New Mexico Environment Department (NMED) Surface Water Quality Bureau (SWQB)

Standard Operating Procedure (SOP) for

LAKE SAMPLING

Approval Signatures

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1.0 Purpose and Scope

The purpose of this document is to describe the sample collection techniques, preservation requirements, equipment, and quality control activities associated with chemical, physical, and biological sampling of surface water in lentic environments. The following describes accepted approaches used in the studies of lentic systems New Mexico. For purposes of this document, the term "lake" shall include natural lakes and ponds, as well as reservoirs, impoundments, and any other human-made lentic waters. Where appropriate this SOP references the chemical sampling techniques used for lotic waters (SWQB SOP 8.2 Chemical Sampling in Lotic Environments) and only discusses where lake sampling differs.

2.0 Responsibilities

The Program Manager coordinates with the Project Manager(s), Technical Staff, and the QAO as applicable to ensure quality data is collected, verified, and validated to support program commitments. The Program Manager will provide input on the scope and intent of the SOP as it pertains to the program's goals and objectives. The Program Manager will review SOP every two (2) years after revision by SME and/or Quality Assurance Officer.

Project Manager is responsible for organizing and planning data collection activities and ensuring monitoring activities adhere to applicable SOPs and Field Sampling Plans.

The Quality Assurance Officer (QAO) is involved in the development and revision of this SOP to ensure the SOP meets the requirements of the SWQB's Quality Assurance Project Plan. The QAO, along with the Subject Matter Expert and Program manager will determine if any revisions to this SOP are needed at a minimum of every two (2) years in accordance with SOP 1.1 for the Creation and Maintenance of SOPs (NMED/SWQB 2020). Pending the review and approval of the document, the QAO will ensure the SOP is accessible through the SWQB's website.

The SME reviews SOP every two (2) years and updates the SOP as the procedure or equipment changes in coordination with the QAO and Program Manager.

Bureau personnel who conduct sampling activities in lentic environments or who supervise those who do are responsible for implementing this procedure.

3.0 Background and Precautions

3.1 Background

Water quality samples will be collected according to Subsection C Paragraph (3) of 20.6.4.14 NMAC in the State of New Mexico Standards for Interstate and Intrastate Surface Waters, which states:

"Lake sampling stations shall be located at any site where the attainment of a water quality criterion is to be assessed. Water quality measurements taken at intervals in the entire water column at a sampling

station shall be averaged for the epilimnion, or in the absence of an epilimnion, for the upper one-third of the water column of the lake to determine attainment of criteria, except that attainment of criteria for toxic pollutants shall be assessed during periods of complete vertical mixing, e.g., during spring or fall turnover, or by taking depth-integrated composite samples of the water column."

Methods of sample collection, preservation and handling used in this SOP are in accordance, except where otherwise noted, with methods described in the following references:

- "Guidelines establishing test procedures for the analysis of pollutants under the Clean Water Act," 40 CFR Part 136 or any test procedure approved or accepted by EPA using procedures provided in 40 CFR Parts 136.3(d), 136.4 and 136.5;
- Standard Methods for the Examination of Water and Wastewater, latest edition, American Public Health Association (APHA 2017);
- Methods for Chemical Analysis of Water and Waste, and other methods published by EPA Office of Research and Development or Office of Water;
- Techniques of Water Resource Investigations of the USGS;
- Annual Book of American Society for Testing and Materials (ASTM) Standards. Volumes 11.01 and 11.02, Water (I) and (II), latest edition, ASTM International;
- Federal Register, latest methods published for monitoring pursuant to Resource Conservation and Recovery Act regulations;
- National Handbook of Recommended Methods for Water-Data Acquisition, latest edition, prepared cooperatively by agencies of the U.S. Government under the sponsorship of the USGS.
- Federal Register, latest methods published for monitoring pursuant to the Safe Drinking Water Act regulations.
- Clean Lakes Program Guidance Manual (USEPA 1980).
- Subsection C Paragraph (3) of 20.6.4.14 NMAC in the State of New Mexico Standards for Interstate and Intrastate Surface Waters (NMAC 2020).
- Chemical Sampling SOP 8.2 (NMED/SWQB 2016a).

