Standard Operating Procedure for the Collection of Water Quality Samples in Lakes

Revised and Adopted July 2018

Final Copy

OKLAHOMA WATER RESOURCES BOARD
WATER QUALITY PROGRAMS DIVISION
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Standard Operating Procedure for the Collection of Water Quality Samples in Lakes

November 2019

Revision Date	Version	Description of Changes	Effective Date
July 2018	1.1	• Addition of depth-integrated sampler procedures • Addition of Ortho-P sample collection procedures • Addition of Kestrel temperature and wind measurement collection procedures • Addition of updated electronic and paper field sheet • Clarification of field data collection terminology • Addition of secchi disk depth procedures • Update of links to documents on OWRB network • Update data storage section to reflect current database.	September 2019
Final	2.0	• Finalized edits • Updated format	November 2019

STANDARD OPERATING PROCEDURE FOR THE COLLECTION OF WATER QUALITY SAMPLES IN LAKES

Originally Adopted 2013

Revised July 2018

1.0 Introduction

The purpose of this document is to provide a simplified outline of the field sampling procedures used by the Water Quality Programs Division of the Oklahoma Water Resources Board (OWRB) for all projects that are part of the Lakes Monitoring Program. While techniques for sampling are outlined in this document, an experienced staff member will conduct further training on an as-needed basis explaining other, more complex techniques. An example of documents pertaining to lakes sampling, including chain of custody forms for Oklahoma Department of Environmental Quality (ODEQ), data sheets, and checklists, are appended at the end of this document.

2.0 Definitions/Terms

3.0 Safety

Upon reaching the sampling location, site safety determinations should be made by the crew leader before proceeding. Please refer to the OWRB safety manual for information on boat safety, trailering, and working from boats (OWRB, 2017).

4.0 Quality of the Measurement

A variety of Quality Assurance/Quality Control (QA/QC) samples are routinely collected to assure that environmental samples meet the Data Quality Objectives (DQO's) outlined in the controlling Quality Assurance Project Plan (QAPP). QA/QC sampling is designed to control each step of the sampling process. The project QAPP should be consulted before trip planning to ensure the appropriate samples are collected. Blank samples are collected to ensure that field personnel are effectively cleaning the equipment used in field sampling, laboratory cleaning methods are adequate, and deionized water is clear of impurities. Duplicate samples may be collected to ensure that composite samples are properly homogenized and processed. Replicate samples may be collected to ensure that the sampling methodology employed is collecting a representative, repeatable sample. Spike or known samples may be submitted to test the efficacy of the analytical laboratory.

4.1 Types of Samples

QA/QC samples are collected to test various DQO's precision, accuracy, and representativeness. Following is a short description of each kind of sample. Samples are submitted to the analytical laboratory with other trip samples on an as needed basis.

• **Laboratory Equipment Cleaning Blank Sample:** A laboratory blank sample is collected to ensure that laboratory cleaning methods are adequate and are not contaminating samples. Reagent grade water should always be used to collect these samples. Only sampling equipment associated with a clean laboratory equipment cleaning blank will be utilized. Submitted on a regular schedule when sample collection equipment is required.
• **Field Equipment Cleaning Blank Sample:** A field equipment cleaning blank sample is collected to ensure that field cleaning methods are adequate and are not cross-contaminating samples. Reagent grade water should always be used to collect these samples. Submitted on a regular schedule when cleaning of sample collection equipment is required.

• **Analytical Blank Sample:** An analytical blank sample is submitted in part to control the methods of the analytical laboratory and to ensure that reagent grade water used in equipment cleaning is of adequate quality. Reagent grade water should always be used to collect these samples. Submitted on a regular schedule.
• **Duplicate Sample:** A duplicate sample is collected to control the sample splitting method. This sample ensures that composite samples are being collected and homogenized appropriately. Submitted on a regular schedule when sample collection equipment is used.
• **Replicate Sample:** A replicate sample is collected to control the general sampling methodology that is being employed. This sample ensures that a representative, repeatable sample is being collected. Replicate samples may also be submitted to verify the accuracy of analytical results. Submitted on a regular schedule for BUMP samples and other special projects.
• **Spike Sample:** A spike sample is a known stock solution diluted by environmental sample. Submitted as required by the governing QAPP or as need arises.
• **Known Sample:** A known sample is a known stock solution diluted in the laboratory with reagent grade water. Submitted as required by the governing QAPP or as need arises.

