



# Water Management During Emergency Situations

## Establishing a Plan Before Disaster Strikes

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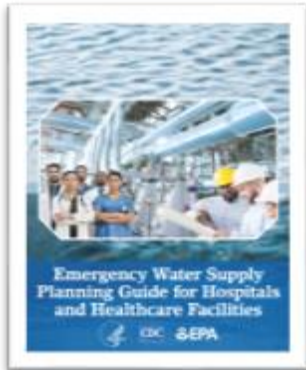
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# Learning Objectives

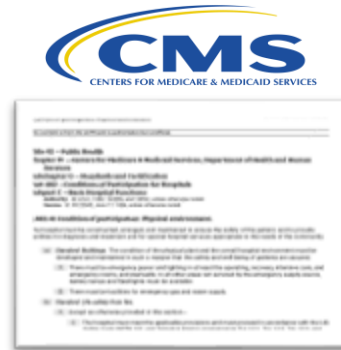
- **Review** the emergency water preparedness guidance:
  - CDC *Emergency Water Supply Planning Guide for Hospitals and Healthcare*
  - CMS 42 CFR 482.41
  - Joint Commission EM.02.02.09 Standard
  - Florida Department of Health (FDOH)
- **Discuss** elements of a WMP that can assist during an event
- **Identify** steps that at WMT can take during a Boil Water Notice
- **Highlight** recent case scenarios

# Emergency Water Preparedness Guidance

# Published Guidance



**CDC:** § 482.41 Condition of participation: Physical environment



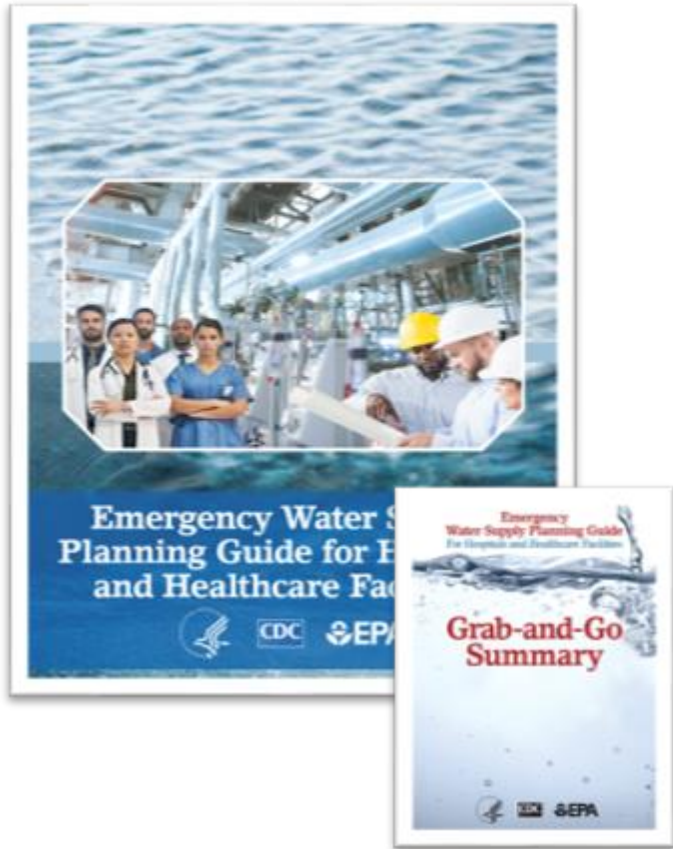
**CMS:** § 482.41 Condition of participation: Physical environment



