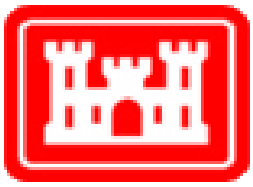
2021 WATER QUALITY MONITORING
BLUE MARSH RESERVOIR
LEESPORT, PENNSYLVANIA



U.S. Army Corps of Engineers
Philadelphia District
Environmental Resources Branch

February 2022

2021 Water Quality Monitoring
Blue Marsh Reservoir
Leesport, Pennsylvania

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1.0 INTRODUCTION

1.1 PURPOSE OF THE MONITORING PROGRAM

The U.S. Army Corps of Engineers (USACE) manages Blue Marsh Reservoir located in east-central Pennsylvania on the Tulpehocken Creek, which is within the Delaware River Basin. Blue Marsh Reservoir provides flood control and a dependable water supply to downstream communities west of Reading, PA. Additionally, the reservoir provides important habitat for fish, waterfowl, and other wildlife, and recreational opportunities through fishing, boating, and swimming. Due to the broad range of uses and demands that Blue Marsh Reservoir serves, the USACE monitors water quality, and other aspects related to ecological health, primarily to ensure public health safety. Results from water quality monitoring are compared to state and federal water quality standards and used to diagnose other problems that commonly affect reservoir health such as low dissolved oxygen, nutrient enrichment and toxic loadings. This report summarizes the results of water quality monitoring at Blue Marsh Reservoir in 2021.

1.2 DESCRIPTION OF BLUE MARSH RESERVOIR

Blue Marsh Reservoir was designed to provide flood control, water supply, and enhanced water quality to downstream communities along Tulpehocken Creek. Located about six miles northwest of Reading, Pennsylvania near Route 183, the reservoir dams a drainage area of 175 square miles. The dam, completed in 1979, can impound up to 42.3 billion gallons of water. The primary surface water inputs into Blue Marsh Reservoir other than Tulpehocken Creek include Wolf, Northkill, and Little Northkill Creek from the northwest; Spring Creek from the west; and Licking Creek from the northeast. The reservoir is approximately 6 miles long and is 52 feet deep immediately above the dam near Lower Heidelberg during normal summer pool.

1.3 ELEMENTS OF THE MONITORING

The USACE, Philadelphia District, has been monitoring the water quality of Blue Marsh Reservoir since 1979. Over this time, the yearly monitoring designs have evolved to address new concerns such as health of public drinking water and contamination of reservoir bottom sediments. The 2021 monitoring program follows that in most recent years and included the following major elements:

- Monthly water quality and bacteria monitoring of reservoir and upstream tributary source waters to evaluate compliance with Pennsylvania state water quality standards and to evaluate the health of the reservoir ecosystem starting on 10 May and ending on 16 August 2021;
- Monthly profile samples for temperature, dissolved oxygen, chlorophyll, pH, turbidity, and conductivity at all stations in the reservoir and watershed;
- Twice weekly total coliform and Escherichia coli bacteria monitoring at three beach stations - to ensure public health and safety at the Blue Marsh Reservoir

swimming beach area; and

- Cyanobacteria sampling at monitoring at the Blue Marsh Reservoir swimming beach and other locations in the reservoir where algal blooms were observed from summer through fall.

2.0 METHODS

2.1 PHYSICAL STRATIFICATION MONITORING

Physical stratification monitoring of the water column was conducted monthly at Blue Marsh Reservoir from 10 May through 16 August 2021 (Table 2-1). Stratification parameters included temperature, dissolved oxygen (DO), pH, Chlorophyll a, turbidity, and conductivity. Monitoring was conducted at nine fixed stations located throughout the reservoir watershed (Fig. 2-1). Six stations were located within the reservoir body (BM-2, BM-6, BM-7, BM-8, BM-9, and BM-10) for which water quality was measured from surface to bottom at 5-ft depth intervals. Three stations (BM-1S, BM-5S, and BM-11S) were monitored for surface water quality only. All water quality parameters were measured with a calibrated YSI 6600 V2-4 water quality probe. For this report, all the stratification monitoring results, when applicable, were summarized and compared to water quality standards established by the Pennsylvania Department of Environmental Protection (PADEP – Chapter 93 Water Quality Standards) and the United States Environmental Protection Agency (EPA).

2.2 WATER COLUMN CHEMISTRY MONITORING

Water column chemistry monitoring was conducted five times at Blue Marsh Reservoir during the 2021 sampling season (Table 2-1). Water samples were collected at nine fixed stations in the reservoir watershed (Fig. 2-1). Surface water samples were collected at stations downstream of the reservoir (BM-1S), and upstream of the reservoir on Tulpehocken Creek (BM-5S) and Northkill Creek (BM-11S). Surface, middle of the water column, and bottom water column samples were collected at the six stations within the reservoir (BM-2, BM-6, BM-7, BM-8, BM-9, and BM-10). Surface water samples were collected by opening sample containers approximately one foot below the surface of the water. Middle and bottom water samples were collected with a Van Dorn design horizontal water bottle sampler. Laboratory water sample analysis was conducted by M.J. Reider Associates, Inc Environmental Testing Laboratory located in Reading, Pennsylvania (U.S. EPA/PA DEP #06-00003).

Water samples collected from all depths were analyzed for ammonia, nitrite, nitrate, total Kjeldahl nitrogen, total phosphorus, soluble phosphorus, total dissolved solids, total suspended solids, biochemical oxygen demand, alkalinity, and total organic carbon. Table 2-2 summarizes the laboratory methods detection limits, state water quality standards, and sample holding times for each water quality parameter monitored.

Table 2-1. Water quality monitoring schedule of Blue Marsh Reservoir during 2021. Monitoring was conducted at 9 fixed stations located throughout the reservoir watershed.

Date of Sample Collection	Physical Stratification Monitoring (all stations)	Water Column Chemistry Monitoring (all stations)	Trophic State Assessment (BM-6)	(1) Coliform Bacteria Monitoring (all stations)	Algae Grab Samples (Observed Blooms)
10 May	X	X	X	X	(2)
07 June	X	X	X	X	(2)
28 June	X	X	X	X	(2)
19 July	X	X	X	X	(2)
16 August	X	X	X	X	(2)

(1) Surface water bacteria samples only
(2) Algae samples were collected from observed algal blooms within the lake and swimming beach areas as needed and in coordination with PADEP from August to November.

2.3 TROPHIC STATE DETERMINATION

The trophic state of Blue Marsh Reservoir was determined by methods outlined by Carlson (1977) and EPA (1983). In general, these methods calculated trophic state indices (TSIs) independently for measures of total phosphorus, chlorophyll *a*, and secchi disk depth. Surface water measures of total phosphorus along with average chlorophyll a measures from YSI sensor monitoring were averaged in the calculation of monthly TSIs (Table 2-1). Secchi disk depth was measured at station BM-6.

2.4 RESERVOIR COLIFORM BACTERIA MONITORING

Monitoring for coliform bacteria contaminants within the watershed was conducted five times at Blue Marsh Reservoir between 10 May and 16 August. Water samples were analyzed for total and escherichia coliform contamination as indicators of risk. Surface water samples were tested at all stations. The samples were collected in the same manner as the chemistry samples or approximately 1-foot below the surface of the water. Table 2-3 presents the test methods, detection limits, United States Environmental Protection Agency (EPA) and Pennsylvania Department of Environmental Protection (PADEP) standards, and sample holding times for the bacteria parameters monitored at Blue Marsh Reservoir in 2021. The bacteria analytical method was based on a membrane filtration technique. All the samples were analyzed within their maximum allowable hold times. Laboratory analysis was conducted by M.J. Reider Associates, Inc Environmental Testing Laboratory located in Reading, Pennsylvania (U.S. EPA/PA DEP #06-00003).

Table 2-2. Water quality test methods, detection limits, state regulatory criteria, and sample holding times for water quality parameters monitored at Blue Marsh Reservoir in 2021

Parameter	(2) Method	Laboratory Limit of Reporting	PADEP Surface Water Quality Criteria	Allowable Hold Times (Days)
Total Alkalinity	SM20 2320 B	2.0 mg/L	Min. 20 mg/L $CaCO_3$	14
Biochemical Oxygen Demand (BOD)	SM5210 B	2.0 mg/L	None	2
Total Phosphorus	SM4500-P F	0.01 mg/L	None	28
Diss./Ortho-Phosphate	NA	NA	None	28
Soluble Phosphorus	SM4500-P F	0.01 mg/L	None	28
Total Organic Carbon (TOC)	SM5310 C	0.5 mg/L	None	28
Total Inorganic Carbon (TIC) *	NA	NA	None	28
Total Carbon (TOC + TIC) *	NA	NA	None	28
(1) Chlorophyll *a*	YSI Probe	----	None	In Situ
Total Kjeldahl Nitrogen	EPA 351.2	0.50 mg/L	None	28
Ammonia	ASTM D6919-03	0.10 mg/L	Temp. and pH dependent	28
Nitrate	EPA 300.0 Rev 2.1	1.0 mg/L	Maximum 10 mg/L (nitrate + nitrite)	28
Nitrite	EPA 300.0 Rev 2.1	0.10 mg/L		28
Total Dissolved Solids	SM2540 C	5.0 mg/L	Maximum 750 mg/L	7
Total Suspended Solids	SM2540 D	1.0 mg/L	None	7

(1) Chlorophyll *a* samples were recorded using a YSI 6600 with a chlorophyll sensor.
(2) Laboratory Methods Reference:
EPA- "Methods for Chemical Analysis of Water and Wastes", EPA-600/4-79-020, March 1983 and subsequent revisions.
SM- "Standard Methods for the Examination of Water and Wastewater", 22nd Edition, 2012.
ASTM International- Formerly American Society for Testing and Materials
* Total Inorganic Carbon and Total Carbon were not sampled for in 2021


BM-11
BM-5
4010
BM-10
BM-9
BM-8
BM-7
Swimming Beach
BM-6
BM-1
BM-2
N-Heidelberg-Rd
Milestone-Rd
3008
3033
Brownsville-Rd
Plum-Creek-Rd
183

Table 2 3. Water quality test methods, detection limits, PADEP/EPA standards, and sample holding times for bacteria parameters monitored at Blue Marsh Reservoir in 2021.

Parameter	Total Coliform	Escherichia Coliform
Test method	SM 9223 B	SM 9223 B
Limit of Quantification	1 mpn/100-mls	1 mpn/100-mls
EPA/PADEP standard	None	Geometric mean <126 mpn/ 100 ml or a single sample <235 mpn/ 100 ml
Maximum allowable holding time	30 hours	30 hours
Holding time	< 30 hours	< 30 hours

Monthly surface water bacteria counts were compared to the EPA primary recreation water quality single sample standard for escherichia coliform bacteria. Application of this standard applies to Blue Marsh Reservoir because swimming and other primary and secondary human/water contact recreation is permitted in the reservoir. The Philadelphia District maintains a bathing beach at Blue Marsh Reservoir and conducts separate bacteria sampling of that area. Given logistical sampling limitations (all monthly reservoir sampling conducted on one day) and that water contact recreation is permitted within the reservoir, the reservoir coliform data collected by the Corps is compared to the single sample standard as a method of evaluating background coliform data on the main body of the reservoir including tributaries. Although our sampling design does not fully meet the Environmental Protection Agency and PA Department of Environmental Protection guidelines for bathing beach monitoring, we feel that this interpretation of the coliform data meets the intent of the Environmental Protection Agency and PA Department of Environmental Protection water quality standards for evaluating Blue Marsh Reservoir bacteria levels within the main reservoir body.

2.5 SWIMMING BEACH MONITORING

Bacteria monitoring was conducted on a twice weekly routine near the public swimming beach at the Dry Brooks day use area (Table 2-4) of Blue Marsh Reservoir to gauge compliance with Pennsylvania Department of Health and United States Environmental Protection Agency bathing beach water quality standards. These standards are in place to ensure public safety for this type of water contact recreation. Three stations (SB-1, SB-2, and SB-3) were monitored in the swimming beach area for total coliform and Escherichia coli (Figure 2-2). The coliform bacteria samples were collected and analyzed by the same methods used for monthly reservoir body coliform bacteria sampling. The bacteria monitoring for the Blue Marsh swimming beach follows a multi-step program of conditional monitoring and increased sampling frequency. Each step or "condition" of monitoring responds to incremental increases of coliform contamination and reflects the

changing risk to public health at the swimming beach area and the appropriate response for public safety to include beach closure.

Table 2-3. Sampling dates for coliform bacteria monitoring at the Blue Marsh Reservoir swimming beach during 2021

Week 1	24 and 27 May	**Week 9**	19 and 22 July
Week 2	01 and 04 June	**Week 10**	26 and 29 July
Week 3	08 and 10 June	**Week 11**	02 and 05 August
Week 4	14 and 17 June	**Week 12**	09 and 12 August
Week 5	21 and 24 June	**Week 13**	16 and 19 August
Week 6	28 June and 01 July	**Week 14**	23 and 26 August
Week 7	06 and 08 July	**Week 15**	30 August
Week 8	12 and 15 July	**Week 16**	07 September

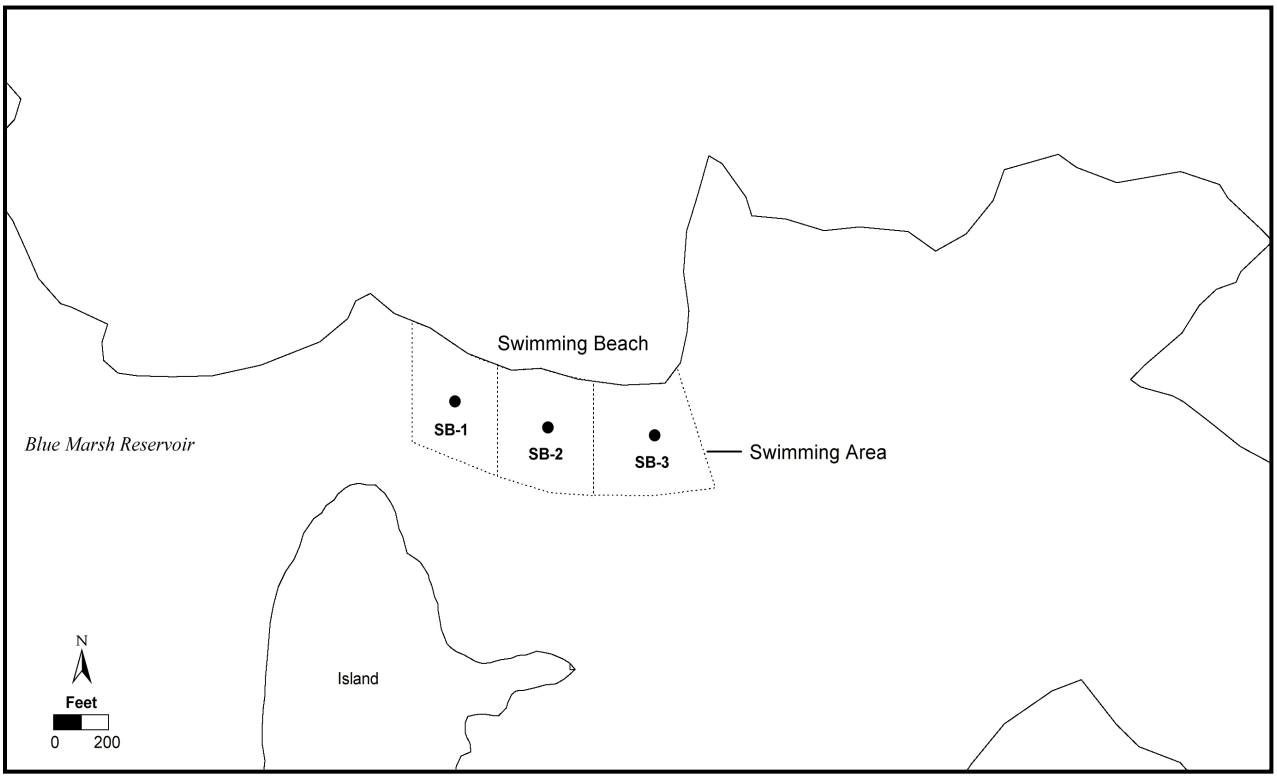


Figure 2-2. Swimming beach bacteriological monitoring stations at Blue Marsh Reservoir in 2021

2.6 LAKE ALGAE MONITORING

Algal blooms have been an historic issue at Blue Marsh Reservoir as the watershed is approximately 75% agriculture-based usage. In 2021, precipitation and warm air temperatures early in the summer season created conditions within Blue Marsh Reservoir that favored the development of algae blooms. High density blooms were observed in many locations throughout the reservoir and throughout the sampling season. In cooperation with the Pennsylvania Department of Environmental Protection, an immediate response and monitoring plan was developed. Stakeholders and the public were notified of the risks of potential harmful toxic algae blooms and the risks associated with contact recreation within the lake.

Sampling kits provided by the Pennsylvania Department of Environmental Protection were used to collect samples from the swimming beach area of Blue Marsh Reservoir and from high density algal blooms throughout the lake when they were observed (Figure 2-3 and Table 2-5)). The sampling was conducted from August through November of 2021. USACE and PADEP collected samples as necessary following the identification of an algal bloom and provided those samples to the Pennsylvania Department of Environmental Protection for processing and analysis utilizing approved collection and analysis methodologies. Algae sample analysis included genera identification, colony estimates and toxin production levels. Sample analysis was conducted at the Pennsylvania Department of Environmental Protection Bureau of Laboratories in Harrisburg, Pennsylvania (colony counts and Identification) and by Green Water Laboratories in Florida (genera and toxin production). No federal or Pennsylvania recreational waters and human contact criteria for cyanobacteria have been established to date. Lab analysis results were therefore compared to the Environmental Protection Agencies *Recommended Human Health Recreational Ambient Water Quality Criteria or Swimming Advisories for Microcystins and Cylindrospermopsin EPA 822-F-19-00.*

TABLE 2-5. Algae sampling fixed station locations at Blue Marsh Reservoir in 2021

Location Description	Latitude	Longitude	Sample Type
Beach Grab	40.383935	-76.040554	Shoreline Grab
Beach Transect	40.383861	-76.050560	Beach Transect (Composite)
Main Lake - 100m off State Hill Boat Launch	40.370300	-76.043700	Surface Grab
Main Lake - near Dam Tower	40.380252	-76.032335	Surface and Deep Grabs
Main Lake - Spring Creek Arm	40.388500	-76.079200	Surface Grab
Main Lake - Licking Creek Arm near Bernville Road Bridge	40.401800	-76.058800	Surface Grab
Main Lake - Tulpehocken Creek Arm near Church Road Bridge	40.405800	-76.079700	Surface Grab

Figure 2-3. Pennsylvania Department of Environmental Protection and US Army Corps of Engineers 2021 harmful algal bloom sampling locations (yellow pin sites) at Blue Marsh Reservoir in Leesport, Pennsylvania.

3.0 RESULTS AND DISCUSSION

3.1 STRATIFICATION MONITORING

The following sections summarize the results of water quality monitoring for physical and chemical parameters: temperature, dissolved oxygen, and pH. Seasonal and spatial patterns of surface water quality measured throughout the reservoir watershed, and seasonal and depth related patterns of the stratified water column based on measures from the deepest portion of the reservoir (station BM-6 or the "Tower") are described. It is appropriate to focus discussion on tributary source waters influencing reservoir water quality and lake stratification at station BM-6 as water quality problems related to depth are generally most severe in deep water habitats. Corps personnel collected the physical/chemical water quality data discussed herein over the monitoring period from May through August 2021, the most biologically productive time of the year for the reservoir. All the parameters were measured with a calibrated YSI 6600 V2-4 water quality sonde and are presented in Appendix A.

3.1.1 Temperature

Temperature is the primary influencing factor on water density, affects the solubility of many chemical compounds, and can therefore influence the effect of pollutants on aquatic life. Increased temperatures elevate the metabolic oxygen demand, in conjunction with reduced oxygen solubility, and can impact many species. Vertical stratification patterns naturally occurring in lakes affect the distribution of dissolved and suspended compounds.

Surface water temperature seasonal patterns upstream of the reservoir at stations BM-5S and BM-11S closely resembled each other throughout the sampling season (Fig. 3-1). Maximum surface water temperatures was 23.13°C at station BM-5S in late June and 23.88°C at station BM-11S in August. The maximum surface water temperature downstream of the reservoir at station BM-1S was 21.70°C in mid-August with a minimum of 14.90°C in May. Downstream temperatures are influenced through selective withdrawals at the Blue Marsh Dam tower. Annually the Corps performs selective withdrawal releases to maintain temperatures downstream in the Tulpehocken Creek of less than 20°C in support of the trout fishery. The ability to meet this objective is dependent on meteorological conditions and other physical and operational limitations. The temperature objective was exceeded in 2021 from late June through August.

Blue Marsh Reservoir was weakly stratified with respect to temperature during 2021. The stratification pattern was most apparent at station BM-6 or the "Tower" station located in the deepest part of the reservoir (Fig. 3-2). The presence of temperature stratification was evident during May sampling with temperatures from surface (15.53°C) to bottom (12.13°C) differing by 3.4°C. The deeper and cooler temperature (<20°C) water was

available for selective withdrawal to attempt to meet downstream temperature objectives into late July. Stratification was seen throughout the summer and an erosion of the epilimnion was seen in mid-August as the lake began the process of de-stratifying.

3.1.2 Dissolved Oxygen

Dissolved oxygen (DO) is the measure of the amount of DO in water. Typically, DO concentrations in surface waters are less than 10 mg/L. Dissolved Oxygen concentrations are subject to diurnal and seasonal fluctuations that can be influenced, in part, by temperature, river discharge, photosynthetic activity and other factors. Dissolved Oxygen is essential to the respiratory metabolism of most aquatic organisms. It affects the availability and solubility of nutrients and subsequently the productivity of aquatic ecosystems. Low levels of oxygen can facilitate the release of nutrients from bottom sediments.

Upstream tributary surface waters at stations BM-5S and BM-11S shown a maximum DO concentration of 11.5 mg/L recorded in May at station BM-5S with a minimum recorded value of 7.20 mg/L in mid-August at Station BM-11S (Fig. 3-3). The maximum surface water DO concentration downstream of the dam at station BM-1S was 9.97 mg/L recorded in May with a minimum of 7.13 mg/L recorded in mid-August.

Seasonal stratification, chemical and biological processes and flood control operations at Blue Marsh Reservoir influence the distribution of DO in the water column during 2021 (Fig. 3-4). Stratification development was apparent in May and persisted through August sampling at station BM-6, as DO concentrations decreased with depth. Historically, the lower oxygen levels deeper in the lake progressively move up the water column to within approximately 10 to 15-feet of the surface in mid- to late August. In most years the surface waters remain oxygenated because of surface algal productivity and surface water wind mixing. In 2021, the DO pattern in the deeper water column was as pronounced as previous years. The low DO conditions can be detrimental to water quality and aquatic life. Dissolved oxygen concentrations in the upper water column of Blue Marsh Reservoir remained in compliance with PADEP water quality standards during the 2021 sampling season. The Pennsylvania water quality standard for DO is a minimum concentration of 5 mg/L within the epilimnion of stratified lakes.

The health of aquatic ecosystems can be impaired by low DO concentrations in the water column. Hypoxia, or conditions of DO concentrations less than 2 mg/L, is generally accepted as the threshold at which the most severe effects on biota occur. In all months sampled during 2021, apart from May, the water column of Blue Marsh was affected by hypoxia (Fig. 3-4). Hypoxic water occupied most of the water column in late June through mid-August. Hypoxia in the lower water column is a symptom of eutrophication. Nutrients in the water column feed explosive algal growth at the surface photic zone. Dead and decaying algae sink to lower levels of the water column and during the process of decay; oxygen is removed from the water.

3.1.3 pH

The hydrogen –ion concentration in water is measured as pH. The pH scale is 0-14. A pH below 7 is considered acidic and a pH above 7 is basic. High pH values tend to facilitate solubilization of ammonia, salts, and heavy metals. Low pH levels tend to increase carbonic acid and carbon dioxide concentrations. Lethal effects of pH on aquatic life typically occur below pH 4.5 and above pH 9.5.

Measures of pH in the surface waters at Blue Marsh Reservoirs upstream sampling stations followed a similar pattern during 2021 (Fig. 3-5). Slightly lower pH measures in release waters downstream at station BM-1S are influenced by in lake water quality conditions and depth of water withdrawal in lake. In the months sampled, no pH measures violated the PADEP water quality standard maximum and minimum pH level of 9.0 and 6.0, respectably. For the entire monitoring period and at all surface water stream stations, pH ranged from 7.06 to 8.18.

The pH profile in the water column of Blue Marsh Reservoir was consistent with a stratified lake during 2021 (Fig. 3-6). Throughout the monitoring period the upper 0-10 feet of the water column had consistently higher pH measures than the deeper waters. During the sampling season, pH at the surface to a depth of approximately 10 feet ranged between 8.15 and 8.61. In contrast, measures of pH in the lower water column (>10 feet deep) were consistently lower during the monitoring period and ranged between 6.92 and 8.55. The higher pH in surface waters (euphotic zone) of the reservoir is a result of excessive algal blooms. As a function of increased productivity during photosynthesis, algae remove CO2 from the water column. Dissolved CO2 is slightly acidic; its reduction in the water column manifests an increase in pH. In 2021, this increased surface water productivity resulted in water samples at Blue Marsh Reservoir station BM-6 being slightly higher in pH than deeper waters. Lake surface waters did not violate the PADEP water quality standard maximum pH level of 9.0 during all months sampled.

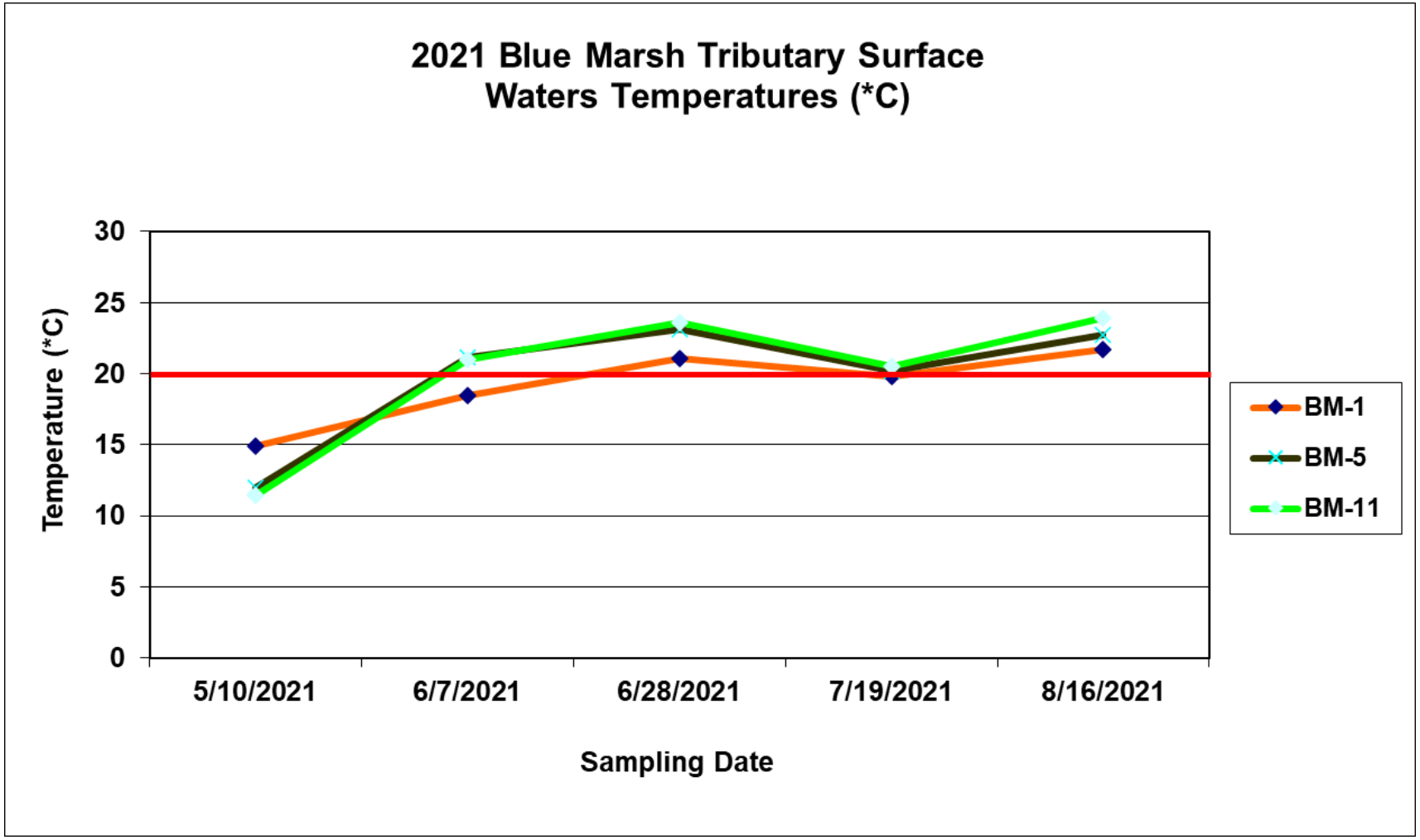


Figure 3-1. Tributary and downstream surface water temperatures (°C) measured at Blue Marsh Reservoir in 2021. Station BM-1S is located downstream of the reservoir. See Appendix A for summary of plotted values. The cold-water species preference temperature of 20°C is shown as a red line reference.

