difference in private plumbing systems and their components necessitates the need for research to identify the impacts diverging system variables have on each other and decontamination activities.

The Working Group identified the following for consideration when developing new decontamination methods for CBR agents:

- Existing efforts and information on decontamination procedures for private plumbing systems should be leveraged and identified, including completed and ongoing research efforts by:
  - EPA ORD (NHSRC)
  - U.S. Army Corps of Engineers
  - AwwaRF
- Conducting additional research on the decontamination of private plumbing systems contaminated by CBR agents may be necessary in areas not currently addressed by available information, including answers to:
  - How parallel does decontamination in private plumbing need to be to decontamination activities in a distribution or collection system?
  - Is dilution an effective means of decontamination?
  - What components of a private plumbing system are most susceptible to failures from the decontamination process?
  - How does the difference between private plumbing and distribution and collection systems impact decontamination activities? [Private plumbing systems may differ by being smaller or

have more bends, appliances (e.g., water heater, washing machine, dishwasher), and more variability in materials (e.g., galvanized steel).]
  - What effect would the incorrect or incomplete decontamination of private plumbing have on a drinking water and/or wastewater system?
  - How do cross connections between private and public plumbing impact decontamination activities?

- Using sprinkler systems as a flushing or decontamination technique may not be possible due to potential spreading of contaminants through the entire building

In addition to the research components necessary to complete this recommendation, several outreach and development considerations should be taken into account as well:

- Addressing safety concerns during decontamination of private plumbing is necessary due to the proximity and likelihood of customer contact
- Gaining permission to access a customer's private plumbing system needs to be considered
- Ensuring that customers understand or perform the required functions (i.e., flushing) to assist with decontamination may be difficult to accomplish:
  - How does a utility determine if homeowner performed decontamination?
  - When is a utility or other response agency responsible for performing decontamination (e.g., contaminant specific)?
  - Would a customer be able to handle contaminated waste (e.g., scale in water heater)?
  - How does a utility provide outreach to and educate the affected residences?
- Gaps identified by the Working Group provided in **Appendix B**

Mid Term Actions

Develop and provide two types, one each for drinking water and wastewater, of facility-based, decontamination training programs from "ground up" for water sector stakeholders and national response teams

(ISSUE 6, REC 4)

COORDINATING ORGANIZATIONS:
EPA (DEVELOP) AND ASSOCIATIONS (DISTRIBUTE)

Develop from the "ground up" two types of facility-based training programs for drinking water and wastewater systems. The training should:

- Include the most current and reliable information/guidance for decontamination of water systems
- Address both contaminated material (water and solid) and decontaminated wastes resulting from the decontamination process
- Include the management and disposal of waste created by the decontamination of infrastructure and from flushing activities
- Include discussions on clearance, wastewater issues, and coordination with other agencies
- Include NIMS/ICS guidance

The Working Group identified the following for consideration when developing and providing facility-based decontamination training from the "ground up":

- Identify the types of training and exercises needed for the water sector
- Leverage previously developed training models from other sectors (e.g., airport preparedness training model)

- Leverage relevant ongoing research outcomes
- Leverage existing disposal and decontamination guidance including:
  - RPTB Module 6
  - The WSI Remediation and Recovery (R/R) Plan within the Consequence Management Plan Guidance (CMPG)
  - A Disposal Decision Support Tool for Disposal of Contaminated Building Water System
  - NACWA Planning for Decontamination of Wastewater: A Guide for Utilities
- Specific training exercises to be provided for water sector stakeholders and national response teams

Create transparent and scientifically defensible process for estimating the fate and transport of contaminants in drinking water and wastewater systems in the absence of information on a specific contaminant

(ISSUE 10, REC 1)

COORDINATING ORGANIZATION:
EPA ORD (NHSRC)

SUPPORTING ORGANIZATION:
DHS

Develop a model or models for estimating the fate and transport of CBR agents in drinking water and wastewater systems for which specific empirical data is not available. These models need to be evident, obvious, and easily understood so they can be applied in response to a water contamination incident where there is incomplete knowledge of the fate and transport properties of the contaminants. This project requires the integration of general knowledge about transport and fate of both chemicals and microorganisms in water, especially drinking water and wastewater. Mathematical simulation models of fate and transport of chemicals have been identified by researchers and regulators as potentially valuable tools for improving the understanding of the environmental behavior of chemicals, which may be released to the environment as a consequence of routine (i.e., normal manufacturing, use, disposal) and non-routine (e.g., accidental spillage) events. Such simulation could rely on Quantitative Structure and Activity Relationships (commonly known by the acronym QSAR). EPA has developed some QSARs for specific applications such as environmental exposure to and removal of pesticides. However, these models need to be modified, or new models created, to apply to the agents of concern, along with the specific conditions found in drinking water and wastewater systems. Specifically, new hypotheses and measurement strategies have to be developed to evaluate and quantify biological, chemical and physical factors relating to the interaction of contaminants with water, disinfection residuals, biofilms, clean and tuberculated surfaces, sediments and suspended solids, and other specific components and conditions found in drinking water and wastewater system. Still, the models need to be simple enough to rapidly provide solutions to the questions that arise during a contamination incident. The models must be reviewed by appropriate scientists inside and outside the water sector so they are accepted by both the water sector and other interested parties.

