Work Plan and Quality Assurance Project Plan (QAPP)

2022 Michigan Inland Lake Harmful Algal Bloom (HAB) Monitoring
Michigan Department of Environment, Great Lakes, and Energy (EGLE)
Water Resources Division (WRD)

Prepared by Aaron Parker, Project Lead, EGLE
April 2022

QAPP Approval

This QAPP has been reviewed and approved by the following persons (signatures):

April 2022

Aaron Parker, Project Lead — Date
Senior Aquatic Biologist
Lake Michigan Unit
Surface Water Assessment Section
EGLE

April 2022

Gary Kohlhepp, Project Supervisor — Date
Supervisor
Lake Michigan Unit
Surface Water Assessment Section
EGLE

Table 1. Distribution list for the Michigan Inland Lake HAB Monitoring Work Plan and QAPP.

Name	Affiliation	Project Role
Dawn Roush	EGLE	Lakes Erie, Huron, and Superior Unit Supervisor
Kevin Goodwin	EGLE	Field sampling, response efforts
Kelly Turek	EGLE	Field sampling, response efforts
Sarah Holden	EGLE	Field sampling, response efforts
Jason Smith	EGLE	Field sampling, response efforts
Keri Fisher	DHHS*	Laboratory cyanotoxin analysis
Alexandra Rafalski	DHHS	Communication with local health departments
Susan Peters	DHHS	Communication with local health departments
Jennifer Gray	DHHS	Communication with local health departments
Michelle Schalow	MDARD**	Companion animal response

* Michigan Department of Health and Human Services (DHHS).
** Michigan Department of Agriculture and Rural Development (MDARD).

1. Introduction

EGLE, WRD, receives reports each year about nuisance algal conditions from district staff, lake associations, and the broader public. The number of such reports, particularly the occurrence of cyanobacteria blooms and concern over the possible presence of toxins such as microcystin, has increased in recent years. As a result, EGLE, WRD, established an internal work group in 2013 to develop an approach to monitor, assess, and report on nuisance and harmful algal conditions, and to improve our understanding of the nature, extent, and frequency of algal blooms in inland waters and nearshore Great Lakes. The need to understand and address HABs became more urgent in August 2014. At that time, severe blooms were observed in the western basin of Lake Erie, and access to drinking water for hundreds of thousands of people was temporarily interrupted due to elevated levels of a cyanobacterial toxin associated with the bloom. This event caused EGLE, WRD, to re-examine and expedite our efforts related to HABs. The term “harmful algal bloom” generally describes accumulations of cyanobacteria that are aesthetically unappealing and produce algal toxins. This work plan focuses on inland lakes; however, we have other work focusing on blue-green algae sampling along Saginaw Bay beaches, which is described in a separate workplan.

1.1. Summary

The majority of sampling will be conducted as response monitoring for water bodies with complaints about significant cyanobacteria blooms. The intent of this component of the HABs monitoring plan is to provide a structure for monitoring when EGLE, WRD, staff believe collecting algal toxin data is warranted. We expect to monitor individual lakes and to analyze samples with both field test strips and quantitative mass spectrometry (MS) analysis. The number of water bodies assessed will depend on the frequency of complaints. The number of samples per response lake will depend on cyanotoxin results from previous years, duration of the blooms, and the extent of the bloom across the water body (i.e., widespread versus localized blooms).

Several inland lakes will be visited in 2022 with varying frequency as part of other monitoring projects. These lakes will be sampled at predetermined times and not in response to any reports of a cyanobacteria bloom. However, field staff that are conducting this work will be trained to recognize a cyanobacteria bloom and collect samples as necessary for cyanotoxin analysis. These projects include shoreline algae sampling by the United States Geological Survey in collaboration with EGLE, the National Lakes Assessment Project, and nutrient sampling in targeted lakes to determine if designated uses are being impaired by excess nutrients (Table 2). The lakes listed under National Lakes Assessment is still tentative. Not all of those lakes will be visited. Details of those projects are described in separate work plans.

Table 2. Inland lakes that will be visited for other projects.