3.2 Precautions

All water sampling field activities in lentic waters will be conducted in accordance with this SOP. Site conditions or project-specific data collection objectives may necessitate the use of alternative field procedures not included in this SOP. The use of field methods other than those presented in this SOP must be approved by the MASS Program Manager or QAO and alternative methods must be accurately documented on field forms.

3.3 Safety

Use gloves when handling caustic and acidic substances and waters suspected to have high bacterial contamination. Follow lab safety procedures if preparing Lugol's solution. All reagent containers and chemicals must be properly stored, labeled, and properly disposed. Take precautions to minimize exposure to chemicals in the lab and in the field.

Boating Safety

All personnel operating and working aboard watercraft must complete US Coast Guard boating safety course every three years. Do not operate watercraft in hazardous weather conditions such as thunderstorms or high winds/rough water. If weather conditions become hazardous while out on water sampling must cease and you must return to boat ramp as safely as possible. Before leaving boat ramp check that engine coolant water is discharging and isn't clogged with debris. Failure to do so may lead to engine overheating. All personnel must wear US Coast Guard type lll personal flotation devices (PFD) at all times while on board watercraft.

Before launching the boat, make sure the drain plug(s) is securely fastened to the drain and that the following safety equipment is present onboard watercraft:

- Oars
- First aid kit
- Fire extinguisher
- PFDs for all onboard
- Throw rope
- Cell phone or radio
- Whistle

4.0 Definitions

DO – Dissolved Oxygen

DOC – Dissolved organic carbon

Depth-integrated composite sample or composite sample – Multiple samples collected at different depths and integrated to represent entire water column or specific region of water column.

Epilimnion – The top-most layer in a thermally stratified lake, occurring above the deeper hypolimnion.

Euphotic zone – the depth of water in a lake that is exposed to enough light for photosynthesis to occur estimated at 2.8 times the secchi depth (French et al. 1982).

HAB – Harmful Algal Bloom

Hypolimnion – The dense, bottom layer of water in a thermally-stratified lake. It is the layer that lies below the thermocline.

Grab sample – Water sample collected at the surface of the lake.
Littoral – The shallow or nearshore areas of a body of water

Program Manager – An individual within the SWQB that manages a program such as the Monitoring, Assessment and Standards Section (MASS), Watershed Protection Section (WPS) or Point Source Regulation Section (PSRS). The Program Manager may be the same individual as the Subject Matter Expert.

Profile measurement – Interval measurements taken with a sonde, which include temperature, DO (concentration and percent saturation), pH, turbidity, salinity, and specific conductivity, taken every 1 meter through water column.

Project Manager – An individual responsible for a specific project. This individual, in most cases, holds a different title within the organization. The Program Manager and Project Manager are not necessarily synonymous. The Project Manager may be the same individual as the Subject Matter Expert.

Quality Assurance Officer (QAO) – An individual within the MASS that is responsible for overseeing the development and implementation of all quality assurance procedures and processes within the SWQB including those projects that receive support or funding from the SWQB. The QAO is also responsible for documenting the verification and validation of data sets for potential use in assessment of surface waters.

Quality Assurance Project Plan (QAPP) – A formal planning document for environmental data collection activities that describes the data collection procedures and the quality assurance and quality control activities that must be implemented to ensure that the results are sufficient and adequate to satisfy the stated performance criteria.

Rads – Radionuclide sample

SLD – Scientific Laboratory Division

Standard Operating Procedure (SOP) – A document that lists the steps that should be completed when performing a task.

Subject Matter Expert (SME) – A person who is familiar with the purpose and procedure for accomplishing a task. The SME may hold another title within the organization.

SQUID – The SWQB internal database for entering and storing surface water quality information including but not limited to projects, monitoring locations and all associated water quality data.

TDS – Total dissolved solids

Thermocline – Zone of the water column where the temperature changes one degree C or more per meter of depth. In a thermally stratified lake, the thermocline is a relatively thin transition between the warmer, shallower layer (epilimnion) and the colder, deeper layer (hypolimnion).

TSS – Total suspended solids

5.0 Equipment

See Lake/Reservoir Sampling Equipment Checklist in the forms section for necessary equipment.