The Oklahoma Department of Environmental Quality (ODEQ) or other contract laboratory can provide stock solutions for spike or known samples, or these samples may be purchased through a laboratory supplier. Consult the Quality Assurance Officer to determine where to acquire stock solutions and appropriate procedures. When preparing QC spike and known samples, **record everything you do**. It is essential that all steps of the process be adequately documented.

4.2 Preparation of Samples

4.2.1 Inorganic Chemistry, Metals, Chlorophyll, and Field QA/QC Samples

Quality Assurance/Quality Control (QA/QC) – Samples will be collected to verify the precision of the analyzing lab as well as sample collection methods.

Analytical Blank Sample

- One sample is collected for each sampling month, when required by the project quality assurance plan, or when deemed necessary by the project manager.
- The sample is collected from reagent grade water from the OWRB water quality lab or, when applicable, is provided by the analytical laboratory.
- The sample will include 1-liter bottles each for ice preservation, sulfuric acid preservation, chlorophyll and field parameters - which may include turbidity, hardness, alkalinity, and ammonia. One 250 mL bottle for total recoverable metals and one 75 mL dissolved metals sample will also be included when necessary and preserved with nitric acid.
- Label with a “31” as the QA code.

Laboratory Blank Sample

- One sample is collected for each sampling month, when required by the QAPP, or when deemed necessary by the project manager.
- The sample is collected by running reagent grade water through all applicable equipment that will be used in the field during a particular sampling month.
- The sample will include 1-liter bottles each for ice preservation, sulfuric acid preservation, chlorophyll, and field parameters - which may include turbidity, hardness, alkalinity, and ammonia. One 250 mL bottle for total recoverable metals and one 75 mL dissolved metals sample will be included when necessary, run through the equipment, and preserved with nitric acid.
- Label with a “32" as the QA code.

Field Blank Sample

- One sample is collected for each sampling trip, when required by the QAPP, or when deemed necessary by the project manager.
- The sample is collected by running reagent grade water through any plasticware or equipment that is used at more than one station after applicable cleaning procedures have been completed. Water should be aliquotted in a manner that is consistent with normal sampling procedures.
- The sample will include 1-liter bottles for ice preservation, sulfuric acid preservation, and field parameters – which may include turbidity, hardness, alkalinity, and ammonia. One 250 mL bottle for total recoverable metals and one 75 mL dissolved metals sample will be included when necessary, run through the equipment, and preserved with nitric acid.
- Label with a "33" as the QA code.

Duplicate Sample

- At least one sample is collected when required by the QAPP, or when deemed necessary by the project manager.
- The sample is collected by using a churn splitter or Van Dorn to divide water from one sample site into two separate samples.
- The sample will include 1-liter bottles for ice preservation, sulfuric acid preservation, chlorophyll, and field parameters - which may include turbidity, hardness, alkalinity, and ammonia. One 250 mL bottle for total recoverable metals and one 75 mL dissolved metals sample will be added when necessary, run through the equipment, and preserved with nitric acid.
- Label one sample set with an "11" (environmental sample) and the other sample set with a "21" (duplicate sample set) as the QA codes.

Replicate Sample

- At least one sample is collected for each BUMP lake sampling event, when required by the QAPP, or when deemed necessary by project manager.
- The sample is collected by repeating the exact sampling process as if collecting two independent sample sets.
- The sample will include 1-liter bottles for ice preservation, sulfuric acid preservation, chlorophyll, and field parameters - which may include turbidity, hardness, alkalinity, and ammonia. One 250 mL bottle for total recoverable metals and one 75 mL dissolved metals sample will be added when necessary, run through the Van Dorn, and preserved with nitric acid.
- Label one sample set with a "12" (environmental sample) and the other sample set with a "22" (replicate sample) for the QA codes.

4.2.2 Bacteria QA/QC Samples

Bacteria collections require all designated QA/QC samples described in 4.2.1 of this document with the exception of laboratory or field blanks, as no sampling equipment is reused.