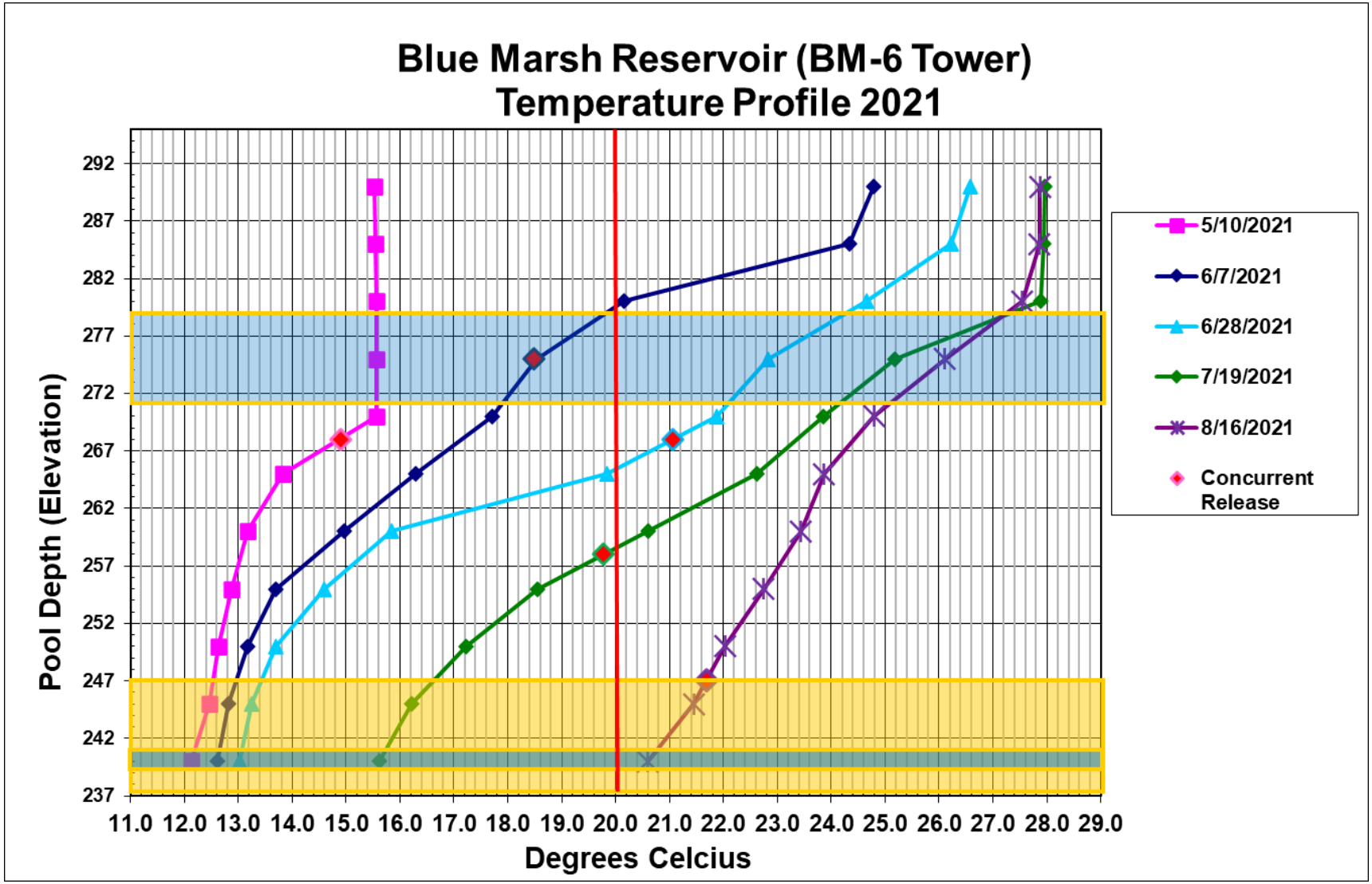
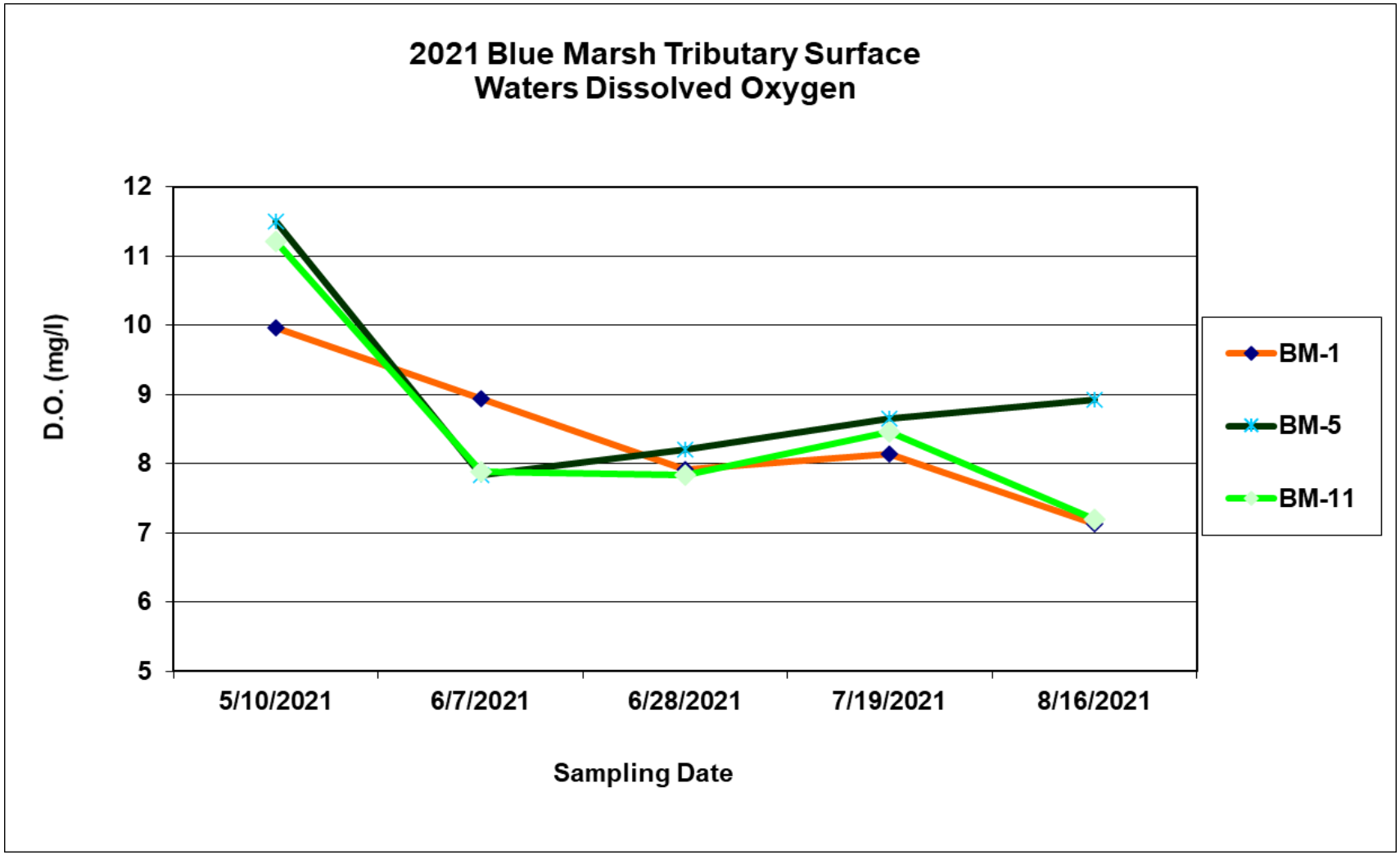


Figure 3-2. Temperature stratification and release portal elevations at station BM-6 of Blue Marsh Reservoir in 2021. See Appendix A for summary of plotted values


2021 Blue Marsh Tributary Surface Waters Dissolved Oxygen
D.O. (mg/l)
12
11
10
9
8
7
6
5
5/10/2021
6/7/2021
6/28/2021
7/19/2021
8/16/2021
Sampling Date
BM-1
BM-5
BM-11

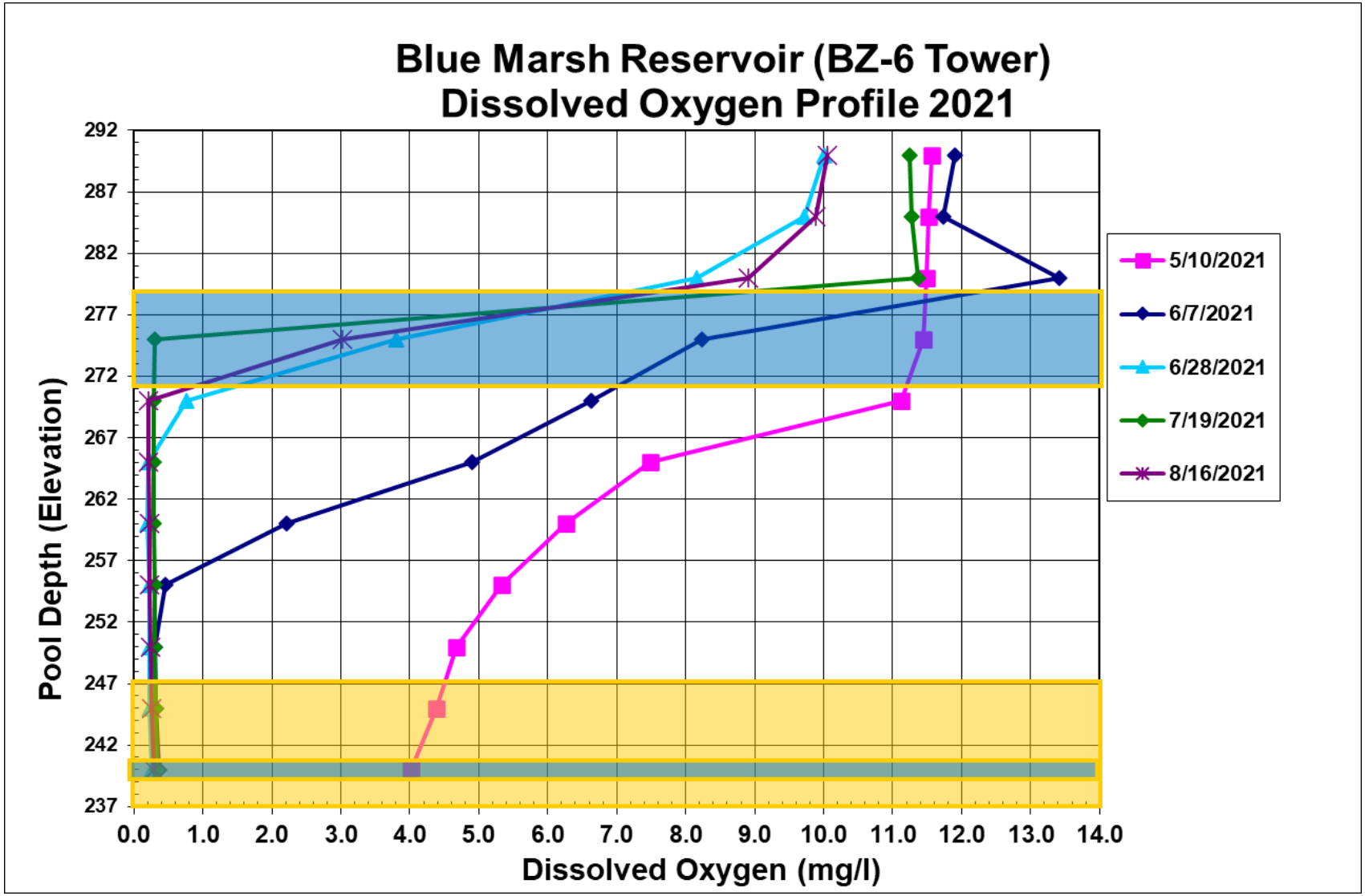


Figure 3-4. Release portal elevations and dissolved oxygen stratification at station BM-6 of Blue Marsh Reservoir in 2021. (PADEP water quality standard for DO is a minimum concentration of 5 mg/L.) See Appendix A for summary of plotted values.

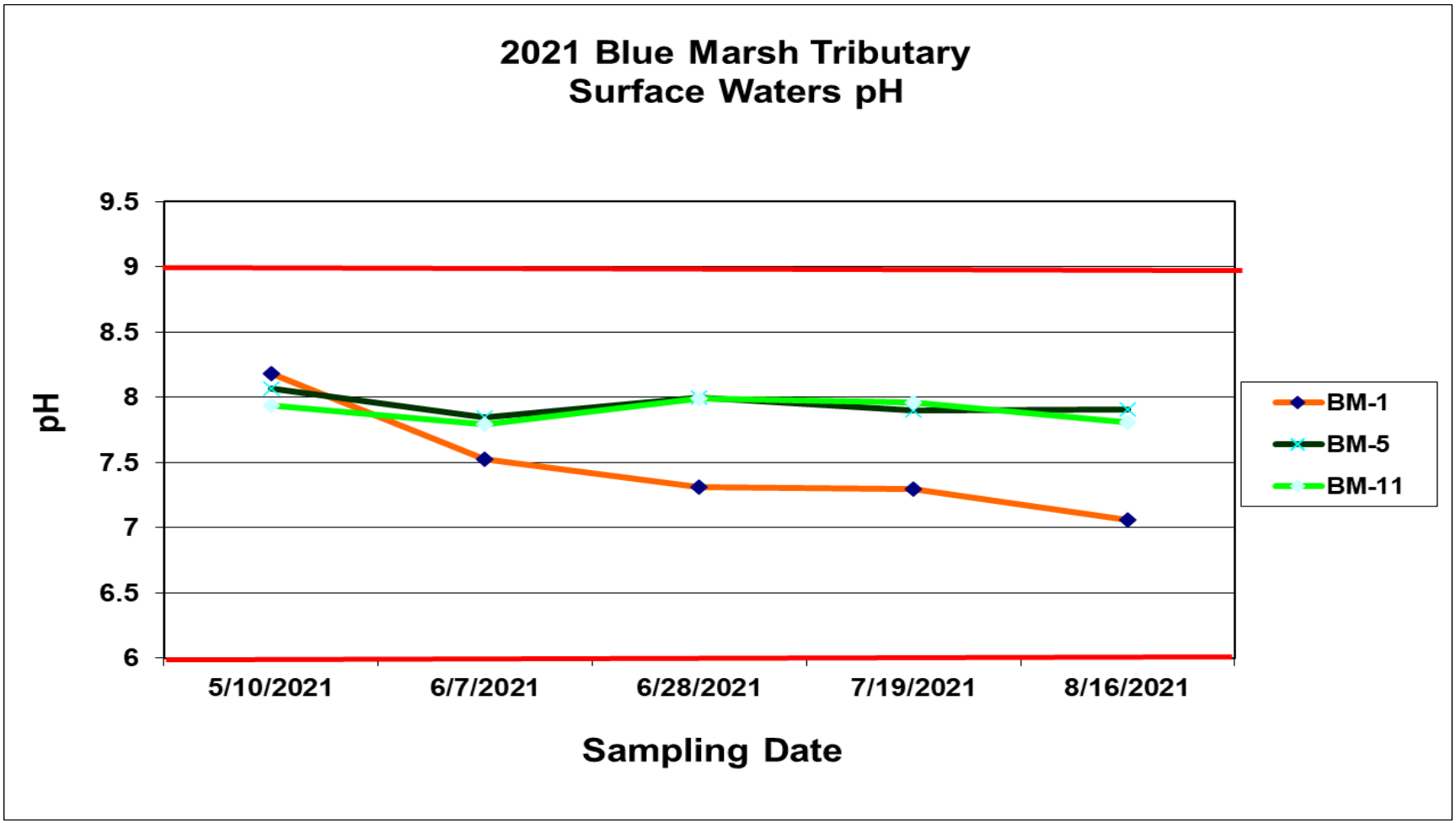


Figure 3-5. Tributary and outflow surface water pH measured at Blue Marsh Reservoir in 2021. (The PADEP water quality standard for pH is a range from 6 to 9.) See Appendix A for summary of plotted values.

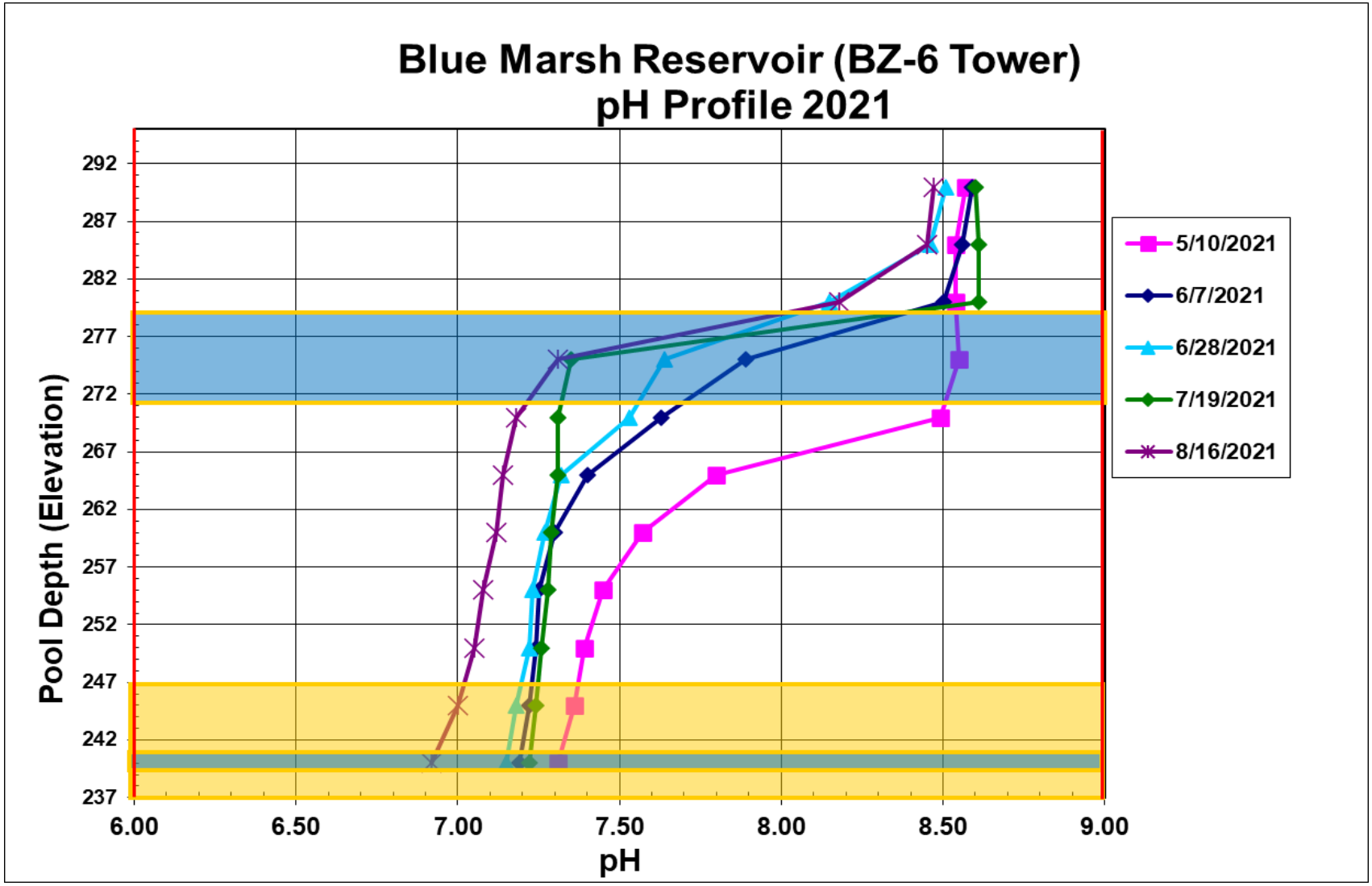


Figure 3-6. Release portal elevations and stratification of pH at station BM-6 of Blue Marsh Reservoir in 2021. (The PADEP water quality standard for pH is a range from 6 to 9.) See Appendix A for summary of plotted values.

3.2 WATER COLUMN CHEMISTRY MONITORING

The following sections describe temporal, spatial, and depth patterns for the water quality parameters measured in surface, middle, and bottom waters of Blue Marsh Reservoir during 2021 (Table 3-2).

3.2.1 Ammonia

Total Ammonia (NH3) is a measure of the most reduced inorganic form of nitrogen in water and includes dissolved ammonia and the ammonium ion. Ammonia is a small component of the nitrogen cycle but as an essential plant nutrient, it contributes to the trophic status of a water body. Excess ammonia contributes to eutrophication of water bodies. This can result in excessive algal growths and impacts on recreation and drinking water supplies. In high concentrations, ammonia is toxic to aquatic life.

EPA guidance for ambient water quality criteria for ammonia in freshwater are dependent on temperature and pH (EPA, 2013). Table 3.1 shows the acute and chronic criteria that are expected to protect freshwater aquatic life. The EPA (2013) also provides tables with the temperature and pH-dependent values of the acute criterion magnitude and the temperature and pH-dependent values of the chronic criterion magnitude. These tables provide an expected ammonia criteria over a wide range of pH and temperature values and can be utilized to evaluate field collected samples.

Ammonia concentrations were low in Blue Marsh Reservoir during 2020 (Table 3-2). Concentrations measured for 42 samples collected from all sampling stations and depths throughout the sampling season did exceed the laboratory minimum reporting limit of 0.05 mg/L. These samples were collected primarily at middle and deep bottom water sampling locations within the reservoir body. The maximum single recorded sample of 1.35 mg/L was collected from station BM-1S on 16 August. Concentrations of ammonia measured at Blue Marsh Reservoir followed the PADEP and EPA water quality standards during 2021.

Table 3.1 Environmental Protection Agency Ammonia Freshwater Criteria 2013

2013 Final Aquatic Life Criteria for Ammonia (Magnitude, Frequency, and Duration) (mg TAN/L) pH 7.0, T=20°C	
Acute (1-hour average)	17
Chronic (30-day rolling average)	1.9*

*Not to exceed 2.5 times the CCC as a 4-day average within the 30-days, i.e. 4.8 mg TAN/L at pH 7 and 20°C, more than once in three years on average.
Criteria frequency: Not to be exceeded more than once in three years on average.

Table 3-2. Summary of surface, middle, and bottom water quality monitoring data for Blue Marsh Reservoir in 2021

Station	Date	ALK mg/L	BOD5 mg/L	DISS-P mg/L	NH3 mg/L	NO2 mg/L	NO3 mg/L	NO3-NO2 mg/L	TDS mg/L	TKN mg/L	TOC mg/L	TP mg/L	TSS mg/L
BM-01S	5/10/2021	114	<2.0	<0.05	<0.05	0.02	4.28	4.3	201	<0.48	2.3	<0.01	4
	6/7/2021	123	2	0.02	<0.05	<0.01	3.86	3.87	200	<0.48	2.3	0.08	3
	6/28/2021	128	2.4	0.02	0.09	0.1	3.43	3.53	214	<0.48	2.5	0.01	6
	7/19/2021	145	<2.0	0.03	0.34	0.04	2.28	2.32	239	0.65	2.7	0.03	3
	8/16/2021	154	3	0.09	1.35	0.12	1.16	1.28	236	1.62	2.8	0.13	8
	Mean	133	2.3	0.04	0.38	0.06	3.00	3.06	218	0.74	2.5	0.05	4.8
	Stdev	16	0.4	0.03	0.56	0.05	1.27	1.24	19	0.50	0.2	0.05	2.2
	Max	154	3	0.09	1.35	0.12	4.28	4.3	239	1.62	2.8	0.13	8
	Min	114	2	0.02	0.05	0.01	1.16	1.28	200	0.48	2.3	0.01	3
	No. of Det.	5	3	4	3	4	5	5	5	2	5	4	5
BM-02S	5/10/2021	119	2.2	<0.05	<0.05	0.02	4.4	4.42	201	<0.48	2.3	0.01	4
	6/7/2021	113	2	0.03	<0.05	<0.01	3.79	3.80	176	<0.48	2.7	0.02	<1
	6/28/2021	102	2.9	0.02	<0.05	<0.01	3.49	3.50	189	<0.48	2.5	<0.01	4
	7/19/2021	83	5.2	0.02	<0.05	<0.01	2.65	2.66	176	<0.43	2.8	0.02	7
	8/16/2021	91	4.3	<0.01	<0.05	0.09	1.86	1.95	151	<0.43	2.7	0.02	3
	Mean	102	3.3	0.03	0.05	0.03	3.24	3.27	179	0.46	2.6	0.02	4
	Stdev	15	1.4	0.02	0	0.03	1.00	0.97	19	0.03	0.2	0.01	2
	Max	119	5.2	0.05	0.05	0.09	4.4	4.42	201	0.48	2.8	0.02	7
	Min	83	2.0	0.01	0.05	0.01	1.86	1.95	151	0.43	2.3	0.01	1
	No. of Det.	5	5	3	0	2	5	5	5	0	5	4	4

Table 3-2 continued. Summary of surface, middle, and bottom water quality monitoring data for Blue Marsh Reservoir in 2021

Station	Date	ALK mg/L	BOD5 mg/L	DISS-P mg/L	NH3 mg/L	NO2 mg/L	NO3 mg/L	NO3-NO2 mg/L	TDS mg/L	TKN mg/L	TOC mg/L	TP mg/L	TSS mg/L
BM-02M	5/10/2021	125	<2.0	<0.05	<0.05	0.02	4.44	4.46	203	<0.48	1.7	<0.01	2
	6/7/2021	140	<2.0	<0.01	<0.05	<0.01	4.17	4.18	224	<0.48	2.1	<0.01	2
	6/28/2021	135	2.2	0.01	0.14	0.14	3.72	3.86	231	<0.48	2.1	0.02	5
	7/19/2021	139	<2.0	0.01	0.22	<0.01	3.00	3.01	214	<0.43	2.2	<0.01	<1
	8/16/2021	118	3.1	0.06	0.21	0.11	1.95	2.06	181	<0.43	2.3	0.01	3
	Mean	131	2.3	0.03	0.13	0.06	3.46	3.51	211	0.46	2.1	0.01	2.6
	Stdev	10	0.5	0.02	0.08	0.06	1.00	0.98	20	0.03	0.2	0.00	1.5
	Max	140	3.1	0.06	0.22	0.14	4.44	4.46	231	0.48	2.3	0.02	5
	Min	118	2.0	0.01	0.05	0.01	1.95	2.06	181	0.43	1.7	0.01	1
	No. of Det.	5	2	3	3	3	5	5	5	0	5	2	4
BM-02D	5/10/2021	128	<2.0	<0.05	0.07	0.03	3.76	3.79	222	<0.48	1.7	<0.01	7
	6/7/2021	140	<2.0	<0.01	<0.05	0.05	3.94	3.99	225	<0.48	1.9	<0.01	2
	6/28/2021	149	2.6	0.02	0.15	0.15	2.93	3.08	255	<0.48	1.9	0.01	1
	7/19/2021	166	2.5	0.03	0.7	<0.01	1.9	1.91	266	0.80	2.2	0.03	<1
	8/16/2021	143	4.7	0.03	0.88	0.11	1.75	1.86	202	0.99	2.3	0.03	5
	Mean	145	2.8	0.03	0.37	0.07	2.86	2.93	234	0.65	2.0	0.02	3
	Stdev	14	1.1	0.01	0.39	0.06	1.02	1.01	26	0.24	0.2	0.01	3
	Max	166	4.7	0.05	0.88	0.15	3.94	3.99	266	0.99	2.3	0.03	7
	Min	128	2.0	0.01	0.05	0.01	1.75	1.86	202	0.48	1.7	0.01	1
	No. of Det.	5	3	3	4	4	5	5	5	2	5	3	4

Table 3-2 continued. Summary of surface, middle, and bottom water quality monitoring data for Blue Marsh Reservoir in 2021

Station	Date	ALK mg/L	BOD5 mg/L	DISS-P mg/L	NH3 mg/L	NO2 mg/L	NO3 mg/L	NO3-NO2 mg/L	TDS mg/L	TKN mg/L	TOC mg/L	TP mg/L	TSS mg/L
BM-05S	5/10/2021	66	<2.0	<0.05	<0.05	<0.01	3.33	3.34	116	<0.48	1.8	0.02	<1
	6/7/2021	191	<2.0	0.06	<0.05	<0.01	6.68	6.69	318	<0.48	1.7	0.07	7
	6/28/2021	200	<2.0	0.05	<0.05	<0.01	7.1	7.11	357	<0.48	1.5	0.05	<1
	7/19/2021	198	<2.0	0.05	<0.05	<0.01	6.74	6.75	344	<0.43	1.7	0.05	12
	8/16/2021	188	5.3	0.05	<0.05	<0.01	5.07	5.08	267	<0.43	2.3	0.06	14
	Mean	169	3	0.05	0.05	0.01	5.78	5.79	280	0.46	1.8	0.05	7
	Stdev	58	1	0.0	0	0	1.58	1.58	98	0.03	0.3	0.02	6
	Max	200	5.3	0.06	0.05	0.01	7.1	7.11	357	0.48	2.3	0.07	14
	Min	66	2	0.05	0.05	0.01	3.33	3.34	116	0.43	1.5	0.02	1
	No. of Det.	5	1	4	0	0	5	5	5	0	5	5	3
BM-06S	5/10/2021	112	2.6	<0.05	<0.05	0.02	4.34	4.36	190	<0.48	2.3	<0.01	6
	6/7/2021	105	<2.0	<0.01	<0.05	<0.01	3.8	3.81	203	0.85	2.3	<0.01	<1
	6/28/2021	97	2.9	<0.01	<0.05	<0.01	3.43	3.44	191	<0.48	2.5	<0.01	<1
	7/19/2021	76	6.5	0.01	<0.05	<0.01	2.65	2.66	140	0.69	2.7	0.01	3
	8/16/2021	88	2.5	<0.01	<0.05	<0.01	1.91	1.92	143	<0.43	2.6	<0.01	5
	Mean	96	3.3	0.02	0.05	0.01	3.23	3.24	173	0.59	2.5	0.01	3
	Stdev	14	1.8	0.02	0	0.00	0.96	0.96	30	0.18	0.2	0.00	2
	Max	112	6.5	0.05	0.05	0.02	4.34	4.36	203	0.85	2.7	0.01	6
	Min	76	2.0	0.01	0.05	0.01	1.91	1.92	140	0.43	2.3	0.01	1
	No. of Det.	5	4	1	0	1	5	5	5	2	5	1	3

Table 3-2 continued. Summary of surface, middle, and bottom water quality monitoring data for Blue Marsh Reservoir in 2021

Station	Date	ALK mg/L	BOD5 mg/L	DISS-P mg/L	NH3 mg/L	NO2 mg/L	NO3 mg/L	NO3-NO2 mg/L	TDS mg/L	TKN mg/L	TOC mg/L	TP mg/L	TSS mg/L
BM-06M	5/10/2021	113	2.7	<0.05	<0.05	0.02	4.35	4.37	183	<0.48	2.2	<0.01	6
	6/7/2021	136	<2.0	<0.01	<0.05	0.03	4.06	4.09	239	<0.48	1.9	<0.01	3
	6/28/2021	108	2.1	0.01	<0.05	0.09	3.34	3.43	213	<0.48	2.3	<0.01	3
	7/19/2021	121	<2.0	0.01	0.16	0.03	3.06	3.09	200	0.43	2.2	<0.01	4
	8/16/2021	144	2.1	0.01	0.54	0.07	1.81	1.88	216	0.58	2.4	0.01	2
	Mean	124	2.2	0.02	0.17	0.05	3.32	3.37	210	0.49	2.2	0.01	4
	Stdev	15	0.3	0.02	0.21	0.03	0.99	0.98	21	0.05	0.2	0.00	2
	Max	144	2.7	0.05	0.54	0.09	4.35	4.37	239	0.58	2.4	0.01	6
	Min	108	2.0	0.01	0.05	0.02	1.81	1.88	183	0.43	1.9	0.01	2
	No. of Det.	5	3	3	2	5	5	5	5	2	5	1	5
BM-06D	5/10/2021	123	<2.0	<0.05	<0.05	0.02	3.87	3.89	224	<0.48	1.7	<0.01	8
	6/7/2021	135	<2.0	<0.01	0.06	0.17	3.44	3.61	249	<0.48	1.7	<0.01	1
	6/28/2021	144	2.7	0.02	0.23	0.12	2.57	2.69	248	<0.48	1.8	<0.01	2
	7/19/2021	158	<2.0	0.02	0.58	<0.01	1.92	1.93	239	0.61	2.2	0.02	1
	8/16/2021	149	4.3	0.04	1.22	0.15	1.12	1.27	219	1.37	2.5	0.05	1
	Mean	142	2.6	0.03	0.43	0.09	2.58	2.68	236	0.68	2.0	0.02	3
	Stdev	13	1.0	0.02	0.49	0.07	1.11	1.10	14	0.39	0.4	0.02	3
	Max	158	4.3	0.05	1.22	0.17	3.87	3.89	249	1.37	2.5	0.05	8
	Min	123	2.0	0.01	0.05	0.01	1.12	1.27	219	0.48	1.7	0.01	1
	No. of Det.	5	2	3	4	4	5	5	5	2	5	2	5

Table 3-2 continued. Summary of surface, middle, and bottom water quality monitoring data for Blue Marsh Reservoir in 2021

Station	Date	ALK mg/L	BOD5 mg/L	DISS-P mg/L	NH3 mg/L	NO2 mg/L	NO3 mg/L	NO3-NO2 mg/L	TDS mg/L	TKN mg/L	TOC mg/L	TP mg/L	TSS mg/L
BM-07S	5/10/2021	121	2.5	<0.05	<0.05	0.02	4.54	4.56	211	<0.48	2.4	0.03	3
	6/7/2021	117	2.2	<0.01	<0.05	<0.01	3.8	3.81	206	<0.48	2.2	<0.01	1
	6/28/2021	100	3.0	0.01	<0.05	<0.01	3.43	3.44	210	<0.48	2.8	<0.01	2
	7/19/2021	82	6.3	0.01	<0.05	<0.01	2.57	2.58	166	<0.43	2.8	<0.01	5
	8/16/2021	91	2.5	<0.01	<0.05	0.08	1.88	1.96	163	<0.43	2.7	<0.01	1
	Mean	102	3.3	0.02	0.05	0.03	3.24	3.27	191	0.46	2.6	0.01	2
	Stdev	17	1.7	0.02	0	0.03	1.04	1.02	24.5	0.03	0.3	0.01	2
	Max	121	6.3	0.05	0.05	0.08	4.54	4.56	211	0.48	2.8	0.03	5
	Min	82	2.2	0.01	0.05	0.01	1.88	1.96	163	0.43	2.2	0.01	1
	No. of Det.	5	5	2	0	2	5	5	5	0	5	1	5
BM-07M	5/10/2021	131	<2.0	<0.05	<0.05	0.02	4.48	4.5	221	<0.48	1.6	<0.01	4
	6/7/2021	145	<2.0	0.01	<0.05	<0.01	4.57	4.58	267	<0.48	2.1	0.02	3
	6/28/2021	135	3.9	0.01	<0.05	<0.01	3.91	3.92	234	<0.48	2.1	<0.01	<1
	7/19/2021	111	<2.0	<0.01	0.15	<0.01	2.94	2.95	191	<0.43	2.8	<0.01	<1
	8/16/2021	104	<2.0	<0.01	0.18	0.05	2.24	2.29	168	0.61	2.4	<0.01	4
	Mean	125.2	2.4	0.02	0.10	0.02	3.63	3.65	216	0.50	2.2	0.01	3
	Stdev	17.1	0.8	0.02	0.06	0.02	1.01	1.00	38.3	0.07	0.4	0.00	2
	Max	145	3.9	0.05	0.18	0.05	4.57	4.58	267	0.61	2.8	0.02	4
	Min	104	2.0	0.01	0.05	0.01	2.24	2.29	168	0.43	1.6	0.01	1
	No. of Det.	5	1	2	2	2	5	5	5	1	5	1	3