Determine fate and transport of decontamination agents in drinking water and wastewater systems and persistence in pipe materials

(ISSUE 10, REC 4)

COORDINATING ORGANIZATIONS:
EPA ORD (NHSRC) AND USACE

Leverage available information and conduct additional research to assess the fate and transport of decontamination agents in drinking water and wastewater and when in contact with pipe materials. The Working Group identified the following for consideration when addressing this recommendation:

- Identify data gaps on fate and transport knowledge of decontamination agents in chlorinated water and wastewater in existing sources
- Identify and leverage existing efforts and information on the fate of decontamination agents in drinking water and wastewater including ongoing research
- Conduct research to fill data gaps on fate and transport knowledge for decontamination agents in water
- Identify and leverage existing efforts and information on the persistence of decontamination agents interacting with pipe materials, including ongoing research
- Conduct additional research on the persistence and interaction of decontamination agents on pipe materials in areas not currently addressed by available information
- Gaps identified by the Working Group provided in **Appendix B**

Provide utilities with information on decontamination factors to be considered when making capital improvement decisions through best practices development organizations advising the water sector

(ISSUE 13, REC 2)

COORDINATING ORGANIZATIONS:
AWWA (DRINKING WATER), NACWA AND WEF (WASTEWATER)

SUPPORTING ORGANIZATION:
USACE

Identify decontamination factors that should be considered when making capital improvements to reduce the risks and mitigate the consequences through effective decontamination and recovery processes. Decisions regarding decontamination factors when making capital improvements could include the type of pipe materials, type of disinfection, ability for physical decontamination and discharge, containment, and pretreatment. When identifying optimum solutions for capital improvements: cost, implementation time, and available technologies must be considered.

The Working Group identified the following for consideration when developing the guidance for factors to consider when making capital improvements:

- Identify key decontamination factors through materials and technique research and best practices for consideration in improvements to infrastructure and practices
- Define the difference between resources and assets
- Consider decontamination within all-hazards preparedness activities

Develop detailed, risk-based frameworks for health assessments of drinking water and wastewater treatment plant and field staff that are consistent in approach across all EPA regions and states

(ISSUE 15, REC 1)

COORDINATING ORGANIZATIONS:
OSHA AND CDC

Evaluate the health risks for plant and field staff, particularly identify specific risks that can be mitigated by changing operating procedures. Leverage existing information to assess contaminant-specific health risks, medical surveillance, procedural and plant operations, and coordination with upstream and or downstream systems.

The Working Group identified the following for consideration when developing risk-based frameworks for health assessments of utility personnel:

- Leverage existing information and/or efforts concerning current practices and protections for drinking water and wastewater treatment plant staff and field staff, including those making repairs
- Address the following in a risk-based framework:
  - Contaminant-specific health risks
  - Baseline medical surveillance information, if available
  - Risk of exposure to treatment plant staff
  - Relative risks of activities and criticality of these actions on plant operations
  - Timelines for when it is safe for operators to return to work
  - Impact of actions on treatment system itself
  - Procedural and plant operations and adjustments

4.4 Long Term Actions

Provide information on the efficacy of pipe cleaning aides, such as NSF-60-certified products, on the decontamination of infrastructure

(ISSUE 2, REC 2)

COORDINATING ORGANIZATION:
EPA ORD (NHSRC)

Assess the effectiveness of commercial products that are certified as safe for use in potable water systems such as "pipe cleaning aids" certified under NSF/ANSI Standard 60 to either neutralize or remove target contaminants that are known to adhere to the interior of water pipe surfaces of infrastructure.

The Working Group identified the following for consideration when providing information on the efficacy of pipe cleaning aids:

- Identify and leverage existing efforts including ongoing research on the efficacy of NSF-60-certified Pipe Cleaning Aids for use in drinking water and wastewater systems:
  - The current listing of certified chemicals can be viewed at the NSF Web site (http://www.nsf.org/Certified/PwsChemicals/)
- Conduct additional research on the efficacy of NSF-60-certified Pipe Cleaning Aids for use in drinking water and wastewater systems in areas not currently addressed by available information
- Review manufacturers' available documented methods for application of the chemicals to water works infrastructure, in particular the information on testing and certification against a health effects standard recognized by EPA and nearly all state regulatory agencies
- Gaps identified by the Working Group provided in **Appendix B**

Identify existing decontamination techniques (or develop new procedures) for CBR agents in treatment plant infrastructure

(ISSUE 3, REC 1)

COORDINATING ORGANIZATION:
EPA ORD (NHSRC)

Identify and/or establish in situ decontamination techniques for the large range of equipment types and fixed infrastructure that may be found in the treatment plants for drinking water and wastewater. This may require the creation of guidance, frameworks or information packets to educate the utilities.