5.0 Personnel and Equipment

5.1 Personnel

Principal investigators for the OWRB are required to have bachelor degrees and/or experience with biological or other applicable sciences. Each sampling trip will have a designated crew leader along with other investigators. In all instances, the collection of water quality samples from lakes requires at least a two-person field crew. Investigators must be familiar with OWRB SOP documents concerning water quality and quantity collections and measurements, as well as habitat assessments and biological collections. In-house training will be conducted for the use of all meters and digital titrators used for water quality or quantity measurements. Training will follow the methods outlined in these documents. Additional training will be provided when new SOPs are developed. Field

crew training will be accomplished through dry-run exercises in the laboratory to familiarize field crews with sample collection, sample preservation, instrument operation, calibration, and maintenance. In addition, when new personnel are hired or new methods developed, qualified staff will train them on sample collection, measurement, and field analysis methods through side-by-side field trips. These trips will familiarize staff with SOP requirements. When training is considered adequate, a qualified staff member will audit field staff for adherence to SOPs.

5.2 Equipment

A checklist listing the equipment needed for collection of water quality samples from lakes and reservoirs is appended at the end of this document and should be utilized during trip setup.

6.0 Sample Collection

6.1 General Sampling Methodology

To locate a sample site, rely on information from the crew leader, maps, GPS, and landmarks. Once the approximate site is located, it is important to find the thalweg or original river channel. Sample sites should be located in the thalweg as this is generally the deepest area of a particular section of the lake and is less influenced by shoreline areas. The thalweg can be located by driving across the lake and noting the point on the depth finder where the bottom rapidly drops off and then rises. Be sure to document the sampling location on the head unit, map, and field sheet.

6.2 Sample Collection

Water samples are collected at each site to be tested for chemical and biological parameters. Samples may be collected using a surface grab, depth integrated, or sub-surface collection method. The method used may be waterbody or project specific. The crew leader will provide specific instructions on the number of samples, applicable collection method, and depths at which samples are to be taken; this information is also available in the project's QAPP. For each sample event, field data is recorded; whenever field conditions allow, the electronic field sheet should be used, however a paper backup is available for use during rain events. The paper data sheet is located at S:\Monitoring/Lakes/Field Data\Field Sheet Paper Copy\1000XXX - BUMP Lakes Paper Field Sheet_New.xlsm and the electronic sheet is located at S:\Monitoring\LAKES\Field Data\Electronic Field Data Sheet\1000XXX - Template Lake Field Sheet_Final.xlsm

For all collection methods, it is important to **prime the sample bottles three times** by rinsing the containers with ambient water before filling (fill the container with a little sample water, shake it, and pour out the water).

- Surface samples are collected by completely immersing the sample containers nozzle down to a depth of 0.5 meters (approximately elbow length) and slowly allowing sample container to fill to brim. Avoid aerating the sample, by lowering the bottle nozzle-down, allowing water to fill the bottle slowly. **It is important to completely fill sample containers leaving no room for air in the container.** Cap sample bottle under water.

- Depth integrated samples are collected using PVC samplers. This method is used to collect depth-integrated samples from the euphotic zone of the water column. The euphotic zone is determined by multiplying the depth at which the Secchi disk reappears by two. Refer to section 7 of this document for details on measuring Secchi disk depth. If the euphotic zone is less than 1 meter in depth, a grab sample should be collected instead. To collect a sample using the depth-integrated sampler, follow the steps below:

    1. Prime churn splitter three times with ambient surface water.

2. Remove stopper from the blanked integrated sampler and open valve to begin priming procedure.

3. Lower sampler vertically into the water to completely fill with water, stopper the upper end of sampler, remove from water, and release stopper.

4. Repeat two more times.

5. Move to the opposite side of the boat, lower the un-stoppered integrated sampler with the valve opened into the water column until the line marking twice the secchi depth is at the water surface.

6. Place the stopper in the tube.

7. Slowly raise the tube until the lower opening is just below the water surface and close the valve.

8. Open the integrated sampler valve to allow sample water to pour into the blanked, primed, open 4 L plastic churn splitter.

9. Repeat steps 3 through 7 until churn splitter is full.

10. Dispense contents into the appropriate 1(12) sample bottles leaving no room for air. Cap and invert the bottle to ensure homogenization.

11. Move to a new location along the boat for the next integrated sample collection. Repeat steps 3 through 7 to collect the replicate (1(22)) samples.