Lake	County	Latitude	Longitude	Project	Frequency	Month Range
Bass Lake	Mason	43.831493	-86.413383	USGS	bi-weekly	July- September
Hardy Dam Pond	Newaygo/Mecosta	43.513941	-85.608412	USGS	bi-weekly	July- September
Hess Lake	Newaygo	43.386952	-85.769018	USGS	bi-weekly	July- September
Ford Lake	Washtenaw	42.219934	-83.598534	USGS	bi-weekly	July- September
Belleville Lake	Wayne	42.212873	-83.495978	USGS	bi-weekly	July- September
Hardy Dam Pond	Newaygo/Mecosta	43.513941	-85.608412	Nutrient project	one time	July-August
Croton Dam Pond	Newaygo	43.449741	-85.663571	Nutrient project	one time	July-August
Bass Lake	Mason	43.830482	-86.412647	Nutrient project	one time	July-August
Unnamed	Mecosta	.	.	NLA	one time - tentative	June-September
Horseshoe Lake (2017 inaccessible)	Iron	.	.	NLA	one time - tentative	June-September
Unnamed	Kent	.	.	NLA	one time - tentative	June-September
Unnamed (2017 too shallow)	Oakland	.	.	NLA	one time - tentative	June-September
Unnamed*	Osceola	.	.	NLA	one time - tentative	June-September
Lorraine Lake	Schoolcraft	.	.	NLA	one time - tentative	June-September
Newton Lake	Barry	.	.	NLA	one time - tentative	June-September
McKeen Lake	Lapeer	.	.	NLA	one time - tentative	June-September
Wagner Lake	Berrien	.	.	NLA	one time - tentative	June-September
Deerfoot Lake	Alger	.	.	NLA	one time - tentative	June-September
Lost Lake	Alcona	.	.	NLA	one time - tentative	June-September
Unnamed	Grand Traverse	.	.	NLA	one time - tentative	June-September
Pickerel Lake	Allegan	.	.	NLA	one time - tentative	June-September
Pine Lake	Oakland	.	.	NLA	one time - tentative	June-September
Second Lake	Newaygo	.	.	NLA	one time - tentative	June-September
Fortune Pond	Iron	.	.	NLA	one time - tentative	June-September
Huyck Lake	Branch	.	.	NLA	one time - tentative	June-September
Three Lake	Clare	.	.	NLA	one time - tentative	June-September
Unnamed	Marquette	.	.	NLA	one time - tentative	June-September
Vineyard Lake	Jackson	.	.	NLA	one time - tentative	June-September
Fish Lake	Oakland	.	.	NLA	one time - tentative	June-September
Loon Lake	Iron	.	.	NLA	one time - tentative	June-September
Unnamed (2017 denied)	Sanilac	.	.	NLA	one time - tentative	June-September
Unnamed	Luce	.	.	NLA	one time - tentative	June-September

Lake	County	Latitude	Longitude	Project	Frequency	Month Range
Unnamed (sylvaina rec)	Gogebic	.	.	NLA	one time - tentative	June-September
Unnamed (2017 denied)	Livingston	.	.	NLA	one time - tentative	June-September
Unnamed	Ontonagan	.	.	NLA	one time - tentative	June-September
Unnamed	Newaygo	.	.	NLA	one time - tentative	June-September
Marble Lake	Branch	.	.	NLA	one time - tentative	June-September
Hardy Dam Impoundment	Newaygo	.	.	NLA	one time - tentative	June-September
Douglas Lake	Cheboygan	.	.	NLA	one time - tentative	June-September
Cloverdale Lake	Barry	.	.	NLA	one time - tentative	June-September
Round Lake	Oakland	.	.	NLA	one time - tentative	June-September
O'neal Lake	Dickinson	.	.	NLA	one time - tentative	June-September
Flint Park Lake	Genessee	.	.	NLA	one time - tentative	June-September
Hidden Lake	Livingston	.	.	NLA	one time - tentative	June-September
Beaufort Lake	Baraga	.	.	NLA	one time - tentative	June-September
Paradise Lake	Cass	.	.	NLA	one time - tentative	June-September
Unnamed	Mackinac	.	.	NLA	one time - tentative	June-September
Unnamed	Ionia	.	.	NLA	one time - tentative	June-September
Gaylord Lake	Gogebic	.	.	NLA	one time - tentative	June-September
Three Legged Lake	Van Buren	.	.	NLA	one time - tentative	June-September
Unnamed	Lapeer	.	.	NLA	one time - tentative	June-September
Lifter Lake	Mecosta	.	.	NLA	one time - tentative	June-September
Doan Lake	Dickinson	.	.	NLA	one time - tentative	June-September
Mud Lake	Ingham	.	.	NLA	one time - tentative	June-September
Roby Lake	Lake	.	.	NLA	one time - tentative	June-September
Lake Gerald	Houghton	.	.	NLA	one time - tentative	June-September
Ready Lake	Luce	.	.	NLA	one time - tentative	June-September
Rainy Lake	Presque Isle	.	.	NLA	one time - tentative	June-September
Crystal Lake-alt*	Montmorency	.	.	NLA	one time - tentative	June-September
Horshoe Lake-alt*	Alcona	.	.	NLA	one time - tentative	June-September
Blaine Lake-alt	Livingston	.	.	NLA	one time - tentative	June-September
Tighe Lake-alt	Schoolcraft	.	.	NLA	one time - tentative	June-September