The Working Group identified the following for consideration when developing decontamination techniques for treatment plants:

- Leveraging existing knowledge to identify decontamination methods that effectively contain and prevent a contamination from spreading through the treatment plant infrastructure and minimizing residual impact from efforts involving:
  - Military experience
  - Decontamination advances for outdoor structures
  - CDC
  - EPA ORD (NHSRC)
  - Other critical infrastructure sectors (e.g., nuclear sector for the decontamination of radiological agents from pumps)

- Conducting additional research to determine in situ decontamination procedures for treatment plants for different contaminant classes:
  - A detailed comparison of contaminant classes, equipment type, and decontamination techniques applicable to decontamination of treatment plant infrastructure may provide the best information on how system variables impact decontamination.
- Educating water suppliers on current treatment techniques available and the development of new techniques currently being researched
- Adapting decontamination procedures to specific components of a treatment plant (e.g., filters, pumps, and sediment basins)
- Identifying the range of equipment types found in a treatment plant and noting how this may vary between drinking water and wastewater plants:
  - Both the inside and outside of equipment should be considered during decontamination.
- Potential difficulties in decontaminating large pieces of equipment
- Identifying the impacts CBR agents may have on the multiple treatment stages in a plant
- Addressing the massive size and scale of a plant
- Understanding the issues related to adhered contaminants on hard surfaces including:
  - Does it leach into the water long after contamination?
  - Are there adherence variations between contaminants?
  - How often is testing needed to verify that contaminants no longer slough off?
  - Will there be long-term impacts due to delayed slough?
  - Should public health surveillance be used as a monitoring tool?
- Identifying how to treat contaminated water before it leaves the plant
- Applying removal procedures for fixed structures (e.g., concrete)
- Gaps identified by the Working Group provided in **Appendix B**

Identify existing decontamination techniques, and/or develop new procedures for CBR agents in utility distribution and collection systems

(ISSUE 5, REC 1)

COORDINATING ORGANIZATION:
EPA ORD (NHSRC)

Identify and develop decontamination procedures for distribution and collection systems to aid a utility in responding to CBR agent events. The approach should include researching:

- The effectiveness of available and emerging decontamination methods, including chlorination, surfactants, and enzymatic treatment
- System variables that may impact distribution and collection system decontamination.

The Working Group identified the following for consideration when developing procedures for CBR agents in distribution and collection systems:

- Understanding and accounting for the public perception of a contamination event in a utility distribution system
- Identifying published literature that may provide insight into the basic science and aid in the selection of decontamination methods in distribution systems

- Identifying and leveraging existing efforts on decontamination procedures for distribution and collection systems, including research efforts ongoing and completed by:
  - EPA ORD (NHSRC)
  - AwwaRF
  - Other sectors (e.g., lessons learned from Hurricane Katrina)
- Conducting additional research on the decontamination of distribution and collection systems contaminated by CBR agents in areas not currently addressed by available information. Specifically:
  - Examining the efficacy of existing decontamination procedures on CBR agents (e.g., efficacy of hyper-chlorination against non-traditional contaminants)
  - Examining the effect of identified or developed procedures on the private plumbing of a system
  - Developing procedures to avoid generating a residual that is itself problematic
- Accounting for all areas that may need to be decontaminated (e.g., inside and outside of pumps)
- Providing guidance on decontamination procedures for distribution and collection systems and private plumbing which needs to address the impact of system variables and contaminant type on procedure used
- Identifying techniques that account for access and difficulty of implementation considerations. For example:
  - Most areas of the distribution system will have limited or no access to workers
  - Cleaning through some valves (e.g., butterfly valves) is difficult
- Gaps identified by the Working Group provided in **Appendix B**

Populate and update WCIT to include additional fate and transport information

(ISSUE 6, REC 2)

COORDINATING ORGANIZATION:
EPA OW (WSD)

Update the Water Contaminant Information Tool (WCIT) to include the fate and transport information of CBR agents, residuals, and decontamination agents in the environment and in chlorinated drinking water and wastewater systems. Current WCIT contaminants containing expert judgments on fate and transport information should also be updated with empirical data.

The Working Group identified the following for consideration when populating and updating WCIT to include fate and transport information:

- Leverage the fate and transport efforts recommended in Issue 10 to populate and update the information in WCIT
- Update WCIT fate and transport information as it pertains to decontamination and recovery

Develop a Web-based information clearinghouse to share and disseminate decontamination and recovery information specific to the water sector

(ISSUE 6, REC 3)

COORDINATING ORGANIZATION:
EPA

Develop and maintain a Web-based distribution platform to centralize and disseminate decontamination information and to provide the water sector with a tool to access the most up-to-date comprehensive decontamination information. This tool should be user friendly and secure.

The Working Group identified the following for consideration when developing a Web-based information clearinghouse to share and disseminate decontamination and recovery information specific to the water sector:

- Leverage the functionalities of existing sources when developing a tool:
  - WaterISAC – contains links to external databases but has limited accessibility
  - WCIT – contains information on water contaminants (Issue 2, Recommendation 4)
  - National Decontamination Team (NDT) Emergency Management Portal – includes matrices other than water and currently not available to the water sector
- Determine a process for the distribution of decontamination information including different access levels to ensure the confidentiality of secure data

Pre-establish information needs to determine target cleanup levels for contaminants that address multiple water uses

(ISSUE 8, REC 2)

COORDINATING ORGANIZATION:
EPA ORD (NHSRC)

Develop information needed to characterize public health risks posed by CBR contamination events and inform decision making to support decontamination and clearance goals of contaminated drinking water and wastewater systems, on an incident specific basis. The coordinating organization should develop data and necessary tools to support the determination of multiple cleanup levels for a given contaminant or contaminant class. The Working Group identified several factors that may present a need for pre-establishing information needs that address multiple cleanup levels:

- Potential uses (e.g., drinking, showering, firefighting)
- Intended population, including special populations (e.g., hospital, elderly, immunocompromised)
- Process for measuring levels to capture all areas of potential contamination (e.g., locations within the distribution system or infrastructure)
- Drinking water versus wastewater systems (could higher levels be accommodated for discharge of contaminated wastewater to the environment than for water consumption)