12. Dispense contents into the appropriate 1(22) sample bottles leaving no room for air. Cap and invert the bottle to ensure homogenization.

13. Place all properly labeled bottles in a cooler with ice.

- Sub-surface samples are collected using a Van Dorn. To collect a sample at depth using the Van Dorn sampler, follow the steps below:

1. Open Van Dorn sampler by pulling the two caps outwards and loop wires onto pegs until they lock in the open position.
2. Slowly lower the Van Dorn over the side of the boat to the desired depth.

3. Release the messenger down the taut rope to trip the closing mechanism.

4. Raise the Van Dorn to the water surface and into boat

5. If sediment or detritus are present in the sample, discard and repeat steps 1 through 4 from the opposite side of the boat, going to a lesser depth to avoid bottom debris.

6. If there is no evidence of sediment, prime the sample bottles three times using the depth-collected sample water from the Van Dorn. Orient the end valves of Van Dorn with one positioned upwards and one positioned downwards to allow sample water to flow into the

appropriate sample bottles. Open valves and fill completely, leaving no room for air in the sample.

7. Preserve the nutrients sample with a vial of H_2SO_4.

8. Screw on lid and seal inside the Ziploc bag – discard used bottle, FlipMate, and unused water. Place all properly labeled bottles in a cooler with ice.

9. Record the collection depth of the bottom sample on the data sheet.

When collecting water samples at any depth, it is important to collect all necessary 1-liter containers of a representative sample. Immediately, or upon returning to the dock, add the pre-measured vial containing 2 mL of sulfuric acid into the sample container designated to be preserved with acid. Be mindful of weather conditions, such as wind, when determining to add acid on the boat or at the dock. The analytical laboratory supplies a new stock of the screw-capped 2 ml vials of sulfuric acid each time sample kits are received. Once the acid has been added and the acid vials have been discarded in the appropriate container, all samples should be placed on ice for transport to the analyzing lab. It is vital that **all** samples be stored on ice at approximately 4°C until they reach the lab.

Dissolved ortho-phosphorus samples are collected for specific projects. Crew leader will notify others prior to sampling activities that the collection of dissolved ortho-phosphorus will be a part of the parametric coverage for the project. Samples may be collected at the surface or at depth as required by the project DQO's. Once collected, samples must be field filtered and placed on ice until delivered to the analytical lab. These samples have a 48-hour holding time and must be submitted to the laboratory within that holding time. If field filtering is not possible for any reason, the samples should be returned to the laboratory as soon as possible and the data should be flagged to indicate likely bias due to inappropriate preservation.

- While wearing sterile gloves, assemble ortho-P sample bottle apparatus before field collection. Attach FlipMate (with 0.45 micron filter facing upwards) to one 125 mL collection bottle; place in Ziploc bag with another 125 mL collection bottle secured with a screw top lid. Label the lid, bottle, and bag. Seal bag.
- *In situ* collection:
    1. Prime collection bottle and lid three times with surface water collected at 0.5m depth. For at-depth water column samples, prime collection bottle and lid three times from Van Dorn nozzle.

    2. Fill collection bottle with enough water to pass sufficiently the 100 mL fill line.

    3. Connect FlipMate and attached collection bottle to the now-filled collection bottle.

    4. Once secure, flip sample bottle apparatus upside down, and attach hand pump to bottom valve.

    5. Squeeze hand pump handle multiple times to facilitate pressure vacuum and sample water begins to filter through to empty digestion cup. Do not exceed 15 in. Hg indicated on pressure gage.

    6. Fill to 100 mL line then release pressure vacuum with hand-pump trigger.

    7. Screw on lid and seal inside the Ziploc bag – discard used bottle, FlipMate, and unused water.

8. Place on ice to keep sample below 4° Celsius

9. Submit to the lab for analysis as soon as possible to eliminate possibility of exceeding the 48-hour hold time.

7.0 Types of Water Quality Samples

Inorganic Panel
The inorganic panel is processed through an analytical laboratory for a nitrogen series, phosphorus series, and certain minerals. A solids series may also be included in this panel if required for projects. Samples that are processed for both a nitrogen and phosphorus series are preserved with sulfuric acid, as such; they have a 48-hour hold time and must be returned to the laboratory within that holding time.