**TJC:** New and Revised Standards in Emergency Management - EM.12.02.09



**FDOH:** Statute 381.006 Environmental Health & Boil Water Notice Guidelines



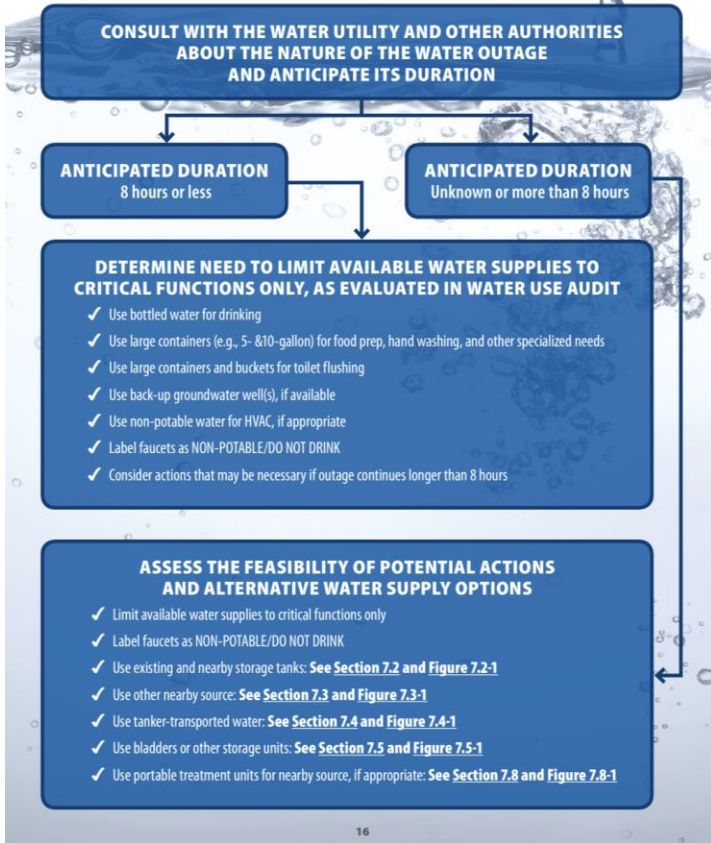
Describes the steps to create an  
**Emergency Water Supply Plan (EWSP)**

1. **Assemble** an EWSP team and documentation for your facility.
2. **Understand** your water usage by performing a water use audit
3. **Analyze** your emergency water supply alternatives
4. **Develop** and exercise your EWSP

The CDC recommends that an EWSP is part of regular, **ongoing water management program** aligned with ANSI/ASHRAE Std. 188.

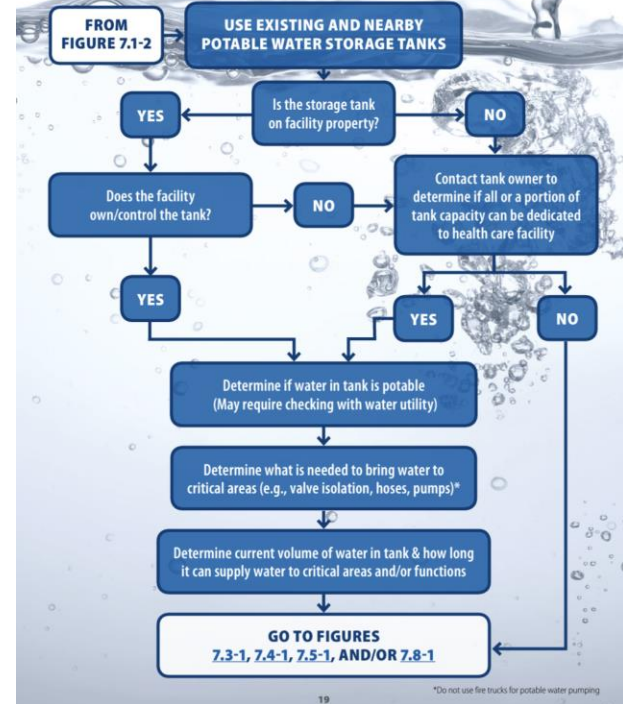
**Figure 7.1-1. ALTERNATIVE WATER SUPPLIES—OVERVIEW**

For accessible explanation of this figure's flowchart see [Appendix G](#).



**Figure 7.2-1. ALTERNATIVE WATER SUPPLIES—STORAGE TANKS**

For accessible explanation of this figure's flowchart see [Appendix G](#).



## Requirements from CMS

### § 482.41 Condition of participation: Physical environment

“(2) There must be facilities for emergency gas and water supply.”

*Considerations for water should be a part of your hospital's Emergency Operations Plan (EOP)*

# Requirements from the Joint Commission

New and Revised Standards in Emergency Management - EM.12.02.09

“The hospital has a plan for managing resources and assets during an emergency or disaster incident. Note: The hospital considers its prioritized hazards identified as part of its hazard vulnerability analysis when developing a plan for resources and assets.”

*Water is considered a resource/asset*

# Florida Statue 381.006 Environmental health

## The FDOH's responsibilities:

- **Safe Drinking Water:** Monitors and assesses drinking water quality.
- **Health Surveillance:** Analyzes water samples for public health.
- **Risk Assessments:** Evaluates water contaminants and issues advisories.
- **Technical Assistance:** Addresses water contamination threats.