The Working Group identified the following for consideration when pre-establishing information needs to determine target cleanup levels for contaminants that address multiple water uses:

- Coordinate with the interagency (EPA, DHS, and CDC) efforts under the leadership of OSTP (within the Executive Office of the President)
- Consult with government agencies and stakeholders to prioritize contaminants of concern for which cleanup levels are needed
- Determine range of water use categories and identify specific uses:

  - Residential uses (e.g., toilet, washing, showering, cooling, pet consumption, cooking)
  - Business uses (e.g., with and without specific personal protective equipment [PPE], cooling, food production, secondary problems created by the use of contaminated water to meet primary need)
  - Other uses (e.g., firefighting, healthcare services)
- Identify factors for mapping cleanup levels to water uses including:
  - Type of contaminant (i.e., biological versus chemical)
  - Contaminant exposure duration (e.g., 1-year, 5-year)
  - Known contaminant toxicology data
  - Different levels for drinking water and wastewater systems
  - Worker exposure levels from National Institute for Occupational Safety and Health (NIOSH), American Conference of Governmental Industrial Hygienists (ACGIH) [which set the threshold limit value (TLV) for worker exposure], American Council of Education on Industrial Hygiene (ACEIH), or Occupational Safety and Health Administration (OSHA)
  - Regulatory considerations for establishing multiple cleanup levels
  - Provide sufficient level of detail on specific uses in public notifications
  - Give precedence to and anticipate water needed to handle life threatening situations (e.g., firefighting use even if contamination exists)
  - Agencies that may be required to act in the response to a contamination event
  - Leveraging examples of multiple level use in the past
- Determine appropriate value type for each use category (e.g., Life-time value? Reference dose? Long-term value?)
- Use process established to meet Recommendation 1 in order to develop information needs to determine target cleanup levels for each contaminant and use. Process should consider existing MCLs for water use and existing EPA Health Advisory values.
- Gaps identified by the Working Group provided in **Appendix B**

Provide information on the treatment of drinking water and wastewater contaminated with CBR agents

(ISSUE 9, REC 1)

COORDINATING ORGANIZATION:
EPA ORD (NHSRC)

SUPPORTING ORGANIZATIONS:
WERF AND CDC

To respond to this recommendation, the coordinating organization should identify or develop appropriate water treatment techniques to be used on CBR agents. Related regulatory requirements, which must be followed when treating the water in water or wastewater utility, should be identified and highlighted. The final output should provide utilities with information and possibly guidance on the treatment techniques available to utilities, and should include discussions to aid utilities in remaining compliant with the federal, state, and local regulations.

The Working Group identified the following for consideration when developing water treatment techniques:

- Identifying and leveraging existing efforts and information on treatment procedures for contaminated drinking water and wastewater. These efforts include:
  - Who is qualified to handle the cleanup work, based on contaminant type and training/capabilities of responders
  - Processes to reduce water or wastewater volume prior to treatment
  - Whether and when water can be discharged to the environment for natural attenuation, depending on contaminant type

  - Environmental fate of associated discharge materials
  - How to deal with the ultimate fate of contaminants and treatment agents
  - Impact of treatment techniques on wastewater treatment plant infrastructure
  - Potential operational adjustments to limit exposure and optimize water treatment (e.g., additional treatment steps, retrofitting, and package plants)
  - Impact of using existing water treatment procedures and adapting to use against CBR agents
  - Universal methods to treat all contaminants or contaminant classes
  - Impact of the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), Resource Conservation and Recovery Act (RCRA) and other triggered regulations on treatment procedures including, obtaining crisis exemptions, compliance and "cradle-to-grave" ownership concerns, specifically on responsibility and liability for the contaminated material and treatment residuals
  - Disposal concerns, including sludge and filter element disposal, and physical challenges to moving and disposing
  - Public notification considerations, such as contact with public, message mapping, crisis and risk management, and restoring public confidence
  - Safety considerations, such as safety and health issues of the utility personnel that may be exposed to treatment processes down stream from the treatment
- Conducting research on treatment in areas not currently addressed by available information:
  - Examine the current ongoing efforts of EPA ORD (NHSRC), AwwaRF, Water Environment Research Foundation (WERF), and other research organizations to avoid duplication of effort
- Gaps identified by the Working Group provided in **Appendix B**

Determine the persistence and interaction of CBR agents in drinking water and wastewater and on pipe materials, and how chlorination affects contaminant persistence and interaction

(ISSUE 10, REC 2)

COORDINATING ORGANIZATION:
EPA ORD (NHSRC)

SUPPORTING ORGANIZATION:
CDC

Leverage available information and conduct additional research to assess the fate and transport of CBR agents in drinking water and wastewater and when in contact with pipe and other infrastructure materials. The Working Group identified the following for consideration when addressing this recommendation:

- Identify data gaps on fate and transport knowledge of CBR agents in chlorinated water
- Identify and leverage existing efforts and information on the persistence of CBR agents in drinking water and wastewater including ongoing research
- Conduct research to fill data gaps on fate and transport knowledge for CBR agents in water
- Identify and leverage existing efforts and information on the persistence of CBR agents interacting with pipe materials, including ongoing research
- Conduct additional research on the persistence and interaction of CBR agents on pipe materials in areas not currently addressed by available information
- Gaps identified by the Working Group provided in **Appendix B**

Integrate fate and transport information into hydraulic models

(ISSUE 10, REC 3)

COORDINATING ORGANIZATION:
EPA ORD (NHSRC)

Use existing information to enhance hydraulic models with fate and transport characteristics of CBR agents, residuals, and decontamination agents in water infrastructure.