Table 3-2 continued. Summary of surface, middle, and bottom water quality monitoring data for Blue Marsh Reservoir in 2021

Station	Date	ALK mg/L	BOD5 mg/L	DISS-P mg/L	NH3 mg/L	NO2 mg/L	NO3 mg/L	NO3-NO2 mg/L	TDS mg/L	TKN mg/L	TOC mg/L	TP mg/L	TSS mg/L
BM-07D	5/10/2021	141	<2.0	<0.05	<0.05	0.03	4.25	4.28	229	<0.48	1.8	0.02	27
	6/7/2021	156	<2.0	0.01	0.14	0.05	3.81	3.86	264	<0.48	2.1	0.02	<1
	6/28/2021	147	<2.0	0.02	0.22	0.07	3.23	3.30	262	<0.48	1.9	<0.01	<1
	7/19/2021	137	<2.0	0.02	0.52	0.03	2.52	2.55	216	0.73	2.6	0.03	4
	8/16/2021	132	3.9	0.03	0.47	0.15	2.00	2.15	181	0.65	2.2	0.04	4
	Mean	143	2.4	0.03	0.28	0.07	3.16	3.23	230	0.56	2.1	0.02	7
	Stdev	9	0.8	0.02	0.21	0.05	0.92	0.89	35	0.12	0.3	0.01	11
	Max	156	3.9	0.05	0.52	0.15	4.25	4.28	264	0.73	2.6	0.04	27
	Min	132	2.0	0.01	0.05	0.03	2	2.15	181	0.48	1.8	0.01	1
	No. of Det.	5	1	4	4	5	5	5	5	2	5	4	3
BM-08S	5/10/2021	122	2.4	<0.05	<0.05	0.02	4.33	4.35	214	<0.48	2.6	<0.01	6
	6/7/2021	114	<2.0	<0.01	<0.05	<0.01	3.76	3.77	209	<0.48	2.2	<0.01	<1
	6/28/2021	96	4.7	<0.01	<0.05	<0.01	3.33	3.34	200	<0.48	2.6	<0.01	<1
	7/19/2021	78	5.8	0.01	<0.05	<0.01	2.51	2.52	94	<0.43	2.8	<0.01	5
	8/16/2021	76	5.1	<0.01	<0.05	<0.01	1.73	1.74	138	0.57	2.7	<0.01	5
	Mean	97	4.0	0.02	0.05	0.01	3.13	3.14	171	0.49	2.6	0.01	4
	Stdev	21	1.7	0.02	0.00	0.00	1.03	1.03	53	0.05	0.2	0.00	2
	Max	122	5.8	0.05	0.05	0.02	4.33	4.35	214	0.57	2.8	0.01	6
	Min	76	2.0	0.01	0.05	0.01	1.73	1.74	94	0.43	2.2	0.01	1
	No. of Det.	5	4	1	0	1	5	5	5	1	5	0	3

Table 3-2 continued. Summary of surface, middle, and bottom water quality monitoring data for Blue Marsh Reservoir in 2021

Station	Date	ALK mg/L	BOD5 mg/L	DISS-P mg/L	NH3 mg/L	NO2 mg/L	NO3 mg/L	NO3-NO2 mg/L	TDS mg/L	TKN mg/L	TOC mg/L	TP mg/L	TSS mg/L
BM-08M	5/10/2021	122	2.8	<0.05	<0.05	0.02	4.37	4.39	211	<0.48	2.3	<0.01	9
	6/7/2021	139	3.3	0.01	<0.05	<0.01	3.96	3.97	241	<0.48	2.2	0.11	148
	6/28/2021	102	3.4	0.02	<0.05	<0.01	3.40	3.41	209	<0.48	2.4	<0.01	3
	7/19/2021	103	<2.0	<0.01	0.16	<0.01	2.75	2.76	189	0.57	2.8	0.02	<1
	8/16/2021	86	2.2	<0.01	0.11	<0.01	1.84	1.85	172	0.66	2.5	<0.01	5
	Mean	110	2.7	0.02	0.08	0.01	3.26	3.28	204	0.53	2.4	0.03	33.2
	Stdev	20	0.6	0.02	0.05	0.00	1.00	1.01	26	0.08	0.2	0.04	64.2
	Max	139	3.4	0.05	0.16	0.02	4.37	4.39	241	0.66	2.8	0.11	148
	Min	86	2.0	0.01	0.05	0.01	1.84	1.85	172	0.48	2.2	0.01	1
	No. of Det.	5	4	2	2	1	5	5	5	2	5	2	4
BM-08D	5/10/2021	118	6	0.08	<0.05	0.01	3.72	3.73	224	2.56	2.5	0.61	367
	6/7/2021	124	<2.0	<0.01	<0.05	<0.01	3.67	3.68	234	<0.48	2.1	<0.01	4
	6/28/2021	140	<2.0	<0.01	0.13	0.04	3.9	3.94	257	<0.48	2	<0.01	4
	7/19/2021	116	<2.0	0.07	0.48	<0.01	2.36	2.37	210	0.69	3.6	0.1	2
	8/16/2021	100	<2.0	0.05	0.35	0.12	1.87	1.99	188	0.55	2.4	<0.01	3
	Mean	120	2.8	0.04	0.21	0.04	3.10	3.14	223	0.95	2.5	0.15	76.0
	Stdev	14	1.8	0.03	0.19	0.05	0.92	0.89	26	0.90	0.6	0.26	163
	Max	140	6.0	0.08	0.48	0.12	3.9	3.94	257	2.56	3.6	0.61	367
	Min	100	2.0	0.01	0.05	0.01	1.87	1.99	188	0.48	2	0.01	2
	No. of Det.	5	1	3	3	3	5	5	5	3	5	2	5

Table 3-2 continued. Summary of surface, middle, and bottom water quality monitoring data for Blue Marsh Reservoir in 2021

Station	Date	ALK mg/L	BOD5 mg/L	DISS-P mg/L	NH3 mg/L	NO2 mg/L	NO3 mg/L	NO3-NO2 mg/L	TDS mg/L	TKN mg/L	TOC mg/L	TP mg/L	TSS mg/L
BM-09S	5/10/2021	128	2.3	<0.05	<0.05	0.02	4.7	4.72	210	<0.48	2.2	<0.01	4
	6/7/2021	115	2.1	0.02	<0.05	<0.01	3.82	3.83	185	<0.48	2.4	<0.01	<1
	6/28/2021	98	2.8	0.01	<0.05	<0.01	3.37	3.38	185	<0.48	2.6	<0.01	2
	7/19/2021	77	6.8	0.02	<0.05	<0.01	2.50	2.51	174	0.80	3.2	0.01	3
	8/16/2021	85	4.4	0.01	<0.05	<0.01	1.79	1.80	171	<0.43	2.7	<0.01	4
	Mean	101	3.7	0.02	0.05	0.01	3.24	3.25	185	0.53	2.6	0.01	3
	Stdev	21	2.0	0.02	0.00	0.00	1.13	1.14	15	0.15	0.4	0.00	1
	Max	128	6.8	0.05	0.05	0.02	4.7	4.72	210	0.8	3.2	0.01	4
	Min	77	2.1	0.01	0.05	0.01	1.79	1.8	171	0.43	2.2	0.01	1
	No. of Det.	5	5	4	0	1	5	5	5	1	5	1	4
BM-09M	5/10/2021	136	2.5	<0.05	<0.05	0.03	4.77	4.8	223	<0.48	2	<0.01	4
	6/7/2021	151	<2.0	0.02	0.17	0.04	4.12	4.16	243	<0.48	2.3	0.01	6
	6/28/2021	147	<2.0	0.01	0.13	0.07	3.94	4.01	247	<0.48	2	0.01	2
	7/19/2021	121	<2.0	<0.01	0.18	<0.01	3.09	3.10	190	<0.43	3	<0.01	<1
	8/16/2021	122	<2.0	0.01	0.35	0.09	2.65	2.74	204	0.46	2.2	<0.01	1
	Mean	135	2.1	0.02	0.18	0.05	3.71	3.76	221	0.47	2.3	0.01	2.8
	Stdev	14	0.2	0.02	0.11	0.03	0.84	0.83	25	0.02	0.4	0.00	2.2
	Max	151	2.5	0.05	0.35	0.09	4.77	4.8	247	0.48	3	0.01	6
	Min	121	2.0	0.01	0.05	0.01	2.65	2.74	190	0.43	2	0.01	1
	No. of Det.	5	1	3	4	4	5	5	5	1	5	2	4

Table 3-2 continued. Summary of surface, middle, and bottom water quality monitoring data for Blue Marsh Reservoir in 2021

Station	Date	ALK mg/L	BOD5 mg/L	DISS-P mg/L	NH3 mg/L	NO2 mg/L	NO3 mg/L	NO3-NO2 mg/L	TDS mg/L	TKN mg/L	TOC mg/L	TP mg/L	TSS mg/L
BM-09D	5/10/2021	143	<2.0	<0.05	<0.05	0.04	4.38	4.42	238	<0.48	1.6	0.02	16
	6/7/2021	154	<2.0	0.02	0.19	0.05	3.66	3.71	247	<0.48	2.3	0.02	1
	6/28/2021	163	<2.0	0.02	0.49	<0.01	2.35	2.36	259	<0.48	2.1	0.02	1
	7/19/2021	140	<2.0	0.05	0.79	<0.01	2.34	2.35	227	1.09	3.3	0.06	3
	8/16/2021	122	<2.0	0.02	0.53	0.11	2.06	2.17	209	0.66	2.2	0.03	6
	Mean	144	2.0	0.03	0.41	0.04	2.96	3.00	236	0.64	2.3	0.03	5
	Stdev	16	0.0	0.02	0.29	0.04	1.01	1.01	19	0.26	0.6	0.02	6
	Max	163	2.0	0.05	0.79	0.11	4.38	4.42	259	1.09	3.3	0.06	16
	Min	122	2.0	0.02	0.05	0.01	2.06	2.17	209	0.48	1.6	0.02	1
	No. of Det.	5	0	4	4	3	5	5	5	2	5	5	5
BM-10S	5/10/2021	146	3	<0.05	<0.05	0.03	4.8	4.83	219	<0.48	2.4	0.01	6
	6/7/2021	116	3.9	0.04	<0.05	0.04	3.86	3.90	203	<0.48	2.5	0.03	4
	6/28/2021	94	3.5	<0.01	<0.05	<0.01	3.39	3.40	188	<0.48	3.4	<0.01	<1
	7/19/2021	87	6.8	<0.01	<0.05	<0.01	2.67	2.68	192	0.63	2.8	<0.01	1
	8/16/2021	77	5	<0.01	<0.05	<0.01	1.64	1.65	158	0.6	2.9	0.02	8
	Mean	104	4.4	0.02	0.05	0.02	3.27	3.29	192	0.53	2.8	0.02	4
	Stdev	28	1.5	0.02	0.00	0.01	1.20	1.21	22	0.07	0.4	0.01	3
	Max	146	6.8	0.05	0.05	0.04	4.8	4.83	219	0.63	3.4	0.03	8
	Min	77	3.0	0.01	0.05	0.01	1.64	1.65	158	0.48	2.4	0.01	1
	No. of Det.	5	5	1	0	2	5	5	5	2	5	3	4

Table 3-2 continued. Summary of surface, middle, and bottom water quality monitoring data for Blue Marsh Reservoir in 2021

Station	Date	ALK mg/L	BOD5 mg/L	DISS-P mg/L	NH3 mg/L	NO2 mg/L	NO3 mg/L	NO3-NO2 mg/L	TDS mg/L	TKN mg/L	TOC mg/L	TP mg/L	TSS mg/L
BM-10M	5/10/2021	155	2.2	<0.05	<0.05	0.02	5.19	5.21	191	<0.48	2.1	0.02	10
	6/7/2021	152	<2.0	0.02	0.08	0.04	4.7	4.74	249	<0.48	2.5	0.03	16
	6/28/2021	100	6.1	<0.01	<0.05	<0.01	3.56	3.57	199	<0.48	2.4	0.01	7
	7/19/2021	126	2.7	0.01	0.07	<0.01	3.79	3.80	224	<0.43	2.3	0.02	1
	8/16/2021	137	4.1	0.01	0.15	<0.01	3.05	3.06	224	0.48	2.6	0.03	9
	Mean	134	3.4	0.02	0.08	0.02	4.06	4.08	217	0.47	2.4	0.02	9
	Stdev	22	1.7	0.017	0.04	0.01	0.87	0.88	23	0.02	0.2	0.01	5
	Max	155	6.1	0.05	0.15	0.04	5.19	5.21	249	0.48	2.6	0.03	16
	Min	100	2.0	0.01	0.05	0.01	3.05	3.06	191	0.43	2.1	0.01	1
	No. of Det.	5	4	3	3	2	5	5	5	1	5	5	5
BM-10D	5/10/2021	159	<2.0	<0.05	<0.05	0.02	5.52	5.54	239	<0.48	1.8	0.02	23
	6/7/2021	161	<2.0	0.01	0.09	0.04	4.74	4.78	243	<0.48	2.5	0.03	20
	6/28/2021	166	2	0.04	0.32	0.07	4.02	4.09	276	<0.48	2	0.08	65
	7/19/2021	148	<2.0	0.02	0.12	<0.01	4.58	4.59	253	<0.43	2.1	0.03	21
	8/16/2021	121	2.4	0.01	0.12	<0.01	2.70	2.71	209	0.64	2.7	0.02	12
	Mean	151	2.1	0.03	0.14	0.03	4.31	4.34	244	0.50	2.2	0.04	28
	Stdev	18	0.2	0.02	0.10	0.03	1.05	1.05	24	0.08	0.4	0.03	21
	Max	166	2.4	0.05	0.32	0.07	5.52	5.54	276	0.64	2.7	0.08	65
	Min	121	2.0	0.01	0.05	0.01	2.7	2.71	209	0.43	1.8	0.02	12
	No. of Det.	5	2	4	4	3	5	5	5	1	5	5	5

Table 3-2 continued. Summary of surface, middle, and bottom water quality monitoring data for Blue Marsh Reservoir in 2021

Station	Date	ALK mg/L	BOD5 mg/L	DISS-P mg/L	NH3 mg/L	NO2 mg/L	NO3 mg/L	NO3-NO2 mg/L	TDS mg/L	TKN mg/L	TOC mg/L	TP mg/L	TSS mg/L
BM-11S	5/10/2021	50	<2.0	<0.05	<0.05	<0.01	2.82	2.83	83	<0.48	1.8	0.03	5
	6/7/2021	83	<2.0	0.04	<0.05	<0.01	3.71	3.72	142	<0.48	2.1	0.04	4
	6/28/2021	119	<2.0	0.04	<0.05	<0.01	3.95	3.96	216	<0.48	2	0.04	2
	7/19/2021	136	<2.0	0.05	<0.05	<0.01	4.73	4.74	240	<0.43	2.2	0.04	10
	8/16/2021	144	15.7	0.09	<0.05	<0.01	3.06	3.07	246	1.36	3.4	0.09	44
	Mean	106	4.7	0.05	0.05	0.01	3.65	3.66	185	0.65	2.3	0.05	13
	Stdev	39	6.1	0.02	0.00	0.00	0.76	0.76	71	0.40	0.6	0.02	18
	Max	144	15.7	0.09	0.05	0.01	4.73	4.74	246	1.36	3.4	0.09	44
	Min	50	2.0	0.04	0.05	0.01	2.82	2.83	83	0.43	1.8	0.03	2
	No. of Det.	5	1	4	0	0	5	5	5	1	5	5	5

< Laboratory analysis result was less than the limit of quantification or limit of detection

3.2.2 Nitrite and Nitrate

Nitrite (NO2) is a measure of a form of nitrogen that occurs as an intermediate in the nitrogen cycle. It is unstable and can rapidly be oxidized to nitrate or reduced to nitrogen gas. Nitrite is a source of nutrients for plants and can be toxic to aquatic life in relatively low concentrations. Nitrite concentrations were low at Blue Marsh Reservoir during 2021 (Table 3-2). Concentrations ranged from less than the reporting limit of 0.01 mg/L to 0.17 mg/L for all stations and depths during the sampling season.

Nitrate (NO3) is the measure of the most oxidized and stable form of nitrogen. It is the principal form of combined nitrogen in natural waters. Nitrate is the primary form of nitrogen used by plants as a nutrient to stimulate plant growth. Nitrate concentrations maintained similar seasonal patterns across all stations in Blue Marsh Reservoir in 2021. Consistently higher concentrations were measured at upstream tributary station BM-5S (Table 3-2). Elevated nitrate concentrations at this station are likely attributed to agriculture activities in the watershed and subsequent runoff and loading. Concentrations at all sampling locations and depths ranged from 1.12 to 7.10 mg/L. Seasonal mean concentrations at surface tributary stations BM-5S (5.78 mg/L) maintained the highest concentrations of all stations and dates sampled.

Concentrations of nitrate and nitrite measured at Blue Marsh Reservoir followed PADEP water quality standards during 2021. The state water quality standard for nitrogen from nitrite and nitrate sources is a summed concentration of not more than 10 mg/L. Summed concentrations at all stations and sampling dates were less than the State standard. The highest nitrogen summed concentration of 7.11 mg/L occurred in the surface waters at station BM-5S in late June.

3.2.3 Total Kjeldahl Nitrogen

Total Kjeldahl nitrogen (TKN) is a measure of organic nitrogen that is inclusive of ammonia. Organic nitrogen is not immediately available for biological activity and is therefore not available for plant growth until decomposition to inorganic form occurs. In general, TKN remained low but variable throughout the water column of Blue Marsh Reservoir in 2021 (Table 3-2). Concentrations measured at all stations and depths in the reservoir and tributaries ranged from less than the laboratory reporting limit of 0.48 mg/L to 2.56 mg/L.

3.2.4 Total Phosphorus

Total phosphorus (TP) is a measure of both organic and inorganic forms of phosphorus. It is an essential plant nutrient and is often the most limiting nutrient to plant growth in freshwater systems. Inputs of phosphorus are the prime contributing factors to eutrophication in most freshwater systems. Phosphorus bound to bottom sediments in

lakes can be released when oxygen levels are depleted in bottom waters. This phosphorus then becomes available for plant growth.

EPA guidance for nutrient criteria in lakes and reservoirs suggests a maximum concentration for total phosphorus of 0.01-mg/L (EPA 2000). Lakes and reservoirs exceeding this concentration are more likely to experience algal bloom problems during the growing season. Total phosphorus in the watershed and lake body of Blue Marsh Reservoir was frequently measured at concentrations well above this standard during 2021 (Table 3-2). Bottom deep waters within the lake and upstream tributary stations BM-5S and BM-11S routinely had higher measured concentrations. This may be a direct result of nutrient enrichment in the upstream watershed and phosphorus release from bottom sediments during anoxic conditions experienced in Blue Marsh Reservoir annually. In 2021, 46 of the 105 samples measured for total phosphorus at Blue Marsh Reservoir, including its tributaries, were greater than the EPA guideline. The single sample values for all stations and depths ranged from 0.61 mg/L to <0.01 mg/L. Agriculture and other land use found in the watershed contribute to the historic and currently measured elevated total phosphorus levels in Blue Marsh reservoir.

3.2.5 Total Dissolved Phosphorus

Total dissolved phosphorus (DISS P) in the water column of Blue Marsh Reservoir is readily available for use by aquatic plants and algae. In 2021, single sample values for all stations and depths ranged from 0.09 mg/L to the minimum laboratory reporting limit of <0.05 mg/L (Table 3-2).

3.2.6 Total Dissolved Solids

Total dissolved solids (TDS) are a measure of the amount of non-filterable dissolved material in the water. Dissolved salts such as sulfate, magnesium, chloride, and sodium contribute to elevated levels. Total dissolved solids (TDS) in the water column of Blue Marsh Reservoir at all stations and depths ranged from 357 mg/L to 83 mg/L in 2021 (Table 3-2). Upstream tributary station BM-5S routinely had the highest monthly measured concentrations and maintained the highest seasonal sampling average of 280 mg/L. The state water quality standard for TDS is a maximum concentration of 500 mg/L. Total dissolved solids measured at Blue Marsh Reservoir in 2021 followed PADEP water quality standards.

3.2.7 Total Suspended Solids

Total suspended solids (TSS) are a measure of the amount of filterable particulate matter that is suspended within the water column. High concentrations increase the turbidity of the water and can hinder photosynthetic activity, result in damage to fish gills, and cause impairment to spawning habitat (smothering). Total suspended solids in the

waters of Blue Marsh Reservoir were generally low during the 2021 sampling period (Table 3-2). Sample results at all stations and depths ranged from 367 mg/L to <1.0 mg/L. The maximum and consistently higher TSS readings were taken in the deep bottom water samples at reservoir lake sampling stations. Uncharacteristically high single TSS readings from these water samples can be attributed to sample collection error. Bottom sediments can be re-suspended during the sample collection process and are sometimes inadvertently included in the sample. Nearly all the elevated sample results occurred at or near bottom water sampling stations and likely were associated with sediment disturbance. The Pennsylvania Department of Environmental Protection has not issued a water quality standard for TSS.

3.2.8 Biochemical Oxygen Demand

Five-day biochemical oxygen demand (BOD) is a measure of the oxygen-depleting burden imposed by organic material present in water. It measures the rate of oxygen uptake by organisms in the water sample over a period of time. It is an indicator of the quality of a water body and the degree of pollution by biodegradable organic matter can therefore be inferred. The five-day biochemical oxygen demand and commonly accepted water quality inferences are as follows:

- 1-2 mg/L is associated with very clean water and little biodegradable wastes;
- 3-5 mg/L is associated with moderately clean water with some biodegradable wastes;
- 6-9 mg/L is associated with fairly polluted water, many bacteria, and much biodegradable wastes;
- 10+ mg/L is associated with very polluted water and large amounts of biodegradable wastes.

Biochemical oxygen demand in the waters of Blue Marsh Reservoir ranged from 15.7 mg/L to <2.0 mg/L (Laboratory method minimum reporting limit) during the 2021 sampling season (Table 3-2). Considering the rare instances of elevated levels, it is inferred that upstream tributaries and the lake body of the reservoir ranged from very clean with little biodegradable wastes to moderately clean waters with some biodegradable wastes at various time during the sampling season. The Pennsylvania Department of Environmental Protection (PADEP) does not issue a water quality standard for BOD.

3.2.9 Alkalinity

Alkalinity is a measure of the acid-neutralizing capacity of water. Waters that have high alkalinity values are considered undesirable because of excessive hardness and high concentrations of sodium salts. Water with low alkalinity has little capacity to buffer acidic inputs and is susceptible to acidification (low pH). The PADEP standard is a minimum concentration of 20-mg/L $CaCO_3$ except where natural conditions are less.

Throughout the monitoring period in 2021, concentrations at all stations and depths for Blue Marsh Reservoir ranged from 50 mg/L $CaCO_3$ to 200 mg/L $CaCO_3$ (Table 3-2). Upstream tributary station BM-5S maintained the highest seasonal mean concentration of 169 mg/L $CaCO_3$. Concentrations of alkalinity measured at Blue Marsh Reservoir followed PADEP water quality standards for all samples collected during 2021.

3.2.10 Total Organic Carbon

Total organic carbon (TOC) is a measurement of the amount of dissolved and particulate carbon that is bound in organic compounds. TOC can be derived from decaying vegetation, bacterial growth, and metabolic activities of living organisms. The bulk of organic carbon in water is composed of humic substances and partly degraded animal and plant materials. Other sources of TOC can include agricultural chemicals such as herbicides and insecticides and wastewater treatment plant discharges. The amount of carbon in a freshwater stream or lake is an indicator of the organic character of a water body. High organic content can increase the growth of microorganisms which contribute to the depletion of oxygen. Total organic carbon concentrations in the water column and tributaries of Blue Marsh Reservoir during 2021 were typical of what might be found in a eutrophic lake (Table 3-2). Concentrations of TOC at all stations and depths ranged from 1.5 mg/L to 3.6 mg/L.

3.2.11 Chlorophyll *a*

Chlorophyll a is the measure of the plant chlorophyll "a" primary pigment which helps plants get energy from light. It is found in most plants, algae, and cyanobacteria. Chlorophyll a measures increase in relation to algal densities in a water body. Chlorophyll a is used as a measure of algal biomass. In 2021, the average concentration during the monitoring period for lake surface waters (</=10 feet) at lake station BM-6 was 10.44 ug/L with the highest concentrations seen during mid-July (Appendix A). Upstream surface water tributary stations maintained lower concentrations throughout the sampling season. Algal productivity in tributary waters would be expected to be less than lake surface waters as a result of thermal warming, longer in lake water residence time, and increased nutrient concentrations and availability at lake stations.

3.3 TROPHIC STATE DETERMINATION

Carlson's (1977) trophic state index (TSI) is a method of quantitatively expressing the magnitude of eutrophication for a lake. The trophic state analysis calculates separate indices for eutrophication based on measures of total phosphorus, chlorophyll a, and secchi disk depth. Index values for each parameter range on the same scale from 0 (least enriched) to 100 (most enriched). The resulting indices can also be compared to qualitative threshold values that correspond to levels of eutrophication: oligotrophic (TSI <40), mesotrophic (TSI >40), and eutrophic (TSI >50).

During 2021, TSI's calculated for measures of secchi disk depth classified Blue Marsh Reservoir as eutrophic in May (51.53), early June (51.53), late June (51.94), July (59.30) and August (51.53) (Fig. 3-7). TSIs calculated for measures of total phosphorus classified Blue Marsh Reservoir as oligotrophic in May (37.35), early June (37.35), late June (37.35), July (37.35) and August (37.35). TSI's calculated for measures of chlorophyll a classified Blue Marsh Reservoir as eutrophic in May (54.92), early June (51.16), late June (50.06), July (58.18) and August (51.28).

Carlson (1977) warned against averaging TSI values estimated for different parameters, and instead suggested giving priority to chlorophyll a in the summer and to phosphorus in the spring, fall, and winter. The trophic state of the reservoir was predominantly eutrophic during the 2021 sampling season. The EPA (1983) also provides criteria for defining the trophic conditions of lakes of the North Temperate Zone based on concentrations of total phosphorus, chlorophyll *a*, and secchi depth (Table 3-3). Considering the general agreement between the EPA classifications with that of the Carlson TSI's, the trophic condition of Blue Marsh Reservoir was predominantly mesotrophic/ eutrophic in 2021.

Table 3-3. EPA trophic classification criteria and average monthly measures for Blue Marsh Reservoir in 2021.

Water Quality Variable	Oligo-trophic	Meso-trophic	Eutrophic	10 May	07 June	28 June	19 July	16 August
Total phos. (ppb)	<10	10-20	>20	<10	<10	<10	10	<10
Chlorophyll (ppb)	<4	4-10	>10	11.93	8.13	7.27	16.63	8.23
Secchi depth (m)	>4	2-4	<2	1.8	1.8	1.75	1.05	1.8

3.4 RESERVOIR COLIFORM BACTERIA MONITORING

Total coliform bacteria include Escherichia coliform (E. coli) and related bacteria that are associated with fecal discharges. Fecal coliform bacteria are a subgroup of the total coliform and are normally associated with waste derived from human and other warm-blooded animals and indicate the presence of fecal contamination but not the associated risk. With respect to EPA and PADEP water quality standards, fecal coliform bacteria standards have been replaced with a recommended E. coli criterion. Bacteria was monitored in the tributary and lake surface waters at Blue Marsh Reservoir on five occasions (May-August) during 2021 (Table 3-4). Blue Marsh surface water samples were not analyzed for fecal coliform bacteria in 2021.

Escherichia coliform is the most reliable indicator of fecal bacterial contamination of surface waters in the United States according to water quality standards set by the EPA (2000). The EPA recommendation for recreational water quality standards for E. coli is

based on two criteria: a geometric mean of 126 organisms/100 ml (geometric mean of five samples collected over not more than a 30 consecutive day period) threshold and 235 organisms/100 ml (single water sample) threshold.

Total coliform values for all stations ranged from 46 colonies/100-ml to greater than the detection limit of >2420 colonies/100-ml. Bacteria in natural waters are common and their presence in the sample is not necessarily a human health concern. No State or federal standards exist for total coliform for water contact recreation.

Given that Corps regular monitoring was completed utilizing single day grab samples, single sample results were compared to the EPA/PADEP Escherichia coli single sample criteria in 2021. The E. coli samples collected at Blue Marsh Reservoir did exceed the 235 organisms/100 ml single water sample threshold on eight occasions at upstream tributary stations BM-5S and BM-11S. Escherichia coliform values for these two stations ranged from 64 colonies/100-ml to 548 colonies/100-ml. Elevated counts at stations BM-5S and BM-11S are likely attributed to agricultural activities in those upstream watersheds. Water contact recreation, such as water skiing, is permitted at Blue Marsh Reservoir. No long term elevated bacteria counts were recorded in the main reservoir body. The Corps recreational public swimming beach area is also monitored for bacteria and managed separately from the monthly routine lake water quality sampling (see Section 3.5).

3.5 WEEKLY SWIMMING BEACH BACTERIA MONITORING

Weekly coliform bacteria monitoring was conducted at the public swimming beach of the Dry Brooks Day Use Area of Blue Marsh Reservoir to gauge compliance with Pennsylvania Department of Health and Unites States Environmental Protection Agency bathing beach water quality standards to ensure public safety for this water contact recreation area.

Escherichia coli is the most reliable indicator of fecal bacterial contamination of surface waters in the United States according to water quality standards set by the EPA (2000). The EPA recommendation for recreational water quality standards for E. coli is based on two criteria: a geometric mean of 126 organisms/100 ml (geometric mean of five samples collected over not more than a 30 consecutive day period) threshold and 235 organisms/100 ml (single water sample) threshold. Samples for E. coli analysis were routinely collected twice weekly from 3 fixed beach area stations on each sampling date in the regulated swimming area. During the 2021 recreation season, E. coli samples at the swimming beach area of Blue Marsh Reservoir exceeded the single sample criteria on two occasions (Table 3-5). No sampling points exceeded the 5-day geometric mean criteria. No bacteria related beach closures occurred during the 2021 recreation season. High bacterial readings often correlate with precipitation and subsequent runoff from the watershed and beach area which is populated with a resident Canada goose population.

