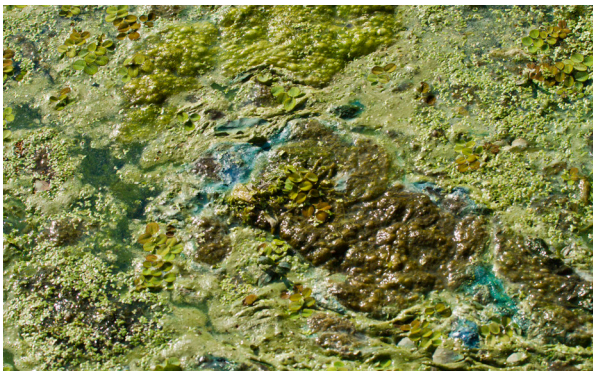
Incident Action Checklist – Harmful Algal Blooms

For on-the-go convenience, the actions in this checklist are divided up into three "rip & run" sections and are examples of activities that surface water utilities can take to: prepare for, respond to and recover from harmful algal bloom (HAB) incidents. You can also populate the "My Contacts" sections with critical information that your utility may need during the HAB incident.

Harmful Algal Bloom Incidents and Water Utilities

Increasingly, utilities face harmful algal bloom or HAB challenges as they try to ensure the delivery of safe drinking water to their customers. HABs can create toxins that are difficult to treat, which can lead to prolonged drinking water outages that can impact both human health and a community's economy. Blue-green algae HABs or cyanobacteria are single-celled microorganisms that live in fresh, brackish and marine surface water. Favorable conditions, such as warm water, elevated levels of nutrients (e.g., nitrogen, phosphorus), slow-moving water and thermal stratification accelerate the growth of cyanobacteria, leading to the creation of a HAB. Some cyanobacterial blooms are capable of producing highly potent cyanotoxins. Despite their increasingly common existence, HABs can be difficult to identify. Their shape, size, location, color and cyanotoxin production can vary bloom by bloom. Tools are available to assist with detecting and monitoring a bloom. Although blooms tend to form during the late summer, seasonal and year-to-year fluctuations in cyanobacteria levels can make predicting their occurrence difficult. Cyanobacterial impacts to drinking water utilities may include, but are not limited to:

- Unpleasant taste and odor, especially earthy and musty tones;
- Interference with water treatment plant operations such as floc formation, filtration and chlorination;
- Increased levels of disinfection by-product (DBP) precursors; and
- Pass through of cyanotoxins into finished drinking water, if not addressed.



If cyanotoxins occur in tap water over the U.S Environmental Protection Agency's (EPA's) national Health Advisory level, people are at risk of various adverse health effects including upset stomach, vomiting and diarrhea as well as liver and kidney damage. The EPA recommends the following Health Advisory levels:

Drinking Water Thresholds	Microcystin (µg/L)	Cylindrospermopsin (µg/L)
Do Not Drink – children under 6	0.3	0.7
Do Not Drink – children 6 and older and adults	1.6	3.0

Table 1: U.S. EPA Recommended Cyanotoxin Thresholds for Drinking Water

Contact your regulatory agency to determine if your state has additional HAB recommendations, standards, regulations or monitoring schedules.

Example of Water System Impacts and Response to a Harmful Algal Bloom Incident

Carroll Township, Ohio

In September 2013, microcystins concentrations at Carroll Township's intake on Lake Erie increased to >5 µg/L, the highest concentration observed in four years of monitoring. A finished water sample collected at the same time had a microcystins concentration of 1.4 µg/L, which exceeded the Ohio Environmental Protection Agency's (EPA's) microcystins threshold of 1 µg/L. After a repeat finished water sample concentration of 3.6 µg/L, Ohio EPA recommended that the water system issue a Do Not Drink Advisory and transition to an emergency connection with a neighboring utility. The advisory impacted over 2,200 people and lasted approximately 48 hours. The water system remained on their emergency connection for several weeks. After the event, the water system spent approximately $250,000 to upgrade the pre-ozonation portion of their conventional surface water treatment process with new ozone generators and concentrators to amplify ozone dosages. In subsequent years, the upgraded and optimized plant was able to effectively treat source water microcystins concentrations of over 50 µg/L, with no finished water detections.

Source: Ohio EPA

Great Lakes Coastal Resilience

Actions to Prepare to Respond to a Harmful Algal Bloom Incident

Planning

- [ ] Identify a HAB lead and team of individuals who would prepare for and respond to a bloom incident.

- [ ] Identify and coordinate with all water systems that utilize the same water source. Upstream systems can be a source of bloom information and downstream systems should be notified as they may also become affected. Be sure to document 24-hour contact information.

- [ ] Develop a list of critical customers who need a continuous source of potable drinking water (e.g., hospitals, nursing homes, dialysis clinics, manufacturers).

- [ ] Review and update all emergency contacts.