The Working Group identified the following for consideration when integrating fate and transport information into hydraulic models:

- Identify available models and systems to study and describe the hydraulic properties of drinking water and wastewater utilities
- Leverage previous fate and transport efforts to accumulate data necessary to use in integration of fate and transport studies into hydraulic models
- Gaps identified by the Working Group provided in **Appendix B**

Determine fate and transport of CBR agents, residuals, decontamination agents and solid discharge in the environment including if discharged to water body or after wastewater treatment (fertilizer or the sludge application to agricultural land, landfill, etc.)

(ISSUE 10, REC 5)

COORDINATING ORGANIZATION:
EPA ORD (NHSRC)

SUPPORTING ORGANIZATIONS:
AwwaRF AND WERF

Evaluate the persistence of CBR agents, residuals, and decontamination agents in water or solid waste when discharged into the environment.

The Working Group identified the following for consideration when evaluating persistence of CBR agents, residuals, and decontamination agents:

- Identify data gaps on fate and transport knowledge of CBR agents in water in existing sources such as WCIT
- Identify and leverage existing efforts and information on the fate and transport of these agents in the environment and after treatment in a wastewater utility, including any ongoing research
- Conduct additional research on CBR agents, decontamination agents, and residual transport in the environment and after treatment in areas not currently addressed by available information
- Gaps identified by the Working Group provided in **Appendix B**

Assess the aerosolization or volatilization of contaminants released from drinking water and wastewater systems

(ISSUE 10, REC 6)

COORDINATING ORGANIZATION:
EPA ORD (NHSRC)

Identify which suspected contaminants would constitute an aerosol once they have been introduced into water. Determine whether there are safety measures that could be employed to effectively mitigate the risk to wastewater utility workers and to firefighters.

The Working Group identified the following for consideration when developing information on aerosolization or volatilization risk:

- Identify and leverage existing efforts and information, including any ongoing research, on aerosolization potential of CBR agents and residuals in the conveyance, treatment and collection systems of wastewater and drinking water systems
- Conduct additional research on CBR agent and residual transport in the environment and after treatment in areas not currently addressed by available information
- Gaps identified by the Working Group provided in **Appendix B**

Determine the risk that an aerosolized attack of CBR agents will result in concentrations of concern to drinking water and wastewater systems

(ISSUE 10, REC 7)

COORDINATING ORGANIZATIONS:
DHS AND EPA

Assess the likelihood that an aerosolized attack would ultimately lead to contamination of water systems and subsequent public safety risks.

The Working Group identified the following for consideration when addressing this recommendation:

- Ongoing, collaborative efforts by the EPA and National Oceanic and Atmospheric Administration (NOAA) to model dispersion forecasts
- Identify routes that the residuals of an aerosolized CBR agent attack would take to be transported and concentrated to drinking water and wastewater utilities (e.g., runoff into drinking water source water)
- Identify what concentrations of CBR agents are of concern in a water or wastewater utility
- Leverage fate and transport information and hydraulic modeling to determine how contaminant concentrations may increase in drinking water and wastewater utilities after an aerosolized attack
- Gaps identified by the Working Group provided in **Appendix B**

Provide surface (in situ) and water analysis methods specific for CBR agents to be used during decontamination and clearance steps through existing efforts

(ISSUE 14, REC 1)

COORDINATING ORGANIZATION:
EPA

SUPPORTING ORGANIZATION:
CDC

Leverage surface (in situ) and water analysis methods specific to decontamination of infrastructure and provide to the water sector. In situ and water analysis methods may not be available for all CBR agents. In addition, research is needed to determine whether water analysis methods are appropriate for determining the effectiveness of decontamination efforts or if in situ methods are required.

The Working Group identified the following for consideration when assessing this recommendation:

- Identify in situ and water analysis methods available and those being researched/tested specific for water infrastructure decontamination
- Leverage existing efforts to provide analytical methods specific to water infrastructure decontamination through the following efforts:
  - Standardized Analytical Methods for Environmental Restoration following Homeland Security Events (SAM)
  - EPA Office of Water (OW) Water Security Division (WSD) method development
  - National Environmental Methods Index for Chemical, Biological, and Radiological Contaminants (NEMI-CBR)

5 NEXT STEPS

The CIPAC Decontamination Working Group will present these recommendations and proposed strategic plan for responding to water sector decontamination needs to the SCC and GCC in May 2008. The councils will review these recommendations to plan for and consider specific initiatives in response to these needs. The Working Group envisions that these initiatives may include collaborative efforts among water sector organizations, specific reprioritization of organization budgets and projects to take action on the recommendations, and grant actions to promote additional research.

In addition, these recommendations and the proposed strategic plan are intended for consideration by the larger research community. Given the critical role that decontamination research plays in water sector preparedness, it is the Working Group's intent that actions by research organizations will be influenced by this report, resulting in further progress on meeting water sector decontamination needs.