6.0 Collecting a Water Sample (Step-by Step Process Description)

6.1 Collecting Physical Data

At each station, use a calibrated multi-parameter sonde data logger to measure the depth profile for dissolved oxygen concentration and percent saturation, specific conductance, salinity, temperature, turbidity and pH. Sonde data loggers will be calibrated according to SWQB SOP 6.1 Sonde Calibration and Maintenance (NMED/SWQB 2018b). Data are collected beginning at the surface and proceeding at one-meter intervals up to 30 meters depth or the top one third of the lake, whichever is greatest. After 30 meters or the top one third of the lake, collect measurements every five meters. Measurements are taken at the surface to within one meter of the bottom of the lake or to the maximum depth allowed by current equipment (60m). Record measurements on the Depth Profile section of the Lake and Reservoir Field Sheet.

Examine the profile for the presence of a thermocline (greater than one degree Celsius change per meter). If a thermocline is present, measurements taken within the epilimnion (above the thermocline) are averaged for assessment. If absent (i.e., the lake is well mixed), measurements taken from the upper one-third of the depth profile are averaged for assessment purposes in accordance with 20.6.4.14 NMAC referenced in section 3.0 above. One degree or more in change in temperature from the surface to a depth of one meter is not considered a thermocline. When determining a thermocline, location rapid changes in other parameters, such as pH and DO, also indicate where stratification is occurring. See Table 1 for example.

STATION_NAME	SAMPLE_DATE	Depth	SALINITY	SPECIFIC CONDUCTANCE	PH	TEMPERATURE	% Dissolved Oxygen Local	Dissolved Oxygen (mg/L)	TURBIDITY
Snow Lake at Dam (Deep) - 77SnowLkDamDp	2011-08-16 11:40:00	0	0.08	175	9.21	22.07	122.9	8.16	24
Snow Lake at Dam (Deep) - 77SnowLkDamDp	2011-08-16 11:40:00	1	0.08	174	9.12	20.73	94.5	6.47	13
Snow Lake at Dam (Deep) - 77SnowLkDamDp	2011-08-16 11:40:00	2	0.08	175	9.02	20.35	81.5	5.61	9.4
Snow Lake at Dam (Deep) - 77SnowLkDamDp	2011-08-16 11:40:00	3	0.09	185	8	19.19	3	0.21	12.7
Snow Lake at Dam (Deep) - 77SnowLkDamDp	2011-08-16 11:40:00	4	0.09	192	7.8	18.17	1	0.08	10.2
Snow Lake at Dam (Deep) - 77SnowLkDamDp	2011-08-16 11:40:00	5	0.09	198	7.68	17.57	0.1	0.01	9.6
Snow Lake at Dam (Deep) - 77SnowLkDamDp	2011-08-16 11:40:00	6	0.1	201	7.59	17.07	0	0	10.7
Snow Lake at Dam (Deep) - 77SnowLkDamDp	2011-08-16 11:40:00	6.5	0.1	204	7.47	16.88	0	0	22

Table 1. Example of thermocline present between 2 and 3 meters with sharp decline in dissolved oxygen

Determine water color at the lake surface using a Forel-Ule Color scale. Measure secchi depth on the shaded side of the boat with sunglasses removed. In estimating the euphotic zone, limnologists have multiplied the secchi depth by various values (Cole 1983 and 1994). At present, NMED uses 2.8 times the secchi depth to estimate euphotic zone (French et al. 1982). Record the estimate for the euphotic zone on the Lake and Reservoir Field Sheet.

6.2 Collecting Lake Water Samples for Chemical Analysis (Deep and Shallow Stations)

Double rinse collection equipment with lake water when used for multiple sites, such as the Kemmerer, 5-gallon carboy, and chlorophyll flask and funnel. Collect water samples in accordance with Subsection C Paragraph (3) of 20.6.4.14 NMAC. For biological data (i.e., phytoplankton, *E. coli*, and chlorophyll) refer to Section 6.3.