Field Panel
Field staff process the field panel for turbidity, hardness, and alkalinity. Completed samples should be void of air. As samples are collected for processing later, the sample is preserved on ice at $4^{o}C$. Alkalinity and turbidity must be processed within a 24 hour time period and hardness must be processed within a 48 hour time period; all field parameter samples must be brought to ambient temperature before analysis. The processing of these samples is further described in corresponding SOP's (OWRB, 2005b; OWRB, 2005c).

Metals Panel
The metals panel is processed through an analytical laboratory for metals included in the Oklahoma Water Quality Standards (OWQS) and various other project-specific minerals (OWRB, 2017). Each sample is collected at 0.5 meters from the lake bottom using a Van Dorn sampler. To avoid contamination, samplers should follow the clean hands/dirty hands methodology described in Section 2.0 of USEPA 1669 methodology (USEPA, 1996).

Sub-surface samples are collected using a Van Dorn. To collect a sample at depth using the Van Dorn sampler, follow steps 1-6 outlined in section 6.2 – sub-surface samples. For metals sampling, add the following preservation steps:

7. Preserve dissolved metals sample with seven (7) drops of nitric acid (HNO_3) and preserved the total metal samples with twenty (20) drops within six hours of collection.

8. Screw on lid and seal inside the Ziploc bag – discard used bottle, FlipMate, and unused water. Place all properly labeled bottles in a cooler with ice.

9. Record the collection depth of the bottom sample on the appropriate data sheet.

Bacteria Panel
The bacteria panel is processed through an analytical laboratory for both E. coli and Enterococci. Unless otherwise described in the QAPP, these samples are collected in 100 mL sterile sample bottles with a surface grab at a depth of 0.5 meters. A QA/QC replicate sample is also collected for each project. The samples are preserved on ice at $4^{o}C$ and delivered to the lab with 24 hours of collection. The chain of custody for these samples is obtained from the analytical laboratory and is located in Appendix A.

Chlorophyll Panel
The procedure for the processing of chlorophyll samples can be found in the Chlorophyll a Collection SOP (OWRB, 2018).

Field Observations

Field observations, including **time**, **air temperature**, **wind direction**, **wind speed**, **percent cloud cover**, **wave condition**, **precipitation**, **barometric pressure** and **site depth** (as measured by the multi-parameter sonde), should be recorded on the data sheet. When field conditions allow, the electronic form should be used, however a paper backup is available for rain events. If recording on a paper field sheet, the data will be transferred to the network and database upon returning from the field and the paper data sheet will be filed appropriately.

Time: To record the time of a sampling event, utilize the Date/Time feature on the handheld. The time should be recorded in military time without the use of a colon between numbers. For example, record "1300" to reference a sampling event taking place at 1:00 PM. See Figure 1.

Military = Civilian	Military = Civilian
0001 = 12:01 am	1300 = 1:00 pm
0100 = 1:00 am	1400 = 2:00 pm
0200 = 2:00 am	1500 = 3:00 pm
0300 = 3:00 am	1600 = 4:00 pm
0400 = 4:00 am	1700 = 5:00 pm
0500 = 5:00 am	1800 = 6:00 pm
0600 = 6:00 am	1900 = 7:00 pm
0700 = 7:00 am	2000 = 8:00 pm
0800 = 8:00 am	2100 = 9:00 pm
0900 = 9:00 am	2200 = 10:00 pm
1000 = 10:00 am	2300 = 11:00 pm
1100 = 11:00 am	2400 = 12 Midnight
1200 = Noon	

Figure 1. Conversion to Military Time

Air Temperature: OWRB utilizes Kestrel Instruments handheld environmental monitors. The most applicable model is the Kestrel Basic 2500 and is the model employed by OWRB. To record a temperature measurement, uncover the unit and slide the cover to the end of the lanyard. Power the device on and navigate to the "**ºC**" selection (temperature measurements are recorded using metric units). Wave the unit in a circle in the air for a minimum of 10 seconds, then record the displayed reading. For a demonstration video, follow the provided link.

Wind Direction: Record wind direction using the "N-NE-E-SE-S-SW-W-NW" format. Most modern smartphones have a compass built in the installed hardware. If there is ever a doubt as to which direction the wind is coming from, use the provided OWRB iPhone.