- [ ] Develop a cyanotoxin management plan. One resource to help in the development of the plan is "Cyanotoxin Management Plan Template and Example Plans." The plan should consist of the following:

  - o Monitoring plan – EPA does not currently regulate cyanotoxins, so systems are not required to monitor; however, some states do require sampling, so please check with your regulatory agency. Make sure the monitoring plan includes, but is not limited to:

    - When and where to sample (different intakes or depths);
    - Sampling frequency;
    - Sample volume;
    - What to sample
      - indicators of cyanotoxins such as chlorophyll a, phycocyanin or qPCR methods for toxin producing genes;
      - cyanobacterial cells or specific cyanotoxins or both;
    - Which analytical screening test(s) to use (including field parameters and methods for indicators described above);
    - Cyanotoxin analytical methods;
    - Laboratory that can run required analysis during weekdays or weekends;
    - Sampling procedures and safe handling; and
    - Situations when it is necessary to send sample(s) to an identified laboratory for confirmation.

    Refer to "A Summary of Methods Available for Cyanotoxin Detection" to identify a sampling method for your utility.

  - o Treatment Plan – Identify cyanotoxin treatment strategies based on your specific water system's type of treatment. Determine short-term and long-term treatment strategies. Refer to "Water Treatment Optimization for Cyanotoxins"

  - o Communications Plan – As deemed appropriate by the utility or per regulatory agency requirements:

    - Identify the required communication steps and appropriate actions that may be taken to inform customers and the general public if cyanotoxins are detected in raw or finished water;
    - Work with local and state officials regarding public communication requirements - what cyanotoxin levels, what type of drinking water sample (e.g., raw, finished, distribution system) and how many confirmation samples are needed to trigger a public notification;
    - Develop communication templates for scenarios for both cyanotoxins and taste and odor events; and
    - Identify appropriate distribution mechanisms such as reverse 911. Refer to the "Drinking Water Cyanotoxin Risk Communication Toolbox"

Actions to Prepare to Respond to a Harmful Algal Bloom Incident

(continued)

- [ ] Develop an alternate water supply plan that specifies the following:
  - o The quantity of water needed to meet customer demand daily.
  - o The identification of multiple alternate sources of water (both raw and finished) such as bottled water, interconnections, hauling raw water to the treatment plant or hauling treated water to a storage tank.
  - o How the system will obtain and transport identified alternate sources (including any treatment requirements).
  - o Who is responsible for obtaining and distributing the alternate sources.

    This should be done in conjunction with local response partners such as your local emergency management agency (EMA) and local emergency planning committee (LEPC), as well as your regulatory agency. For more information, go to "Planning for an Emergency Drinking Water Supply."
- [ ] Meet with your local EMA, health departments and consecutive systems to share your cyanotoxin management plan and your alternate water supply plan.
- [ ] Conduct internal and external (e.g., EMA, health department, regulatory agency) HAB tabletop exercises regularly.
- [ ] Participate in Incident Command System (ICS) and National Incident Management System (NIMS) training either online or in person with your local emergency management agency.
- [ ] Join your state's Water and Wastewater Agency Response Network (WARN) or other local mutual aid network. In addition, determine if you are included in a statewide mutual aid law.

Facility _____

- [ ] Determine if your utility has the ability to draw raw water from different intakes or different depths.
- [ ] Test all interconnections in preparation for potential use in an emergency and evaluate potential corrosion control issues.
- [ ] Select distribution sampling sites with 24-hour access.
- [ ] Identify areas of the distribution system that could be isolated to limit the number of customers affected.
- [ ] Implement a comprehensive source water monitoring program that involves routine raw water cyanobacteria sampling at multiple depths and locations.
- [ ] Monitor any operational changes (e.g., decreased filter run time, turbidity or pH change, green sludge or filter backwash) that could indicate a potential HAB threat.

Notes:

Actions to Respond to a Harmful Algal Bloom Incident in Raw Water

Notification

- [ ] Notify the state regulatory agency and local EMA of your water system's status.
- [ ] Notify utilities that have interconnections with your utility and those with the same water source.
- [ ] Notify the local health department.
- [ ] Though not required by federal law, it is important to keep customers regularly updated on the situation through local media, social media, a website or other mechanisms. Updates should continue until regular operations resume.

Notes:

Facility

- [ ] Conduct raw water and finished water sampling per your established HAB management plan, including analyzing for intra- and extra-cellular cyanotoxins, or as directed by the state regulatory agency. Exercise proper safety measures when sampling for cyanotoxins to prevent skin exposure. Wash hands after sampling.
- [ ] Adjust water treatment processes. Utilities should confirm the type and concentration of cyanotoxins present in the source water in order to determine the most effective treatment strategy. Applying the wrong treatment process at a specific treatment stage could rupture the cyanobacteria cells and result in the release, rather than removal of, cyanotoxins. Refer to "Water Treatment Optimization for Cyanotoxins"
- [ ] Implement mitigation measures to control blooms that have already occurred in the source water. Remedial measures include physically removing surface scums and applying algaecides and other chemicals (e.g., permanganate, hydrogen peroxide) to control blooms. Each bloom is unique and proper measures need to be considered on a case by case basis. Refer to "Control and Treatment" for examples of control and prevention measures. Control measures must be selected carefully as they can have unintended consequences on water quality and negative impacts on the ecosystem. Refer also to state and primacy agencies as some control measures and source water treatment may have specific requirements or regulations. *Disclaimer: EPA has not conducted an assessment of the effectiveness of any of the listed control and treatment methods.*

Documentation

- [ ] Document all events, timeframes, and resulting impacts, so this information can be used as part of the post-incident investigation.