Use a plastic (acrylic) or fluoropolymer Kemmerer for collecting water chemistry (TSS/TDS, anions, nutrients, DOC, metals), phytoplankton, and chlorophyll *a* composite samples. Organic samples must be collected using a fluoropolymer (i.e., PTFE, Teflon®) Kemmerer and composited in a glass or fluoropolymer carboy. Organic samples collected with equipment that is not constructed of glass, fluoropolymer, or stainless steel are inconsistent with sampling methods described in the Chemical Sampling SOP 8.2 (NMED/SWQB 2016a) and Table II of 40 CFR Part 136.3 (e). Previous results from samples collected using non-compliant equipment have not shown detections of organic analytes that would implicate the sampling equipment as a potential source of contamination. Regardless, organic results obtained through the use of non-compliant equipment should be flagged with a SWQB validation code.

During periods of lake stratification (**thermocline is present**) TSS/TDS, nutrients, DOC, dissolved metals, total metals, radionuclides and organics are integrated from the top, middle and bottom of the entire water column by taking three Kemmerer samples (Figure 1). A fluoropolymer Kemmerer must be used when collecting organics. If any of the Kemmerer samples fall at the same depth as the thermocline, collect from one meter above. For the bottom sample, keep the Kemmerer at least 1 meter away from the bottom to avoid stirring up sediments. Composite three 5-liter Kemmerer samples in a 5-gallon

carboy (glass or fluoropolymer if collecting organics). All water quality samples are poured off from the composited sample into their respective containers; 1-liter Cubitainers® or other containers as prescribed by the analysis to be performed. Dissolved metal samples are typically filtered within 15 mins of sample collection and prior to being poured into 1-liter Cubitainers®. All lake samples which require preservation will be preserved within 15 minutes of sample collection in accordance with 40 CFR 136.3 (e) Table II. However due to wind, waves, weather and unforeseen events preservation may not occur within 15 mins of sample collection but as soon thereafter as practically possible. E. Coli and microcystins are collected from the surface at the sampling station. See sections 6.3.2 and 6.3.4 of this SOP for more information.

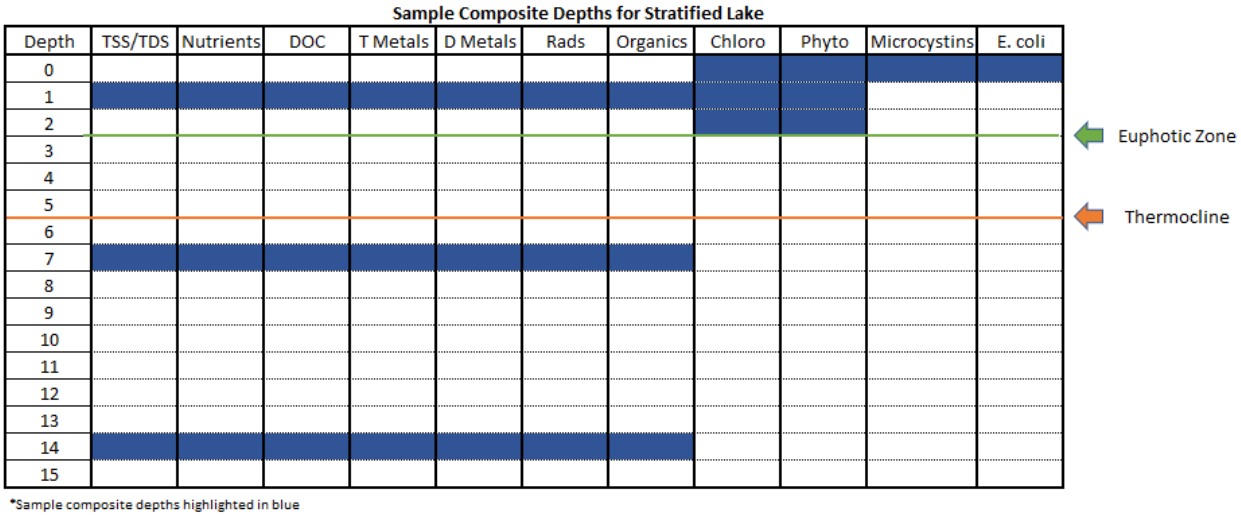

Figure 1. Sample collection methods when a thermocline is present.