1.2. Study Objectives

This work plan is designed to address the following objectives:

- Measure the geographical extent and frequency of HABs in Michigan inland lakes (i.e., how widespread is the problem).
- Quantify algal toxin concentrations in lakes with no or few previous public reports of cyanobacteria blooms.

1.3. Project Organization and Responsibility

Table 3 contains a list of key personnel, and their contact information, involved in the execution of this work assignment. Other staff may assist as needed.

Table 3. Personnel and monitoring/sample analysis responsibilities.

Personnel Name	Affiliation and Contact Information	Monitoring Responsibilities
Aaron Parker	EGLE Water Resources Division 517-342-4415 ParkerA7@Michigan.gov	Project Lead, targeted lake sampling, response monitoring, QA oversight
Kevin Goodwin	EGLE-Water Resources Division 517-284-5552 GoodwinK@Michigan.gov	HABs committee, targeted lake sampling
Jason Smith	EGLE-Water Resources Division 517-290-4601 SmithJ18@Michigan.gov	HABs committee, targeted lake sampling
Sarah Holden	EGLE- Water Resources Division 517-342-4083 HoldenS1@Michigan.gov	HABs committee, targeted lake sampling
Keri Fisher	Michigan Department of Health and Human Services 517-335-9489 FisherK@Michigan.gov	Cyanotoxins analysis

1.3.1. Project Lead

The EGLE Project Lead (Aaron Parker) is responsible for the implementation of the study and its associated QAPP. In addition, the EGLE Project Lead is responsible for:

- Ensuring an adequate QAPP is developed and distributed to all appropriate project personnel.
- Ensuring the overall goal and requirements outlined in the QAPP are met through effective organizing and planning.
- Ensuring effective lines of communication.
- Ensuring all data products are reviewed and approved according to accepted policies and guidelines before being released.

1.3.2. Project Supervisor

Gary Kohlhepp is the Lake Michigan Unit Supervisor and the Project Supervisor. His responsibilities include:

- Ensuring the project is appropriately organized and has effective lines of communication.
- Ensuring program roles are clearly understood.
- Ensuring Standard Operating Procedures (SOP) that describe current practices are written, approved, and distributed to appropriate project personnel.
- Implementing program-level corrective actions on an as-needed basis.
- Reviewing reports to ensure quality assurance goals are met.

1.3.3. Monitoring Staff

The Surface Water Assessment Section (SWAS) biologists (Sarah Holden, Kevin Goodwin, Jason Smith, and Aaron Parker) are all in the HABs work group and will be used as available to conduct the project sampling and be responsible for following field/sampling SOPs and project QAPPs. Other SWAS staff may assist with sampling as needed. All collection and delivery of samples will be performed by these staff as well. Their responsibilities include:

- Keeping well-informed of the sampling schedule.
- Ensuring the monitoring staff commitments for all surveys are met.
- Ensuring effective lines of communication.
- Ensuring all quality assurance/quality control (QA/QC) requirements are followed.
- Managing the day-to-day field sampling activities to ensure field procedures and activities conform to the requirements of the applicable SOPs.
- Resolving day-to-day problems in the implementation of this monitoring study.
- Reviewing records and field data for accuracy, validity, and completeness.
- Communicating problems to the Project Lead.

2. SAMPLING AND ANALYTICAL PROCEDURES

2.1. Sampling Locations and Schedule

Response Lakes

Response lakes will be sampled based on reports and documentation of significant cyanobacteria blooms, with consideration of sampling results from previous years. EGLE staff expect to monitor lakes predominantly in the southern region of the state, from which most of the bloom reports tend to originate. EGLE staff is planning to make approximately 30 lake trips, although this number is flexible based on the status of other monitoring responsibilities. When a response is initiated after receiving a complaint, the Project Lead or Project Supervisor will notify District, DHHS, and MDARD staff. DHHS staff will notify the appropriate local health departments about which water bodies are being sampled. A graduate student, Brenna Friday, from Wayne State University will also be informed of active cyanobacteria blooms for her Ph.D. project.