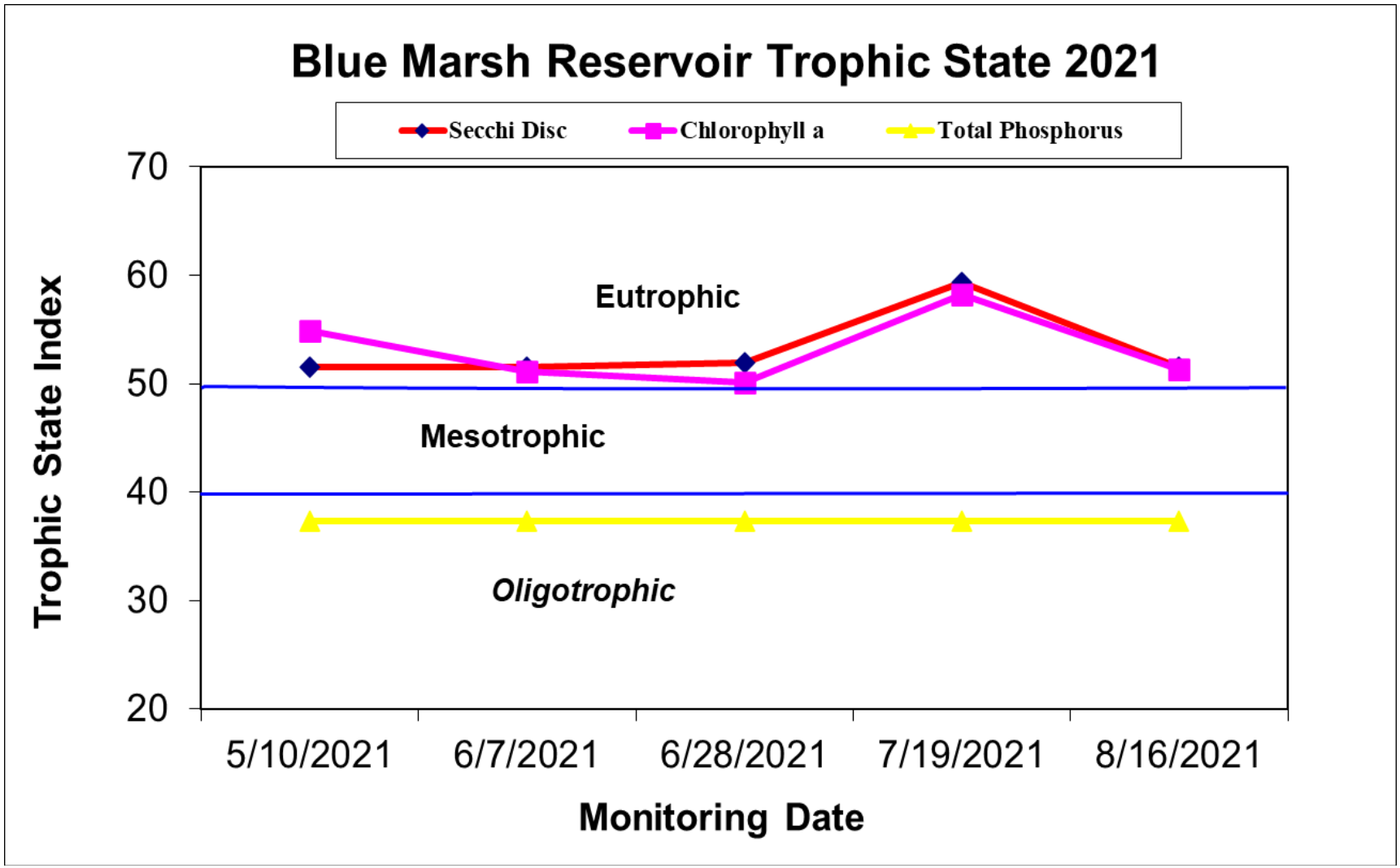


Figure 3-7. Trophic state indices calculated from secchi disk depth and concentrations of total phosphorus and chlorophyll *a* at Blue Marsh Reservoir in 2021.

Table 3-4. Surface Water Stations Bacteria counts (colonies/100 ml) at Blue Marsh Reservoir during 2021. Shaded values indicate results were not in compliance with EPA and PA Department of Health water quality standards for E-coli levels at bathing beaches: maximum single count greater than 235 colonies/100-ml.
NS = Not Sampled

STATION	DATE	Total Coliform		Fecal Coliform (FC)		Escherichia coli	
BM-1S	5/10/2021		219		NS		1
	6/7/2021	>	2420		NS		9
	6/28/2021		1990		NS		4
	7/19/2021	>	2420		NS		1
	8/16/2021		2420		NS		5
BM-2S	5/10/2021		46		NS	<	1
	6/7/2021		99		NS		2
	6/28/2021		79		NS		1
	7/19/2021		2420		NS		6
	8/16/2021	>	2420		NS	<	1
BM-5S	5/10/2021	>	2420		NS		345
	6/7/2021	>	2420		NS		365
	6/28/2021	>	2420		NS		236
	7/19/2021	>	2420		NS		261
	8/16/2021	>	2420		NS		96
BM-6S	5/10/2021		49		NS		2
	6/7/2021		104		NS		3
	6/28/2021		816		NS		28
	7/19/2021	>	2420		NS		3
	8/16/2021	>	2420		NS		12
BM-7S	5/10/2021		105		NS		1
	6/7/2021		99		NS		2
	6/28/2021		166		NS	<	1
	7/19/2021	>	2420		NS		3
	8/16/2021	>	2420		NS		1
BM-8S	5/10/2021		91		NS		1
	6/7/2021		66		NS	<	1
	6/28/2021		102		NS		1
	7/19/2021		649		NS		1
	8/16/2021	>	2420		NS		1
BM-9S	5/10/2021		291		NS		2
	6/7/2021		210		NS		2
	6/28/2021		272		NS	<	1
	7/19/2021		816		NS		1
	8/16/2021	>	2420		NS		1
BM-10S	5/10/2021		1550		NS		43
	6/7/2021		416		NS		24
	6/28/2021		166		NS		2
	7/19/2021		866		NS		10
	8/16/2021	>	2420		NS		4
BM-11S	5/10/2021	>	2420		NS		285
	6/7/2021	>	2420		NS		548
	6/28/2021	>	2420		NS		435
	7/19/2021	>	2420		NS		365
	8/16/2021	>	2420		NS		64

Table 3-5. Maximum counts and 5-day e-coli running geometric means of the three swimming beach stations at Blue Marsh Reservoir in 2021. Shaded values indicate results were not in compliance with EPA and PA Department of Health water quality standards for e-coli levels at one or more beach sampling stations sampled on the same day: maximum single count greater than 235 colonies/100-ml; 5-day geometric mean greater than 126 colonies/100-ml.

Week	Date	Single Maximum Count	Sampling Station 5-Day Geometric Means		
			sb1	sb2	sb3
Week 1	5/24/2021	11	-	-	-
	5/27/2021	71	-	-	-
Week 2	6/1/2021	36	-	-	-
	6/4/2021	120	-	-	-
Week 3	6/8/2021	3	13.90	15.66	20.79
	6/10/2021	37	15.96	19.96	20.31
Week 4	6/14/2021	5	9.39	12.86	8.96
	6/17/2021	17	7.12	6.28	8.67
Week 5	6/21/2021	26	6.08	3.38	3.82
	6/24/2021	4	8.02	4.47	3.52
Week 6	6/28/2021	20	9.64	3.29	3.82
	7/1/2021	20	11.29	4.54	6.28
Week 7	7/6/2021	51	16.35	7.58	6.28
	7/8/2021	79	20.41	9.22	9.64
Week 8	7/12/2021	102	38.78	17.62	20.21
	7/15/2021	96	53.08	19.11	17.59
Week 9	7/19/2021	345	105.73	19.11	19.08
	7/22/2021	154	107.34	24.91	29.65
Week 10	7/26/2021	144	69.51	44.41	41.65
	7/29/2021	50	50.48	34.29	37.82
Week 11	8/2/2021	145	37.60	49.93	71.50
	8/5/2021	8	15.42	30.87	60.80
Week 12	8/9/2021	22	9.54	22.90	41.20
	8/12/2021	18	8.49	13.93	29.66
Week 13	8/16/2021	52	9.60	15.32	29.90
	8/19/2021	258	15.70	9.01	24.63
Week 14	8/23/2021	148	22.08	21.31	22.42
	8/26/2021	3	18.38	16.43	12.08
Week 15	8/30/2021	12	21.90	15.52	10.74
Week 16	9/7/2021	54	20.86	14.31	10.82

3.6 ALGAE AND CYANOBACTERIA MONITORING

Cyanobacteria and algae are photosynthetic organisms found in aquatic environments. Cyanobacteria, formerly known as blue-green algae, are a group of bacteria. These bacteria were originally called blue-green algae because dense growths often turn the water pea green, brownish-green or blue-green. Dense growths of these organisms are often referred to as a "bloom". They are found in all lakes and are a natural part of the lake ecosystem.

The development and proliferation (intensity) of algal blooms result from a combination of environmental factors including available nutrients (quantity and quality), sunlight, air and water temperature, ecosystem disturbance (stable or wind mixing conditions, turbidity), hydrology (precipitation, river flow and water storage levels) and water chemistry. As photosynthetic organisms, high nutrient and light concentrations can promote a population explosion and result in blooms, especially during warm weather. In high densities, some species of these organisms produce potent natural toxins. Not all blue-green algae or algal blooms produce toxins. Blooms with the potential to harm human health or aquatic ecosystems are referred to as harmful algal blooms or HABs. In freshwater systems, cyanobacteria can produce HABs and toxins that can harm people, animals, aquatic ecosystems, drinking water supplies, and recreational activities, including swimming and recreational fishing.

Algal blooms have historically been a concern at Blue Marsh Reservoir as the watershed is approximately 75% agriculture and tributary inflows contain elevated levels of nutrients. In the watershed, runoff and soil erosion from fertilized agricultural areas and lawns, runoff from animal husbandry agricultural areas, erosion from river banks, river beds, and sewage effluent are major sources of nutrients entering water ways and tributaries of Blue Marsh Reservoir. All of these pathways are considered external sources and promote and support the growth of algae and cyanobacteria within the lake. In addition to these external sources, internal origins of nutrients comes from the reservoir sediments. Phosphate attaches to sediments. When dissolved oxygen concentrations are low in the water (anoxic conditions), sediments release phosphate into the water column. Anoxic conditions are experienced annually within Blue Marsh Reservoir causing the release of nutrients from bottom sediments. These nutrients are then recycled back into the water column and support the growth of algae and cyanobacteria.

In summer 2021, Blue Marsh Reservoir experienced rainfall events in the watershed in addition to extended periods of warm and sunny weather. U.S. Army Corps of Engineers staff observed varying densities of algal blooms throughout the reservoir. Figures 3-8, 3-9 and 3-10 represent typical algal bloom conditions observed at Blue Marsh Reservoir annually. In response to these observations, the Philadelphia District took the following steps:

1. The Philadelphia District USACE initiated coordination with the Pennsylvania Department of Environmental Protection and water supply interests regarding response and monitoring plans.
2. Philadelphia District USACE staff received field sampling methodology training provided by the Pennsylvania Department of Environmental Protection.
3. Philadelphia District USACE maintained posted public notices at lake recreational access locations (in addition to social media postings with links to Centers for Disease Control and Prevention cyanobacteria website) highlighting the presence and risks of potential harmful toxic algae and to pursue lake recreation at your own risk.

4. Philadelphia District USACE initiated and conducted increased sampling and monitoring efforts throughout the recreation season in cooperation with the Pennsylvania Department of Environmental Protection.

In partnership with the Pennsylvania Department of Environmental Protection, the Philadelphia District conducted sampling and testing of algal blooms throughout the reservoir to include the recreational swimming beach area (Table 3-6). Samples were collected by USACE staff and provided to Pennsylvania Department of Environmental Protection for analysis and reporting per the Pennsylvania draft HAB sampling and response guidelines currently still in development. Samples were analyzed for colony counts and genera (Table 3-7). Based on cyanobacteria screening, if there were enough cyanobacteria, then a toxin analysis was completed (Table 3-8). Sampling and laboratory test results shown high cell colony densities of cyanobacteria within the lake during bloom conditions and a variety of potential toxigenic producing genera.

Algae colony densities were variable with same samples elevated in visually identified bloom conditions. Toxin production levels were also variable but did not exceed the Environmental Protection Agency (2019) recommended recreational contact water criteria in any samples. The Western Berks Water Authority maintains a raw water intake downstream of the reservoir in the Tulpehocken Creek and has a direct lake water withdrawal pipeline connected to the existing reservoir water control tower. Raw water lake samples did exceed EPA/PADEP drinking water criteria for microcystins within the lake surface waters on multiple occasions. No lake/reservoir recreational closures were initiated because of algal blooms or toxin production. However, the entire lake remained in a public warning condition for much of the recreational season.

TABLE 3-6. Algae sampling fixed station locations at Blue Marsh Reservoir in 2021

Location Description	Latitude	Longitude	Sample Type
Beach Grab	40.383935	-76.040554	Shoreline Grab
Beach Transect	40.383861	-76.050560	Beach Transect (Composite)
Main Lake - 100m off State Hill Boat Launch	40.370300	-76.043700	Surface Grab
Main Lake - near Dam Tower	40.380252	-76.032335	Surface Grab and Deep Grabs
Main Lake - Spring Creek Arm	40.388500	-76.079200	Surface Grab
Main Lake - Licking Creek Arm near Bernville Road Bridge	40.401800	-76.058800	Surface Grab
Main Lake - Tulpehocken Creek Arm near Church Road Bridge	40.405800	-76.079700	Surface Grab

Figure 3-8. Photographs of typical algal bloom conditions at the Philadelphia District USACE Blue Marsh Reservoir during the summer and fall recreational season.

Figure 3-9. Photographs of typical algal bloom conditions at the Philadelphia District USACE Blue Marsh Reservoir during the summer and fall recreational season.

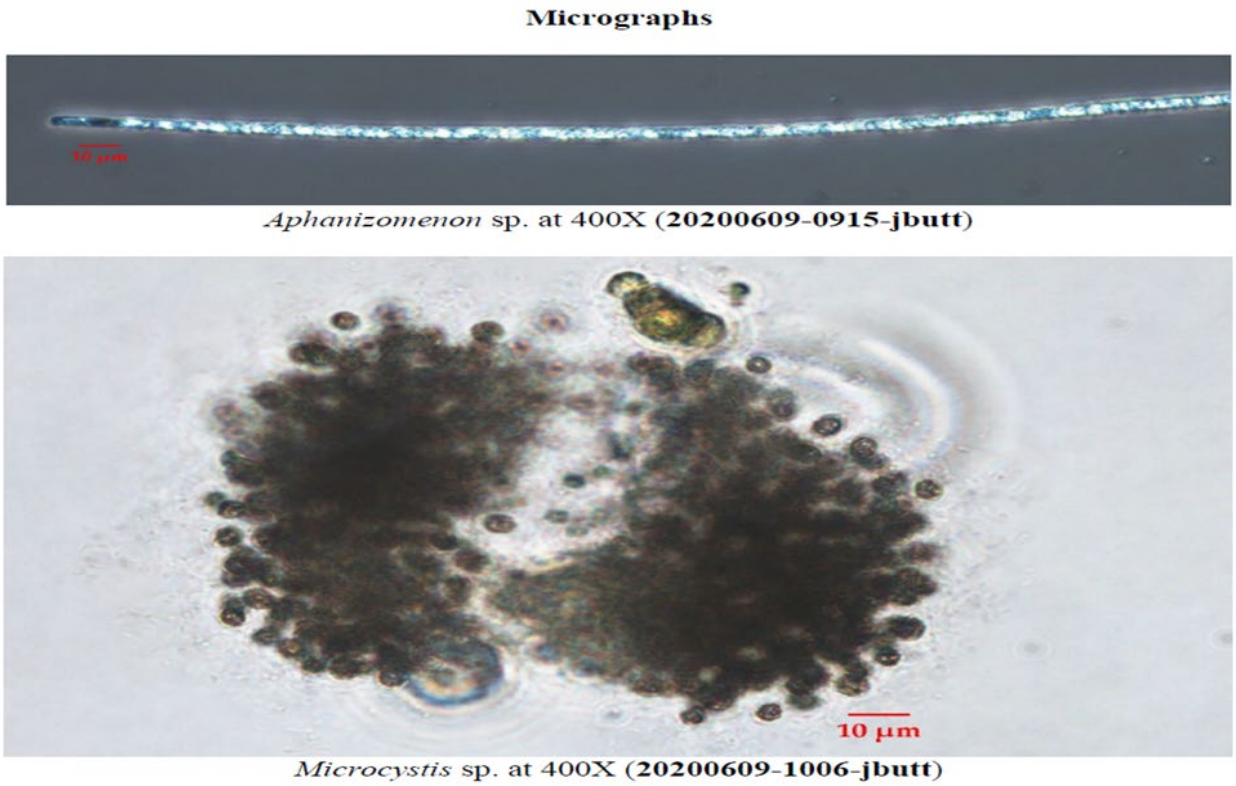


Figure 3-10. Laboratory microscopic photographs of toxigenic cyanobacteria typically found in Blue Marsh Reservoir water samples collected during the summer and fall recreational season.

TABLE 3-7. Pennsylvania Bureau of Laboratories and Green Water Laboratories colony count (colonies per ml) and toxin producing genera identified for samples collected in 2021 at Blue Marsh Dam and Reservoir in Leesport, Pennsylvania.

Sampling Date: 8/4/2021											
Sampling Sites	Microcystis	Cylindrospermopsis	Raphidiopsis	Pseudanabaena	Oscillatoria	Woronchinia	Planktothrix	Lyngbya	Dolichospermum	Cuspidothrix	Aphanizomenon
Swim Beach Grab	76							210	10		210
Swim Beach Grab	29							200	10		340
Swim Beach Transect	20							10	10		80
Swim Beach Transect	10							100	10		160
Church Road Bridge	10							10	19		1500
Church Road Bridge	10							29	14		860
Church Road Bridge Scum Sample	57							190	38		27000
Licking Creek	140					10		1300	10		780
Spring Creek	72							57			230
State Hill Boat Launch	20			20				40			140
Dam Tower	20					100		60			220
Sampling Date: 8/22/2021											
Sampling Sites	Microcystis	Cylindrospermopsis	Raphidiopsis	Pseudanabaena	Oscillatoria	Woronchinia	Planktothrix	Lyngbya	Dolichospermum	Cuspidothrix	Aphanizomenon
Swim Beach Grab	14							10			1700
Swim Beach Transect	40							10			1800
Church Road Bridge	43							10			6000
Licking Creek	38							10			4300
Spring Creek	10							10			6100
State Hill Boat Launch	10							10			2300
Dam Tower	10							10			2600
Sampling Date: 8/25/2021											
Sampling Sites	Microcystis	Cylindrospermopsis	Raphidiopsis	Pseudanabaena	Oscillatoria	Woronchinia	Planktothrix	Lyngbya	Dolichospermum	Cuspidothrix	Aphanizomenon

Swim Beach Grab	10										3400
Swim Beach Transect	10										5500
Sampling Date: 8/30/2021											
Sampling Sites	Microcystis	Cylindrospermopsis	Raphidiopsis	Pseudanabaena	Oscillatoria	Woronchinia	Planktothrix	Lyngbya	Dolichospermum	Cuspidothrix	Aphanizomenon
Swim Beach Grab											3100
Swim Beach Transect								14			1600
Sampling Date: 9/7/2021											
Sampling Sites	Microcystis	Cylindrospermopsis	Raphidiopsis	Pseudanabaena	Oscillatoria	Woronchinia	Planktothrix	Lyngbya	Dolichospermum	Cuspidothrix	Aphanizomenon
Swim Beach Grab		1600		29		10					730
Swim Beach Transect		2100		10		20					860
Sampling Date: 9/20/2021											
Sampling Sites	Microcystis	Cylindrospermopsis	Raphidiopsis	Pseudanabaena	Oscillatoria	Woronchinia	Planktothrix	Lyngbya	Dolichospermum	Cuspidothrix	Aphanizomenon
Swim Beach Grab	170			19		38		76			12000
Swim Beach Transect	43			14		10		14			5900
Sampling Date: 9/29/2021											
Sampling Sites	Microcystis	Cylindrospermopsis	Raphidiopsis	Pseudanabaena	Oscillatoria	Woronchinia	Planktothrix	Lyngbya	Dolichospermum	Cuspidothrix	Aphanizomenon
Swim Beach Grab	240	1700		29							
Swim Beach Transect	100	2700		10							
Sampling Date: 10/5/2021											
Sampling Sites	Microcystis	Cylindrospermopsis	Raphidiopsis	Pseudanabaena	Oscillatoria	Woronchinia	Planktothrix	Lyngbya	Dolichospermum	Cuspidothrix	Aphanizomenon
Swim Beach Grab	>5		*	*			*			*	*
Swim Beach Transect	>3		*				*			*	*
Licking Creek (Scum Grab)	>50					>4	>10		1	>10	* Bloom Level
The Licking Creek sample contained the highest observed density of PTOX cyanobacteria for the Blue Marsh Lake sample collection in 2021											
Sampling Date: 10/13/2021											
Sampling Sites	Microcystis	Cylindrospermopsis	Raphidiopsis	Pseudanabaena	Oscillatoria	Woronchinia	Planktothrix	Lyngbya	Dolichospermum	Cuspidothrix	Aphanizomenon
Swim Beach Grab	1		>500				>5		1	>15	>10

Swim Beach Transect	>5		>300				>10			>30	>5
Sampling Date: 10/29/2021											
Sampling Sites	Microcystis	Cylindrospermopsis	Raphidiopsis	Pseudanabaena	Oscillatoria	Woronchinia	Planktothrix	Lyngbya	Dolichospermum	Cuspidothrix	Aphanizomenon
Church Road Bridge	3					>5					>10
Licking Creek	1										
Sampling Date: 11/1/2021											
Sampling Sites	Microcystis	Cylindrospermopsis	Raphidiopsis	Pseudanabaena	Oscillatoria	Woronchinia	Planktothrix	Lyngbya	Dolichospermum	Cuspidothrix	Aphanizomenon
Dam Tower Elevation 252						1					
Dam Tower Elevation 243											
Dam Tower Elevation 256											
Dam Tower Elevation 269											
Dam Tower Elevation 282											
Church Road Bridge											
Observed in Sample *											

TABLE 3-8. GreenWater Laboratory, Florida toxin analysis results for algae samples collected in 2021 at the USACE Blue Marsh Dam and Reservoir in Leesport, Pennsylvania.

Federal and State Drinking Water and Recreational Contact Criteria		Hepatotoxins – Liver Damage		Neurotoxins – Nerve Damage	
		Microcystins / Nodularins	Cylindrospermopsin	Anatoxin-a	Saxitoxin
Pennsylvania Drinking Water Standard		0.3 ppb	0.7 ppb	NA	NA
Ohio Drinking Water Standard- Child		0.3 ppb	0.7 ppb	20.0 ppb	0.3 ppb
EPA Drinking Water Health Advisories		0.3 - 1.6 ppb (Child) – (Adult)	0.7 - 3.0 ppb (Child) – (Adult)	NA	NA
Ohio Contact Recreational Standard		6.0 ppb	5.0 ppb	80.0 ppb	0.8 ppb
EPA Recommended Recreational Criteria		8.0 ppb	15.0 ppb	NA	NA
World Health Organization (2020a and 2020b) Recreational Recommended Criteria		24 ppb	NA	59 ppb	NA
Date	**Site**				
8/4/21	Swim Beach Grab	ND	ND	ND	ND
8/4/21	Swim Beach Grab	ND	<0.05 ppb	<0.15 ppb	0.02 ppb
8/4/21	Swim Beach Transect	ND	ND	ND	ND
8/4/21	Swim Beach Transect	ND	ND	ND	ND
8/4/21	Church Road Bridge	ND	0.07 ppb	<0.15 ppb	0.27 ppb
8/4/21	Church Road Bridge	ND	<0.05 ppb	<0.15 ppb	0.28 ppb
8/4/21	Church Road Bridge Scum Sample	ND	<0.05 ppb	<0.15 ppb	0.23 ppb
8/4/21	Licking Creek	ND	<0.05 ppb	<0.15 ppb	0.13 ppb
8/4/21	Spring Creek	ND	ND	ND	ND
8/4/21	State Hill Boat Launch	ND	ND	ND	ND
8/4/21	Dam Tower	ND	ND	ND	ND
8/22/21	Swim Beach Grab	ND	<0.05 ppb	0.23 ppb	0.05 ppb
8/22/21	Swim Beach Transect	ND	<0.05 ppb	0.16 ppb	0.05 ppb
8/22/21	Church Road Bridge	ND	<0.05 ppb	0.44 ppb	0.06 ppb
8/22/21	Licking Creek	ND	<0.05 ppb	0.22 ppb	0.04 ppb
8/22/21	Spring Creek	ND	<0.05 ppb	0.28 ppb	0.045 ppb
8/22/21	State Hill Boat Launch	ND	<0.05 ppb	0.20 ppb	0.06 ppb

8/22/21	Dam Tower	ND	<0.05 ppb	<0.05 ppb	0.05 ppb
8/25/21	Swim Beach Grab	ND	<0.05 ppb	<0.30 ppb	0.03 ppb
8/25/21	Swim Beach Transect	ND	<0.05 ppb	<0.30 ppb	0.03 ppb
8/30/21	Swim Beach Grab	ND	<0.05 ppb	<0.30 ppb	0.05 ppb
8/30/21	Swim Beach Transect	ND	<0.05 ppb	<0.30 ppb	0.08 ppb
9/7/21	Swim Beach Grab	0.56 ppb	<0.05 ppb	0.38 ppb	<0.05 ppb
9/7/21	Swim Beach Transect	0.49 ppb	ND	0.37 ppb	ND
9/8/21	Church Road Bridge	0.89 ppb	ND	0.72 ppb	ND
9/8/21	Licking Creek	0.67 ppb	ND	0.68 ppb	ND
9/8/21	Spring Creek	1.49 ppb	ND	0.52 ppb	ND
9/8/21	State Hill Boat Launch	0.52 ppb	ND	0.57 ppb	ND
9/8/21	Dam Tower	0.33 ppb	ND	0.65 ppb	ND
9/8/21	Dam Tower (40-50 Feet depth sample)	ND	ND	ND	ND
9/8/21	Reservoir Downstream Stilling Basin	ND	ND	ND	ND
9/15/21	Swim Beach Grab	2.60 ppb	ND	1.43 ppb	0.07 ppb
9/15/21	Swim Beach Transect	2.67 ppb	ND	1.54 ppb	0.07 ppb
9/29/21	Church Road Bridge	0.60 ppb	ND	0.35 ppb	ND
9/29/21	Licking Creek	1.32 ppb	ND	0.29 ppb	ND
9/29/21	Spring Creek	0.96 ppb	ND	0.43 ppb	ND
9/29/21	Spring Creek (Scum Grab Sample)	1.62 ppb	ND	0.32 ppb	ND
9/29/21	State Hill Boat Launch	0.91 ppb	ND	0.33 ppb	ND
9/29/21	Swim Beach Transect	0.74 ppb	ND	0.23 ppb	ND
9/29/21	Swim Beach Grab	0.69 ppb	ND	0.24 ppb	ND
9/29/21	Dam Tower (Deep Water Sample)	0.32 ppb	ND	0.07 ppb	ND
9/29/21	Dam Tower (Surface)	0.71 ppb	ND	0.19 ppb	ND

10/5/21	Swim Beach Grab	1.04 ppb	ND	0.40 ppb	ND
10/5/21	Swim Beach Transect	0.40 ppb	ND	0.39 ppb	ND
10/5/21	Licking Creek (Scum Grab)	6.7 ppb	ND	0.31 ppb	ND
10/13/21	Swim Beach Grab	0.30 ppb	ND	0.50 ppb	ND
10/13/21	Swim Beach Transect	0.31 ppb	ND	0.49 ppb	ND
10/29/21	Church Road Bridge	1.67 ppb	ND	ND	ND
10/29/21	Licking Creek	ND	ND	ND	ND
11/1/21	Church Road Bridge	ND	ND	ND	ND
11/1/21	Dam Tower Pool Elevation 243	ND	ND	ND	ND
11/1/21	Dam Tower Pool Elevation 252	ND	ND	ND	ND
11/1/21	Dam Tower Pool Elevation 256	ND	ND	ND	ND
11/1/21	Dam Tower Pool Elevation 269	ND	ND	ND	ND
11/1/21	Dam Tower Pool Elevation 282	ND	ND	ND	ND

µg/L (micrograms per liter) = ppb (part per billion) = ng/ml (Nanogram per milliliter)
ND – Not Detected or less than laboratory detection limit

4.0 REFERENCES

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APPENDIX A

BLUE MARSH RESERVOIR 2021
STRATIFICATION DATA TABLES

2021 Blue Marsh Stratification/Profile

Station	Date	Time	Depth	Temp	DO	DO	pH	pHmV	ORP	Turbidity	Chloro.	SpCond
	M/D/Y	hh:mm:ss	ft	C	%	mg/L		mV	mV	NTU	ug/L	mS/cm
BM-1	5/10/2021	07:42:29	1.0	14.90	98.8	9.97	8.18	-108.0	143.7	1.7	7.1	0.289
	6/7/2021	7:20:49	1.0	18.49	95.5	8.94	7.53	-71.2	120.4	3.2	8.8	0.340
	6/28/2021	7:38:54	1.0	21.07	88.9	7.91	7.31	-59	183.7	1.9	8.5	0.376
	7/19/2021	7:49:21	1.0	19.78	89.1	8.13	7.3	-58.2	163	2	3.7	0.382
	8/16/2021	8:00:51	1.0	21.7	81.2	7.13	7.06	-44.7	152.5	2.8	2	0.414
BM-2	5/10/2021	9:53:25	0.5	15.54	117.9	11.74	8.55	-129.1	118.6	1.2	7.6	0.295
		9:52:34	5	15.54	117.6	11.71	8.53	-127.7	119.6	1.0	15.2	0.295
		9:51:45	10	15.54	116.6	11.61	8.54	-128.6	118	1.9	14.4	0.296
		9:51:03	15	15.53	115.2	11.48	8.51	-127	118.7	1.8	13.6	0.295
		9:49:45	20	15.43	107.8	10.76	8.38	-119.3	123	1.4	12.6	0.294
		9:48:23	25	14.34	77.1	7.88	7.89	-91.5	129.5	1.3	7.4	0.302
		9:46:50	30	13.54	61.2	6.36	7.65	-77.5	132.3	2.5	6.5	0.304
		9:45:27	35	13	49.2	5.18	7.53	-70.6	132.6	3.6	4.8	0.300
		9:43:02	40	12.41	32.7	3.49	7.43	-65.3	125.6	8.3	6	0.295
		9:42:14	45	12.36	32.9	3.52	7.46	-66.7	149.3	20.5	8.7	0.295
BM-2	6/7/2021	9:23:25	0.5	25.43	148.8	12.19	8.64	-137.2	92.8	1.3	5.7	0.362
		9:22:30	5	23.95	148.8	12.53	8.63	-136	93.7	2.4	8.1	0.349
		9:21:20	10	21.78	157.7	13.84	8.61	-134.5	94	3.9	11.3	0.334
		9:18:40	15	18.6	80.3	7.5	7.78	-85.8	113.8	5.1	14.9	0.339
		9:16:02	20	17.08	51.1	4.92	7.52	-71	122.1	4.0	13.7	0.358
		9:14:30	25	15.57	36.5	3.63	7.46	-67.2	124.6	3.7	9.9	0.345
		9:13:00	30	14.84	23	2.33	7.43	-65.3	126.4	3.3	4.9	0.342
		9:10:55	35	13.78	5.7	0.59	7.4	-63.8	128	2.4	3.3	0.328
		9:09:11	40	13.42	3.4	0.35	7.42	-64.7	131.6	9.9	1.5	0.326
BM-2	6/28/2021	10:01:17	0.5	26.35	126.3	10.17	8.54	-131.9	64.1	1.6	5.5	0.372
		10:00:53	5	26.06	125.3	10.15	8.53	-131.2	62.9	2.7	7.9	0.370
		9:59:19	10	25.43	115.7	9.47	8.37	-121.4	59.6	2.4	11.4	0.372
		9:57:17	15	23.1	39.3	3.36	7.47	-68.3	68.5	5.4	23.1	0.394
		9:55:50	20	19.97	2.8	0.25	7.33	-60.1	62.6	2.1	5.4	0.397
		9:54:46	25	17.26	2.6	0.25	7.34	-60.7	58.2	0.3	4	0.366
		9:53:44	30	15.36	2.6	0.26	7.36	-61.8	61.8	0.2	2.6	0.354
		9:52:54	35	14.43	2.8	0.28	7.39	-62.9	68.6	0.0	1.6	0.347
		9:51:17	40	13.44	3.2	0.34	7.41	-64	69.7	2.4	1.5	0.340
		9:50:10	45	13.37	3.9	0.41	7.43	-65.1	67.6	3.1	1.6	0.340
BM-2	7/19/2021	9:38:34	0.5	27.67	142	11.17	8.58	-134.3	84.9	8.2	14.5	0.326
		9:36:50	5	27.6	138.1	10.88	8.52	-130.9	79.4	7.8	19	0.327
		9:36:06	10	27.43	129.1	10.2	8.35	-120.8	81	7.9	16.8	0.329
		9:34:25	15	25.56	17.7	1.44	7.41	-65.1	75.3	1.2	4.9	0.404
		9:32:26	20	23.88	3.5	0.3	7.34	-61.2	59.1	1	4	0.425
		9:31:29	25	22.6	3.4	0.29	7.34	-61.1	53.6	0.9	2.7	0.422
		9:30:15	30	20.58	3.4	0.31	7.35	-61.3	54.8	2.6	2.5	0.408
		9:29:17	35	18.42	3.3	0.31	7.35	-61	60.9	2.6	1.7	0.396
		9:27:58	40	16.64	3.4	0.33	7.34	-60.7	66.9	3.5	1.8	0.386
		9:26:31	45	15.27	3.9	0.39	7.31	-58.6	66.3	12.7	2.6	0.379