When the lake is well mixed (**thermocline is not present**), all samples except microcystins and E. coli are collected from the top, middle, and bottom of the euphotic zone (Figure 2). A fluoropolymer Kemmerer must be used when collecting organics. Composite three 5-liter Kemmerer samples in a 5-gallon carboy (glass or fluoropolymer if collecting organics). If the lake max depth is 3 meters or less, samples must be collected at two meters or less from the surface of lake. If the lake is one and a half meters or less the vertical Kemmerer cannot be used and water samples must be taken from just below the surface. All water quality samples are poured off from the composited sample into their respective containers. Dissolved metal samples are typically filtered within 15 mins of sample collection and prior to being poured into 1-liter Cubitainers®. All lake samples which require preservation will be preserved within 15 mins of samples collection in accordance with 40 CFR 136.3 (e) Table II. However due to wind, waves, weather and unforeseen events preservation may not occur within 15 mins of sample collection but as soon thereafter as practically possible. E. coli and microcystins are collected from the surface at the sampling station. See sections 6.3.2 and 6.3.4 of this SOP for more information.

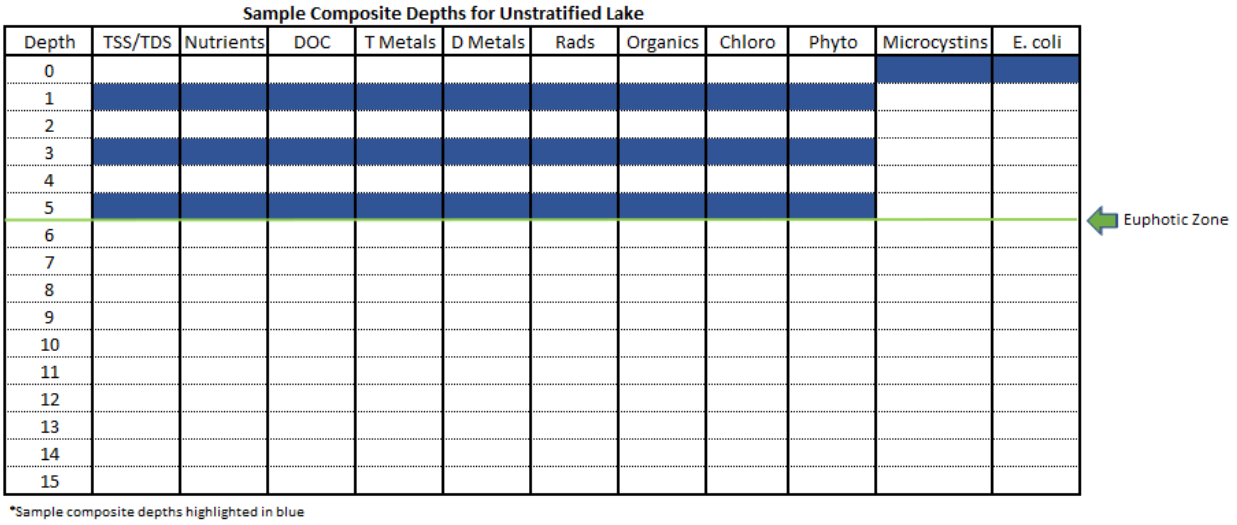

Figure 2. Sample collection methods when a thermocline is not present

For stratified and unstratified sample collection methods described above, refer to Chemical Sampling in lotic Environments SOP 8.2 (NMED/SWQB 2016a) for the specific sampling, preservation requirements, quality control activities, handling, packaging, and transporting procedures based on the analyte suite.

6.3 Collecting Biological Data

6.3.1 Phytoplankton Sampling

Phytoplankton samples are composited from the top, middle, and bottom of the euphotic zone in both stratified and mixed lakes (Figures 1 & 2). Composite samples from the appropriate depths with a clean Kemmerer rinsed with lake water and fill a 1-liter Cubitainer®. If the lake max depth is 2 meters or less, samples must be collected at one meter or less from the surface. If the lake is one and a half meters or less in depth, the Kemmerer cannot be used and water samples must be taken just below the surface as a grab sample using a one liter Cubitainer®. Preserve sample within 2 hours of collection using approximately 10 milliliters of Lugol's solution until the sample turns to a weak tea color. Store samples in the dark and on ice or under refrigeration (EPA 2012). At the end of the sampling season after all samples are collected (but no longer than one year from earliest sample collection) ship samples to the contracted lab for identification and enumeration.