District staff will also be provided with Abraxis test strips and trained on how to use them. To respond to lakes in a timely manner, district staff will be encouraged to collect samples and run the initial test strip analysis. Depending on the initial results, district staff and the Project Lead will arrange further sample analysis at the laboratory, additional sample collections, or closure of the response.

2.2. Sampling Methods

2.2.1. Field Protocols

Photographs

During each visit, photos will be taken if they are likely to provide helpful documentation of the visual extent of the algal bloom in at least one near-shore sampling location. Photos should be taken to generally cover the range of conditions present (i.e., looking down into the water, looking out across the lake, near shore conditions, and use of props to provide visual evidence of the amount of algae present). Other photos will be taken as needed to capture any other noteworthy conditions. Pictures will be taken from the same location to facilitate comparison over time if a lake is sampled more than once. Upon return to the office, pictures will be downloaded to the designated network drive and folder for storage.

Survey Cellular Phone Application

Field survey data will be collected using the EGLE HABS survey in the Survey123 application (Appendix A). After each survey is complete it will be sent to the ArcGIS cloud server. Those data will then be exported onto a network drive from the server. Water quality data and location coordinates collected using an EXO Sonde unit will be logged into the device. Field data will be downloaded from the sonde unit after each collection and saved on the Project Lead's computer. In the event that the Survey123 application is not functioning properly, data sheets will be filled out. Upon return to the office, sonde data will be downloaded and submitted to the Project Lead for data entry and storage. Either the Survey123 application or sonde unit will be used to record the location of each sampling station.

Water Samples

In cases where a lake can be sampled by boat, at least three shoreline sites and one center lake location will generally be sampled for cyanotoxins. Response lakes that do not have public boat access will be limited to shoreline sampling. If boat access or a boat is not available, then the Project Lead will typically find shoreline sites at public access areas along the lake such as parks, beaches, boat launches, etc., using Google Earth prior to sampling. All samples will be tested for total microcystin (qualitative Abraxis test strips). If delivered to the laboratory, a suite of cyanotoxins (liquid chromatography tandem mass spectrometry [LC/MS/MS] quantitative [see Section 2.2.2.]) will be analyzed. Cyanotoxin samples will be collected in 250 milliliter (ml) Polyethylene terephthalate glycol (PETG) sample bottles that have been triple-rinsed with site water. Samples will be collected in an area of undisturbed water after rinsing. Shoreline sampling locations will be distributed approximately evenly around the shoreline of each lake. However, downwind locations, bays which may be used for recreation (i.e., have shoreline homes, access sites), or beaches will be preferentially targeted. Shoreline surface samples (top ~ ½ inch of water) will be collected in water approximately 1 to 6 feet deep. Ambient water that is representative of the site will be sampled. However, if a visible cyanobacteria scum is present at a site, additional scum samples may be collected. In some cases, cyanobacteria may be sequestered amongst filamentous green algae. If staff suspect that cyanobacteria are within strands or mats of filamentous green algae, then staff will collect an aliquot of algae and place it into the sample bottle for testing.

At the center location of lakes that are accessed by boat, temperature, conductivity, pH, dissolved oxygen, phycocyanin, and chlorophyll-a will be measured using a YSI sonde along a depth gradient. Phycocyanin and chlorophyll-a will also be measured at the surface and 2 to 4 feet of water at each shoreline location. Sonde calibration will follow established protocols.

Surface water nutrient samples will be collected from the center of the lake in Nalgene sample bottles that have been triple-rinsed with site water. Chlorophyll-a samples will be collected as a depth-integrated sample in the photic zone (two times the Secchi depth). Chlorophyll-a samples will be placed in dark, Nalgene bottles. The following four sample bottles will be collected: (1) General Chemistry Acidic (GA); (1) Neutral (GN); (1) Chlorophyll-a; and (1) cyanotoxins. Following sampling, preservatives will be added to the chlorophyll-a and GA bottles and then all sample bottles will be placed in a cooler on ice for transport and storage prior to delivery to the laboratory.