Wind Speed: Using the Kestrel Meter, select "SPD AVG MPH" and power the unit OFF (clearing the memory). While powering the unit back on, point the unit into the wind and hold for a minimum of 20 seconds. Averaging mode measures and averages wind speed in 3-second increments to provide an average reading on the display. The average will likely rise rather rapidly, then begin to fall; once the number starts to decrease, record the measurement. This process should take a total of at least 30 seconds to ensure an accurate reading.

Percent Cloud Cover: Percent cloud cover represents an estimate of cloud cover in the vicinity of the boat at the time of sampling. Cloud cover can change rapidly, so observations will likely differ from site to site. Acceptable percentages are in 25% increments: 0%, 25%, 50%, 75%, and 100%.

Wave Conditions: Along with percent cloud cover, wave conditions are subjective observations. Those charged with filling out the Field Data Sheet should do so for all sites at all lakes sampled on a given day.

Precipitation: Record amount of precipitation for the immediate area surrounding the boat at the time of sampling. Options include "Clear – No Precip, Fog, Rain, Sleet, or Snow." Select the category that best describes the current condition.
Barometric Pressure: Each YSI handheld has the ability to record the atmospheric barometric pressure. When assessing each site, record the barometric pressure in mm Hg.

Specific Conductance: Specific Conductance can vary widely across Oklahoma's lakes and contribute to Total Hardness measurements when completing Field Chemistry. Hach handhelds record Specific Conductance and display the measure in SPC COND. Record the Specific Conductance at each site.

Site Depth: One of the final measurements taken at each site is bottom depth. Using the boat's fish finder transducer, identify and slowly approach the perceived bottom of the lake. Once the bottom has been located, record that depth on the field sheet. The final sonde recording at each location should be 0.2m off the actual bottom of the lake's surface.

Secchi disk depths are also recorded at each site and used as an indicator of water clarity and determination of the euphotic zone. This is accomplished by lowering the measured and marked disk into the water on the shaded site of the boat while not wearing sunglasses (Kent State, 2009).

1. Lower the secchi disk straight down until it just disappears from sight and grasp the chain at the water line, thus marking the disappearance depth.
2. Raise secchi disk until it reappears, again grasping the chain at the water line, thus marking the reappearance depth.
3. Divide the distance between these two depths and record to the nearest centimeter on the field sheet. Because different people measuring Secchi transparency at the same site may obtain slightly different results due to vision differences, the same crewmember is to measure Secchi disk depth at each lake.

8.0 Forms

Examples of forms discussed here are appended at the end of this document.

8.1 Chains of Custody

Chains of custody are documents remitted to the analytical laboratory documenting characteristics and metadata for each lake's samples. These forms are used for several purposes; they act as a **legal** document to show proper delivery of samples occurred and they make a general list of the parameters that should be analyzed. Chains of custody are available for inorganic, metals, and organic panels. They are a data sheet and a **legal** document and should be treated with the responsibility this dictates. The date and time for each sample collected must be included and the form should be legible, accurate, and complete. Additional information such as chlorophyll–a extraction date and time, acid, and bottle lot numbers should also be included. All forms should also be signed and dated by field and laboratory receiving personnel at the time of delivery. To avoid confusion and loss of data, a new chain of custody should be used for each lake/project. For guidance on proper procedure to complete the chains of custody, refer to your supervisor and/or crew leader. All samples are pre-logged in advance of sampling and a chain of custody document is generated by the ODEQ. The chain of custody is included with the trip sample kit that is picked up by field staff the week prior to the sampling trip. If bacteria or extracted chlorophyll samples are to be turned in at a later date a new chain is generated and remitted with those samples.

9.0 Data Storage

When weather permits, the electronic field sheet should be completed on the laptop and saved in the format "Sample ID Lake Name Season Year." If the paper copy is used, it should be stored in the appropriate binder. The data from the electronic field sheet should be transferred to the network upon arrival to the office for review and upload to the Ambient Water Quality Monitoring System (AWQMS). Each sample should be maintained electronically in the database under its unique sample number.

10.0 References

Kent State University - Department of Biological Sciences. (2009). Retrieved from The Secchi Dip-In: www.secchidipin.org

OWRB. (2005). *Standard Operating Procedure for the Measurement of Hardness and Alkalinity in Lakes.* Oklahoma City, OK: OWRB.