Lugols Solution Preparation:

Using a Mettler balance or equivalent. Measure 25 g KI and 12.5 g of I_2. Cover the I_2 reagent with tinfoil as it is light sensitive and will evaporate. Combine 225 ml DI water and dry chemicals in a large flask. This must be performed in a fume hood. Add a magnetic stir bar and place on a hotplate equipped with stirring action. Warm slightly while stirring to facilitate dissolution of the

dry chemicals. *Do Not Boil!* In about an hour, once the solution is completely dissolved, pour into an opaque container using a glass funnel. Add 25 ml Glacial Acetic acid to container and cap tightly. Invert several times to mix solution. Label container with date, contents, and pH (usually around 2.4 su)

6.3.2 E. coli Sampling

Collect *E. coli* samples from the surface of the water at sampling location in accordance with the procedures in Bacteriological Sampling SOP 9.1 (NMED/SWQB 2016b). See Figures 1 and 2 for a visual representation of the sample collection depths. Typically, a 120 mL polyethylene sample bottle is used containing sodium thiosulfate for neutralizing of chlorine.

6.3.3 Chlorophyll *a* Samples

Chlorophyll samples are composited from the top, middle, and bottom of the euphotic zone in both stratified and mixed lakes (Figures 1 and 2). Composite samples from appropriate depths within the euphotic zone with a clean Kemmerer rinsed with lake water and pour into a 1-liter Cubitainer®. If the lake max depth is 2 meters or less, samples must be collected at one meter or less from the surface of lake. If the lake is one and a half meters or less in depth, the Kemmerer cannot be used and water grab samples must be taken from just below the surface using a one gallon Cubitainer®. Samples must be stored on ice and out of sunlight and filtered as soon as possible after collection . Filter sample water through a Whatman Glass Fiber Grade GF/F or GF/C filter until substantial color development is on the filter medium, indicating adequate chlorophyll pigment is present. Do not exceed a vacuum pressure of 6in. Hg (20kPa) during filtration. Excessively long filtration times (>10 min) and high pressures may damage cells and result in a loss of chlorophyll (EPA 1997). If clogging or filtering time is a concern, use the larger retention of the GF/C filter. It has been shown that there is no difference between chlorophyll concentrations collected on Whatman GF/F of GF/C filters (Prepas et al. 1988). Be sure to record the volume of water filtered on the field sheet. Remove the filter from the filtering apparatus, fold it in half, place it in a petri dish labeled with sample identification and filter volume, then wrap the petri dish with aluminum foil, put in a zip lock bag and place on dry ice. Upon returning to the SWQB lab, store samples in a freezer until shipped to contract lab. Samples should be processed as soon as possible after collection; however, samples on filters taken from water having pH 7 or higher can be frozen for up to 28 days before analysis, if necessary. Samples from acidic water (< pH 7) should be processed promptly after filtration to prevent possible chlorophyll degradation from residual acidic water on filter. If processing must be delayed, hold sample water on ice or at 4°C and protect from exposure to light by using opaque bottles and storing in the dark. Samples are analyzed for Chlorophyll *a* concentration using a contract lab.

When using a contract lab, confirm sample processing methods. If processing methods differ from above, follow instructions provided by the contract lab for processing samples.

6.3.4 Microcystin Samples

Microcystin samples are collected to identify HABs in areas of a lake where HABs have been observed or are of concern due to heavy recreation (swim beach, boat launch, etc.). Sampling should be performed mid-summer to fall when HABs are most likely to bloom. Collect surface grab samples using a 1-liter Cubitainer™. If long, filamentous algae are present, leave headspace in Cubitainer™ and shake vigorously to ensure sample is homogenized. Pour the sample into two 40mL glass vials provided by the lab. Be careful not to overfill/spill reagents already present in the vials. SLD will perform freeze/thaw lysing process in different glassware after receiving the samples so it is inconsequential if there is headspace in the sample vials. Immediately store sample on ice away from sunlight. Samples must be maintained at 0-10° C until arrival at lab. Hold time for samples is not to exceed 14 days after collection, however, SLD requires samples be delivered within 72 hours of collection. Be sure to notify SLD as soon as possible prior to sampling to ensure they are prepared for sample processing.