Nutrient samples (GA: one bottle for total phosphorus, total Kjeldahl nitrogen, and nitrate+nitrite; GN: one bottle for orthophosphate; and one chlorophyll-a bottle) will be submitted to the EGLE Environmental Laboratory for analysis. Quantitative cyanotoxin samples will be submitted to the DHHS laboratory for analysis using LC/MS/MS. Qualitative microcystin samples will be analyzed by EGLE using Abraxis test strips.

Qualitative microcystin samples may be held on ice or refrigerated for 48 hours prior to analysis. If microcystin samples are held longer than 48 hours, they should be frozen with care taken to reduce volume to allow for expansion, typically leaving head space above the ‘shoulder’ in the sample bottle.

2.2.2. Sample Analysis

See Table 4 for analytical methods and reporting limits for all sample analyses. Nutrient and chlorophyll-a samples will be submitted to the EGLE laboratory for analysis. Quantitative cyanotoxin samples will be submitted to DHHS laboratory for LC/MS/MS analysis of these toxins: Anatoxin-a, cylindrospermopsin, nodularin, and ten different microcystin congeners. Qualitative microcystin samples will be tested using Abraxis test strips (PN52022) following procedures provided with the test strips.

Table 4. Analytical methods and reporting limits.

Parameter	Analytical Method	Reporting Level (micrograms per liter [ug/L])
Microcystin RR	LC/MS/MS	0.5
Microcystin YR	LC/MS/MS	0.5
Microcystin HTYR	LC/MS/MS	0.5
Microcystin LR	LC/MS/MS	0.5
Microcystin LR ASP3	LC/MS/MS	0.5
Microcystin WR	LC/MS/MS	0.5
Microcystin LA	LC/MS/MS	0.5
Microcystin LY	LC/MS/MS	0.5
Microcystin LW	LC/MS/MS	0.5
Microcystin LF	LC/MS/MS	0.5

Parameter	Analytical Method	Reporting Level (micrograms per liter [ug/L])
Nodularin	LC/MS/MS	0.5
Anatoxin-a	LC/MS/MS	0.25
Cylindrospermopsin	LC/MS/MS	0.25
Qualitative Total Microcystin	Abraxis Test Strips (PN52022)	1
Total Phosphorus	EPA 365.4	10
Kjeldahl Nitrogen	EPA 351.2	100
Ammonia	EPA 350.1	10
Nitrate+Nitrite	EPA 353.2	10
Ortho-phosphate	EPA 365.1	10
Chlorophyll a	10200H (Standard Methods)	1

2.2.3. Corrective Action

Monitoring staff will maintain close communication with the Project Lead. Adjustments to the sampling schedule, or adjustments to any other aspects of the study, will only be made in consultation with the Project Lead. All field and laboratory personnel are responsible for notifying the Project Lead of circumstances that may necessitate any adjustments. Changes to the project work plan will be reflected through submission of work plan amendments, as necessary.

2.2.4. Chain of Custody

Proper sample handling and custody procedures ensure the custody and integrity of samples from the time of sampling, continuing through transport, sample receipt, preparation, and analysis. All chain of custody procedures will be followed for both of the State of Michigan Laboratories.

2.3. Reporting

2.3.1. Data Management

Cyanotoxin and water chemistry results will be saved to a designated network drive and folder for storage. Results will be shared with Alexandra Rafalski, DHHS, and Susan Peters, DHHS, as soon as they are available. After each sampling event, the initial microcystin test strip results will be sent to the DHHS, who will then report the results to the appropriate county health departments (see Appendix B for example of data that will be sent to the DHHS after each sampling event).

2.3.2. Final Report

A final report will be prepared by the Project Lead to communicate the results of this study and raw toxin data to interested parties. Because previous response sampling has occurred as late as December, the report will be completed in 2023.

3. DATA QUALITY OBJECTIVES AND CRITERIA

The primary objectives of this project are to: (1) assess the number and geographical extent of cyanobacteria blooms; and (2) determine whether cyanotoxins are present in inland lakes with confirmed blooms. To achieve this, SWAS biologists will collect algal bloom condition, water quality data, and quantitative toxin data at response lakes and possibly additional lakes for separate projects. Response lakes that have not been sampled in previous years or were sampled only rarely will be sampled to determine if they have algal toxin concentrations at levels of concern.