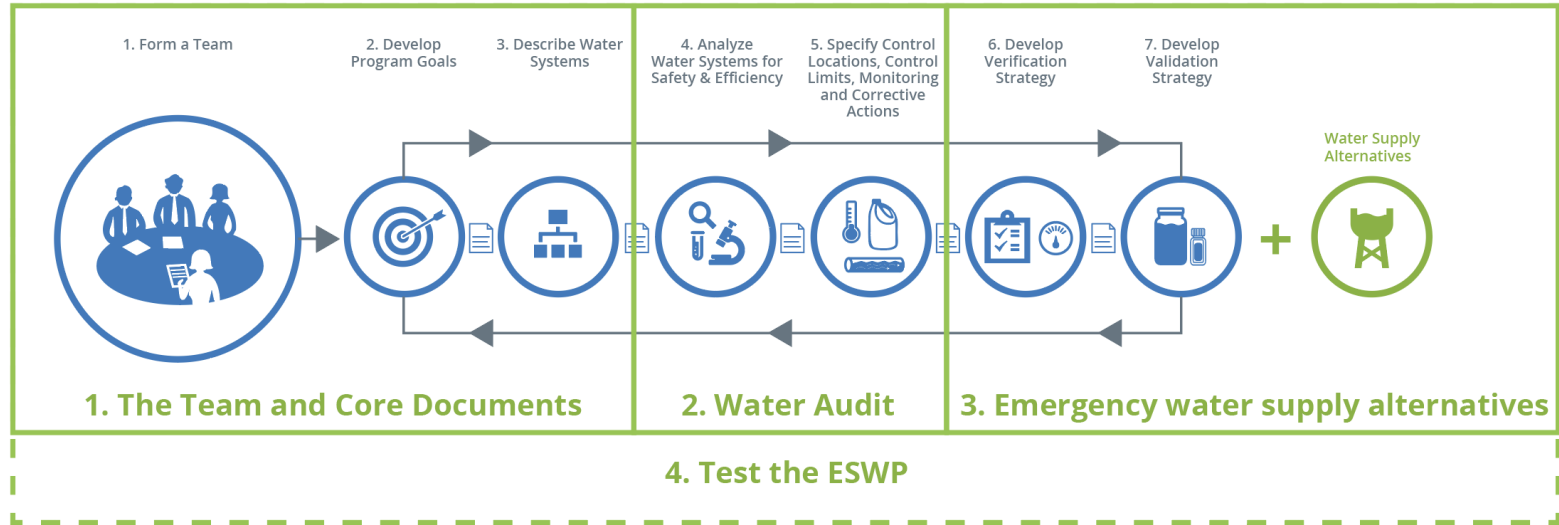
# FDOH's Guidelines for the Issuance of Precautionary Boil Water Notices

- **Issuance:** Guidelines for issuing notices during contamination
- **Coordination:** Works with other agencies for safety
- **Content:** Specifies required notice information
- **Rescission:** Steps to lift notices safely



# Elements of WMP

# 7 STEPS OF THE WATER MANAGEMENT PROGRAM



Defensible documentation is essential and required

*Adapted from Figure 1 of ASHRAE 188:2021, the CDC Toolkit, and other Industry Guidance*

# What Should My Team Do?

## 1. Meet with your water management team (WMT)

- Invite additional stakeholders to participate, especially those involved in the EOP

## 2. Review your data, identify the gaps:

- Process Flow Diagrams (PFD)
- Risk Characterization Matrix
- Hazard Control / Corrective Action summaries
- Water quality monitoring
- Validation testing
- Training and Protocols



# Water Management Team

## Improvement Opportunities:

- **Documented** in the WMP documents
- **Cross-functional** including Executive Leadership, Facilities, and Infection Prevention

## Roster of Stakeholders, by department:

- Facilities
- Infection Prevention
- Environmental Services
- Risk Management
- Sterile Processing
- Admin/Executive Sponsor

# Water System Survey

1. Written Description
2. Process Flow Diagram

## Opportunities for Improvement:

- Perform in depth survey of all potable and non-potable water systems
- Identify municipal point of entry and cold distribution
- Map out different hot water heaters, recirculation loops, mixing valves, and identify end point fixtures