At sites where microcystin samples are collected, record the water color using the Forel-Ule Color scale and the secchi depth as outlined in Section 6.1. Record sonde grab data from just below surface and the GPS location on a field from. A nutrient and phytoplankton sample at each microcystin location may also be collected following section 6.2.

6.4 Sampling Harmful Algal Blooms (HAB) and Recreational Stations

Recreational stations are selected in littoral zones of lake where past HABs have been known to occur or areas that are prone to heavy public recreation (swim beach, boat launch, campground, etc.). Additional stations may be selected if potential HAB is present. Use of the EPA CyAN application (Blake, et. al. 2018) may be used to identify potential bloom areas. See the EPA CyAN application website at https://www.epa.gov/water-research/cyanobacteria-assessment-network-mobile-application-cyan-app for more information. Once locations have been selected, record GPS coordinates and take photos of the sample location. Take a sonde reading just below surface and record Forel-Ule water indicator color. Collect E. coli and microcystin samples following sections 6.3.2 and 6.3.4.

7.0 Data and Records Management

All field data and chemical/biological samples collected following the procedures outlined above are entered in SWQB's water quality database as part of a Lake Sampling Event. A second staff member verifies that the data are entered correctly. Date of entry and verification are noted on the field sheet.

Sampling events and data are stored in the SQUID database. Hard copy forms are stored in the project binder located in the SWQB file storage cabinets. Electronic forms are stored within the project file within the shared server. Per 1.21.2.436 NMAC, water quality records are to be maintained for five years from the close of file and then transferred to archives for permanent storage.

Enter all field form data into appropriate electronic Lake/Reservoir Field Sheet (form can be found on the SWQB SOP website). Save these forms in the electronic project folder. Open a blank/new electronic SLD Submittal Auto form and follow the instructions to create submittals. Copy and save the combined

data tab into its own Excel file. In the electronic field form, copy the profile tab into its own Excel file and save within the project file.

Uploading field sampling event data into the SQUID database:

- Select the Data Management tab.
- Select Imports.
- Select Sampling Event Data.
- Navigate to the project file and select the file with the combined data and import.

Uploading Depth Profile into the SQUID database:

- In SQUID under the Projects tab locate the project and sampling event you want to add a depth profile to.
- Select "Add Depth Profile" located in the same row as the Lake-Chemical sampling event
- Choose the appropriate .csv or .xlsx file and click "Upload File"

Phytoplankton Data Upload

Data received from the contracted lab must be formatted properly in new Excel upload sheet in order to be entered into SQUID. Copy and paste lab data received from the contracted lab into the appropriate columns of the upload spread sheet. Follow the format presented in Figure 3. For taxon data you must combine the genus and species columns from the lab spread sheet. The easiest way to do this is to use the Excel formula (=GENUS&" "&SPECIES). For example: (=J2&" "&K2). Copy and re-paste cells values to remove the formula but keep text. In SQUID, under the Data Management Tab, select imports then biological results. Select appropriate file and select "insert" then select "process results". Make sure both columns match (for "count" row select "number of natural units"). Click process results and ensure there are no import errors. Click "Import Results" to finish upload process.

	A	B	C	D	E	F	G	H	I
1	LAB ID	Sample ID	Water Body	Collection Date	Status	Taxon	Life Stage	Exclude	Number of Natural Units
2	Water Quality Lab	2530652	Snow Lake	9/3/2019	Final	Achnanthidium minutissimum	Adult	N	1
3	Water Quality Lab	2530652	Snow Lake	9/3/2019	Final	Cylotella striata	Adult	N	77
4	Water Quality Lab	2530652	Snow Lake	9/3/2019	Final	Plagioselmis nannoplanctica	Adult	N	35
5	Water Quality Lab	2530652	Snow Lake	9/3/2019	Final	Rhodomonas lacustris	Adult	N	2
6	Water Quality Lab	2530660	Bill Evans Lake	9/4/2019	Final	Cryptomonas erosa	Adult	N	4
7	Water Quality Lab	2530660	Bill Evans Lake	9/4/2019	Final	Plagioselmis nannoplanctica	Adult	N	71
8	Water Quality Lab	2530660	Bill Evans Lake	9/4/2019	Final	Chroococcus microscopicus	Adult	N	9

Figure 3. Proper phytoplankton spreadsheet formatting for data upload

E. Coli Data Upload

See SWQB SOP 9.1 Bacteriological Sampling and Analysis (NMED/SWQB 2016b) for upload instructions into SQUID.