3.1. Data Quality Objectives

A mixture of variables may affect data quality, including staff training, sample collection/handling procedures and equipment, sample analysis techniques, and record keeping. To control these variables, the Data Quality Objective process is used. Data Quality Objectives developed for this project specify discrete parameters in four areas: (1) Observational Precision and Accuracy; (2) Representativeness; (3) Completeness; and (4) Comparability. A brief description of each of these parameters is presented below.

3.1.1. Observational Precision and Accuracy

Precision is the degree of agreement between two or more measurements, while accuracy is a measurement of correctness. For this study, lake and shoreline conditions are assessed through the use of qualitative and semi-quantitative observations. Observational data that are qualitative will be either gathered collaboratively by two staff or be gathered by one and independently confirmed by the second staff person in the field prior to departing from the site. Accuracy is ensured by measuring necessary data with standardized and calibrated field equipment including metric measuring rods, optic range finders, and water chemistry sondes.

Because of the qualitative and semi-quantitative types of data gathered, use of consistent, trained staff and a system of checks and balances in the field are critical to maintaining precision between staff and accuracy for all staff measurements. Categorical assessments or estimations of extent will be agreed upon by two staff after each arrive at their independent assessment, with discrepancies discussed and resolved to create a process by which staff are routinely calibrating their estimations.

Field data quality is addressed, in part, by consistent performance of sample procedures as laid out in this QAPP. Quality is enhanced by the training and experience of project staff and documentation of sampling activities. This QAPP and the work plan will be distributed to all field sampling personnel who will be required to read and verify they understand the procedures and requirements.

3.1.2. Representativeness

Because the objective of this project is to investigate the concentration of cyanotoxins in Michigan inland lakes, key factors considered in the design of the sampling plan included: (1) encompassing a wide geographic range of lakes with the goal of capturing the range of broad variation in conditions related to cyanobacteria blooms; and (2) performing these sampling protocols during specified sample frame that is relevant to questions of nutrient expression (early spring through late fall), and sampling in response to reports of algal blooms to understand not only conditions but the persistence thereof.

3.1.3. Completeness

The Survey 123 application, sonde data, photographs, and samples will be reviewed and confirmed prior to departing each sampling site during each sampling event. If a sample bottle is lost or damaged during shipping, we will use the results generated by the other samples at a lake to draw conclusions about the missing data as appropriate.

3.1.4. Comparability

Comparability is a measure of the confidence with which one data set can be compared with another. Field and laboratory data comparability will be ensured by conducting sample collection and preservation, and laboratory analysis in accordance with this QAPP. Well-established sample locations, clear definition of the assessed locations at each lake, limiting the participating trained field staff, use of the same laboratories for specified parameters, and following routine processes and order (e.g., first center lake sample collection and then shoreline sample collection) all serve to reduce variability associated with sampling error. The objective is to facilitate observations and conclusions that can be made from comparing the results both over time and over geographic extent.

3.2. QA/QC

Field staff will complete all required fields in the Survey123 application. The data will be reviewed by the originator in the field prior to departing each survey site and then reviewed again in the office for completeness prior to being exported to an EXCEL file and stored. The final report for this study will be reviewed for accuracy before being finalized.

3.3. Special Training

All field personnel conducting inland lake HAB monitoring will receive guidance in monitoring procedures relevant to this study and adherence to QA/QC involved in these protocols. Staff will conduct sampling with the Project Lead or other staff who have conducted sampling with the Project Lead to ensure consistency in field protocols and be provided copies of the QAPP and field guide cheat sheet (Appendix B).

3.4. Progress and Analysis Quality Control

This QAPP and other supporting materials will be distributed to all personnel involved in the work assignment. All project members will conform to the following guidelines:

All technical assessment activities including data interpretation, calculations, or other related computational activities are subject to audit or peer review. Thus, project members are instructed to maintain careful electronic records for all aspects of the assessment process.

The Project Supervisor will perform surveillance activities throughout the duration of the project to ensure that management and technical aspects are being properly implemented according to the schedule and quality requirements specified in the data review and technical approach documentation. These surveillance activities will include ensuring:

- Project milestones are achieved and documented.
- Corrective actions are implemented.
- Budgets are followed.
- Peer reviews are performed.
- Data are properly stored and maintained.