OWRB. (2005). *Standard Operating Procedure for the Measurement of Turbidity in Lakes.* Oklahoma City, OK: OWRB.

OWRB. (2017). *Office and Field Safety Manual.* Oklahoma City, OK: OWRB.

OWRB. (2017). *Oklahoma Water Quality Standards OZC 785:45.* Oklahoma City, OK: OWRB.

OWRB. (2018). *Standard Operating Procedure for the Collection of Chlorophyll-a Samples in Lakes.* Oklahoma City, OK: OWRB.

U.S. Environmental Protection Agency. (1996). *Method 1669 Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels.* Washington D.C.: USEPA.

Bump Lakes Field Data Sheet

Oklahoma Water Resources Board

Lake/Reservoir Data:	Data Collectors:	Instrument Data:
Reservoir Name:	Water:	Sonde #:
OWRB Trip ID Number: 1000	Sonde/Env:	Handheld #:
Visit Date & Quarter:	Additional:	Amber Bottle Lot:
Lake Elevation:	Van Dorn ID: Churn ID:	Clear Bottle Lot:
	Int Sampler: Project:	Acid Lot:
		DI Date:
		DI Lot #: 235

General Information

Site #	Time (24 Hr)	Air Temp (°C)	Wind Direction*	Avg. Wind Speed (MPH)	Cloud Cover % 0-25-50-75-100	Precipitation*	Wave Condition*	Barometric Pressure (mmHg)	Spc. Cond (µS/cm)	Site Depth (m)	Secchi Depth (cm)	Zoo Sample (m)
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												
16												
17												
33												

Site/Lake Comments

Bump Lakes Field Data Sheet

Site #	Alkalinity (mg/L)	Hardness (mg/L)	Turbidity (NTU)	Chl-a Volume (mL)	Chlorophyll Extractor Initials:
1(12)					
1(22)					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
(33)					
Dilution %					
Titrant:					

Chemistry Times

Date & Time

Chemistry Started: _____

Chlorophyll Filtered: _____

Chlorophyll Extracted: _____

Field Sheet Review

Date & Time

Fieldsheet Completed: _____

Office Reviewed: _____

Uploaded To AWQMS: _____

Chemistry Notes/Comments

_____

_____

_____

_____

_____

_____

_____

_____

STATE ENVIRONMENTAL LABORATORY SERVICES DIVISION
CHAIN OF CUSTODY

General Inquiries (toll free): 1-866-412-3057

PROJECT INFORMATION

Contact Name: OWRB	Samplers (Print Names): ZMA LAD	Project Number: (Lab Use Only) OWRB-001_0619
Trip Name: HEYBURN		

SAMPLE INFORMATION										TESTING REQUIRED
Sample #	Description	Date Collected (M/D/Y)	Time Collected (Circle AM or PM)	Sample Depth	Sample Matrix[1]	Container[2]	(Water) Collection Type[3]	QA Code	Thermal Pres.	
OWRB-1301225-01	1000496.01A Heyburn (01S)	9/27/18	955 AM PM	0.5	AQU	CPB 1L H2SO4	SRF	12	Ice	NO2 NO3, TKN, TOTAL P
OWRB-1301225-02	1000496.01B Heyburn (01S)		AM PM	0.5	AQU	CPB 1L NONE	SRF	12	Ice	TDS, CHLORIDE, SULFATE, Conductivity 201.3
OWRB-1301225-03	1000496.01C Heyburn (01S)		AM PM	0.5	AQU	CGT 12ML NONE	SRF	12	Ice	CHLOROPHYLL, Filter Volume 250
OWRB-1301226-01	1000496.01D Heyburn (01S)		AM PM	0.5	AQU	CPB 1L H2SO4	SRF	22	Ice	NO2 NO3, TKN, TOTAL P
OWRB-1301226-02	1000496.01E Heyburn (01S)		AM PM	0.5	AQU	CPB 1L NONE	SRF	22	Ice	TDS, CHLORIDE, SULFATE, Conductivity 201.3
OWRB-1301226-03	1000496.01F Heyburn (01S)		955 AM PM	0.5	AQU	CGT 12ML NONE	SRF	22	Ice	CHLOROPHYLL, Filter Volume 250
OWRB-1301227-01	1000496.02A Heyburn (02)		1115 AM PM	0.5	AQU	CPB 1L H2SO4	SRF	10	Ice	NO2 NO3, TKN, TOTAL P
OWRB-1301227-02	1000496.02B Heyburn (02)		1115 AM PM	0.5	AQU	CPB 1L NONE	SRF	10	Ice	TDS, CHLORIDE, SULFATE, Conductivity 203.1
OWRB-1301227-03	1000496.02C Heyburn (02)		1115 AM PM	0.5	AQU	CGT 12ML NONE	SRF	10	Ice	CHLOROPHYLL, Filter Volume 250