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Figure A-1: Summary of Recommendations by Decontamination and Recovery Stage and Functional Category

Category	Planning/ Preparedness	Key Decontamination Activity Stage			
		Response	Characterization	Remediation/ Cleanup	Clearance/ Return to Service
Supporting Information and Capabilities	Develop a flowchart to show progression of roles and decision-making authority to be used by the utilities and responding/coordinating agencies during decontamination, treatment, and recovery (Issue 11 Rec 1)		Develop a decision-making framework for the decontamination of CBR agents in water systems specifically to be used by utilities, responders, and other decision makers (Issue 4 Rec 1)		
	Develop information guidelines for utilities on allocating and acquiring decontamination and treatment resources (Issue 13 Rec 1)		Develop detailed, risk-based frameworks for health and safety assessments of drinking water and wastewater treatment plant and field staff that are consistent in approach across all EPA regions and states (Issue 15 Rec 1)		
	Provide utilities with information on decontamination factors to be considered when making capital improvement decisions through best practices development organizations advising the water sector (Issue 13 Rec 2)		Create a transparent and scientifically defensible process for estimating the fate and transport of CBR agents in drinking water and wastewater utilities, in the absence of information on a specific contaminant (Issue 10 Rec 1)		
	Inform utilities of the critical assets available to the water sector to aid decontamination, treatment and recovery from CBR contamination (Issue 13 Rec 3)		Determine the fate and transport of decontamination agents in drinking water and wastewater utilities and persistence in pipe materials (Issue 10 Rec 4)		
	Leverage existing efforts to identify laboratory capabilities and laboratory capacities specific to CBR agent decontamination needs (Issue 14 Rec 2)		Determine the persistence and interaction of CBR agents in drinking water and wastewater and on pipe materials, and how chlorination affects persistence and interaction (Issue 10 Rec 2)		
			Determine fate and transport of CBR agents, residuals, decontamination agents and solid discharge in the environment including if discharged to water body or after wastewater treatment (fertilizer or the sludge application to agricultural land, landfill, etc.) (Issue 10 Rec 5)		

Figure A-1: Summary of Recommendations by Decontamination and Recovery Stage and Functional Category, cont.

Category	Planning/ Preparedness	Key Decontamination Activity Stage			
		Response	Characterization	Remediation/ Cleanup	Clearance/ Return to Service
Supporting Information and Capabilities			Assess the aerosolization or volatilization of contaminants released from drinking water and wastewater systems (Issue 10 Rec 6)		
			Determine the risk that an aerosolized attack of CBR agents will result in concentrations of concern to water or wastewater systems (Issue 10 Rec 7)		
			Provide surface (in situ) and water analysis methods specific for CBR agents to be used during decontamination and clearance steps through existing efforts (Issue 14 Rec 1)		
Policy		Develop a decision-making framework regarding containing or purging contaminated water (Issue 1 Rec 1)		Revise existing guidance or develop new guidance for containment and disposal of decontamination waste including large amounts of water and associated solid wastes (Issue 1 Rec 2)	
	Provide guidance on regulatory waiver process for discharge/disposal, decontamination/treatment, and return to service activities during CBR incidents (Issue 12 Rec 1)				
				Pre-establish information needs to determine target cleanup levels for contaminants that address multiple water uses (Issue 8 Rec 2)	
				Develop transparent process for establishing target cleanup levels that can be used on an incident-specific basis (Issue 8 Rec 1)	
Decontamination Technologies and Procedures				Provide information on using traditional techniques (i.e., those in routine use by utilities) for non-traditional contaminants (Issue 2 Rec 1)	
				Provide information on the efficacy of pipe cleaning aids, such as NSF-60-certified products, on the decontamination of infrastructure (Issue 2 Rec 2)	
				Provide operational steps to minimize impact of decontamination (Issue 2 Rec 3)	
			Identify existing decontamination techniques (or develop new procedures) for CBR agents in treatment plant infrastructure (Issue 3 Rec 1)		

Figure A-1: Summary of Recommendations by Decontamination and Recovery Stage and Functional Category, cont.

Category	Planning/ Preparedness	Key Decontamination Activity Stage			
		Response	Characterization	Remediation/ Cleanup	Clearance/ Return to Service
Decontamination Technologies and Procedures				Identify existing decontamination techniques, and/or develop new procedures for CBR agents in utility distribution and collection systems (Issue 5 Rec 1)	
				Identify existing decontamination techniques and/or develop new decontamination methods for CBR agents in private plumbing (Issue 5 Rec 2)	
			Integrate fate and transport information into hydraulic models (Issue 10 Rec 3)		
				Establish measurement process for cleanup and clearance that addresses extent of sampling (Issue 8 Rec 3)	
				Provide information on the treatment of drinking water and wastewater contaminated with CBR agents (Issue 9 Rec 1)	
Outreach and Communications	Identify the current state of decontamination and recovery knowledge for CBR agents and develop a preferred/vetted guidance to reconcile any conflicting information (Issue 6 Rec 1)			Develop and provide two types, one each for drinking water and wastewater, of facility-based, decontamination training programs from "ground up" for water sector stakeholders and national response teams (Issue 6 Rec 4)	
	Populate and update WCIT to include additional fate and transport information (Issue 6 Rec 2)				
	Develop a Web-based information clearinghouse to share and disseminate decontamination and recovery information specific to the water sector sector (Issue 6 Rec 3)				
	Develop guidance to help utilities prepare outreach materials to educate utility personnel, lawmakers, and response agencies on decontamination and recovery processes before an incident (Issue 7 Rec 1)			Use existing information services and Web-based databases to disseminate near-term practical decontamination solutions to utilities (Issue 2 Rec 4)	
	Develop guidelines for risk communication activities during decontamination and recovery phases (Issue 7 Rec 2)				

APPENDIX B

The Working Group identified the following data gaps in the current state of knowledge of decontamination in the water sector. The gaps have been linked to Working Group recommendations under the appropriate priority issue.