3.5. Reports to Management

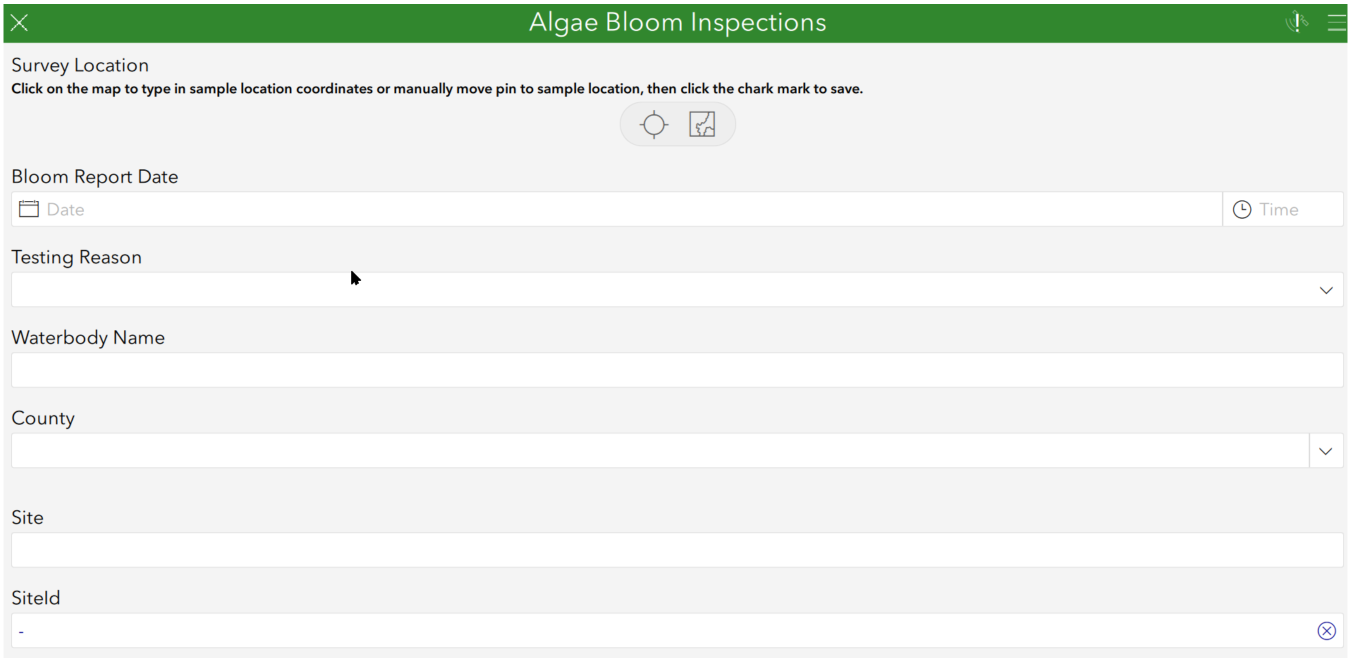
The Project Lead will provide periodic progress reports to the Project Supervisor. As appropriate, these reports will inform the Project Supervisor of the following:

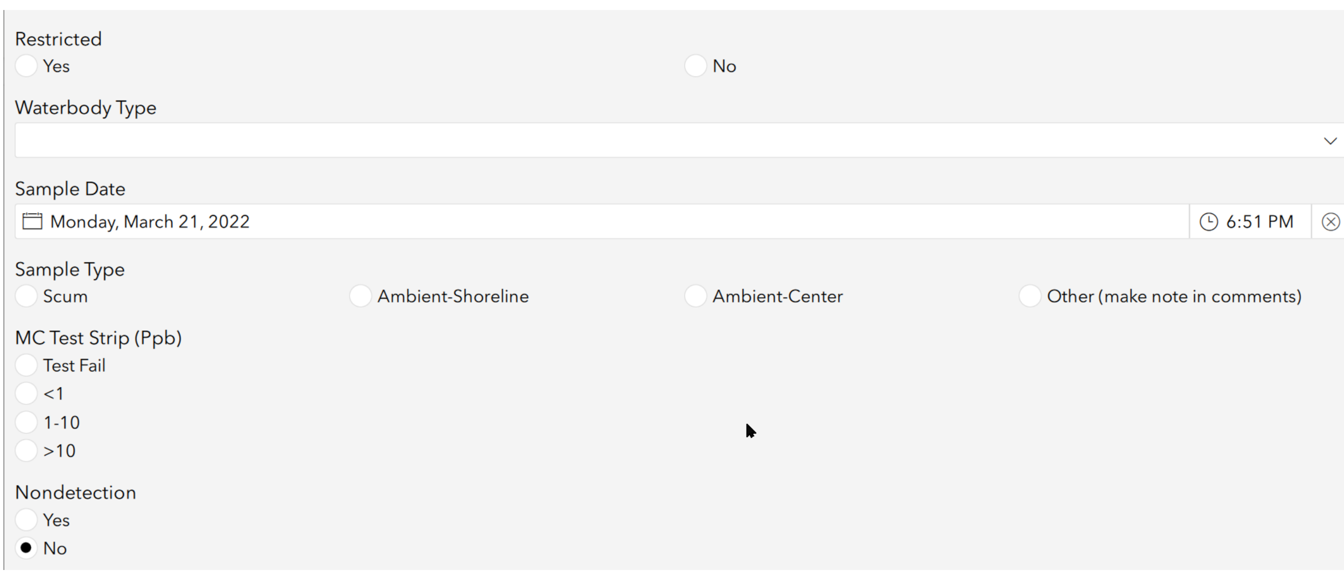
- Adherence to project schedule.