2021 Blue Marsh Stratification/Profile

Station	Date	Time	Depth	Temp	DO	DO	pH	pHmV	ORP	Turbidity	Chloro.	SpCond
	M/D/Y	hh:mm:ss	ft	C	%	mg/L		mV	mV	NTU	ug/L	mS/cm
		9:39:28	0.5	27.74	131.3	10.32	8.49	-129.2	76.2	1.7	8.4	0.332
		9:38:01	5	27.76	128.9	10.13	8.42	-125.3	75.2	2.1	9.9	0.333
BM-2		9:37:06	10	27.72	121.8	9.58	8.34	-120.4	73.1	2.8	9.5	0.334
	8/16/2021	9:35:27	15	25.87	37.7	3.07	7.43	-66.2	73.1	2.3	7.9	0.359
		9:34:18	20	24.68	3.8	0.31	7.31	-59	70.3	1.7	5.7	0.371
		9:32:56	25	23.91	5.4	0.45	7.34	-60.9	67.2	0.2	2.5	0.396
		9:32:11	30	23.17	8.1	0.69	7.38	-63.1	69.7	0.2	1.8	0.408
		9:26:32	35	22.65	4.6	0.4	7.23	-54.5	5.3	11.1	7.3	0.409
		9:25:09	40	22.41	7.6	0.66	7.29	-58	19.1	20.1	6	0.409
	5/10/2021	13:02:28	1.0	12	106.9	11.5	8.07	-100.8	149.3	3.7	0.5	0.435
	6/7/2021	12:35:37	0.5	21.16	88.3	7.84	7.85	-90.5	140.2	7.1	0.3	0.528
BM-5	6/28/2021	13:02:05	1.0	23.13	96	8.2	8	-99.6	144.9	4.1	0.1	0.581
	7/19/2021	12:39:45	0.5	20.16	95.6	8.65	7.9	-92.8	162.3	5.9	0.6	0.544
	8/16/2021	12:55:07	1.0	22.69	103.5	8.92	7.91	-93.8	162.5	7.1	3.5	0.540
		9:24:46	0.5	15.53	116.2	11.57	8.57	-130.1	120.5	1.6	11.1	0.288
		9:24:03	5	15.55	115.6	11.52	8.54	-128.6	121.9	1.3	13	0.288
		9:23:12	10	15.56	115.4	11.49	8.54	-128.6	121.6	1.1	11.7	0.288
		9:22:26	15	15.56	114.9	11.44	8.55	-128.9	121.3	1.3	12.6	0.288
		9:20:13	20	15.56	111.9	11.13	8.49	-125.5	122.3	1.1	12.3	0.289
BM-6	5/10/2021	9:17:57	25	13.82	72.5	7.49	7.8	-86.1	134	1	7.5	0.291
		9:15:55	30	13.18	59.7	6.26	7.57	-73.2	138	1.2	6.3	0.292
Secchi		9:14:28	35	12.88	50.5	5.33	7.45	-66.3	140.9	2.4	5.9	0.292
1.80 M		9:13:22	40	12.64	44.1	4.68	7.39	-63.1	141.7	3.1	5	0.291
		9:12:10	45	12.46	41.1	4.38	7.36	-61.6	143.1	3.5	4.6	0.289
		9:10:45	50	12.13	37.4	4.02	7.31	-58.2	145.4	6.8	4.9	0.288
		8:48:23	0.5	24.79	143.6	11.9	8.59	-133.9	80.9	1.5	7.1	0.349
		8:47:28	5	24.34	140.4	11.74	8.56	-132.1	80.4	1.7	6.9	0.344
		8:44:28	10	20.16	148.2	13.42	8.5	-127.8	78.3	2.5	10.4	0.325
BM-6		8:41:38	15	18.54	88.1	8.24	7.89	-92.4	81.2	3.3	11	0.341
		8:39:08	20	17.72	69.7	6.63	7.63	-76.9	83.5	3.9	11.8	0.350
		8:35:52	25	16.3	50	4.9	7.4	-64.1	82.2	3.2	9.7	0.338
Secchi	6/7/2021	8:33:40	30	14.97	21.9	2.21	7.3	-58.2	76.6	2.5	6.1	0.331
1.80 M		8:32:40	35	13.7	4.3	0.45	7.25	-55.1	74.5	1.3	3.2	0.317
		8:31:52	40	13.17	2.8	0.3	7.24	-54.4	73.8	1.4	3.4	0.314
		8:30:42	45	12.81	3	0.32	7.22	-53.2	71.8	1.2	1.8	0.318
		8:28:54	50	12.62	3.5	0.37	7.19	-51.7	66.3	4.9	1.1	0.319
		9:34:11	0.5	26.57	124.7	10	8.51	-129.8	71.1	1.4	4.9	0.361
		9:33:35	5	26.23	120.4	9.72	8.46	-126.8	69.6	1.9	7.6	0.360
BM-6		9:32:29	10	24.65	98.2	8.16	8.15	-108.3	69	2.9	9.3	0.363
		9:30:34	15	22.83	44.2	3.8	7.64	-78.2	67.3	4	24.1	0.396
Secchi	6/28/2021	9:27:46	20	21.88	8.7	0.76	7.53	-71.6	57.7	2.6	20.8	0.402
		9:25:02	25	19.83	2.3	0.21	7.32	-59.7	60.1	0.3	6	0.387
1.75 M		9:22:52	30	15.84	2	0.2	7.27	-56.3	58.6	0	2.9	0.353
		9:19:38	35	14.59	2.1	0.22	7.23	-54.1	64.4	0	1.5	0.341
		9:18:32	40	13.69	2.1	0.22	7.22	-53.5	69.6	0.1	0.9	0.332
		9:17:02	45	13.24	2.2	0.23	7.18	-51.5	69.6	1.5	1.5	0.332
		9:15:47	50	13.02	2.4	0.25	7.15	-49.6	68.3	3.1	1.5	0.333

2021 Blue Marsh Stratification/Profile

Station	Date	Time	Depth	Temp	DO	DO	pH	pHmV	ORP	Turbidity	Chloro.	SpCond
	M/D/Y	hh:mm:ss	ft	C	%	mg/L		mV	mV	NTU	ug/L	mS/cm
		8:55:32	0.5	27.96	143.6	11.24	8.6	-135.6	105.6	6.5	15.5	0.322
		8:54:01	5	27.95	144.1	11.28	8.61	-136.4	102.9	5.8	18.5	0.322
		8:52:55	10	27.89	145	11.37	8.61	-136.6	100.7	6.4	15.9	0.320
BM-6		8:47:49	15	25.17	3.7	0.3	7.35	-61.8	82	1.9	6.9	0.414
		8:46:39	20	23.85	3.3	0.28	7.31	-59.5	81.7	0.6	4	0.420
Secchi		8:45:04	25	22.62	3.3	0.29	7.31	-59.1	78.9	0.6	2.8	0.414
	7/19/2021	8:44:20	30	20.6	3.2	0.29	7.29	-58	79.9	0.0	3.2	0.402
1.05 M		8:43:17	35	18.55	3.2	0.3	7.28	-57	80.5	0.0	1.9	0.385
		8:42:10	40	17.23	3.2	0.31	7.26	-56	80.1	0.0	1.9	0.378
		8:41:25	45	16.22	3.3	0.32	7.24	-54.8	77.7	1.2	2.3	0.372
		8:40:31	50	15.62	3.4	0.34	7.22	-53.4	81.7	2.0	2	0.371
		8:39:35	51	15.35	3.8	0.38	7.19	-52.1	84.8	3.1	2.1	0.370
BM-6		9:10:25	0.5	27.87	128.2	10.05	8.47	-128.2	86.1	1.3	7.7	0.338
		9:09:37	5	27.86	126.0	9.88	8.45	-126.9	84.3	1.4	8.2	0.338
		9:07:19	10	27.55	113.0	8.91	8.18	-110.6	83.5	3.5	8.8	0.342
		9:05:08	15	26.11	37.4	3.02	7.31	-59.2	76.3	2.5	8.3	0.367
Secchi	8/16/2021	9:03:32	20	24.79	2.5	0.21	7.18	-51.6	68.5	0.6	6.4	0.389
		9:02:01	25	23.87	2.5	0.21	7.14	-49.3	67.7	0.0	3.2	0.411
1.80 M		9:00:01	30	23.44	2.6	0.22	7.12	-48.4	66.9	0.0	2.1	0.417
		8:58:37	35	22.75	2.6	0.22	7.08	-45.9	66.5	0.1	1.9	0.417
		8:57:23	40	22.03	2.8	0.24	7.05	-44	64.4	0.6	1.8	0.414
		8:54:30	45	21.45	3.0	0.26	7	-40.9	54.3	2.9	1.6	0.415
		8:53:04	50	20.6	3.2	0.28	6.92	-36.3	34.4	8.4	2.7	0.419
		10:24:39	0.5	15.56	119.1	11.86	8.52	-127.5	122.7	1.5	9.5	0.311
		10:23:52	5.0	15.56	118.3	11.77	8.5	-126.1	123.9	1.5	15.8	0.311
BM-7		10:22:46	10.0	15.55	114.2	11.37	8.49	-125.7	123.2	1.8	14.7	0.311
	5/10/2021	10:21:41	15.0	15.25	99.2	9.94	8.26	-112.3	126.5	1.7	12.2	0.313
		10:19:53	20.0	14.74	79.4	8.05	7.89	-91.6	134.2	1.3	6.8	0.317
		10:18:20	25.0	13.64	62	6.44	7.63	-76.8	138.1	5.2	4.9	0.316
		10:16:25	30.0	13.45	53	5.52	7.6	-74.7	137.9	30.7	6	0.314
		9:52:16	0.5	24.18	147.8	12.39	8.67	-138.6	100.1	2.5	7.5	0.362
		9:51:14	5	23.59	143.5	12.16	8.63	-136	101.8	3.5	10.3	0.357
		9:49:23	10	21.55	152.3	13.42	8.44	-124.4	112.7	4.3	13.3	0.349
BM-7		9:47:54	15	19.13	75.4	6.97	7.73	-83.2	128.3	6.5	21.8	0.383
	6/7/2021	9:46:42	20	16.97	53.6	5.17	7.58	-74.3	133	3.4	11.5	0.381
		9:44:35	25	15.55	39.4	3.93	7.52	-70.4	137.2	3.8	8.7	0.364
		9:42:50	30	14.7	23	2.33	7.47	-67.6	140.9	5.6	3.6	0.355
		9:39:42	31	14.41	17.6	1.79	7.46	-67.2	146	6.7	4.1	0.353
		10:31:21	0.5	26.94	135.9	10.83	8.57	-133.8	53.4	1.5	6.5	0.366
		10:30:57	5	26.31	131.8	10.63	8.5	-129.7	53.7	2.9	10	0.365
		10:30:00	10	25.91	120.2	9.76	8.3	-117.3	54.8	3.2	12.2	0.366
BM-7	6/28/2021	10:28:41	15	22.76	67	5.76	7.62	-77.3	61.6	2.8	18.7	0.401
		10:25:34	20	19.59	3	0.28	7.35	-61.2	41.6	3.6	5.2	0.408
		10:24:40	25	17.29	3	0.29	7.37	-62.5	33.6	18.8	3.9	0.384
		10:23:21	30	15.58	3.8	0.38	7.41	-64.4	26.2	16.2	5	0.371
		10:50:50	32	15.28	3.8	0.38	7.45	-66.5	42.7	9.5	2	0.370

2021 Blue Marsh Stratification/Profile

Station	Date	Time	Depth	Temp	DO	DO	pH	pHmV	ORP	Turbidity	Chloro.	SpCond
	M/D/Y	hh:mm:ss	ft	C	%	mg/L		mV	mV	NTU	ug/L	mS/cm
BM-7	7/19/2021	10:13:55	0.5	27.85	147.4	11.56	8.57	-134.2	81	6.7	15.4	0.327
		10:12:25	5	27.64	139.4	10.97	8.43	-125.4	80.7	7.1	18.9	0.326
		10:11:04	10	27.39	129.6	10.25	8.25	-115.1	79.4	5	13.5	0.324
		10:08:49	15	25.32	33.1	2.71	7.38	-63.5	67.7	1.1	3.7	0.375
		10:08:00	20	24.16	25.2	2.11	7.34	-61.3	61.7	1.2	4	0.381
		10:06:16	25	22.92	4.3	0.37	7.32	-59.6	42.2	1.6	3.9	0.400
		10:04:04	30	20.31	5.1	0.46	7.34	-61	1.5	27.4	3.8	0.418
BM-7	8/16/2021	10:07:01	0.5	27.48	123.6	9.76	8.34	-120.3	71.5	3.4	9.4	0.335
		10:06:12	5	27.47	121.8	9.61	8.33	-119.9	68.2	3.1	9.7	0.335
		10:05:17	10	27.43	118.3	9.35	8.28	-116.6	65.1	3.4	8.9	0.335
		10:03:22	15	26.47	66.4	5.34	7.47	-68.8	60.4	1.6	4.7	0.359
		10:01:43	20	24.75	19.3	1.6	7.28	-57.5	44.9	0.4	2.5	0.374
		10:00:00	25	23.93	3.9	0.32	7.27	-56.9	25.1	0.8	2.2	0.382
		9:58:12	30	22.85	5.2	0.45	7.31	-59.2	-19	4.9	0.8	0.396
		9:57:11	32	22.59	7.9	0.68	7.35	-61.3	-14.5	10.9	1.7	0.401
BM-8	5/10/2021	12:10:28	0.5	15.95	135.9	13.41	8.66	-135.2	138.7	2.1	7.9	0.320
		12:09:35	5.0	15.69	134.6	13.36	8.68	-136.6	138.4	2.4	18.5	0.317
		12:08:01	10.0	15.49	123.6	12.32	8.57	-130.1	141.3	3.1	22.2	0.320
		12:06:50	15.0	15.47	114.8	11.45	8.44	-122.5	145.8	2.5	19.8	0.322
		12:05:30	20.0	14.05	97.8	10.05	7.99	-97	155.7	10.1	23.3	0.308
		12:03:51	22.0	12.95	103.9	10.95	8.04	-99.6	157.9	16.3	24.9	0.302
BM-8	6/7/2021	11:34:56	0.5	25.26	172.6	14.18	8.67	-139.1	119.7	1.2	5.9	0.370
		11:33:39	5	23.92	150.1	12.65	8.4	-123	135.2	2.4	9.9	0.361
		11:32:34	10	21.42	114.9	10.15	8.03	-100.5	144.7	6.8	20.3	0.363
		11:31:23	15	18.86	66.7	6.2	7.57	-73.7	155.1	4.7	12.1	0.350
		11:29:51	20	17.38	48.2	4.62	7.5	-69.9	159.6	3.1	8.9	0.337
		11:26:35	21	16.34	40.3	3.95	7.54	-72	165.2	4.9	8.3	0.375
BM-8	6/28/2021	12:02:40	0.5	28.1	160.9	12.56	8.62	-137	131.3	1.9	4.1	0.366
		12:01:28	5	26.95	157.2	12.52	8.48	-128.2	142.1	3.3	9	0.359
		12:00:34	10	25.74	137.4	11.19	8.28	-116.4	146	4.1	11.2	0.364
		11:58:01	15	22.84	67.1	5.77	7.55	-73	155.8	5	17.2	0.377
		11:56:51	20	20.56	19.5	1.75	7.47	-68.4	153.6	4	15.1	0.419
		11:55:50	22	18.44	5.2	0.49	7.46	-67.2	150.9	6	4.7	0.402
BM-8	7/19/2021	11:40:59	0.5	28.38	160.6	12.48	8.52	-131.3	155.3	4.6	8.7	0.322
		11:40:16	5	27.68	151.7	11.94	8.4	-123.9	162.7	5	17.9	0.317
		11:39:16	10	27.31	104.1	8.25	7.85	-91	174	3.2	11.1	0.335
		11:37:47	15	24.95	39.7	3.28	7.43	-66.1	184.7	2.7	3.8	0.356
		11:36:34	20	23.8	16.5	1.39	7.41	-65.1	186	2.3	3.6	0.350
		11:35:46	21	23.36	10.1	0.86	7.42	-65.6	186.8	2.1	4.1	0.374
BM-8	8/16/2021	12:00:04	0.5	27.93	177.5	13.9	8.67	-140.1	164	5.4	9.8	0.318
		11:59:13	5	27.77	173.3	13.61	8.65	-138.6	166.7	6.1	11.2	0.319
		11:58:06	10	27.61	151.2	11.91	8.48	-128.6	175	4.2	8.2	0.321
		11:55:54	15	26.3	75.6	6.1	7.62	-77.5	196.9	4.9	5.6	0.366
		11:54:14	20	24.8	15.8	1.31	7.48	-69.2	201.2	3.6	3.2	0.371
BM-9	5/10/2021											
		10:56:30	0.5	15.66	119.8	11.9	8.46	-123.9	131.1	1.6	8.3	0.328
		10:55:23	5	15.64	119.4	11.86	8.48	-124.8	130.6	2	12.6	0.328
		10:53:58	10	15.55	117.9	11.74	8.47	-124.4	131.1	1.1	16.5	0.328
		10:51:44	15	15.47	109.5	10.92	8.36	-118.1	134.4	2.3	14.5	0.329
		10:49:55	20	14.68	72.5	7.35	7.8	-86.4	145.2	5.1	8.1	0.338
		10:48:53	25	14.24	60.8	6.22	7.66	-78.4	149.1	11.8	4.7	0.349
		10:47:27	30	13.89	50.8	5.24	7.59	-74.3	152.2	14.5	4.6	0.333
		10:46:02	32	13.79	48.1	4.97	7.6	-74.9	155.5	33.4	6.5	0.332

2021 Blue Marsh Stratification/Profile

Station	Date	Time	Depth	Temp	DO	DO	pH	pHmV	ORP	Turbidity	Chloro.	SpCond
	M/D/Y	hh:mm:ss	ft	C	%	mg/L		mV	mV	NTU	ug/L	mS/cm
BM-9	6/7/2021	10:21:34	0.5	25.06	159.8	13.17	8.64	-137.2	106.3	1.6	7.1	0.373
		10:20:51	5	23.76	153.5	12.97	8.65	-137.4	106.9	4.1	12.7	0.358
		10:19:24	10	21.44	170.1	15.02	8.3	-116.6	119.7	3.8	13.8	0.358
		10:17:45	15	19.13	71.2	6.58	7.72	-82.5	134.9	6.3	24.4	0.380
		10:15:06	20	16.71	50.7	4.93	7.56	-73.1	142.9	3.7	11.3	0.382
		10:13:02	25	15.29	36.4	3.65	7.51	-70.1	147.1	4.7	6.7	0.365
		10:11:00	30	14.32	10.7	1.09	7.49	-68.6	151.2	6.7	5.3	0.355
		10:09:50	32	14.23	8.4	0.86	7.52	-70.3	152.7	7.9	4.1	0.355
BM-9	6/28/2021	11:00:24	0.5	27.87	148	11.6	8.65	-138.9	63.5	2.6	5.7	0.367
		10:59:37	5	26.93	148.7	11.85	8.65	-138.2	62	2.9	9.7	0.362
		10:58:39	10	25.7	158.1	12.89	8.61	-135.9	59.1	3.2	11.2	0.356
		10:56:34	15	23.29	101	8.61	7.78	-86.5	69.4	5.3	19.5	0.413
		10:54:11	20	20.14	8.4	0.76	7.39	-63.3	60.3	3.9	8.7	0.414
		10:52:44	25	16.65	3.1	0.3	7.4	-64.1	47.5	4.5	3	0.381
		10:51:59	30	15.53	3.2	0.32	7.42	-65	41.4	8.6	2.2	0.372
		10:50:59	32	15.29	3.7	0.37	7.44	-66.2	42.6	9.2	2.4	0.370
BM-9	7/19/2021	10:38:47	0.5	27.97	170.9	13.37	8.67	-139.6	87.2	8.1	13.9	0.317
		10:37:31	5	27.83	163	12.79	8.54	-132.2	88.6	7.4	18.9	0.318
		10:35:21	10	27.46	113.8	8.99	7.96	-97.8	92.7	3.8	13	0.328
		10:33:38	15	25.16	40.7	3.35	7.38	-63.6	84.5	1.2	4.6	0.370
		10:31:58	20	24.06	24.4	2.05	7.37	-63	71	1.3	3.9	0.392
		10:30:58	25	23.17	7.8	0.67	7.36	-62.1	60.4	3.2	3.5	0.388
		10:29:36	30	21.1	7	0.62	7.39	-63.9	40	8.3	3.4	0.411
BM-9	8/16/2021	10:37:46	0.5	27.77	149.8	11.77	8.53	-131.6	62.7	4.5	10.3	0.325
		10:36:44	5	27.65	143.3	11.28	8.48	-128.5	57.7	4.9	10.9	0.326
		10:35:31	10	27.42	111.2	8.78	8.06	-103.8	56.4	3.2	6.2	0.335
		10:33:54	15	26.1	46.1	3.73	7.33	-60.7	46.1	1.8	2.9	0.397
		10:31:39	20	24.88	13	1.07	7.23	-54.6	10.2	1.6	1.7	0.410
		10:30:45	25	24.05	3.2	0.27	7.2	-52.7	-6.5	3	2	0.396
		10:29:46	30	23.33	3.3	0.28	7.19	-52.2	-32.5	15.2	2.5	0.420
		10:28:52	31	23.24	3.6	0.3	7.2	-52.8	-36.6	20.3	2.9	0.427
BM-10	5/10/2021	11:30:50	0.5	15.29	108.2	10.83	8.21	-109.6	146.2	4.8	10.5	0.351
		11:29:56	5	15.03	105.7	10.64	8.2	-109	146.4	5.2	15.8	0.349
		11:28:02	10	14.71	99.3	10.07	8.08	-102.1	152.8	5.3	13.1	0.347
		11:26:20	15	13.04	90.5	9.51	8	-97.5	157.4	7.9	5.1	0.351
		11:24:33	20	12.54	87.2	9.27	7.98	-96.2	161	23.0	3	0.353
BM-10	6/7/2021	10:54:25	0.5	25.83	220.7	17.94	8.67	-139.4	114.2	2.8	9.7	0.380
		10:53:23	5	24.68	195.4	16.23	8.41	-123.7	125.2	4.8	13.3	0.380
		10:51:36	10	21.97	80.6	7.05	7.72	-83	144.4	10.5	3.5	0.419
		10:49:18	15	19.76	53.6	4.89	7.57	-73.8	152.6	15.1	5.6	0.401
		10:46:39	20	17.13	10.6	1.02	7.49	-69	160.5	13.5	5	0.416
BM-10	6/28/2021	11:27:46	0.5	28.45	191.3	14.85	8.48	-128.8	129.5	5.3	8.3	0.365
		11:27:11	5	27.37	189.3	14.97	8.46	-127.5	130.8	8.3	13.5	0.357
		11:26:00	10	25.7	146.3	11.92	8.03	-101.7	139	8.6	15.9	0.401
		11:24:34	15	23.54	91.4	7.75	7.81	-88.4	143.2	24.2	8.8	0.494
		11:22:13	20	21.43	32.9	2.9	7.53	-71.6	147.8	46.4	12.8	0.465

2021 Blue Marsh Stratification/Profile

Station	Date	Time	Depth	Temp	DO	DO	pH	pHmV	ORP	Turbidity	Chloro.	SpCond
	M/D/Y	hh:mm:ss	ft	C	%	mg/L		mV	mV	NTU	ug/L	mS/cm
BM-10	7/19/2021	11:09:36	0.5	27.76	162.4	12.76	8.46	-127.4	131	6.2	15.1	0.334
		11:08:11	5	27.54	151.9	11.98	8.29	-117.1	139.8	5.9	16.4	0.333
		11:06:48	10	26.43	97.7	7.85	7.71	-82.9	151.6	7.2	10.7	0.416
		11:05:46	15	24.48	82	6.83	7.69	-81.7	152.8	20	8.7	0.466
		11:04:14	20	23.57	81.2	6.89	7.74	-84.1	151.2	44.7	7.8	0.476
BM-10	8/16/2021	11:15:11	0.5	27.82	204.3	16.03	8.71	-142.3	126.8	9	11.8	0.307
		11:14:04	5	27.68	179	14.09	8.56	-133.6	132.2	10.7	10.2	0.313
		11:13:04	10	27.33	146.1	11.56	8.18	-111	142	6.9	8.8	0.357
		11:11:47	15	26.16	95.1	7.69	7.75	-85.1	151.3	10.9	7.4	0.436
		11:10:19	20	24.73	90.2	7.48	7.74	-84.3	153.8	27.4	5.4	0.492
BM-11	5/10/2021	13:04:54	1.0	11.4	102.7	11.21	7.94	-93.7	154.6	3.1	0.5	0.135
	6/7/2021	12:38:43	0.5	20.96	88.4	7.88	7.79	-86.6	149.9	6.3	1.8	0.227
	6/28/2021	12:59:27	1.0	23.6	92.4	7.83	7.99	-98.6	140.3	6.6	1.1	0.549
	7/19/2021	12:37:00	0.5	20.48	93.9	8.45	7.96	-96.6	152.2	9.7	1.3	0.395
	8/16/2021	12:58:36	1.0	23.88	85.4	7.2	7.81	-88.2	168.4	11.30	7.4	0.407

APPENDIX B

BLUE MARSH RESERVOIR 2021
BACTERIA SAMPLING DATA TABLES

BLUE MARSH RESERVOIR SWIMMING BEACH MONITORING PROGRAM RESULTS
E-coli Coliform 2021

		FECAL COLIFORM				E-COLI			
DAY	DATE	SB1	SB2	SB3	Arith. AVG.&LOG	SB1	SB2	SB3	Ave./LOG
Mon.	24-May				#DIV/0!	4.00	11.00	9.00	8.00
Thur.	27-May				#DIV/0!	71.00	36.00	60.00	55.67
Tues.	1-Jun				#DIV/0!	32.00	36.00	20.00	29.33
Fri.	4-Jun				#DIV/0!	57.00	66.00	120.00	81.00
Tues.	8-Jun				#DIV/0!	1.00	1.00	3.00	1.67
5 smpl. Log Value		#NUM!	#NUM!	#NUM!	#DIV/0!	1.14	1.19	1.32	1.25
5 smpl. Geo. Mean		#NUM!	#NUM!	#NUM!	#DIV/0!	13.90	15.66	20.79	17.75
Thur.	10-Jun				#DIV/0!	8.00	37.00	8.00	17.67
5 smpl. Log Value		#NUM!	#NUM!	#NUM!	#DIV/0!	1.20	1.30	1.31	1.32
5 smpl. Geo. Mean		#NUM!	#NUM!	#NUM!	#DIV/0!	15.96	19.96	20.31	20.80
Mon.	14-Jun				#DIV/0!	5.00	4.00	1.00	3.33
5 smpl. Log Value		#NUM!	#NUM!	#NUM!	#DIV/0!	0.97	1.11	0.95	1.07
5 smpl. Geo. Mean		#NUM!	#NUM!	#NUM!	#DIV/0!	9.39	12.86	8.96	11.85
Thur.	17-Jun				#DIV/0!	8.00	1.00	17.00	8.67
5 smpl. Log Value		#NUM!	#NUM!	#NUM!	#DIV/0!	0.85	0.80	0.94	0.97
5 smpl. Geo. Mean		#NUM!	#NUM!	#NUM!	#DIV/0!	7.12	6.28	8.67	9.28
Mon.	21-Jun				#DIV/0!	26.00	3.00	2.00	10.33
5 smpl. Log Value		#NUM!	#NUM!	#NUM!	#DIV/0!	0.78	0.53	0.58	0.79
5 smpl. Geo. Mean		#NUM!	#NUM!	#NUM!	#DIV/0!	6.08	3.38	3.82	6.15
Thur.	24-Jun				#DIV/0!	4.00	4.00	2.00	3.33
5 smpl. Log Value		#NUM!	#NUM!	#NUM!	#DIV/0!	0.90	0.65	0.55	0.85
5 smpl. Geo. Mean		#NUM!	#NUM!	#NUM!	#DIV/0!	8.02	4.47	3.52	7.06
Mon.	28-Jun				#DIV/0!	20.00	8.00	12.00	13.33
5 smpl. Log Value		#NUM!	#NUM!	#NUM!	#DIV/0!	0.98	0.52	0.58	0.82
5 smpl. Geo. Mean		#NUM!	#NUM!	#NUM!	#DIV/0!	9.64	3.29	3.82	6.68
Thur.	1-Jul				#DIV/0!	11.00	20.00	12.00	14.33
5 smpl. Log Value		#NUM!	#NUM!	#NUM!	#DIV/0!	1.05	0.66	0.80	0.95

5 smpl. Geo. Mean		#NUM!	#NUM!	#NUM!	#DIV/0!	11.29	4.54	6.28	8.94
Tues.	6-Jul				#DIV/0!	51.00	13.00	17.00	27.00
5 smpl. Log Value		#NUM!	#NUM!	#NUM!	#DIV/0!	1.21	0.88	0.80	1.05
5 smpl. Geo. Mean		#NUM!	#NUM!	#NUM!	#DIV/0!	16.35	7.58	6.28	11.22
Thur.	8-Jul				#DIV/0!	79.00	8.00	17.00	34.67
5 smpl. Log Value		#NUM!	#NUM!	#NUM!	#DIV/0!	1.31	0.96	0.98	1.16
5 smpl. Geo. Mean		#NUM!	#NUM!	#NUM!	#DIV/0!	20.41	9.22	9.64	14.29
Mon.	12-Jul				#DIV/0!	99.00	102.00	81.00	94.00
5 smpl. Log Value		#NUM!	#NUM!	#NUM!	#DIV/0!	1.59	1.25	1.31	1.45
5 smpl. Geo. Mean		#NUM!	#NUM!	#NUM!	#DIV/0!	38.78	17.62	20.21	27.87
Thur.	15-Jul				#DIV/0!	96.00	12.00	6.00	38.00
5 smpl. Log Value		#NUM!	#NUM!	#NUM!	#DIV/0!	1.72	1.28	1.25	1.54
5 smpl. Geo. Mean		#NUM!	#NUM!	#NUM!	#DIV/0!	53.08	19.11	17.59	34.36
Mon.	19-Jul				#DIV/0!	345.00	20.00	18.00	127.67
5 smpl. Log Value		#NUM!	#NUM!	#NUM!	#DIV/0!	2.02	1.28	1.28	1.73
5 smpl. Geo. Mean		#NUM!	#NUM!	#NUM!	#DIV/0!	105.73	19.11	19.08	53.22
Thur.	22-Jul				#DIV/0!	55.00	49.00	154.00	86.00
5 smpl. Log Value		#NUM!	#NUM!	#NUM!	#DIV/0!	2.03	1.40	1.47	1.83
5 smpl. Geo. Mean		#NUM!	#NUM!	#NUM!	#DIV/0!	107.34	24.91	29.65	67.09
Mon.	26-Jul				#DIV/0!	9.00	144.00	93.00	82.00
5 smpl. Log Value		#NUM!	#NUM!	#NUM!	#DIV/0!	1.84	1.65	1.62	1.90
5 smpl. Geo. Mean		#NUM!	#NUM!	#NUM!	#DIV/0!	69.51	44.41	41.65	79.70
Thur.	29-Jul				#DIV/0!	20.00	28.00	50.00	32.67
5 smpl. Log Value		#NUM!	#NUM!	#NUM!	#DIV/0!	1.70	1.54	1.58	1.81
5 smpl. Geo. Mean		#NUM!	#NUM!	#NUM!	#DIV/0!	50.48	34.29	37.82	64.51
Mon.	2-Aug				#DIV/0!	22.00	71.00	145.00	79.33
5 smpl. Log Value		#NUM!	#NUM!	#NUM!	#DIV/0!	1.58	1.69	1.85	1.87
5 smpl. Geo. Mean		#NUM!	#NUM!	#NUM!	#DIV/0!	37.60	48.93	71.50	74.75
Thur.	5-Aug				#DIV/0!	4.00	2.00	8.00	4.67
5 smpl. Log Value		#NUM!	#NUM!	#NUM!	#DIV/0!	1.19	1.49	1.78	1.59
5 smpl. Geo. Mean		#NUM!	#NUM!	#NUM!	#DIV/0!	15.42	30.87	60.80	38.56
Mon.	9-Aug				#DIV/0!	5.00	11.00	22.00	12.67
5 smpl. Log Value		#NUM!	#NUM!	#NUM!	#DIV/0!	0.98	1.36	1.61	1.42