Table B-2: Data Gaps Identified by the CIPAC Water Sector Decontamination Working Group

Recommendations	Data Gaps
Issue 2: Near-term practical solutions	
Provide information on using traditional techniques (i.e., those in routine use by utilities) for non-traditional contaminants (Issue 2, Rec 1)	Data on the effectiveness of traditional treatment techniques for CBR agents
	Data on the effect that system variables have on the effectiveness of traditional treatment techniques on non-traditional contaminants
Provide information on the efficacy of pipe cleaning aids, such as NSF-60-certified products, on the decontamination of infrastructure (Issue 2, Rec 2)	Data on the efficacy of NSF-60 certified products
	Data on the effect of biofilms on decontamination procedures
Provide operational steps to minimize impact of decontamination (Issue 2, Rec 3)	Data on the effect that system operations have on the effectiveness of traditional treatment techniques on non-traditional contaminants
	Data on effect of operational steps to minimize the impact of CBR agents
	Data on the effect that system variables have on these operational steps when used for decontamination
	Distribution system models for contaminant transport
Use existing information services and Web-based databases to disseminate near-term practical decontamination solutions to utilities (Issue 2, Rec 4)	Mechanisms to disseminate information to utilities and stakeholders; transferring to utility community the knowledge maintained in sensitive or classified or other documents
	Outreach mechanisms to disseminate information to utilities and stakeholders
Issue 3: Decontamination procedures for infrastructure in treatment plants	
Identify existing decontamination techniques (or develop new procedures) for CBR agents in treatment plant infrastructure (Issue 3, Rec 1)	Data on the effectiveness of in situ processes for decontamination of different equipment in drinking water for CBR agents
	Data on the effectiveness of in situ processes for decontamination of different equipment in wastewater for CBR agents

Recommendations	Data Gaps
	Outreach mechanisms to disseminate information to utilities and stakeholders
	Assessment of the aerosol risk of contaminated water introduced into wastewater conveyance or treatment systems
	Determination of whether there are likely to be concentrations of concern from an aerosolized, wide-area attack or a direct injection into the distribution or collection system
Issue 5: Decontamination procedures for distribution and collection systems	
Identify existing decontamination techniques, and/or develop new procedures for CBR agents in utility distribution and collection systems (Issue 5, Rec 1)	Additional data on the effectiveness of chlorine, chloramines, and enzymes for decontamination of the distribution system for CBR agents
	Data on the effectiveness of surfactants, co-solvents, organic acids and chelating agents for decontamination of the distribution system for CBR agents
	Data on the effect that system variables have on the effectiveness of treatment techniques for distribution systems
	Data on the effect that operational variables have on the effectiveness of treatment techniques for distribution systems
Identify existing decontamination techniques and/or develop new decontamination methods for CBR agents in private plumbing (Issue 5, Rec 2)	Information on techniques that can be used for decontamination of private plumbing for CBR agents
	Outreach mechanisms to disseminate information to utilities and other applicable personnel
Issue 8: Cleanup levels	
Develop transparent process for establishing target cleanup levels that can be used on an incident-specific basis (Issue 8, Rec 1)	Outreach mechanisms to disseminate information to utilities and stakeholders
	More detailed guidance on the process for authorized decision makers to use for decision making to establish cleanup levels for biologicals and chemicals in drinking and wastewater systems
	Guidance on process for authorized decision makers to establish cleanup levels for the following in water for radiological contaminants and biotoxins
	Guidance on how contaminant levels should be measured in a system to determine extent of contamination and to assess effectiveness of decontamination steps
	Guidance needs to address the different types/scales of contamination: • Vandalism/tampering (isolated, limited) • System-wide

Recommendations	Data Gaps
	Processes needs to be publicly vetted before finalization of levels for CBR agents in drinking water and wastewater systems
Pre-establish information needs to determine target cleanup levels for contaminants that address multiple water uses (Issue 8, Rec 2)	Availability of cleanup levels for the following in drinking water and wastewater systems for CBR agents
	Availability of multiple cleanup levels for each contaminant to accommodate different uses
Establish measurement process for cleanup and clearance that addresses extent of sampling (Issue 8, Rec 3)	Data on effect of measuring water/wastewater versus pipe surface for CBR agents
	Determination of whether surface measurement methods are needed to assess infrastructure contamination levels (and cleanup adequacy)
Issue 9: Treatment procedures for contaminated drinking water and wastewater	
Provide information on the treatment of drinking water and wastewater contaminated with CBR agents (Issue 9, Rec 1)	Data on effective techniques to decontaminate drinking water and wastewater for CBR agents
	Data on the effect that system variables have on decontamination of drinking water and wastewater
	Data on the effect that system operations have on decontamination of drinking water and wastewater
	Data on drinking water and wastewater matrices that impact effectiveness of decontamination
	Outreach mechanisms to disseminate information to utilities and other applicable personnel
Issue 10: Agent fate and transport	
Create transparent and scientifically defensible process for estimating the fate and transport of contaminants in drinking water and wastewater systems in the absence of information on a specific contaminant (Issue 10, Rec 1)	Transparent process to estimate the fate and transport of contaminants in drinking and wastewater systems
Determine the persistence and interaction of CBR agents in drinking water and wastewater and on pipe materials, and how chlorination affects contaminant persistence and interaction (Issue 10, Rec 2)	Information on the effect of system characteristics on the fate and transport of CBR contaminants and decontamination agents
	Information on the effect of operational variables on the fate and transport of CBR contaminants and decontamination agents