- Deviations from approved QAPP, as determined from project assessment and oversight activities.
- The impact of these deviations on analytical tool application quality and uncertainty.
- The need for, and results, of response actions to correct the deviations.
- Potential uncertainties in decisions based on analytical tool results and data.

Appendix A

Harmful Algal Bloom Survey123 application





Total Microcystins (Ppb)
Non-detects - must include <
Not Sampled - Enter NS

Anatoxin (Ppb)
Non-detects - must include <
Not Sampled - Enter NS

Cylindrospermopsin (Ppb)
Non-detects - must include <
Not Sampled - Enter NS

Nodularin (Ppb)
Non-detects - must include <
Not Sampled - Enter NS

Sent To Lab?
- Yes
- No

Harmful Algal Bloom Survey 123 application block for requested information.

Comments

Oh habs Case Definition
- Unconfirmed
- Undetected
- Suspected
- Confirmed

Public Health Action

Field Quality Check
- Yes
- ● No

Lab Quality Check
- Yes
- ● No

HABs Inspection Photos

Appendix B

HABS FIELD GUIDE

Sampling Description

One lake center location:	3 shoreline locations:
• Integrated CA (2X secchi) • Water Chem Nutrients (GA and GN) • Secchi • Sonde measurements (6 depths)	• Secchi • Surface grabs Cyanotoxin • Algal community sample collection (one site) • Sonde measurements (2 depths)

Sample Types

GA: 250 ml standard sampling bottle; total phosphorus, total Kjeldahl nitrogen, and nitrate+nitrite; EGLE Laboratory
GN: 250 ml standard sampling bottle, orthophosphate; EGLE Laboratory
CA: 250 amber CA bottle; Chlorophyll a; EGLE Laboratory
Algal Toxins: 250 ml PETG bottle (square); Test strip sample pulled from this bottle. Then bottle to the DHHS Laboratory for: Anatoxin-A, Cylindrospermopsin, Microcystins

Sample Locations

Surface grabs: ~1 foot from surface of water. Can use chlorophyll sampling bottle or submerge bottle past elbow.
Shoreline sampling locations should be distributed approximately evenly around the lake. However, downwind locations, bays which may be used for recreation, areas impacted by river outlets, or beaches will be preferentially targeted.

Equipment List

Field Equipment	Bottles per Lake	Boat Gear	Etc.
YSI	(4) 250 ml PETG Bottles	Boat, Motor, Anchor	Bottle Labels
Secchi	(1) Chl A Bottle	Gas Can	Sharpies, Pencils
Chl Sampling Bottle	(3) Standard 250ml Bottles	Depth Finder	Gloves
Chem Kit		Throwables, Life Vests	Cooler, Ice
			Field Sheets/Lake Maps

Field Sheets/Labeling

Label all bottles with Lake Name, Sample Date, and Site Name.
Lake outline/bathymetric map to mark shoreline sample locations.
EGLE Laboratory Sheet.
DHHS Laboratory Sheet.

Sample Storage

Samples should be refrigerated, if not analyzed, for test strip microcystin and taken to the laboratory on the day of sampling.

Shipping/Sample Delivery

GA, GN, and CA samples will be delivered to the EGLE Laboratory within 48 hours of collection.
Cyanotoxins will be delivered to the DHHS Laboratory within 48 hours of collection.

Project Contacts

Aaron Parker: 517-342-4415 (cell)
Gary Kohlhepp: 517-230-7548 (cell)