BLUE MARSH BEACH BACTERIA DATA

5 smpl. Geo. Mean		#NUM!	#NUM!	#NUM!	#DIV/0!	9.54	22.90	41.20	26.29
Thur.	12-Aug				#DIV/0!	5.00	12.00	18.00	11.67
5 smpl. Log Value		#NUM!	#NUM!	#NUM!	#DIV/0!	0.93	1.14	1.47	1.25
5 smpl. Geo. Mean		#NUM!	#NUM!	#NUM!	#DIV/0!	8.49	13.93	29.66	17.80
Mon.	16-Aug				#DIV/0!	37.00	45.00	52.00	44.67
5 smpl. Log Value		#NUM!	#NUM!	#NUM!	#DIV/0!	0.98	1.19	1.48	1.28
5 smpl. Geo. Mean		#NUM!	#NUM!	#NUM!	#DIV/0!	9.60	15.32	29.90	18.95
Thur.	19-Aug				#DIV/0!	258.00	5.00	55.00	106.00
5 smpl. Log Value		#NUM!	#NUM!	#NUM!	#DIV/0!	1.20	0.95	1.39	1.30
5 smpl. Geo. Mean		#NUM!	#NUM!	#NUM!	#DIV/0!	15.70	9.01	24.63	20.08
Mon.	23-Aug				#DIV/0!	22.00	148.00	5.00	58.33
5 smpl. Log Value		#NUM!	#NUM!	#NUM!	#DIV/0!	1.34	1.33	1.35	1.52
5 smpl. Geo. Mean		#NUM!	#NUM!	#NUM!	#DIV/0!	22.08	21.31	22.42	33.28
Thur.	26-Aug				#DIV/0!	2.00	3.00	1.00	2.00
5 smpl. Log Value		#NUM!	#NUM!	#NUM!	#DIV/0!	1.26	1.22	1.08	1.36
5 smpl. Geo. Mean		#NUM!	#NUM!	#NUM!	#DIV/0!	18.38	16.43	12.08	23.01
Mon.	30-Aug				#DIV/0!	12.00	9.00	10.00	10.33
5 smpl. Log Value		#NUM!	#NUM!	#NUM!	#DIV/0!	1.34	1.19	1.03	1.35
5 smpl. Geo. Mean		#NUM!	#NUM!	#NUM!	#DIV/0!	21.90	15.52	10.74	22.45
Tues.	7-Sep				#DIV/0!	29.00	30.00	54.00	37.67
5 smpl. Log Value		#NUM!	#NUM!	#NUM!	#DIV/0!	1.32	1.16	1.03	1.34
5 smpl. Geo. Mean		#NUM!	#NUM!	#NUM!	#DIV/0!	20.86	14.31	10.82	21.70

APPENDIX C

BLUE MARSH RESERVOIR 2021
LABORATORY CUSTODY SHEETS

Certificate of Analysis

M.J. Reider Associates, Inc.
ENVIRONMENTAL TESTING LABORATORY
U.S. EPA/PA DEP #06-00003

Laboratory No.: 2114819
Report: 05/21/21
Lab Contact: Richard A Wheeler

Attention: David Wertz
Reported To: Tetra Tech
USACE, Phila Dist. Env.Resources Branch 100 Penn Square E.
Arlington, VA 22201

Project: 2021 - Blue Marsh Reservoir

Lab ID: 2114819-01 **Collected By:** Client **Sampled:** 05/10/21 07:30 **Received:** 05/10/21 14:00
Sample Desc: BM-1S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.05	mg/l		0.05	SM 4500-P F	05/13/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	114	mg CaCO3/L		2	SM 2320 B	05/18/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	05/11/21	U	APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	05/11/21 15:55		SWA
Nitrate as N	4.28	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	05/10/21 15:04		MRW
Nitrite as N	0.02	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	05/10/21 15:04	J	MRW
Nitrate+Nitrite as N	4.30	mg/l	0.108	1.10	CALCULATED	05/10/21 15:04		MRW
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	05/18/21	U	TML
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	05/13/21		TML
Solids, Total Dissolved	201	mg/l	4	5	SM 2540 C	05/11/21		TMH
Total Organic Carbon	2.3	mg/l	0.3	0.5	SM 5310 C	05/11/21		ALD
Solids, Total Suspended	4	mg/l	1	1	SM 2540 D	05/11/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	1	mpn/100ml	1	SM 9223 B/Quantitray	5/10/21 15:20	5/11/21 15:42		JMW
Total Coliform	219	mpn/100ml	1	SM 9223 B/Quantitray	5/10/21 15:20	5/11/21 15:42		JMW

Lab ID: 2114819-02 **Collected By:** Client **Sampled:** 05/10/21 09:45 **Received:** 05/10/21 14:00
Sample Desc: BM-2S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.05	mg/l		0.05	SM 4500-P F	05/13/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	119	mg CaCO3/L		2	SM 2320 B	05/18/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	05/11/21	U	APR
Biochemical Oxygen Demand	2.2	mg/l	2.0	2.0	SM 5210 B	05/11/21 17:15		SWA
Nitrate as N	4.40	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	05/10/21 18:43		MRW
Nitrite as N	0.02	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	05/10/21 18:43	J	MRW
Nitrate+Nitrite as N	4.42	mg/l	0.108	1.10	CALCULATED	05/10/21 18:43		MRW
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	05/18/21	U	TML
Phosphorus as P, Total	0.01	mg/l	0.01	0.01	SM 4500-P F	05/13/21		TML
Solids, Total Dissolved	201	mg/l	4	5	SM 2540 C	05/11/21		TMH
Total Organic Carbon	2.3	mg/l	0.3	0.5	SM 5310 C	05/11/21		ALD
Solids, Total Suspended	4	mg/l	1	1	SM 2540 D	05/11/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	<1	mpn/100ml	1	SM 9223 B/Quantitray	5/10/21 15:20	5/11/21 15:42		JMW
Total Coliform	46	mpn/100ml	1	SM 9223 B/Quantitray	5/10/21 15:20	5/11/21 15:42		JMW

Lab ID: 2114819-03 **Collected By:** Client **Sampled:** 05/10/21 09:45 **Received:** 05/10/21 14:00
Sample Desc: BM-2M **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.05	mg/l		0.05	SM 4500-P F	05/13/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	125	mg CaCO3/L		2	SM 2320 B	05/18/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	05/11/21	U	APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	05/11/21 15:55		SWA
Nitrate as N	4.44	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	05/10/21 15:10		MRW
Nitrite as N	0.02	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	05/10/21 15:10	J	MRW
Nitrate+Nitrite as N	4.46	mg/l	0.108	1.10	CALCULATED	05/10/21 15:10		MRW
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	05/18/21	U	TML
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	05/13/21		TML
Solids, Total Dissolved	203	mg/l	4	5	SM 2540 C	05/11/21		TMH
Total Organic Carbon	1.7	mg/l	0.3	0.5	SM 5310 C	05/11/21		ALD
Solids, Total Suspended	2	mg/l	1	1	SM 2540 D	05/11/21		ALD

Lab ID: 2114819-04 **Collected By:** Client **Sampled:** 05/10/21 09:45 **Received:** 05/10/21 14:00
Sample Desc: BM-2D **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.05	mg/l		0.05	SM 4500-P F	05/13/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	128	mg CaCO3/L		2	SM 2320 B	05/18/21		APR
Ammonia as N	0.07	mg/l	0.05	0.10	ASTM D6919-03	05/11/21	J	APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	05/11/21 15:55		SWA
Nitrate as N	3.76	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	05/10/21 15:26		MRW
Nitrite as N	0.03	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	05/10/21 15:26	J	MRW
Nitrate+Nitrite as N	3.79	mg/l	0.108	1.10	CALCULATED	05/10/21 15:26		MRW
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	05/12/21	U	TML
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	05/13/21		TML
Solids, Total Dissolved	222	mg/l	4	5	SM 2540 C	05/11/21		TMH
Total Organic Carbon	1.7	mg/l	0.3	0.5	SM 5310 C	05/11/21		ALD
Solids, Total Suspended	7	mg/l	1	1	SM 2540 D	05/11/21		ALD

Lab ID: 2114819-05 **Collected By:** Client **Sampled:** 05/10/21 13:00 **Received:** 05/10/21 14:00
Sample Desc: BM-5S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.05	mg/l		0.05	SM 4500-P F	05/13/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	66	mg CaCO3/L		2	SM 2320 B	05/18/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	05/11/21	U	APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	05/11/21 15:55		SWA
Nitrate as N	3.33	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	05/10/21 21:48		MRW
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	05/10/21 21:48	U	MRW
Nitrate+Nitrite as N	<3.34	mg/l	0.108	1.10	CALCULATED	05/10/21 21:48		MRW
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	05/12/21	U	TML
Phosphorus as P, Total	0.02	mg/l	0.01	0.01	SM 4500-P F	05/13/21		TML
Solids, Total Dissolved	116	mg/l	4	5	SM 2540 C	05/11/21		TMH
Total Organic Carbon	1.8	mg/l	0.3	0.5	SM 5310 C	05/11/21		ALD
Solids, Total Suspended	<1	mg/l	1	1	SM 2540 D	05/11/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	345	mpn/100ml	1	SM 9223 B/Quantitray	5/10/21 15:20	5/11/21 15:42		JMW
Total Coliform	>2420	mpn/100ml	1	SM 9223 B/Quantitray	5/10/21 15:20	5/11/21 15:42		JMW

Lab ID: 2114819-06 **Collected By:** Client **Sampled:** 05/10/21 08:54 **Received:** 05/10/21 14:00
Sample Desc: BM-6S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.05	mg/l		0.05	SM 4500-P F	05/13/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	112	mg CaCO3/L		2	SM 2320 B	05/18/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	05/11/21	U	APR
Biochemical Oxygen Demand	2.6	mg/l	2.0	2.0	SM 5210 B	05/11/21 13:25		SWA
Nitrate as N	4.34	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	05/10/21 21:15		MRW
Nitrite as N	0.02	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	05/10/21 21:15	J	MRW
Nitrate+Nitrite as N	4.36	mg/l	0.108	1.10	CALCULATED	05/10/21 21:15		MRW
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	05/12/21	U	TML
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	05/13/21		TML
Solids, Total Dissolved	190	mg/l	4	5	SM 2540 C	05/11/21		TMH
Total Organic Carbon	2.3	mg/l	0.3	0.5	SM 5310 C	05/11/21		ALD
Solids, Total Suspended	6	mg/l	1	1	SM 2540 D	05/11/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	2	mpn/100ml	1	SM 9223 B/Quantitray	5/10/21 15:20	5/11/21 15:42		JMW
Total Coliform	49	mpn/100ml	1	SM 9223 B/Quantitray	5/10/21 15:20	5/11/21 15:42		JMW

Lab ID: 2114819-07 **Collected By:** Client **Sampled:** 05/10/21 08:54 **Received:** 05/10/21 14:00
Sample Desc: BM-6M **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.05	mg/l		0.05	SM 4500-P F	05/13/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	113	mg CaCO3/L		2	SM 2320 B	05/18/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	05/11/21	U	APR
Biochemical Oxygen Demand	2.7	mg/l	2.0	2.0	SM 5210 B	05/11/21 13:25		SWA
Nitrate as N	4.35	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	05/10/21 18:09		MRW
Nitrite as N	0.02	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	05/10/21 18:09	J	MRW
Nitrate+Nitrite as N	4.37	mg/l	0.108	1.10	CALCULATED	05/10/21 18:09		MRW
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	05/12/21	U	TML
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	05/13/21		TML
Solids, Total Dissolved	183	mg/l	4	5	SM 2540 C	05/11/21		TMH
Total Organic Carbon	2.2	mg/l	0.3	0.5	SM 5310 C	05/11/21		ALD
Solids, Total Suspended	6	mg/l	1	1	SM 2540 D	05/11/21		ALD

Lab ID: 2114819-08 **Collected By:** Client **Sampled:** 05/10/21 08:54 **Received:** 05/10/21 14:00
Sample Desc: BM-6D **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.05	mg/l		0.05	SM 4500-P F	05/13/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	123	mg CaCO3/L		2	SM 2320 B	05/18/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	05/11/21	U	APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	05/11/21 15:55		SWA
Nitrate as N	3.87	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	05/10/21 17:36		MRW
Nitrite as N	0.02	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	05/10/21 17:36	J	MRW
Nitrate+Nitrite as N	3.89	mg/l	0.108	1.10	CALCULATED	05/10/21 17:36		MRW
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	05/12/21	U	TML
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	05/13/21		TML
Solids, Total Dissolved	224	mg/l	4	5	SM 2540 C	05/11/21		TMH
Total Organic Carbon	1.7	mg/l	0.3	0.5	SM 5310 C	05/11/21		ALD
Solids, Total Suspended	8	mg/l	1	1	SM 2540 D	05/11/21		ALD

Lab ID: 2114819-09 **Collected By:** Client **Sampled:** 05/10/21 10:20 **Received:** 05/10/21 14:00
Sample Desc: BM-7S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.05	mg/l		0.05	SM 4500-P F	05/13/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	121	mg CaCO3/L		2	SM 2320 B	05/18/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	05/11/21	U	APR
Biochemical Oxygen Demand	2.5	mg/l	2.0	2.0	SM 5210 B	05/11/21 17:15		SWA
Nitrate as N	4.54	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	05/10/21 20:07		MRW
Nitrite as N	0.02	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	05/10/21 20:07	J	MRW
Nitrate+Nitrite as N	4.56	mg/l	0.108	1.10	CALCULATED	05/10/21 20:07		MRW
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	05/12/21	U	TML
Phosphorus as P, Total	0.03	mg/l	0.01	0.01	SM 4500-P F	05/13/21		TML
Solids, Total Dissolved	211	mg/l	4	5	SM 2540 C	05/11/21		TMH
Total Organic Carbon	2.4	mg/l	0.3	0.5	SM 5310 C	05/11/21		ALD
Solids, Total Suspended	3	mg/l	1	1	SM 2540 D	05/11/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	1	mpn/100ml	1	SM 9223 B/Quantitray	5/10/21 15:20	5/11/21 15:42		JMW
Total Coliform	105	mpn/100ml	1	SM 9223 B/Quantitray	5/10/21 15:20	5/11/21 15:42		JMW

Lab ID: 2114819-10 **Collected By:** Client **Sampled:** 05/10/21 10:20 **Received:** 05/10/21 14:00
Sample Desc: BM-7M **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.05	mg/l		0.05	SM 4500-P F	05/13/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	131	mg CaCO3/L		2	SM 2320 B	05/18/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	05/11/21	U	APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	05/11/21 15:55		SWA
Nitrate as N	4.48	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	05/10/21 15:55		MRW
Nitrite as N	0.02	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	05/10/21 15:55	J	MRW
Nitrate+Nitrite as N	4.50	mg/l	0.108	1.10	CALCULATED	05/10/21 15:55		MRW
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	05/12/21	U	TML
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	05/13/21		TML
Solids, Total Dissolved	221	mg/l	4	5	SM 2540 C	05/11/21		TMH
Total Organic Carbon	1.6	mg/l	0.3	0.5	SM 5310 C	05/11/21		ALD
Solids, Total Suspended	4	mg/l	1	1	SM 2540 D	05/11/21		ALD

Lab ID: 2114819-11 **Collected By:** Client **Sampled:** 05/10/21 10:20 **Received:** 05/10/21 14:00
Sample Desc: BM-7D **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.05	mg/l		0.05	SM 4500-P F	05/13/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	141	mg CaCO3/L		2	SM 2320 B	05/18/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	05/11/21	U	APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	05/11/21 15:55		SWA
Nitrate as N	4.25	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	05/10/21 15:43		MRW
Nitrite as N	0.03	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	05/10/21 15:43	J	MRW
Nitrate+Nitrite as N	4.28	mg/l	0.108	1.10	CALCULATED	05/10/21 15:43		MRW
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	05/12/21	U	TML
Phosphorus as P, Total	0.02	mg/l	0.01	0.01	SM 4500-P F	05/13/21		TML
Solids, Total Dissolved	229	mg/l	4	5	SM 2540 C	05/11/21		TMH
Total Organic Carbon	1.8	mg/l	0.3	0.5	SM 5310 C	05/11/21		ALD
Solids, Total Suspended	27	mg/l	1	1	SM 2540 D	05/11/21		ALD

Lab ID: 2114819-12 **Collected By:** Client **Sampled:** 05/10/21 12:00 **Received:** 05/10/21 14:00
Sample Desc: BM-8S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.05	mg/l		0.05	SM 4500-P F	05/13/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	122	mg CaCO3/L		2	SM 2320 B	05/18/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	05/11/21	U	APR
Biochemical Oxygen Demand	2.4	mg/l	2.0	2.0	SM 5210 B	05/11/21 17:15		SWA
Nitrate as N	4.33	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	05/10/21 17:02		MRW
Nitrite as N	0.02	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	05/10/21 17:02	J	MRW
Nitrate+Nitrite as N	4.35	mg/l	0.108	1.10	CALCULATED	05/10/21 17:02		MRW
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	05/12/21	U	TML
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	05/13/21		TML
Solids, Total Dissolved	214	mg/l	4	5	SM 2540 C	05/11/21		TMH
Total Organic Carbon	2.6	mg/l	0.3	0.5	SM 5310 C	05/11/21		ALD
Solids, Total Suspended	6	mg/l	1	1	SM 2540 D	05/11/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	1	mpn/100ml	1	SM 9223 B/Quantitray	5/10/21 15:20	5/11/21 15:42		JMW
Total Coliform	91	mpn/100ml	1	SM 9223 B/Quantitray	5/10/21 15:20	5/11/21 15:42		JMW

Lab ID: 2114819-13 **Collected By:** Client **Sampled:** 05/10/21 12:00 **Received:** 05/10/21 14:00
Sample Desc: BM-8M **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.05	mg/l		0.05	SM 4500-P F	05/13/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	122	mg CaCO3/L		2	SM 2320 B	05/18/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	05/11/21	U	APR
Biochemical Oxygen Demand	2.8	mg/l	2.0	2.0	SM 5210 B	05/11/21 15:55		SWA
Nitrate as N	4.37	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	05/10/21 17:53		MRW
Nitrite as N	0.02	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	05/10/21 17:53	J	MRW
Nitrate+Nitrite as N	4.39	mg/l	0.108	1.10	CALCULATED	05/10/21 17:53		MRW
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	05/12/21	Q-10, U	TML
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	05/13/21		TML
Solids, Total Dissolved	211	mg/l	4	5	SM 2540 C	05/11/21		TMH
Total Organic Carbon	2.3	mg/l	0.3	0.5	SM 5310 C	05/11/21		ALD
Solids, Total Suspended	9	mg/l	1	1	SM 2540 D	05/11/21		ALD

Lab ID: 2114819-14 **Collected By:** Client **Sampled:** 05/10/21 12:00 **Received:** 05/10/21 14:00
Sample Desc: BM-8D **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.08	mg/l		0.05	SM 4500-P F	05/13/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	118	mg CaCO3/L		2	SM 2320 B	05/18/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	05/11/21	U	APR
Biochemical Oxygen Demand	6.0	mg/l	2.0	2.0	SM 5210 B	05/11/21 15:55		SWA
Nitrate as N	3.72	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	05/10/21 19:00		MRW
Nitrite as N	0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	05/10/21 19:00	J	MRW
Nitrate+Nitrite as N	3.73	mg/l	0.108	1.10	CALCULATED	05/10/21 19:00		MRW
Nitrogen, Total Kjeldahl (TKN)	2.56	mg/l	0.48	0.50	EPA 351.2	05/12/21		TML
Phosphorus as P, Total	0.61	mg/l	0.01	0.01	SM 4500-P F	05/13/21		TML
Solids, Total Dissolved	224	mg/l	4	5	SM 2540 C	05/11/21		TMH
Total Organic Carbon	2.5	mg/l	0.3	0.5	SM 5310 C	05/11/21		ALD
Solids, Total Suspended	367	mg/l	1	1	SM 2540 D	05/11/21		ALD

Lab ID: 2114819-15 **Collected By:** Client **Sampled:** 05/10/21 10:50 **Received:** 05/10/21 14:00
Sample Desc: BM-9S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.05	mg/l		0.05	SM 4500-P F	05/13/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	128	mg CaCO3/L		2	SM 2320 B	05/18/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	05/11/21	U	APR
Biochemical Oxygen Demand	2.3	mg/l	2.0	2.0	SM 5210 B	05/11/21 15:55		SWA
Nitrate as N	4.70	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	05/10/21 22:05		MRW
Nitrite as N	0.02	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	05/10/21 22:05	J	MRW
Nitrate+Nitrite as N	4.72	mg/l	0.108	1.10	CALCULATED	05/10/21 22:05		MRW
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	05/12/21	U	TML
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	05/13/21		TML
Solids, Total Dissolved	210	mg/l	4	5	SM 2540 C	05/11/21		TMH
Total Organic Carbon	2.2	mg/l	0.3	0.5	SM 5310 C	05/11/21		ALD
Solids, Total Suspended	4	mg/l	1	1	SM 2540 D	05/11/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	2	mpn/100ml	1	SM 9223 B/Quantitray	5/10/21 15:20	5/11/21 15:42		JMW
Total Coliform	291	mpn/100ml	1	SM 9223 B/Quantitray	5/10/21 15:20	5/11/21 15:42		JMW

Lab ID: 2114819-16 **Collected By:** Client **Sampled:** 05/10/21 10:50 **Received:** 05/10/21 14:00
Sample Desc: BM-9M **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.05	mg/l		0.05	SM 4500-P F	05/14/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	136	mg CaCO3/L		2	SM 2320 B	05/18/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	05/11/21	U	APR
Biochemical Oxygen Demand	2.5	mg/l	2.0	2.0	SM 5210 B	05/11/21 17:15		SWA
Nitrate as N	4.77	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	05/10/21 14:36		MRW
Nitrite as N	0.03	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	05/10/21 14:36	J	MRW
Nitrate+Nitrite as N	4.80	mg/l	0.108	1.10	CALCULATED	05/10/21 14:36		MRW
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	05/12/21	U	TML
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	05/13/21		TML
Solids, Total Dissolved	223	mg/l	4	5	SM 2540 C	05/11/21		TMH
Total Organic Carbon	2.0	mg/l	0.3	0.5	SM 5310 C	05/11/21		ALD
Solids, Total Suspended	4	mg/l	1	1	SM 2540 D	05/11/21		ALD

Lab ID: 2114819-17 **Collected By:** Client **Sampled:** 05/10/21 10:50 **Received:** 05/10/21 14:00
Sample Desc: BM-9D **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.05	mg/l		0.05	SM 4500-P F	05/14/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	143	mg CaCO3/L		2	SM 2320 B	05/18/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	05/11/21	U	APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	05/11/21 15:55		SWA
Nitrate as N	4.38	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	05/10/21 14:53		MRW
Nitrite as N	0.04	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	05/10/21 14:53	J	MRW
Nitrate+Nitrite as N	4.42	mg/l	0.108	1.10	CALCULATED	05/10/21 14:53		MRW
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	05/12/21	U	TML
Phosphorus as P, Total	0.02	mg/l	0.01	0.01	SM 4500-P F	05/13/21		TML
Solids, Total Dissolved	238	mg/l	4	5	SM 2540 C	05/11/21		TMH
Total Organic Carbon	1.6	mg/l	0.3	0.5	SM 5310 C	05/11/21		ALD
Solids, Total Suspended	16	mg/l	1	1	SM 2540 D	05/11/21		ALD

Lab ID: 2114819-18 **Collected By:** Client **Sampled:** 05/10/21 11:25 **Received:** 05/10/21 14:00
Sample Desc: BM-10S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.05	mg/l		0.05	SM 4500-P F	05/14/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	146	mg CaCO3/L		2	SM 2320 B	05/18/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	05/11/21	U	APR
Biochemical Oxygen Demand	3.0	mg/l	2.0	2.0	SM 5210 B	05/11/21 13:25		SWA
Nitrate as N	4.80	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	05/10/21 17:19		MRW
Nitrite as N	0.03	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	05/10/21 17:19	J	MRW
Nitrate+Nitrite as N	4.83	mg/l	0.108	1.10	CALCULATED	05/10/21 17:19		MRW
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	05/12/21	U	TML
Phosphorus as P, Total	0.01	mg/l	0.01	0.01	SM 4500-P F	05/13/21		TML
Solids, Total Dissolved	219	mg/l	4	5	SM 2540 C	05/11/21		TMH
Total Organic Carbon	2.4	mg/l	0.3	0.5	SM 5310 C	05/12/21		ALD
Solids, Total Suspended	6	mg/l	1	1	SM 2540 D	05/11/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	43	mpn/100ml	1	SM 9223 B/Quantitray	5/10/21 15:20	5/11/21 15:42		JMW
Total Coliform	1550	mpn/100ml	1	SM 9223 B/Quantitray	5/10/21 15:20	5/11/21 15:42		JMW

Lab ID: 2114819-19 **Collected By:** Client **Sampled:** 05/10/21 11:25 **Received:** 05/10/21 14:00
Sample Desc: BM-10M **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.05	mg/l		0.05	SM 4500-P F	05/14/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	155	mg CaCO3/L		2	SM 2320 B	05/18/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	05/11/21	U	APR
Biochemical Oxygen Demand	2.2	mg/l	2.0	2.0	SM 5210 B	05/11/21 13:25		SWA
Nitrate as N	5.19	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	05/10/21 18:26		MRW
Nitrite as N	0.02	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	05/10/21 18:26	J	MRW
Nitrate+Nitrite as N	5.21	mg/l	0.108	1.10	CALCULATED	05/10/21 18:26		MRW
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	05/12/21	U	TML
Phosphorus as P, Total	0.02	mg/l	0.01	0.01	SM 4500-P F	05/13/21		TML
Solids, Total Dissolved	191	mg/l	4	5	SM 2540 C	05/11/21		TMH
Total Organic Carbon	2.1	mg/l	0.3	0.5	SM 5310 C	05/12/21		ALD
Solids, Total Suspended	10	mg/l	1	1	SM 2540 D	05/11/21		ALD

Lab ID: 2114819-20 **Collected By:** Client **Sampled:** 05/10/21 11:25 **Received:** 05/10/21 14:00
Sample Desc: BM-10D **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.05	mg/l		0.05	SM 4500-P F	05/14/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	159	mg CaCO3/L		2	SM 2320 B	05/18/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	05/11/21	U	APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	05/11/21 15:55		SWA
Nitrate as N	5.52	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	05/10/21 21:31		MRW
Nitrite as N	0.02	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	05/10/21 21:31	J	MRW
Nitrate+Nitrite as N	5.54	mg/l	0.108	1.10	CALCULATED	05/10/21 21:31		MRW
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	05/12/21	U	TML
Phosphorus as P, Total	0.02	mg/l	0.01	0.01	SM 4500-P F	05/13/21		TML
Solids, Total Dissolved	239	mg/l	4	5	SM 2540 C	05/11/21		TMH
Total Organic Carbon	1.8	mg/l	0.3	0.5	SM 5310 C	05/12/21		ALD
Solids, Total Suspended	23	mg/l	1	1	SM 2540 D	05/11/21		ALD

Lab ID: 2114819-21 **Collected By:** Client **Sampled:** 05/10/21 13:00 **Received:** 05/10/21 14:00
Sample Desc: BM-11S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.05	mg/l		0.05	SM 4500-P F	05/20/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	50	mg CaCO3/L		2	SM 2320 B	05/18/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	05/11/21	U	APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	05/11/21 15:55		SWA
Nitrate as N	2.82	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	05/10/21 20:58		MRW
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	05/10/21 20:58	U	MRW
Nitrate+Nitrite as N	<2.83	mg/l	0.108	1.10	CALCULATED	05/10/21 20:58		MRW
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	05/12/21	U	TML
Phosphorus as P, Total	0.03	mg/l	0.01	0.01	SM 4500-P F	05/20/21		TML
Solids, Total Dissolved	83	mg/l	4	5	SM 2540 C	05/11/21		TMH
Total Organic Carbon	1.8	mg/l	0.3	0.5	SM 5310 C	05/12/21		ALD
Solids, Total Suspended	5	mg/l	1	1	SM 2540 D	05/11/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	285	mpn/100ml	1	SM 9223 B/Quantitray	5/10/21 15:20	5/11/21 15:42		JMW
Total Coliform	>2420	mpn/100ml	1	SM 9223 B/Quantitray	5/10/21 15:20	5/11/21 15:42		JMW

Preparation Methods

Specific Method	Preparation Method	Prep Batch	Prepared Date	Prepared By
2114819-01				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0663	05/13/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0610	05/12/2021	TML
2114819-02				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0663	05/13/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0610	05/12/2021	TML
2114819-03				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0663	05/13/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0610	05/12/2021	TML
2114819-04				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0663	05/13/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0610	05/12/2021	TML
2114819-05				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0663	05/13/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0610	05/12/2021	TML
2114819-06				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0663	05/13/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0610	05/12/2021	TML
2114819-07				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0663	05/13/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0610	05/12/2021	TML
2114819-08				
Dissolved General Chemistry				

SM 4500-P F	SM 4500-P B	B1E0663	05/13/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0610	05/12/2021	TML
2114819-09				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0663	05/13/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0610	05/12/2021	TML
2114819-10				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0663	05/13/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0610	05/12/2021	TML
2114819-11				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0663	05/13/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0610	05/12/2021	TML
2114819-12				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0663	05/13/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0610	05/12/2021	TML
2114819-13				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0663	05/13/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0610	05/12/2021	TML
2114819-14				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0663	05/13/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0610	05/12/2021	TML
2114819-15				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0663	05/13/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0610	05/12/2021	TML
2114819-16				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0663	05/13/2021	TML

General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0610	05/12/2021	TML
2114819-17				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0663	05/13/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0610	05/12/2021	TML
2114819-18				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0663	05/13/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0610	05/12/2021	TML
2114819-19				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0663	05/13/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0610	05/12/2021	TML
2114819-20				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0663	05/13/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0610	05/12/2021	TML
2114819-21				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0910	05/18/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1E0909	05/18/2021	TML

Notes and Definitions

G-11	The sample was filtered after it was received at the laboratory.
G-17	The sample was preserved in the laboratory.
J	Estimated value
Q-10	The matrix spike(s) were outside acceptable limits of 90-110% recovery at 110.9%.
U	Analyte was not detected above the indicated value.

M.J. Reider Associates, Inc.
107 Angelica St, Reading PA, 19611
610-374-5129 www.mjreider.com

WORK ORDER
Chain of Custody

2114819

Client Code: 3157
Client: Tetra Tech
Project Manager: Richard A Wheeler
Project: 2021 - Blue Marsh Reservoir
Report To: Tetra Tech - David Wertz - USACE, Phila Dist. Env.Resources Branch 100 Penn Square E., Arlington, VA 22201
Invoice To: Tetra Tech - David Wertz - USACE, Phila Dist. Env.Resources Branch 100 Penn Square E., Arlington, VA 22201

Comments:

Collected By : (Full Name) Greg Wacik

2114819-01 BM-1S

Matrix: Non-Potable Water
Type: Grab
Date: 5/10/21
Time: 0730

BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, TC (#) SM 9223B
NH3-N D6919-03, PO4 SM 4500P-E, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

2114819-02 BM-2S

Matrix: Non-Potable Water
Type: Grab
Date: 5/10/21
Time: 0945

BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, NO3-N EPA 300.0, PO4-D SM 4500P-F, TC (#) SM 9223B, NO2-N, NO3-N, Combined NO3+NO2
TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D, PO4 SM 4500P-E, NH3-N D6919-03

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

	Date/Time		Date/Time
Relinquished By	5/10/21 1330	Received By	5/10/21 1337
Relinquished By		Received By	
Relinquished By		Received at Laboratory By	5/10/21 1400

Sample Kit Prepared By:	Date/Time
DJM	4/28/21
Sample Temp (°C):	5.0
Samples on Ice?	Yes No NA
Approved By:	cm
Entered By:	

Printed: 4/28/2021 9:15:46AM

Report Template: wko WorkOrder COC ls

M.J. Reider Associates, Inc.