Working Document  
Version Date: 08-18-2022  
WMT Review Date: xxxxxxxx

- 1. RECEIVING**  
A - Municipal Supply (Chlorine)  
F - Laboratory/High Purity Water
- 2. SUPPLEMENTAL DISINFECTION/TREATMENT**  
C - Decorative Water Feature (Chlorine) **CL**
- 3. CONDITIONING**  
A - Softening  
B - Filtration (Ice Machines) **CL**
- 4. HEATING**  
A - Hot Water (120-180°F)
- 5. DISTRIBUTION (Potable)**  
A - Cold Water **CL**  
B - Cold Water (Ice Machines) **CL**  
C - Hot Water **CL**
- 7. DISTRIBUTION (Non-Potable)**  
A - Fire Suppression  
B - Irrigation  
C - Decorative Water Feature **CL**

**8. ABBREVIATIONS**

**KEY**

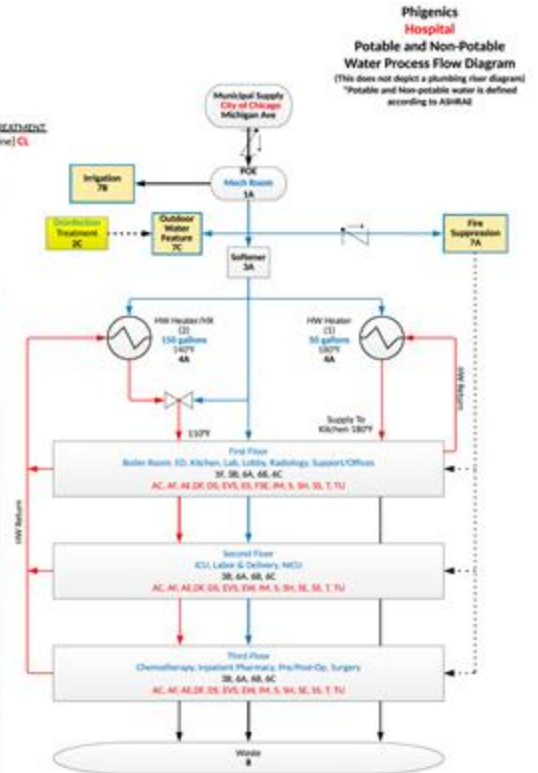
**Fixtures**

AC = AutoClaves  
AF = Automatic Faucets  
BWF = Bottled Water Filter  
BS = Bulbless Sprayer  
DF = Drinking Fountain  
DS = Drink Station  
ES = Emergency Shower  
EVS = EVS Closet  
EW = Eye Wash  
FSE = Food Service Equipment  
H = Handfiller  
HB = Hot Water Billie  
MF = Ice Machine  
JT = Jotted Tub  
L = Laundry  
ML = Motors/ Alarms  
MD = Medical Devices  
OS = Other Specialty  
POJ = Point of Use Mixing Valve  
S = Sink (Manual)  
SA = Sink with Aerator  
SE = Sterile Equip.  
SF = Sink with Faucet Flow Restrictor  
SH = Shower  
SHH = Shower with Hot  
SL = Sink with Laminar Flow  
SS = Scrub Sinks  
T = Toilet/ Urinal  
TU = Tub  
WHA = Water Hammer Arrestor

**CL** = Control Location

**Equipment**

⊗ = Thermostatic Mixing Valve  
⊗ = BPF Backflow Preventer  
⊗ = Potable HW Heater/Exchanger



# Water System Risk Assessment

## Opportunities for Improvement:

- Based on the system survey, perform a systematic risk assessment of each processing step (i.e. softening, heating, filtering, distribution)
- Hazard ≠ Risk → Risk = Probability x Severity

Processing Step	Potential Hazards	Risk Significant?	Risk Basis	Control Measure(s)
3B/6B. CONDITIONING/DISTRIBUTION (Potable) Filtration/Cold Water (Ice Machines)	B	Yes	Ice machines have been associated with cases of waterborne pathogen disease based on the potential for water aspiration. Based on design and water usage, there is potential for bacteria growth. Improperly maintained filters can cause poor microbiological quality; however cold water temperatures reduce the risk for growth. Due to distribution directly from the fixture, there is exposure at this processing step.  Manufacturer's recommendation is to perform regular preventative maintenance.	1. <b>Preventative Maintenance</b>
6A. DISTRIBUTION (Potable) Cold Water	B	Yes	The distribution system is the avenue through which exposure occurs, at building fixtures which aerosolize water. Temperatures of cold water systems reduce the risk of microbial amplification within the system compared to hot water systems, but do not remove the potential for microbial growth and amplification.  The municipality applies chlorine or monochloramine to the water serving the facility, resulting in the need to measure free residual oxidant (FRO) at the incoming point and throughout the distribution system to characterize the disinfectant profile at the facility.  The inpatient profile for the facility includes immunocompromised patients, presenting a higher susceptibility to waterborne pathogen disease.	1. <b>Disinfectant</b>