SAMPLER'S COMMENTS

SAMPLE RECEIVING COMMENTS

CHAIN OF CUSTODY RECORD MUST BE SIGNED

*** SEE PAGE 2 FOR CHAIN OF CUSTODY RECORD ***

707 NORTH ROBINSON, P.O. BOX 1677, OKLAHOMA CITY, OKLAHOMA 73101-1677

CHECK OFF AND INITIAL FOR TRIP SET UP AND BEFORE LEAVING

LAKE WATER QUALITY SAMPLING (BUMP)	
	1 Liter sample bottles for each lake (1 acid, 1 chlorophyll , and 1 ice and associated QA/QC bottles) Zoo- and Phyto- plankton 125mL bottle (labeled with lake name on lid)
	1 Cooler per lake + coolers of ice
	Sonde (Calibrated), cord reel, and YSI Handheld (Some lakes may need 100m cable)
	Sonde box—Sonde tools (yellow wrench and probe loosener) and batteries (C & D)
	Acid kit stocked w/ plenty of sulfuric acid and waste container (Be sure to have GLOVES)
	Secchi disk
	Lugol's Kit (Lugol's Iodine, pipettes, and gloves)
	Laptop
	Zooplankton kit (net, bucket, ethanol bottle, DI squirt bottle, wax pencil)
	Clipboard with field datasheets, lake maps with marked sites, DEQ chains, and portable GPS if needed
	Pencils, sharpies, and wax pencil
	Atmospheric Data Center (Kestrel)
	Boat Bag (Boat keys, gas card, boat plug, GPS system with depth finder)
	Life jackets (1 per person)
	Trolling motor, battery, and battery jump pack (if taking 10ft jon)
	Tools and Road Map (Should be in the trucks, check before leaving)
	Camera
	Rain or winter gear, if necessary
	Battery jump pack
	Truck Keys (With lot key, gas card, and record book)
FOR OVERNIGHT TRIPS ONLY	
	Overnight kit; stocked (DI water, filters, filter apparatus-Erlenmeyer flask, tube, hand pump, clamp, filter base, filter cup, forceps, spatula, sharpie, foil, and graduated cylinder)
	Alkalinity Kit; stocked
	Hardness Kit; stocked
	Turbidimeter with Kim wipes, standards, extra vials and log book

Checklist for hitching and hauling boats

	Description	Comments
	Check tires- look for uneven wear, air in tires, and loose bearings	
	Check tie-downs front and back- make sure boat is snug against trailer	
	Make sure transom saver is in place	
	Check spare tire	
	Check battery- bump engine to check that it turns over **(Caution- don't start and let run**)	
	Connect lights and check that trailer lights & blinkers work	
	Cross chains when hitching/place electrical wires on top of chains to prevent damage due to dragging	
	Check for first aid kit and tool box in boat	
	Check that boat has enough gas for the day	
	Check dates on fire extinguishers/shake to mix	
	Attach trailer to the ball hitch and crank up the jack to the storing position	

Checklist for unhitching boats

	Description	Comments
	Block tires	
	Unhook chains and lay them on top of trailer tongue	
	Unplug lights- secure wires on truck and boat where they won't drag or be pinched	
	Crank jack up to release trailer from ball hitch	
	Store anchor & paddles in the appropriate storage on the boat; remove life jackets so they can be stored at the office.	
	Double check to make sure boat plug has been pulled	
	Leave boats cranked up to let water drain	

If problems occur, fix what you can, and let someone know what has been done. If possible, take a different boat until repairs can be made.