Chlorophyll *a* Data Upload

Results from the laboratory are uploaded to SQUID using the *Chlorophyll a Analysis Sheet*.
Uploading chlorophyll *a* data into the SQUID database:

- Select the Data Management tab.
- Select Imports.
- Select Biological Results.
- Navigate to the project file and select the file with the combined data
- Click upload

Water Chemistry, Metals, Organics, Radionuclides and Microcystin data Upload

Data are received electronically and are provided to the QAO who is responsible for uploading into SQUID (NMED/SWQB 2018a). For most analytical analysis of samples, the SWQB uses the Air and Heavy Metals, Organics, Water, and Radiochemistry Sections of the New Mexico State Laboratory Division (SLD) Chemistry Bureau. SLD uses a software-based Laboratory Information Management System (LIMS) to issue standardized result reports which include detection limits, quantitation limits, and data qualifiers. For more information on the upload process contact the QAO.

8.0 QUALITY ASSURANCE/CONTROL ACTIVITIES

The SWQB controls the quality of lake sampling data by using standardized methods that are documented in this SOP. All personnel who conduct lake sampling must be familiar with these protocols, sign the acknowledgment form associated with this specific SOP and collect data in accordance with the procedures as they are defined in this SOP. In addition to standardized methods, proper training of field personnel represents a critical aspect of meeting the data quality objectives in order to fulfill the goals of the SWQB's QAPP (NMED/SWQB 2018a).

QA/QC activities for chemical sampling (bacteriological, water chemistry, metals, organics, radionuclides and microcystin) are the same as described in the Chemical Sampling SOP for streams (SOP 8.2).

Any SWQB personnel who conduct lake sampling are required to receive training in the field and be supervised by MASS monitoring staff for all aspects of sample collections. Any MASS monitoring staff who conduct training in the field must have conducted at least 1 field season of lake sampling prior to training of other staff. Once training has occurred and all aspects of lake sampling procedures have been observed as correct, personnel may conduct unsupervised lake sampling for the SWQB. The trainee will be approved for lake sampling data collections until next SOP revision. This process will ensure comparability and accuracy of data used for water quality assessments, refinement of water quality standards and TMDL development.

Assurance of field data collection for lake sampling are done through adherence to the process outlined in this and other applicable SOPs and oversight of the process by the QAO. If at any time the QAO determines this process is not being adhered to, the QAO has the authority to cease activities specific to this SOP with prior support and approval by the SWQB Bureau Chief and MASS Program Manager, until such a time that the issue can be resolved.

9.0 RELATED FORMS

- Lake/Reservoir Sampling Equipment Checklist
- Lake/Reservoir Field Sheet
- Chlorophyll *a* Analysis Sheet.

10.0 REVISON HISTORY

Original modified from SOP 2007.

Revision 1 – March 2012 –clarified sampling procedures for conditions with a thermocline present (stratified) and when a thermocline is absent (mixed); added guidance on sampling lakes where low DO is a suspected water quality concern

Revision 2 – March 2013 – added information regarding compliant and non-compliant sampling equipment for organic samples to be consistent with SOP 8.2 Chemical Sampling and 40 CFR Part 136; added clarification for sampling in shallow lakes (≤ 3 meters in depth) and use of larger filters for chlorophyll

Revision 3 – March 2014 – revised language and figures to clarify sampling depths during different mixing conditions. Added the use of either a contract lab or in-house analysis.

Revision 4 – August 13, 2020 – revised language and figures to include organics sampling. Clarified sampling depths in compliance with 20.6.4.14(C)(3). Added Lugol's solution formula. Added microcystin sampling. Added process for depth profile data upload into SQUID. Added DOC sampling. Updated sampling location figures. Added sampling at recreational sites. Added phytoplankton and chlorophyll-*a* lab result upload instructions. Added boating safety section. Standard Operating No. changed from 12.0 to 12.1.
Miguel Montoya, QAO; Jonathan Celmer, SME; Kris Barrios, MASS Program Manager

11.0 REFERENCES

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