# Patient Risk Assessment

## Opportunities for Improvement:

- Identify different types of patient care provided at the facility
- Assess both clinical and environmental risk
- Utilize results to drive decisions for monitoring and testing strategy

Water Management Program - Risk Characterization Matrix

		<i>Environmental Risk Categories - for waterborne pathogen growth and aerosolized water exposure</i>			
<i>Clinical Risk Categories - susceptibility to waterborne pathogen disease</i>		Highest	High	Medium	Low
Highest		ICU NICU	Chemotherapy Surgery		
High		Labor & Delivery	Emergency Department		Clinical Lab Radiology
Medium				Lobby	Inpatient Pharmacy
Low					Boiler Room Kitchen Support/Offices

# Control Measures

## Control Measures:

- Example from program: Ice machines, hot water heaters

## Opportunities for Improvement:

- Determine control locations based on the risk assessment
- Ensure each control location has required components as part of the plan:
  - Control measures, Control Limits, Monitoring method and frequency, and corrective actions

ICE MACHINES: All ice machines have a preventative maintenance performed on them 2 times per year per manufacturer's recommendations.

- All parts are cleaned and scrubbed. Any parts removed are soaked in a cleaner/sanitizer solution.
- Drains are brushed and sanitized.
- All new parts contain agion antimicrobial to prevent the growth of any bacteria or legionella.

Processing Step	Water System	Control Measure(s)	Control Limit	Monitoring Method	Frequency	Corrective Action	Records
3B/6B. CONDITIONING/DISTRIBUTION (Potable) Filtration/Cold Water (Ice Machines)	Potable	1. Preventative Maintenance	Perform unit inspection Change filter Clean/disinfect internal and external components	Perform procedures per manufacturer's recommendations	Quarterly	1. If maintenance is not performed:  1. Remove from service 2. Perform immediately 3. Review procedure for preventative maintenance	phiAnalytics/PM System
6A. DISTRIBUTION (Potable) Cold Water	Potable	1. Disinfectant	Free Residual Oxidant (FRO): 0.2-4.0 ppm as Cl <sub>2</sub>	Perform free chlorine test within the potable distribution system at the incoming water source	Weekly	1. Perform flushing of low flow areas and retest	phiAnalytics
6C. DISTRIBUTION (Potable) Hot Water	Potable	1. Disinfectant	Free Residual Oxidant (FRO): 0.2-4.0 ppm as Cl <sub>2</sub>	Perform free chlorine test within the potable distribution system at each hot water loop supply	Weekly	1. Perform flushing of loop or low flow areas and retest	phiAnalytics

# Steps to take during a Boil Water Notice

# Types of Boil Notice Scenarios — FDOH

- Microbial contamination identified
- Zero or negative pressure
- Low water pressure
- Water main breaks or interruptions
- Flooding of wells
- Disaster-related events



# Recommendations from the FDOH's Boil Water Notice Guidelines — 1 of 4

## Coordination

Coordinate with health departments, environmental agencies, and water utilities to confirm water safety. This ensures all relevant authorities agree the water is safe.

- **Collaborate** with health departments and environmental agencies to ensure water safety.
- **Communicate** clearly with all stakeholders, including water utilities and the public.
- **Document** all actions taken and results obtained during the process.
- **Verify** that all safety standards and protocols have been met before lifting the notice.

# Recommendations from the FDOH's Boil Water Notice Guidelines — 2 of 4

## System Flushing

Remove contaminants and ensure the water supply is safe for consumption:

- **Adequately Flush:** Flush the water distribution system thoroughly to remove contaminants.
- **Restore Water Pressure:** Ensure all service connections have adequate water pressure.
- **Recommendation:** If water quality monitoring and testing shows insufficient hazard control, a temporary increase supplemental disinfection may be needed. Used data to determine!



# Recommendations from the FDOH's Boil Water Notice Guidelines — 3 of 4

## Water Testing

Conduct environmental testing to ensure the water is free from harmful microorganisms:

- **Document** all actions taken and results obtained during the process.
- **Recommendation/Lesson Learned:** use a risk characterization matrix (RCM) to identify # of samples and locations based on patient populations which may be affected.