Client Code: 3157 **Client:** Tetra Tech

Project Manager: Richard A Wheeler **Project:** 2021 - Blue Marsh Reservoir

Comments:

Collected By : (Full Name) Greg Wacik

2114819-03 BM-2M

Matrix: Non-Potable Water Date: 5/10/21
Type: Grab Time: 0945

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F
NH3-N D6919-03, PO4 SM 4500P-E, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2114819-04 BM-2D

Matrix: Non-Potable Water Date: 5/10/21
Type: Grab Time: 0945

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F
NH3-N D6919-03, PO4 SM 4500P-E, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2114819-05 BM-5S

Matrix: Non-Potable Water Date: 5/10/21
Type: Grab Time: 1300

BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, TC (#) SM 9223B
NH3-N D6919-03, PO4 SM 4500P-E, TSS SM 2540D, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

	Date/Time		Date/Time
Relinquished By	5/10/21 1330	Received By	5/10/21 1337
Relinquished By		Received By	
Relinquished By		Received at Laboratory By	5/10/21 1400

Sample Kit Prepared By:	Date/Time
DJM	4/28/21
Sample Temp (°C):	5.0
Samples on Ice?	(Yes) No NA
Approved By:	CMM
Entered By:	

Printed: 4/28/2021 9:15:46AM

Report Template: WO WorkOrder COC is

M.J. Reider Associates, Inc.

Client Code: 3157 **Client:** Tetra Tech

Project Manager: Richard A Wheeler **Project:** 2021 - Blue Marsh Reservoir

Comments: *Bottle received empty UBN 5/10/21

Collected By : (Full Name)

2114819-06 BM-6S

Matrix: Non-Potable Water Date: 5/10/21
Type: Grab Time: 0854

BOD SM 5210B, EC (#) SM 9223B Confirmation, PO4-D SM 4500P-F, TC (#) SM 9223B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2
NH3-N D6919-03, PO4 SM 4500P-E, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

2114819-07 BM-6M

Matrix: Non-Potable Water Date: 5/10/21
Type: Grab Time: 0854

NO2-N EPA 300.0, NO3-N EPA 300.0, PO4-D SM 4500P-F, BOD SM 5210B, NO2-N, NO3-N, Combined NO3+NO2
NH3-N D6919-03, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D, PO4 SM 4500P-E, TDS SM 2540C

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2114819-08 BM-6D

Matrix: Non-Potable Water Date: 5/10/21
Type: Grab Time: 0854

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F
NH3-N D6919-03, PO4 SM 4500P-E, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

A - Pl 500ml NP, minimal hdspc*
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

Relinquished By	Date/Time 5/10/21 1330	Received By	Date/Time 5/10/21 1337
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received at Laboratory By	Date/Time 5/10/21 1400

Sample Kit Prepared By: DJM	Date/Time 4/28/21
Sample Temp (°C): 5.0	
Samples on Ice? (Yes) No NA	
Approved By: CML	
Entered By:	

Printed: 4/28/2021 9:15:46AM

Report Template: wko WorkOrder COC is

M.J. Reider Associates, Inc.

Client Code: 3157 **Client:** Tetra Tech

Project Manager: Richard A Wheeler **Project:** 2021 - Blue Marsh Reservoir

Comments:

Collected By : (Full Name) Greg Wacik

2114819-09 BM-7S

Matrix: Non-Potable Water Date: 5/10/21
Type: Grab Time: 1020

BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, TC (#) SM 9223B
NH3-N D6919-03, PO4 SM 4500P-E, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

2114819-10 BM-7M

Matrix: Non-Potable Water Date: 5/10/21
Type: Grab Time: 1020

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F
TSS SM 2540D, NH3-N D6919-03, PO4 SM 4500P-E, TDS SM 2540C, TOC SM 5310C, TKN EPA 351.2

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2114819-11 BM-7D

Matrix: Non-Potable Water Date: 5/10/21
Type: Grab Time: 1020

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F
NH3-N D6919-03, PO4 SM 4500P-E, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

	Date/Time		Date/Time
Relinquished By	5/10/21 1330	Received By	5/10/21 1337
Relinquished By		Received By	
Relinquished By		Received at Laboratory By	5/10/21 1400

Sample Kit Prepared By: DDM	Date/Time 4/28/21
Sample Temp (°C):	5.0
Samples on Ice?	(Yes) No NA
Approved By:	CML
Entered By:	

Printed: 4/28/2021 9:15:46AM

Report Template: [illegible]

M.J. Reider Associates, Inc.

Client Code: 3157 **Client:** Tetra Tech

Project Manager: Richard A Wheeler **Project:** 2021 - Blue Marsh Reservoir

Comments:

Collected By : (Full Name) Greg Wacik

2114819-12 BM-8S

Matrix: Non-Potable Water Date: 5/10/21
Type: Grab Time: 1200

BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, TC (#) SM 9223B
NH3-N D6919-03, PO4 SM 4500P-E, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

2114819-13 BM-8M

Matrix: Non-Potable Water Date: 5/10/21
Type: Grab Time: 1200

NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0
PO4 SM 4500P-E, TDS SM 2540C, NH3-N D6919-03, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2114819-14 BM-8D

Matrix: Non-Potable Water Date: 5/10/21
Type: Grab Time: 1200

NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, BOD SM 5210B, PO4-D SM 4500P-F
TOC SM 5310C, TSS SM 2540D, PO4 SM 4500P-E, TDS SM 2540C, TKN EPA 351.2, NH3-N D6919-03

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

Relinquished By	Date/Time 5/10/21 1330	Received By	Date/Time 5/10/21 1337
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received at Laboratory By	Date/Time 5/10/21 1400

Sample Kit Prepared By: DJM	Date/Time 4/28/21
Sample Temp (°C):	5.0
Samples on Ice?	(Yes) No NA
Approved By:	CMM
Entered By:	

Printed: 4/28/2021 9:15:46AM

Report Template: MJRA Workorder COC 15

M.J. Reider Associates, Inc.

Client Code: 3157 **Client:** Tetra Tech

Project Manager: Richard A Wheeler **Project:** 2021 - Blue Marsh Reservoir

Comments:

Collected By : (Full Name) Greg Wacik

2114819-15 BM-9S

Matrix: Non-Potable Water Date: 5/10/21
Type: Grab Time: 1050

BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, TC (#) SM 9223B, NO2-N EPA 300.0, NO3-N EPA 300.0
PO4 SM 4500P-E, NH3-N D6919-03, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

2114819-16 BM-9M

Matrix: Non-Potable Water Date: 5/10/21
Type: Grab Time: 1050

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F
NH3-N D6919-03, PO4 SM 4500P-E, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2114819-17 BM-9D

Matrix: Non-Potable Water Date: 5/10/21
Type: Grab Time: 1050

PO4-D SM 4500P-F, BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2
TSS SM 2540D, TDS SM 2540C, TOC SM 5310C, NH3-N D6919-03, PO4 SM 4500P-E, TKN EPA 351.2

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

	Date/Time		Date/Time
Relinquished By	5/10/21 1330	Received By	5/10/21 1337
Relinquished By		Received By	
Relinquished By		Received at Laboratory By	5/10/21 1400

Sample Kit Prepared By:	Date/Time
JSV	4-29-21
Sample Temp (°C):	5.0
Samples on Ice?	(Yes) No NA
Approved By:	CMC
Entered By:	

Report Template:

Printed: 4/28/2021 9:15:46AM

M.J. Reider Associates, Inc.

Client Code: 3157 **Client:** Tetra Tech

Project Manager: Richard A Wheeler **Project:** 2021 - Blue Marsh Reservoir

Comments:

Collected By : (Full Name) Greg Wacik

2114819-18 BM-10S

Matrix: Non-Potable Water Date: 5/10/21
Type: Grab Time: 1125

NO2-N EPA 300.0, NO3-N EPA 300.0, EC (#) SM 9223B Confirmation, BOD SM 5210B, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, TC (#) SM 9223B
NH3-N D6919-03, PO4 SM 4500P-E, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

2114819-19 BM-10M

Matrix: Non-Potable Water Date: 5/10/21
Type: Grab Time: 1125

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F
NH3-N D6919-03, PO4 SM 4500P-E, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2114819-20 BM-10D

Matrix: Non-Potable Water Date: 5/10/21
Type: Grab Time: 1125

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F
NH3-N D6919-03, PO4 SM 4500P-E, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

Relinquished By	Date/Time 5/10/21 1330	Received By	Date/Time 5/10/21 1337
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received at Laboratory By	Date/Time 5/10/21 1400

Sample Kit Prepared By: JSV	Date/Time 4-29-21
Sample Temp (°C):	5.0
Samples on Ice?	(Yes) No NA
Approved By:	CMC
Entered By:	

Report Template:

Printed: 4/28/2021 9:15:46AM

M.J. Reider Associates, Inc.

Client Code: 3157
Project Manager: Richard A Wheeler

Client: Tetra Tech
Project: 2021 - Blue Marsh Reservoir

Comments:

Collected By : (Full Name) Greg Wack

2114819-21 BM-11S

Matrix: Non-Potable Water
Type: Grab

Date: 5/21/21
Time: 1300

BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, NO3-N EPA 300.0, PO4-D SM 4500P-F, TC (#) SM 9223B, NO2-N, NO3-N, Combined NO3+NO2
NH3-N D6919-03, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D, PO4 SM 4500P-E

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

Relinquished By	Date/Time 5/10/21 1330	Received By	Date/Time 5/10/21 1337
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received at Laboratory By	Date/Time 5/10/21 1400

Sample Kit Prepared By: JSV	Date/Time 4-29-21
Sample Temp (°C):	5.0
Samples on Ice?	(Yes) No NA
Approved By:	CMW
Entered By:	

The Client, by signing (or having the client's agent sign), agrees to MJRA's Terms and Conditions and to pay for the above requested services including any additional associated fees incurred.

Printed: 4/28/2021 9:15:46AM

Report Template: v

M.J. Reider Associates, Inc.
107 Angelica St, Reading PA, 19611
610-374-5129 www.mjreider.com

WORK ORDER
Chain of Custody

2114819

Client Code: 3157
Client: Tetra Tech
Project Manager: Richard A Wheeler
Project: 2021 - Blue Marsh Reservoir
Report To: Tetra Tech - David Wertz - USACE, Phila Dist. Env.Resources Branch 100 Penn Square E., Arlington, VA 22201
Invoice To: Tetra Tech - David Wertz - USACE, Phila Dist. Env.Resources Branch 100 Penn Square E., Arlington, VA 22201

Comments: A/K added to ~~-01 - 21~~ -01 through -21 RAW 5/11/21

Collected By : (Full Name) Greg Wacik

2114819-01 BM-1S

Matrix: Non-Potable Water
Type: Grab
Date: 5/10/21
Time: 0730

BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, TC (#) SM 9223B
NH3-N D6919-03, PO4 SM 4500P-E, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

2114819-02 BM-2S

Matrix: Non-Potable Water
Type: Grab
Date: 5/10/21
Time: 0945

BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, NO3-N EPA 300.0, PO4-D SM 4500P-F, TC (#) SM 9223B, NO2-N, NO3-N, Combined NO3+NO2
TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D, PO4 SM 4500P-E, NH3-N D6919-03

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

	Date/Time		Date/Time
Relinquished By	5/10/21 1330	Received By	5/10/21 1337
Relinquished By		Received By	
Relinquished By		Received at Laboratory By	5/10/21 1400

Sample Kit Prepared By:	Date/Time
DJM	4/28/21
Sample Temp (°C):	5.0
Samples on Ice?	(Yes) No NA
Approved By:	
Entered By:	

Printed: 4/28/2021 9:15:46AM

Report Template

M.J. Reider Associates, Inc.

Client Code: 3157
Project Manager: Richard A Wheeler

Client: Tetra Tech
Project: 2021 - Blue Marsh Reservoir

Comments:

Collected By : (Full Name) Greg Wacik

2114819-03 BM-2M

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F
NH3-N D6919-03, PO4 SM 4500P-E, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

Matrix: Non-Potable Water
Type: Grab
Date: 5/10/21
Time: 0945

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2114819-04 BM-2D

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F
NH3-N D6919-03, PO4 SM 4500P-E, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

Matrix: Non-Potable Water
Type: Grab
Date: 5/10/21
Time: 0945

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2114819-05 BM-5S

BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, TC (#) SM 9223B
NH3-N D6919-03, PO4 SM 4500P-E, TSS SM 2540D, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C

Matrix: Non-Potable Water
Type: Grab
Date: 5/10/21
Time: 1300

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

	Date/Time		Date/Time
Relinquished By	5/10/21 1330	Received By	5/10/21 1337
Relinquished By		Received By	
Relinquished By		Received at Laboratory By	5/10/21 1400

Sample Kit Prepared By:	Date/Time
DJM	4/28/21
Sample Temp (°C):	5.0
Samples on Ice?	(Yes) No NA
Approved By:	CMM
Entered By:	

Printed: 4/28/2021 9:15:46AM

Report Template

M.J. Reider Associates, Inc.

Client Code: 3157
Project Manager: Richard A Wheeler
Collected By : (Full Name)

Client: Tetra Tech
Project: 2021 - Blue Marsh Reservoir
Comments: *Bottle received empty UBW 5/10/21

2114819-06 BM-6S

BOD SM 5210B, EC (#) SM 9223B Confirmation, PO4-D SM 4500P-F, TC (#) SM 9223B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2
NH3-N D6919-03, PO4 SM 4500P-E, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

Matrix: Non-Potable Water
Type: Grab
Date: 5/10/21
Time: 0854

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

2114819-07 BM-6M

NO2-N EPA 300.0, NO3-N EPA 300.0, PO4-D SM 4500P-F, BOD SM 5210B, NO2-N, NO3-N, Combined NO3+NO2
NH3-N D6919-03, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D, PO4 SM 4500P-E, TDS SM 2540C

Matrix: Non-Potable Water
Type: Grab
Date: 5/10/21
Time: 0854

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2114819-08 BM-6D

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F
NH3-N D6919-03, PO4 SM 4500P-E, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

Matrix: Non-Potable Water
Type: Grab
Date: 5/10/21
Time: 0854

A - Pl 500ml NP, minimal hdspc*
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

Relinquished By	Date/Time: 5/10/21 1330	Received By	Date/Time: 5/10/21 1337
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received at Laboratory By	Date/Time: 5/10/21 1400

Sample Kit Prepared By: DJM	Date/Time: 4/28/21
Sample Temp (°C):	5.0
Samples on Ice?	(Yes) No NA
Approved By:	CMC
Entered By:	

Report Template

Printed: 4/28/2021 9:15:46AM

M.J. Reider Associates, Inc.

Client Code: 3157
Project Manager: Richard A Wheeler

Client: Tetra Tech
Project: 2021 - Blue Marsh Reservoir
Comments:

Collected By : (Full Name) Greg Wacik

2114819-09 BM-7S

Matrix: Non-Potable Water
Type: Grab
Date: 5/10/21
Time: 1020

BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, TC (#) SM 9223B
NH3-N D6919-03, PO4 SM 4500P-E, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

2114819-10 BM-7M

Matrix: Non-Potable Water
Type: Grab
Date: 5/10/21
Time: 1020

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F
TSS SM 2540D, NH3-N D6919-03, PO4 SM 4500P-E, TDS SM 2540C, TOC SM 5310C, TKN EPA 351.2

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2114819-11 BM-7D

Matrix: Non-Potable Water
Type: Grab
Date: 5/10/21
Time: 1020

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F
NH3-N D6919-03, PO4 SM 4500P-E, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

	Date/Time		Date/Time
Relinquished By	5/10/21 1330	Received By	5/10/21 1337
Relinquished By		Received By	
Relinquished By		Received at Laboratory By	5/10/21 1400

Sample Kit Prepared By:	Date/Time
DJM	4/28/21
Sample Temp (°C):	5.0
Samples on Ice?	(Yes) No NA
Approved By:	CML
Entered By:	

Printed: 4/28/2021 9:15:46AM

Report Template

M.J. Reider Associates, Inc.

Client Code: 3157
Project Manager: Richard A Wheeler

Client: Tetra Tech
Project: 2021 - Blue Marsh Reservoir
Comments:

Collected By : (Full Name) Greg Wack

2114819-12 BM-8S

BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, TC (#) SM 9223B
NH3-N D6919-03, PO4 SM 4500P-E, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

Matrix: Non-Potable Water
Type: Grab
Date: 5/10/21
Time: 1200

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

2114819-13 BM-8M

NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0
PO4 SM 4500P-E, TDS SM 2540C, NH3-N D6919-03, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

Matrix: Non-Potable Water
Type: Grab
Date: 5/10/21
Time: 1205

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2114819-14 BM-8D

NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, BOD SM 5210B, PO4-D SM 4500P-F
TOC SM 5310C, TSS SM 2540D, PO4 SM 4500P-E, TDS SM 2540C, TKN EPA 351.2, NH3-N D6919-03

Matrix: Non-Potable Water
Type: Grab
Date: 5/10/21
Time: 1207

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

	Date/Time		Date/Time
Relinquished By	5/10/21 1330	Received By	5/10/21 1337
Relinquished By		Received By	
Relinquished By		Received at Laboratory By	5/10/21 1400

Sample Kit Prepared By:	Date/Time
DJM	4/28/21
Sample Temp (°C):	5.0
Samples on Ice?	(Yes) No NA
Approved By:	CMC
Entered By:	SW

Printed: 4/28/2021 9:15:46AM

Report Template

M.J. Reider Associates, Inc.

Client Code: 3157
Project Manager: Richard A Wheeler

Client: Tetra Tech
Project: 2021 - Blue Marsh Reservoir

Comments:

Collected By : (Full Name) Greg Wacik

2114819-15 BM-9S

BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, TC (#) SM 9223B, NO2-N EPA 300.0, NO3-N EPA 300.0
PO4 SM 4500P-E, NH3-N D6919-03, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

Matrix: Non-Potable Water
Type: Grab
Date: 5/10/21
Time: 1050

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

2114819-16 BM-9M

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F
NH3-N D6919-03, PO4 SM 4500P-E, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

Matrix: Non-Potable Water
Type: Grab
Date: 5/10/21
Time: 1050

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2114819-17 BM-9D

PO4-D SM 4500P-F, BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2
TSS SM 2540D, TDS SM 2540C, TOC SM 5310C, NH3-N D6919-03, PO4 SM 4500P-E, TKN EPA 351.2

Matrix: Non-Potable Water
Type: Grab
Date: 5/10/21
Time: 1050

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

	Date/Time		Date/Time
Relinquished By	5/10/21 1330	Received By	5/10/21 1337
Relinquished By		Received By	
Relinquished By		Received at Laboratory By	5/10/21 1400

Sample Kit Prepared By:	Date/Time
JSV	4-29-21
Sample Temp (°C):	5.0
Samples on Ice?	(Yes) No NA
Approved By:	CMC
Entered By:	JSV

Report Template: wko Work Order COC ls

Printed: 4/28/2021 9:15:46AM

M.J. Reider Associates, Inc.

Client Code: 3157
Project Manager: Richard A Wheeler

Client: Tetra Tech
Project: 2021 - Blue Marsh Reservoir

Comments:

Collected By : Greg Wack
(Full Name)

2114819-21 BM-11S

Matrix: Non-Potable Water
Type: Grab

Date: 5/21/21
Time: 1300

BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, NO3-N EPA 300.0, PO4-D SM 4500P-F, TC (#) SM 9223B, NO2-N, NO3-N, Combined NO3+NO2
NH3-N D6919-03, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D, PO4 SM 4500P-E

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

Relinquished By	Date/Time 5/10/21 1330	Received By	Date/Time 5/10/21 1337
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received at Laboratory By	Date/Time 5/10/21 1400

Sample Kit Prepared By: JSV	Date/Time 4-29-21
Sample Temp (°C):	5.0
Samples on Ice?	(Yes) No NA
Approved By:	CMC
Entered By:	

Printed: 4/28/2021 9:15:46AM

Report Template

MJRA Terms & Conditions

All samples submitted must be accompanied by signed documentation representing a Chain of Custody (COC). The COC Record acts as a contract between the client and MJRA. Signing the COC form gives approval for MJRA to perform the requested analyses and is an agreement to pay for the cost of such analyses**.** COC Records must be completed in black or blue indelible ink (must not run when wet). COC documentation begins at the time of sample collection. Client is required to document all sample details prior to releasing samples to MJRA. All samples must be placed on ice immediately after sampling and shipped or delivered to the laboratory in a manner that will maintain the sample temperature above freezing and below 6C (loose ice is preferred)**.**

Sample Submission, Sample Acceptance & Sampling Containers

Included on the COC must be the sample description, date and time of collection (including start and stop for composites), container size and type, preservative information, sample matrix, indication of whether the sample is a grab or composite, number of containers & a list of the tests to be performed. Poor sample collection technique, inappropriate sampling containers and/or improper sample preservation may lead to sample rejection. Suitable sample containers, labels, and preservatives (as applicable), along with blank COCs are provided at no additional cost.

Turnaround Times (TAT)

Average TAT for test results range from 5 to 15 working days depending on the specific analyses and time of year submitted. Faster turnaround times (*RUSH TAT) may be available depending on the current workload in a particular department and the nature of the analyses requested. We encourage you to verify requests for expedited sample results with one of our Technical Directors prior to sample submittal. Without confirmation from a Technical Director, your results may not be completed by your deadline. *RUSH TAT Surcharges are applied for expedited turnaround times.

Analytical Results, Sample Collection Integrity & Subcontracting

Analytical values are for the sample as submitted and relate only to the item tested. The value indicates a snapshot of the constituent content of the sample at the time of sample collection. Analytical results can be impacted by poor sample collection technique and/or improper preservation. All sample collection completed by MJRA was performed in accordance with applicable regulatory protocols or as specified in customer specific sampling plans. Constituent content will vary over time based on the matrix of the sample and the physical and chemical changes to its environment. All sample results and laboratory reports are strictly confidential. Results will not be available to anyone except the primary client or authorized party representing the client unless MJRA receives additional permissions from the client. When necessary, MJRA will subcontract certain analyses to a third party accredited laboratory. If client prohibits subcontracting, it must be provided in writing and include instruction on how to proceed with client samples that require third party analyses.

Payment Terms

Payment Terms are Net 30 days. Prices are subject to change without notice. A standing monthly charge of 1.5% of the clients over-30-day-unpaid balance may be added to the balance after 30 days and each month thereafter (day 31, 61, 91 etc.). The laboratory accepts all major credit cards, ACH transactions, checks and cash. New clients must pay for all services rendered prior to sample collection and/or in some cases report processing. Clients must contact the MJRA accounting department to pursue a credit-based account. MJRA reserves the right to terminate the client's credit account and to refuse to perform additional services on a credit basis if any balance is outstanding for more than 60 days.

Warranty & Litigation

MJRA does not guarantee any results of its services but has agreed to use its best efforts, in accordance with the standards and practices of the industry, to cause such results to be accurate and complete. We disclaim any other warranties, expressed or implied, including a warranty of fitness for a particular purpose and warranty of merchantability. Clients agree that they shall reimburse MJRA for any and all fees, cost and litigation expenses, including reasonable attorney fees incurred by MJRA in obtaining payment for the services rendered. All costs associated with compliance with any subpoena for documents, testimony, or any other purpose relating to work performed by MJRA, for a client, shall be paid by that client. MJRA's aggregate liability for negligent acts and omissions and of an intentional breach by MJRA will not exceed the fee paid for the services. Client agrees to indemnify and hold MJRA harmless for any and all liabilities in excess of said amount. Neither MJRA nor the client shall be liable to the other for special, incidental consequential or punitive liability or damages included but not limited to those arising from delay, loss of use, loss of profits or revenues. MJRA will not be liable to the client unless the client has notified MJRA of the discovery of the alleged negligent act, error, omissions or breach within 30 days of the day of its discovery and within one year of the date of invoice.

Reviewed and Approved by:

Richard A Wheeler
Director of Field Services

Certificate of Analysis

M.J. Reider Associates, Inc.
ENVIRONMENTAL TESTING LABORATORY
U.S. EPA/PA DEP #06-00003

Laboratory No.: 2116073
Report: 06/21/21
Lab Contact: Richard A Wheeler

Attention: David Wertz
Reported To: Tetra Tech
USACE, Phila Dist. Env.Resources Branch 100 Penn Square E.
Arlington, VA 22201

Project: 2021 - Blue Marsh Reservoir

Lab ID: 2116073-01 **Collected By:** Client **Sampled:** 06/07/21 07:15 **Received:** 06/07/21 13:45
Sample Desc: BM-1S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.02	mg/l		0.01	SM 4500-P F	06/10/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	123	mg CaCO3/L		2	SM 2320 B	06/08/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	06/08/21	U	APR
Biochemical Oxygen Demand	2.0	mg/l	2.0	2.0	SM 5210 B	06/08/21 13:25		SWA
Nitrate as N	3.86	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/08/21 0:15		JAF
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/08/21 0:15	U	JAF
Nitrate+Nitrite as N	<3.87	mg/l	0.108	1.10	CALCULATED	06/08/21 0:15		JAF
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/11/21	U	TML
Phosphorus as P, Total	0.08	mg/l	0.01	0.01	SM 4500-P F	06/09/21		TML
Solids, Total Dissolved	200	mg/l	4	5	SM 2540 C	06/08/21		TMH
Total Organic Carbon	2.3	mg/l	0.3	0.5	SM 5310 C	06/08/21		ALD
Solids, Total Suspended	3	mg/l	1	1	SM 2540 D	06/08/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	9	mpn/100ml	1	SM 9223 B/Quantitray	6/7/21 14:27	6/8/21 9:01		JMW
Total Coliform	>2420	mpn/100ml	1	SM 9223 B/Quantitray	6/7/21 14:27	6/8/21 9:01		JMW

Lab ID: 2116073-02 **Collected By:** Client **Sampled:** 06/07/21 09:15 **Received:** 06/07/21 13:45
Sample Desc: BM-2S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.03	mg/l		0.01	SM 4500-P F	06/16/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	113	mg CaCO3/L		2	SM 2320 B	06/08/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	06/08/21	U	APR
Biochemical Oxygen Demand	2.0	mg/l	2.0	2.0	SM 5210 B	06/08/21 15:00		MRW
Nitrate as N	3.79	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/07/21 21:09		JAF
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/07/21 21:09	U	JAF
Nitrate+Nitrite as N	<3.80	mg/l	0.108	1.10	CALCULATED	06/07/21 21:09		JAF
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/11/21	U	TML
Phosphorus as P, Total	0.02	mg/l	0.01	0.01	SM 4500-P F	06/16/21		TML
Solids, Total Dissolved	176	mg/l	4	5	SM 2540 C	06/08/21		TMH
Total Organic Carbon	2.7	mg/l	0.3	0.5	SM 5310 C	06/08/21		ALD
Solids, Total Suspended	<1	mg/l	1	1	SM 2540 D	06/08/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	2	mpn/100ml	1	SM 9223 B/Quantitray	6/7/21 14:27	6/8/21 9:01		JMW
Total Coliform	99	mpn/100ml	1	SM 9223 B/Quantitray	6/7/21 14:27	6/8/21 9:01		JMW

Lab ID: 2116073-03 **Collected By:** Client **Sampled:** 06/07/21 09:15 **Received:** 06/07/21 13:45
Sample Desc: BM-2M **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.01	mg/l		0.01	SM 4500-P F	06/10/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	140	mg CaCO3/L		2	SM 2320 B	06/08/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	06/08/21	U	APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	06/08/21 14:15		SWA
Nitrate as N	4.17	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/08/21 2:29		JAF
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/08/21 2:29	U	JAF
Nitrate+Nitrite as N	<4.18	mg/l	0.108	1.10	CALCULATED	06/08/21 2:29		JAF
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/11/21	U	TML
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	06/09/21		TML
Solids, Total Dissolved	224	mg/l	4	5	SM 2540 C	06/08/21		TMH
Total Organic Carbon	2.1	mg/l	0.3	0.5	SM 5310 C	06/08/21		ALD
Solids, Total Suspended	2	mg/l	1	1	SM 2540 D	06/08/21		ALD

Lab ID: 2116073-04 **Collected By:** Client **Sampled:** 06/07/21 09:15 **Received:** 06/07/21 13:45
Sample Desc: BM-2D **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.01	mg/l		0.01	SM 4500-P F	06/10/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	140	mg CaCO3/L		2	SM 2320 B	06/08/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	06/08/21	U	APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	06/08/21 14:15		SWA
Nitrate as N	3.94	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/07/21 21:43		JAF
Nitrite as N	0.05	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/07/21 21:43	J	JAF
Nitrate+Nitrite as N	3.99	mg/l	0.108	1.10	CALCULATED	06/07/21 21:43		JAF
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/11/21	U	TML
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	06/09/21		TML
Solids, Total Dissolved	225	mg/l	4	5	SM 2540 C	06/08/21		TMH
Total Organic Carbon	1.9	mg/l	0.3	0.5	SM 5310 C	06/08/21		ALD
Solids, Total Suspended	2	mg/l	1	1	SM 2540 D	06/08/21		ALD

Lab ID: 2116073-05 **Collected By:** Client **Sampled:** 06/07/21 12:30 **Received:** 06/07/21 13:45
Sample Desc: BM-5S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.06	mg/l		0.01	SM 4500-P F	06/10/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	191	mg CaCO3/L		2	SM 2320 B	06/08/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	06/08/21	U	APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	06/08/21 14:15		SWA
Nitrate as N	6.68	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/07/21 23:24		JAF
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/07/21 23:24	U	JAF
Nitrate+Nitrite as N	<6.69	mg/l	0.108	1.10	CALCULATED	06/07/21 23:24		JAF
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/11/21	U	TML
Phosphorus as P, Total	0.07	mg/l	0.01	0.01	SM 4500-P F	06/09/21		TML
Solids, Total Dissolved	318	mg/l	4	5	SM 2540 C	06/08/21		TMH
Total Organic Carbon	1.7	mg/l	0.3	0.5	SM 5310 C	06/08/21		ALD
Solids, Total Suspended	7	mg/l	1	1	SM 2540 D	06/08/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	365	mpn/100ml	1	SM 9223 B/Quantitray	6/7/21 14:27	6/8/21 9:01		JMW
Total Coliform	>2420	mpn/100ml	1	SM 9223 B/Quantitray	6/7/21 14:27	6/8/21 9:01		JMW

Lab ID: 2116073-06 **Collected By:** Client **Sampled:** 06/07/21 08:15 **Received:** 06/07/21 13:45
Sample Desc: BM-6S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.01	mg/l		0.01	SM 4500-P F	06/10/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	105	mg CaCO3/L		2	SM 2320 B	06/08/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	06/08/21	U	APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	06/08/21 15:00		MRW
Nitrate as N	3.80	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/07/21 20:53		JAF
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/07/21 20:53	U	JAF
Nitrate+Nitrite as N	<3.81	mg/l	0.108	1.10	CALCULATED	06/07/21 20:53		JAF
Nitrogen, Total Kjeldahl (TKN)	0.85	mg/l	0.48	0.50	EPA 351.2	06/11/21		TML
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	06/09/21		TML
Solids, Total Dissolved	203	mg/l	4	5	SM 2540 C	06/08/21		TMH
Total Organic Carbon	2.3	mg/l	0.3	0.5	SM 5310 C	06/08/21		ALD
Solids, Total Suspended	<1	mg/l	1	1	SM 2540 D	06/08/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	3	mpn/100ml	1	SM 9223 B/Quantitray	6/7/21 14:27	6/8/21 9:01		JMW
Total Coliform	104	mpn/100ml	1	SM 9223 B/Quantitray	6/7/21 14:27	6/8/21 9:01		JMW

Lab ID: 2116073-07 **Collected By:** Client **Sampled:** 06/07/21 08:15 **Received:** 06/07/21 13:45
Sample Desc: BM-6M **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.01	mg/l		0.01	SM 4500-P F	06/10/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	136	mg CaCO3/L		2	SM 2320 B	06/08/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	06/08/21	U	APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	06/08/21 14:15		SWA
Nitrate as N	4.06	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/07/21 22:00		JAF
Nitrite as N	0.03	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/07/21 22:00	J	JAF
Nitrate+Nitrite as N	4.09	mg/l	0.108	1.10	CALCULATED	06/07/21 22:00		JAF
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/11/21	U	TML
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	06/09/21		TML
Solids, Total Dissolved	239	mg/l	4	5	SM 2540 C	06/08/21		TMH
Total Organic Carbon	1.9	mg/l	0.3	0.5	SM 5310 C	06/08/21		ALD
Solids, Total Suspended	3	mg/l	1	1	SM 2540 D	06/08/21		ALD