Recommendations	Data Gaps
	Data on agent fate and transport in wastewater systems
	Additional data on fate and transport for contaminants in drinking water systems still needed (and empirical data to update expert judgment values)
Integrate fate and transport information into hydraulic models (Issue 10, Rec 3)	Information on the effect of operational variables on the fate and transport of CBR contaminants and decontamination agents
Determine the fate and transport of decontamination agents in drinking water and wastewater systems and persistence in pipe materials (Issue 10, Rec 4)	Information on the effect of operational variables on the fate and transport of CBR contaminants and decontamination agents
	Information on the effect of operational variables on the fate and transport of CBR contaminants and decontamination agents
Determine fate and transport of CBR agents, residuals, decontamination agents and solid discharge in the environment including if discharged to water body or after wastewater treatment (fertilizer or the sludge application to agricultural land, landfill, etc.) (Issue 10, Rec 5)	Data on agent fate and transport after removal from the system
Assess the aerosolization or volatilization of contaminants released from drinking water and wastewater systems (Issue 10, Rec 6)	Data on agent fate and transport after removal from the system

APPENDIX C

Issue Paper - Initial Incident Response - Containment or Purging?

Note this paper is not the opinion of the entire Working Group but that of one member who has conducted related research separate from the rest of the Working Group.

Recommendation:

The primary objective of water utilities and public health authorities in a contamination incident, is the safety of the public served by the water system and the prevention of exposure to the contaminant, particularly through ingestion. To this end, federal guidance should recommend consideration of expedited purging of the contaminated water from the system. The decision to implement such purging operations should be made quickly, but with appropriate consultation with and notification of public health and regulatory agencies and potentially affected agencies, particularly wastewater utilities.

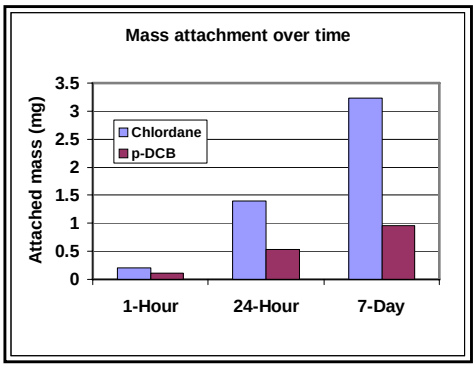
Background and Rationale:

The EPA Response Protocol Toolbox, particularly modules 2 and 6, is the most current and directly applicable guidance source on initial incident response. This guidance discusses "containment" (which appears to be intended as isolation of the affected area of the system) and suggests that "*if there are consumers within the isolated area, it will likely be necessary to notify them of any restrictions regarding use of the water (i.e., public notification) and possibly provide them with an alternate supply of drinking water*." This and guidance that has been issued by other agencies implies that discharge of the contaminated water to wastewater systems or to the environment, via storm sewers, is a paramount consideration and that until arrangements for pretreatment can be made the contaminated water should remain in the water system, with reliance on public notification to avoid dangers to the consumers. This reliance on "public notification" to be an effective and timely protective measure is problematic for a number of reasons:

1. The decision to issue a public notification of this type is not likely to be timely. Utility and public agencies are understandably reluctant to issue such public warnings, and historically have done so only after an extended effort to confirm the existence of the problem. (A 2007 paper by Bristow and Brumbelow on the "Delay between Sensing and Response in Water Contamination Events" reviewed the responses to 13 water contamination incidents and found an average of 2.35 days elapsed before decisions to issue public warnings were made.) On the other hand, a decision to initiate an operational response in the system (i.e., purging the suspect water) is much more easily made and is typically done in water works practice at the first indication of a problem.

2. Even once the decision to notify the public is made, there are not technologies widely implemented that can reliably and timely get the word out. The most promising of the mass notification tools would be the "reverse 911" telephone services that can be commercially subscribed to by public agencies or utilities. However, the advocacy organizations "Partnership for Public Warning" and "National Emergency Number Association" have noted that most of the population is not served by such capability. (NENA in 2004 estimated that only 25% of the population was in areas served by some type of emergency notification system.) Also, systems that would attempt to flood a specific geographic area with an alert could run into constraints of network congestion in which "*All Circuits are Busy*" (Paul Erling, Enera Communications, personal communication, 9/6/07).

A secondary, but still important, reason for an expedited purging of the contaminated water from the system is provided by recent research conducted for the AWWA Research Foundation (AwwaRF Project 2981) which indicates that extended residence of the contaminant in the system would lead to more substantial adherence of the contaminant to the infrastructure (i.e., pipe) surfaces. This would result in a more extensive decontamination effort before the system could be restored.



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