*\*an RCM should already be part of your existing WMP*



# Recommendations from the FDOH's Boil Water Notice Guidelines — 3 of 4

## Water Management Program - Risk Characterization Matrix

*Environmental Risk Categories - for waterborne pathogen growth and aerosolized water exposure*

<i>Clinical Risk Categories - susceptibility to waterborne pathogen disease</i>	Highest	High	Medium	Low
Highest	ICU NICU	Chemotherapy Surgery		
High	Labor & Delivery	Emergency Department		Clinical Lab Radiology
Medium			Lobby	Inpatient Pharmacy
Low				Boiler Room Kitchen Support/Offices

# Recommendations from the FDOH's Boil Water Notice Guidelines — 4 of 4

## Public Notification

Inform the public that the boil water notice has been lifted and the water is safe to use.

- **Inform the Public:** Announce the lifting of the notice through local media, social media, and direct communication.
- **Provide Clear Instructions:** Explain that the water is now safe to use and any necessary steps for residents.
- **Update Regularly:** Ensure continuous updates until the public is fully informed.



# Recommendations for Closing a Disruption: Returning to Normal Operations

- **Review** Hazard Control Data:
  - Disinfectant
  - Temperature
- **Perform Environmental Testing**, based on clinical decisions:
  - *E. Coli*
  - Total Bacteria
  - Other Waterborne Pathogens of concern
- **Other Considerations** to review:
  - Sterile Processing, Dialysis, Endoscopy, Laboratory, etc.

# Highlight Recent Case Scenarios

# Case #1

## Situation:

- Boil water advisory due to main break

## What the WMT did:

- Flushed every fixture before repairs were made and still under boil advisory
- Connected water tanker after flushing

## Result:

- Due to flushing before connecting the tanker, the team needed to do additional flushing to avoid potential contamination

## Case #2

### **Situation:**

- Multiple recurring boil water advisory during active hurricane impacts

### **What the WMT did:**

- Proactively meet with stakeholders to set up an emergency response team to set up a flushing plan and designate team activities
- Signage for water conservation posted, bottled water handed out

### **Result:**

- Hospital was able to confidently and defensibly return to normal operations

# Case #3

## Situation:

- Microbial contamination identified by municipality and alert for "Water Main Break"

## What the WMT did:

- Followed the FDOH Flushing, Temperature, and Sup. Disinfection protocol
- Performed *E. Coli* testing

## Result:

- Validation data was available within 48hrs to defensibly confirm potable water safety, and confirm efficacy of this process for future disruptions across system

# Example Flushing Form

Location Name (Add additional room # or unique location identifier)	HOT FRO / TRO Reading	COLD FRO / TRO Reading	Visual Cloudiness in sample Y / N	Visual Color in sample Y / N
<b>Points of Entry or Municipal Backflows</b>				
POE #1				
POE #2				
POE #3				
Other				
<b>Critical EOCs</b>				
EOC 1 - Location 1 (mid or distal?)				
EOC 1 - Location 2 (mid or distal?)				
EOC 2 - Location 1 (mid or distal?)				
EOC 2 - Location 2 (mid or distal?)				
EOC 3 - Location 1 (mid or distal?)				
EOC 3 - Location 2 (mid or distal?)				
Other				
<b>Mid-Point Locations (EOC locations may be used in this section):</b>				
Location 1				
Location 2				
Location 3				
Location 4				
<b>Distal Locations (EOC locations may be used in this section):</b>				
Location 1				
Location 2				
Location 3				
Location 4				

# Example Validation Report



Organism was detected.



Result is below the method limit of detection (LOD).

## Phigenics Validation Test Coliform Report Summary

Method Used: Colitag

Collector	Location Identification	Water Type (Potable/Non-Potable)	Total Coliforms	<i>E. coli</i>
			Detected / Not Detected	
G. Alvarez	Main FI 1 Distal Location Lobby mens RR sink Hot	Potable	Not Detected	Not Detected
G. Alvarez	Main FI 1 Distal Location Lobby mens RR sink Cold	Potable	Not Detected	Not Detected
G. Alvarez	Backflow Valve Cold	Potable	Not Detected	Not Detected

**Avoid broad changes in control measures (disinfection, filters), monitoring, equipment, prior to obtaining data and evidence that demonstrates the need for additional mitigation or purchases.**

*Defensible decisions are backed by data*

Q & A