Actions to Respond to a Harmful Algal Bloom Incident in Drinking Water

Notification

- ☐ Notify the state regulatory agency, local EMA and the local health department of the cyanotoxin sample detection in finished drinking water.
- ☐ Notify utilities that have interconnections with your utility.
- ☐ Determine if any water health advisories need to be issued. Use pre-identified communication mediums (e.g., reverse 911, social media) to notify customers. Refer to the "Drinking Water Cyanotoxin Risk Communication Toolbox."

  o Continue to keep customers updated regularly.

Notes:

Facility

- ☐ Activate the alternate water plan, if necessary. If bottled water is being supplied, provide information to customers on the distribution locations.
- ☐ Continue raw water and finished water sampling as directed by the state regulatory agency.
- ☐ Adjust water treatment processes. Utilities should confirm the type and concentration of cyanotoxins present in the source water in order to determine the most effective treatment strategy. Applying the wrong treatment process at a specific treatment stage could rupture the cyanobacteria cells and result in the release, rather than removal of, cyanotoxins. Refer to "Water Treatment Optimization for Cyanotoxins."
- ☐ Implement mitigation measures to control blooms that have already occurred in the source water. Remedial measures include physically removing surface scums and applying algaecides and other chemicals (e.g., permanganate, hydrogen peroxide) to control blooms. Refer to "Control and Treatment" for examples of control and prevention measures. Control measures must be selected carefully as they can have unintended consequences on water quality and negative impacts on the ecosystem. Refer also to state and primacy agencies as some control measures and source water treatment may have specific requirements or regulations. *Disclaimer: EPA has not conducted an assessment of the effectiveness of any of the listed control and treatment methods.*
- ☐ Use WARN for help in obtaining sampling supplies, additional personnel and HAB technical assistance as needed.

Documentation

- ☐ Document all events, timeframes, and resulting impacts, so this information can be used as part of the post-incident investigation.

Actions to Recover from a Harmful Algal Bloom Incident

- [ ] Lift advisories once you and your state regulatory agency have deemed the situation safe.
- [ ] Assign a utility representative to continue providing updates to customers regarding current mitigation actions as well as preparation for future incidents.
- [ ] Complete damage assessments.
- [ ] Work with vendors and internal departments to return to normal service.
- [ ] Develop a lessons learned document and an after action report (AAR) to document your response activities, including what went well and what did not go well. Create an improvement plan (IP) based on your AAR and use the IP to update your vulnerability assessment, emergency response plan and cyanotoxin management plan. Share the lessons learned with water systems you sell water to, if applicable.
- [ ] Revise budget and asset management plans to address increased costs from response-related activities and follow-up actions.
- [ ] Work with your state regulatory agency to obtain technical assistance to mitigate the circumstances that led to the HAB incident and to reduce the likelihood of reoccurrence.
- [ ] Identify mitigation and long-term adaptation measures with your community that can help prevent HABs in the future and increase utility resilience when they do occur. For example, consider longer-term source water protection strategies that your community can implement (such as green infrastructure) to decrease nutrients in the source watershed. Review impacts related to HABs when planning for system upgrades (e.g., treatment changes).
- [ ] Conduct annual utility-specific HAB awareness training with all employees.

Notes:

My Contacts and Resources

CONTACT NAME	UTILITY/ORGANIZATION NAME	PHONE NUMBER
	Wholesale system	
	System with same source water	
	System with same source water	
	Local Laboratory	
	State Primacy Agency	
	Local EMA	
	Local Health Department	
	WARN Chair	
	State EMA	

Resources

- Recommendations for Public Water Systems to Manage Cyanotoxins in Drinking Water (EPA)
- Cyanotoxin Management Plan Template and Example Plans (EPA)
- Cyanobacterial Harmful Algal Blooms (EPA)
  - Cyantobacteria Guidelines and Recommendations (EPA and State information)
  - Prevention and Mitigation - Control and Treatment (EPA)
  - Cyanobacteria State Resources and Laboratories (EPA)
  - Drinking Water Cyanotoxin Risk Communication Toolbox (EPA)
- Harmful Algal Blooms: Information for Public Water Systems (Ohio Environmental Protection Agency)
- Technical Assistance in State and Local Response to Harmful Algal Blooms (Centers for Disease Control and Prevention [CDC])
- Water Treatment Optimization for Cyanotoxins (EPA)
- Drinking Water Health Advisory for the Cyanobacterial Microcystin Toxins (EPA)
- Drinking Water Health Advisory for the Cyanobacterial Toxin Cylindrospermopsin (EPA)
- Water/Wastewater Agency Response Network (EPA)
- Planning for an Emergency Drinking Water Supply (AWWA/EPA)
- A Water Utility Manager's Guide to Cyanotoxins (American Water Works Association [AWWA] and Water Research Foundation [WRF])