Lab ID: 2116073-08 **Collected By:** Client **Sampled:** 06/07/21 08:15 **Received:** 06/07/21 13:45
Sample Desc: BM-6D **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.01	mg/l		0.01	SM 4500-P F	06/10/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	135	mg CaCO3/L		2	SM 2320 B	06/08/21		APR
Ammonia as N	0.06	mg/l	0.05	0.10	ASTM D6919-03	06/08/21	J	APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	06/08/21 14:15		SWA
Nitrate as N	3.44	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/07/21 21:26		JAF
Nitrite as N	0.17	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/07/21 21:26		JAF
Nitrate+Nitrite as N	3.61	mg/l	0.108	1.10	CALCULATED	06/07/21 21:26		JAF
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/11/21	U	TML
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	06/09/21		TML
Solids, Total Dissolved	249	mg/l	4	5	SM 2540 C	06/08/21		TMH
Total Organic Carbon	1.7	mg/l	0.3	0.5	SM 5310 C	06/08/21		ALD
Solids, Total Suspended	1	mg/l	1	1	SM 2540 D	06/08/21		ALD

Lab ID: 2116073-09 **Collected By:** Client **Sampled:** 06/07/21 09:35 **Received:** 06/07/21 13:45
Sample Desc: BM-7S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.01	mg/l		0.01	SM 4500-P F	06/10/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	117	mg CaCO3/L		2	SM 2320 B	06/08/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	06/08/21	U	APR
Biochemical Oxygen Demand	2.2	mg/l	2.0	2.0	SM 5210 B	06/08/21 15:00		MRW
Nitrate as N	3.80	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/08/21 2:12		JAF
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/08/21 2:12	U	JAF
Nitrate+Nitrite as N	<3.81	mg/l	0.108	1.10	CALCULATED	06/08/21 2:12		JAF
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/11/21	U	TML
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	06/09/21		TML
Solids, Total Dissolved	206	mg/l	4	5	SM 2540 C	06/08/21		TMH
Total Organic Carbon	2.2	mg/l	0.3	0.5	SM 5310 C	06/08/21		ALD
Solids, Total Suspended	1	mg/l	1	1	SM 2540 D	06/08/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	2	mpn/100ml	1	SM 9223 B/Quantitray	6/7/21 14:27	6/8/21 9:01		JMW
Total Coliform	99	mpn/100ml	1	SM 9223 B/Quantitray	6/7/21 14:27	6/8/21 9:01		JMW

Lab ID: 2116073-10 **Collected By:** Client **Sampled:** 06/07/21 09:35 **Received:** 06/07/21 13:45
Sample Desc: BM-7M **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.01	mg/l		0.01	SM 4500-P F	06/10/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	145	mg CaCO3/L		2	SM 2320 B	06/08/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	06/08/21	U	APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	06/08/21 13:25		SWA
Nitrate as N	4.57	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/07/21 22:34		JAF
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/07/21 22:34	U	JAF
Nitrate+Nitrite as N	<4.58	mg/l	0.108	1.10	CALCULATED	06/07/21 22:34		JAF
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/11/21	U	TML
Phosphorus as P, Total	0.02	mg/l	0.01	0.01	SM 4500-P F	06/09/21		TML
Solids, Total Dissolved	267	mg/l	4	5	SM 2540 C	06/08/21		TMH
Total Organic Carbon	2.1	mg/l	0.3	0.5	SM 5310 C	06/08/21		ALD
Solids, Total Suspended	3	mg/l	1	1	SM 2540 D	06/08/21		ALD

Lab ID: 2116073-11 **Collected By:** Client **Sampled:** 06/07/21 09:35 **Received:** 06/07/21 13:45
Sample Desc: BM-7D **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.01	mg/l		0.01	SM 4500-P F	06/10/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	156	mg CaCO3/L		2	SM 2320 B	06/08/21		APR
Ammonia as N	0.14	mg/l	0.05	0.10	ASTM D6919-03	06/08/21		APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	06/08/21 13:25		SWA
Nitrate as N	3.81	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/07/21 22:17		JAF
Nitrite as N	0.05	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/07/21 22:17	J	JAF
Nitrate+Nitrite as N	3.86	mg/l	0.108	1.10	CALCULATED	06/07/21 22:17		JAF
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/11/21	Q-10, U	TML
Phosphorus as P, Total	0.02	mg/l	0.01	0.01	SM 4500-P F	06/09/21		TML
Solids, Total Dissolved	264	mg/l	4	5	SM 2540 C	06/08/21		TMH
Total Organic Carbon	2.1	mg/l	0.3	0.5	SM 5310 C	06/08/21		ALD
Solids, Total Suspended	<1	mg/l	1	1	SM 2540 D	06/08/21		ALD

Lab ID: 2116073-12 **Collected By:** Client **Sampled:** 06/07/21 11:15 **Received:** 06/07/21 13:45
Sample Desc: BM-8S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.01	mg/l		0.01	SM 4500-P F	06/10/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	114	mg CaCO3/L		2	SM 2320 B	06/08/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	06/08/21	U	APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	06/08/21 15:00		MRW
Nitrate as N	3.76	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/07/21 23:58		JAF
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/07/21 23:58	U	JAF
Nitrate+Nitrite as N	<3.77	mg/l	0.108	1.10	CALCULATED	06/07/21 23:58		JAF
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/11/21	U	TML
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	06/09/21		TML
Solids, Total Dissolved	209	mg/l	4	5	SM 2540 C	06/08/21		TMH
Total Organic Carbon	2.2	mg/l	0.3	0.5	SM 5310 C	06/08/21		ALD
Solids, Total Suspended	<1	mg/l	1	1	SM 2540 D	06/08/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	<1	mpn/100ml	1	SM 9223 B/Quantitray	6/7/21 14:27	6/8/21 9:01		JMW
Total Coliform	66	mpn/100ml	1	SM 9223 B/Quantitray	6/7/21 14:27	6/8/21 9:01		JMW

Lab ID: 2116073-13 **Collected By:** Client **Sampled:** 06/07/21 11:15 **Received:** 06/07/21 13:45
Sample Desc: BM-8M **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.01	mg/l		0.01	SM 4500-P F	06/10/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	139	mg CaCO3/L		2	SM 2320 B	06/08/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	06/08/21	U	APR
Biochemical Oxygen Demand	3.3	mg/l	2.0	2.0	SM 5210 B	06/08/21 13:25		SWA
Nitrate as N	3.96	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/07/21 23:41		JAF
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/07/21 23:41	U	JAF
Nitrate+Nitrite as N	<3.97	mg/l	0.108	1.10	CALCULATED	06/07/21 23:41		JAF
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/11/21	U	TML
Phosphorus as P, Total	0.11	mg/l	0.01	0.01	SM 4500-P F	06/09/21		TML
Solids, Total Dissolved	241	mg/l	4	5	SM 2540 C	06/08/21		TMH
Total Organic Carbon	2.2	mg/l	0.3	0.5	SM 5310 C	06/08/21		ALD
Solids, Total Suspended	148	mg/l	1	1	SM 2540 D	06/08/21		ALD

Lab ID: 2116073-14 **Collected By:** Client **Sampled:** 06/07/21 11:15 **Received:** 06/07/21 13:45
Sample Desc: BM-8D **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.01	mg/l		0.01	SM 4500-P F	06/10/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	124	mg CaCO3/L		2	SM 2320 B	06/08/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	06/08/21	U	APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	06/08/21 14:15		SWA
Nitrate as N	3.67	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/08/21 1:39		JAF
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/08/21 1:39	U	JAF
Nitrate+Nitrite as N	<3.68	mg/l	0.108	1.10	CALCULATED	06/08/21 1:39		JAF
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/11/21	U	TML
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	06/09/21		TML
Solids, Total Dissolved	234	mg/l	4	5	SM 2540 C	06/08/21		TMH
Total Organic Carbon	2.1	mg/l	0.3	0.5	SM 5310 C	06/08/21		ALD
Solids, Total Suspended	4	mg/l	1	1	SM 2540 D	06/08/21		ALD

Lab ID: 2116073-15 **Collected By:** Client **Sampled:** 06/07/21 10:15 **Received:** 06/07/21 13:45
Sample Desc: BM-9S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.02	mg/l		0.01	SM 4500-P F	06/16/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	115	mg CaCO3/L		2	SM 2320 B	06/08/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	06/08/21	U	APR
Biochemical Oxygen Demand	2.1	mg/l	2.0	2.0	SM 5210 B	06/08/21 15:00		MRW
Nitrate as N	3.82	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/08/21 1:56		JAF
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/08/21 1:56	U	JAF
Nitrate+Nitrite as N	<3.83	mg/l	0.108	1.10	CALCULATED	06/08/21 1:56		JAF
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/11/21	U	TML
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	06/16/21		TML
Solids, Total Dissolved	185	mg/l	4	5	SM 2540 C	06/08/21		TMH
Total Organic Carbon	2.4	mg/l	0.3	0.5	SM 5310 C	06/08/21		ALD
Solids, Total Suspended	<1	mg/l	1	1	SM 2540 D	06/08/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	2	mpn/100ml	1	SM 9223 B/Quantitray	6/7/21 14:27	6/8/21 9:01		JMW
Total Coliform	210	mpn/100ml	1	SM 9223 B/Quantitray	6/7/21 14:27	6/8/21 9:01		JMW

Lab ID: 2116073-16 **Collected By:** Client **Sampled:** 06/07/21 10:15 **Received:** 06/07/21 13:45
Sample Desc: BM-9M **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.02	mg/l		0.01	SM 4500-P F	06/10/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	151	mg CaCO3/L		2	SM 2320 B	06/08/21		APR
Ammonia as N	0.17	mg/l	0.05	0.10	ASTM D6919-03	06/08/21		APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	06/08/21 14:15		SWA
Nitrate as N	4.12	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/08/21 4:10		JAF
Nitrite as N	0.04	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/08/21 4:10	J	JAF
Nitrate+Nitrite as N	4.16	mg/l	0.108	1.10	CALCULATED	06/08/21 4:10		JAF
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/11/21	U	TML
Phosphorus as P, Total	0.01	mg/l	0.01	0.01	SM 4500-P F	06/09/21		TML
Solids, Total Dissolved	243	mg/l	4	5	SM 2540 C	06/08/21		TMH
Total Organic Carbon	2.3	mg/l	0.3	0.5	SM 5310 C	06/08/21		ALD
Solids, Total Suspended	6	mg/l	1	1	SM 2540 D	06/08/21		ALD

Lab ID: 2116073-17 **Collected By:** Client **Sampled:** 06/07/21 10:15 **Received:** 06/07/21 13:45
Sample Desc: BM-9D **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.02	mg/l		0.01	SM 4500-P F	06/10/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	154	mg CaCO3/L		2	SM 2320 B	06/08/21		APR
Ammonia as N	0.19	mg/l	0.05	0.10	ASTM D6919-03	06/08/21		APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	06/08/21 14:15		SWA
Nitrate as N	3.66	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/08/21 3:53		JAF
Nitrite as N	0.05	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/08/21 3:53	J	JAF
Nitrate+Nitrite as N	3.71	mg/l	0.108	1.10	CALCULATED	06/08/21 3:53		JAF
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/11/21	U	TML
Phosphorus as P, Total	0.02	mg/l	0.01	0.01	SM 4500-P F	06/09/21		TML
Solids, Total Dissolved	247	mg/l	4	5	SM 2540 C	06/08/21		TMH
Total Organic Carbon	2.3	mg/l	0.3	0.5	SM 5310 C	06/08/21		ALD
Solids, Total Suspended	1	mg/l	1	1	SM 2540 D	06/08/21		ALD

Lab ID: 2116073-18 **Collected By:** Client **Sampled:** 06/07/21 10:45 **Received:** 06/07/21 13:45
Sample Desc: BM-10S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.04	mg/l		0.01	SM 4500-P F	06/16/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	116	mg CaCO3/L		2	SM 2320 B	06/08/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	06/08/21	U	APR
Biochemical Oxygen Demand	3.9	mg/l	2.0	2.0	SM 5210 B	06/08/21 15:00		MRW
Nitrate as N	3.86	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/08/21 3:37		JAF
Nitrite as N	0.04	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/08/21 3:37	J	JAF
Nitrate+Nitrite as N	3.90	mg/l	0.108	1.10	CALCULATED	06/08/21 3:37		JAF
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/11/21	Q-10a, U	TML
Phosphorus as P, Total	0.03	mg/l	0.01	0.01	SM 4500-P F	06/16/21		TML
Solids, Total Dissolved	203	mg/l	4	5	SM 2540 C	06/08/21		TMH
Total Organic Carbon	2.5	mg/l	0.3	0.5	SM 5310 C	06/08/21		ALD
Solids, Total Suspended	4	mg/l	1	1	SM 2540 D	06/08/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	24	mpn/100ml	1	SM 9223 B/Quantitray	6/7/21 14:27	6/8/21 9:01		JMW
Total Coliform	416	mpn/100ml	1	SM 9223 B/Quantitray	6/7/21 14:27	6/8/21 9:01		JMW

Lab ID: 2116073-19 **Collected By:** Client **Sampled:** 06/07/21 10:45 **Received:** 06/07/21 13:45
Sample Desc: BM-10M **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.02	mg/l		0.01	SM 4500-P F	06/10/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	152	mg CaCO3/L		2	SM 2320 B	06/08/21		APR
Ammonia as N	0.08	mg/l	0.05	0.10	ASTM D6919-03	06/08/21	J	APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	06/08/21 14:15		SWA
Nitrate as N	4.70	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/08/21 0:31		JAF
Nitrite as N	0.04	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/08/21 0:31	J	JAF
Nitrate+Nitrite as N	4.74	mg/l	0.108	1.10	CALCULATED	06/08/21 0:31		JAF
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/11/21	U	TML
Phosphorus as P, Total	0.03	mg/l	0.01	0.01	SM 4500-P F	06/09/21		TML
Solids, Total Dissolved	249	mg/l	4	5	SM 2540 C	06/08/21		TMH
Total Organic Carbon	2.5	mg/l	0.3	0.5	SM 5310 C	06/09/21		ALD
Solids, Total Suspended	16	mg/l	1	1	SM 2540 D	06/08/21		ALD

Lab ID: 2116073-20 **Collected By:** Client **Sampled:** 06/07/21 10:45 **Received:** 06/07/21 13:45
Sample Desc: BM-10D **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.01	mg/l		0.01	SM 4500-P F	06/10/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	161	mg CaCO3/L		2	SM 2320 B	06/08/21		APR
Ammonia as N	0.09	mg/l	0.05	0.10	ASTM D6919-03	06/08/21	J	APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	06/08/21 14:15		SWA
Nitrate as N	4.74	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/08/21 1:22		JAF
Nitrite as N	0.04	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/08/21 1:22	J	JAF
Nitrate+Nitrite as N	4.78	mg/l	0.108	1.10	CALCULATED	06/08/21 1:22		JAF
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/11/21	U	TML
Phosphorus as P, Total	0.03	mg/l	0.01	0.01	SM 4500-P F	06/09/21		TML
Solids, Total Dissolved	243	mg/l	4	5	SM 2540 C	06/08/21		TMH
Total Organic Carbon	2.5	mg/l	0.3	0.5	SM 5310 C	06/09/21		ALD
Solids, Total Suspended	20	mg/l	1	1	SM 2540 D	06/08/21		ALD

Lab ID: 2116073-21 **Collected By:** Client **Sampled:** 06/07/21 12:30 **Received:** 06/07/21 13:45
Sample Desc: BM-11S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.04	mg/l		0.01	SM 4500-P F	06/10/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	83	mg CaCO3/L		2	SM 2320 B	06/08/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	06/08/21	U	APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	06/08/21 14:15		SWA
Nitrate as N	3.71	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/08/21 4:27		JAF
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/08/21 4:27	U	JAF
Nitrate+Nitrite as N	<3.72	mg/l	0.108	1.10	CALCULATED	06/08/21 4:27		JAF
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/11/21	U	TML
Phosphorus as P, Total	0.04	mg/l	0.01	0.01	SM 4500-P F	06/09/21		TML
Solids, Total Dissolved	142	mg/l	4	5	SM 2540 C	06/08/21		TMH
Total Organic Carbon	2.1	mg/l	0.3	0.5	SM 5310 C	06/09/21		ALD
Solids, Total Suspended	4	mg/l	1	1	SM 2540 D	06/08/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	548	mpn/100ml	1	SM 9223 B/Quantitray	6/7/21 14:27	6/8/21 9:01		JMW
Total Coliform	>2420	mpn/100ml	1	SM 9223 B/Quantitray	6/7/21 14:27	6/8/21 9:01		JMW

Preparation Methods

Specific Method	Preparation Method	Prep Batch	Prepared Date	Prepared By
2116073-01				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0505	06/09/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0511	06/08/2021	TML
2116073-02				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0761	06/11/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0763	06/11/2021	TML
2116073-03				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0505	06/09/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0511	06/08/2021	TML
2116073-04				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0505	06/09/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0511	06/08/2021	TML
2116073-05				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0505	06/09/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0511	06/08/2021	TML
2116073-06				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0505	06/09/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0511	06/08/2021	TML
2116073-07				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0505	06/09/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0511	06/08/2021	TML
2116073-08				
Dissolved General Chemistry				

SM 4500-P F	SM 4500-P B	B1F0505	06/09/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0511	06/08/2021	TML
2116073-09				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0505	06/09/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0511	06/08/2021	TML
2116073-10				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0505	06/09/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0511	06/08/2021	TML
2116073-11				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0505	06/09/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0511	06/08/2021	TML
2116073-12				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0505	06/09/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0511	06/08/2021	TML
2116073-13				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0505	06/09/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0511	06/08/2021	TML
2116073-14				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0505	06/09/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0511	06/08/2021	TML
2116073-15				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0761	06/11/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0763	06/11/2021	TML
2116073-16				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0505	06/09/2021	SNF

General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0511	06/08/2021	TML
2116073-17				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0505	06/09/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0511	06/08/2021	TML
2116073-18				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0761	06/11/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0763	06/11/2021	TML
2116073-19				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0505	06/09/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0511	06/08/2021	TML
2116073-20				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0505	06/09/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0511	06/08/2021	TML
2116073-21				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0505	06/09/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F0511	06/08/2021	TML

Notes and Definitions

G-11	The sample was filtered after it was received at the laboratory.
G-17	The sample was preserved in the laboratory.
J	Estimated value
Q-10	The matrix spike(s) were outside acceptable limits of 90-110% recovery at 110.3%.
Q-10a	The matrix spike(s) were outside acceptable limits of 90-110% recovery at 112% and 111%.
U	Analyte was not detected above the indicated value.

M.J. Reider Associates, Inc.
107 Angelica St, Reading PA, 19611
610-374-5129 www.mjreider.com

WORK ORDER
Chain of Custody

2116073

Client Code: 3157
Client: Tetra Tech
Project Manager: Richard A Wheeler
Project: 2021 - Blue Marsh Reservoir
Report To: Tetra Tech - David Wertz - USACE, Phila Dist. Env.Resources Branch 100 Penn Square E., Arlington, VA 22201
Invoice To: Tetra Tech - David Wertz - USACE, Phila Dist. Env.Resources Branch 100 Penn Square E., Arlington, VA 22201

Comments: Dark Bottles accidently labeled incorrectly

Collected By : (Full Name) Gregory Wacik

2116073-01 BM-1S

Matrix: Non-Potable Water
Type: Grab
Date: 6/7/21
Time: 0715

BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, TC (#) SM 9223B
Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

2116073-02 BM-2S

Matrix: Non-Potable Water
Type: Grab
Date: 6/7/21
Time: 915

BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, TC (#) SM 9223B
Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

	Relinquished By	Date/Time	Received By	Date/Time
1		6/7/21 1115		6/7/21 1315
2				
3				6/7/21 1345

Received at Laboratory By

Sample Kit Prepared By:	Date/Time
CML	5/7

Sample Temp (°C): 5.0
Samples on Ice? (Yes) No NA
Approved By: CML
Entered By:

The Client, by signing (or having the client's agent sign), agrees to MJRA's Terms and Conditions and to pay for the above requested services including any additional associated fees incurred.

Printed: 5/7/2021 8:28:24AM

Report Template: WR_WorkOrder COC .fs

M.J. Reider Associates, Inc.

2116073

Client Code: 3157 **Client:** Tetra Tech

Project Manager: Richard A Wheeler **Project:** 2021 - Blue Marsh Reservoir

Comments: Incorrect Bottle Label Date

Collected By : (Full Name) Gregory Wacik

2116073-03 BM-2M

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F

Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

Matrix: Non-Potable Water Date: 6/7/21
Type: Grab Time: 915

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2116073-04 BM-2D

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F

Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TOC SM 5310C, TSS SM 2540D, TKN EPA 351.2

Matrix: Non-Potable Water Date: 6/7/21
Type: Grab Time: 915

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2116073-05 BM-5S

BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, TC (#) SM 9223B, PO4-D SM 4500P-F

Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

Matrix: Non-Potable Water Date: 6/7/21
Type: Grab Time: 1230

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

	Date/Time		Date/Time
Relinquished By	6/7/21 1:15	Received By	6/7/21 1315
Relinquished By		Received By	
Relinquished By		Received at Laboratory By	6/7/21 1345

Sample Kit Prepared By:	Date/Time
CML	5/7

Sample Temp (°C): 5.0
Samples on Ice? (Yes) No NA
Approved By: CML
Entered By:

Printed: 5/7/2021 8:28:24AM

Report Template: wko WorkOrder COC ls

M.J. Reider Associates, Inc.

2116073

Client Code: 3157 **Client:** Tetra Tech

Project Manager: Richard A Wheeler **Project:** 2021 - Blue Marsh Reservoir

Comments: Incorrect Bottle label Dates

Collected By : (Full Name) Gregory Wacik

2116073-06 BM-6S

NO2-N EPA 300.0, TC (#) SM 9223B, BOD SM 5210B, EC (#) SM 9223B Confirmation, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F

NH3-N D6919-03, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, Alk SM 2320B, PO4 SM 4500P-F, TSS SM 2540D

Matrix: Non-Potable Water Date: 6/7/21
Type: Grab Time: 815

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

2116073-07 BM-6M

NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, BOD SM 5210B, PO4-D SM 4500P-F

TSS SM 2540D, PO4 SM 4500P-F, Alk SM 2320B, NH3-N D6919-03, TDS SM 2540C, TOC SM 5310C, TKN EPA 351.2

Matrix: Non-Potable Water Date: 6/7/21
Type: Grab Time: 815

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2116073-08 BM-6D

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F

Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

Matrix: Non-Potable Water Date: 6/7/21
Type: Grab Time: 815

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

	Date/Time		Date/Time
Relinquished By	6/7/21 1115	Received By	6/7/21 1315
Relinquished By		Received By	
Relinquished By		Received at Laboratory By	6/7/21 1345

Sample Kit Prepared By:	Date/Time
CML	5/7
Sample Temp (°C):	5.0
Samples on Ice?	(Yes) No NA
Approved By:	
Entered By:	

The Client, by signing (or having the client's agent sign), agrees to MJRA's Terms and Conditions and to pay for the above requested services including any additional associated fees incurred.

Printed: 5/7/2021 8:28:24AM

Report Template: wko WorkOrder COC 1s

M.J. Reider Associates, Inc.

2116073

Client Code: 3157 **Client:** Tetra Tech

Project Manager: Richard A Wheeler **Project:** 2021 - Blue Marsh Reservoir

Comments: Incorrect Bottle label Dates

Collected By : (Full Name) Gregory Wacik

2116073-09 BM-7S

TC (#) SM 9223B, BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F

TSS SM 2540D, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F

Matrix: Non-Potable Water Date: 6/7/21
Type: Grab Time: 935

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

2116073-10 BM-7M

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F

Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

Matrix: Non-Potable Water Date: 6/7/21
Type: Grab Time: 935

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2116073-11 BM-7D

NO2-N EPA 300.0, NO3-N EPA 300.0, BOD SM 5210B, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F

Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

Matrix: Non-Potable Water Date: 6/7/21
Type: Grab Time: 935

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

	Date/Time		Date/Time
Relinquished By	6/7/21 1345	Received By	6/7/21 1315
Relinquished By		Received By	
Relinquished By		Received at Laboratory By	6/7/21 1345

Sample Kit Prepared By:	Date/Time
CML	5/7

Sample Temp (°C): 5.0
Samples on Ice? (Yes) No NA
Approved By: CML
Entered By:

The Client, by signing (or having the client's agent sign), agrees to MJRA's Terms and Conditions and to pay for the above requested services including any additional associated fees incurred.

Printed: 5/7/2021 8:28:24AM

Report Template: wko WorkOrder COC 1a

M.J. Reider Associates, Inc.

2116073

Client Code: 3157 **Client:** Tetra Tech

Project Manager: Richard A Wheeler **Project:** 2021 - Blue Marsh Reservoir

Comments: Incorrect Bottle Label Dates

Collected By : (Full Name) Gregory Wacik

2116073-12 BM-8S

BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, TC (#) SM 9223B
Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

Matrix: Non-Potable Water Date: 6/7/21
Type: Grab Time: 1115

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

2116073-13 BM-8M

NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0
PO4 SM 4500P-F, TDS SM 2540C, Alk SM 2320B, NH3-N D6919-03, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

Matrix: Non-Potable Water Date: 6/7/21
Type: Grab Time: 1115

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2116073-14 BM-8D

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, PO4-D SM 4500P-F, NO2-N, NO3-N, Combined NO3+NO2
NH3-N D6919-03, TDS SM 2540C, Alk SM 2320B, PO4 SM 4500P-F, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

Matrix: Non-Potable Water Date: 6/7/21
Type: Grab Time: 1115

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

Relinquished By	6/7/21 1:15 Date/Time	Received By	6/7/21 1315 Date/Time
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received at Laboratory By	6/7/21 1345 Date/Time

Sample Kit Prepared By:	Date/Time
CML	5/7

Sample Temp (°C): 5.0
Samples on Ice? (Yes) No NA
Approved By: CML
Entered By:

The Client, by signing (or having the client's agent sign), agrees to MJRA's Terms and Conditions and to pay for the above requested services including any additional associated fees incurred.

Printed: 5/7/2021 8:28:24AM

Report Template: wko WorkOrder COC ls

M.J. Reider Associates, Inc.

2116073

Client Code: 3157 **Client:** Tetra Tech

Project Manager: Richard A Wheeler **Project:** 2021 - Blue Marsh Reservoir

Comments: Incorrect Bottle Label Date

Collected By : (Full Name) Gregory Wack

2116073-15 BM-9S

NO2-N EPA 300.0, NO3-N EPA 300.0, BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, TC (#) SM 9223B

NH3-N D6919-03, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D, Alk SM 2320B, PO4 SM 4500P-F

Matrix: Non-Potable Water Date: 6/7/21
Type: Grab Time: 1015

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

2116073-16 BM-9M

NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, BOD SM 5210B, NO2-N EPA 300.0

PO4 SM 4500P-F, Alk SM 2320B, NH3-N D6919-03, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

Matrix: Non-Potable Water Date: 6/7/21
Type: Grab Time: 1015

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2116073-17 BM-9D

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F

Alk SM 2320B, NH3-N D6919-03, TDS SM 2540C, TOC SM 5310C, TSS SM 2540D, PO4 SM 4500P-F, TKN EPA 351.2

Matrix: Non-Potable Water Date: 6/7/21
Type: Grab Time: 1015

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

	Date/Time		Date/Time
Relinquished By	6/7/21 1145	Received By	6/7/21 1315
Relinquished By		Received By	
Relinquished By		Received at Laboratory By	6/7/21 1345

Sample Kit Prepared By:	Date/Time
CML	5/7
Sample Temp (°C):	5.0
Samples on Ice?	Yes No NA
Approved By:	CML
Entered By:	

The Client, by signing (or having the client's agent sign), agrees to MJRA's Terms and Conditions and to pay for the above requested services including any additional associated fees incurred.

Printed: 5/7/2021 8:28:24AM

Report Template: wko WorkOrder COC ls

M.J. Reider Associates, Inc.

2116073

Client Code: 3157 **Client:** Tetra Tech

Project Manager: Richard A Wheeler **Project:** 2021 - Blue Marsh Reservoir

Comments: Incorrect Bottle label Daty

Collected By : (Full Name) Gregory Wacik

2116073-18 BM-10S

NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, TC (#) SM 9223B
Alk SM 2320B, PO4 SM 4500P-F, NH3-N D6919-03, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

Matrix: Non-Potable Water Date: 6/7/21
Type: Grab Time: 1045

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

2116073-19 BM-10M

NO2-N EPA 300.0, NO3-N EPA 300.0, BOD SM 5210B, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F
Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

Matrix: Non-Potable Water Date: 6/7/21
Type: Grab Time: 1045

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2116073-20 BM-10D

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F
NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TOC SM 5310C, TSS SM 2540D, TKN EPA 351.2, Alk SM 2320B

Matrix: Non-Potable Water Date: 6/7/21
Type: Grab Time: 1045

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

Relinquished By	6/7/21 1145 Date/Time	Received By	6/7/21 1315 Date/Time
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received at Laboratory By	6/7/21 1345 Date/Time

Sample Kit Prepared By:	Date/Time
CML	5/7

Sample Temp (°C): 5.0
Samples on Ice? (Yes) No NA
Approved By: CML
Entered By:

The Client, by signing (or having the client's agent sign), agrees to MJRA's Terms and Conditions and to pay for the above requested services including any additional associated fees incurred.

Printed: 5/7/2021 8:28:24AM

Report Template: wko WorkOrder COC is

M.J. Reider Associates, Inc.

2116073

Client Code: 3157 **Client:** Tetra Tech

Project Manager: Richard A Wheeler **Project:** 2021 - Blue Marsh Reservoir

Comments: Incorrect Bottle Label Date

Collected By : (Full Name) Gregory Wack

2116073-21 BM-11S

NO3-N EPA 300.0, BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, TC (#) SM 9223B
Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

Matrix: Non-Potable Water
Type: Grab

Date: 6/7/21
Time: 1230

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

Relinquished By	Date/Time 6/7/21 1415	Received By	Date/Time 6/7/21 1315
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received at Laboratory By	Date/Time 6/7/21 1345

Sample Kit Prepared By: CML	Date/Time 5/7
Sample Temp (°C):	5.0
Samples on Ice?	(Yes) No NA
Approved By:	CML
Entered By:	

The Client, by signing (or having the client's agent sign), agrees to MJRA's Terms and Conditions and to pay for the above requested services including any additional associated fees incurred.

Printed: 5/7/2021 8:28:24AM

Report Template: wko WorkOrder COC ls

MJRA Terms & Conditions

All samples submitted must be accompanied by signed documentation representing a Chain of Custody (COC). The COC Record acts as a contract between the client and MJRA. Signing the COC form gives approval for MJRA to perform the requested analyses and is an agreement to pay for the cost of such analyses**.** COC Records must be completed in black or blue indelible ink (must not run when wet). COC documentation begins at the time of sample collection. Client is required to document all sample details prior to releasing samples to MJRA. All samples must be placed on ice immediately after sampling and shipped or delivered to the laboratory in a manner that will maintain the sample temperature above freezing and below 6C (loose ice is preferred)**.**

Sample Submission, Sample Acceptance & Sampling Containers

Included on the COC must be the sample description, date and time of collection (including start and stop for composites), container size and type, preservative information, sample matrix, indication of whether the sample is a grab or composite, number of containers & a list of the tests to be performed. Poor sample collection technique, inappropriate sampling containers and/or improper sample preservation may lead to sample rejection. Suitable sample containers, labels, and preservatives (as applicable), along with blank COCs are provided at no additional cost.

Turnaround Times (TAT)

Average TAT for test results range from 5 to 15 working days depending on the specific analyses and time of year submitted. Faster turnaround times (*RUSH TAT) may be available depending on the current workload in a particular department and the nature of the analyses requested. We encourage you to verify requests for expedited sample results with one of our Technical Directors prior to sample submittal. Without confirmation from a Technical Director, your results may not be completed by your deadline. *RUSH TAT Surcharges are applied for expedited turnaround times.

Analytical Results, Sample Collection Integrity & Subcontracting

Analytical values are for the sample as submitted and relate only to the item tested. The value indicates a snapshot of the constituent content of the sample at the time of sample collection. Analytical results can be impacted by poor sample collection technique and/or improper preservation. All sample collection completed by MJRA was performed in accordance with applicable regulatory protocols or as specified in customer specific sampling plans. Constituent content will vary over time based on the matrix of the sample and the physical and chemical changes to its environment. All sample results and laboratory reports are strictly confidential. Results will not be available to anyone except the primary client or authorized party representing the client unless MJRA receives additional permissions from the client. When necessary, MJRA will subcontract certain analyses to a third party accredited laboratory. If client prohibits subcontracting, it must be provided in writing and include instruction on how to proceed with client samples that require third party analyses.

Payment Terms

Payment Terms are Net 30 days. Prices are subject to change without notice. A standing monthly charge of 1.5% of the clients over-30-day-unpaid balance may be added to the balance after 30 days and each month thereafter (day 31, 61, 91 etc.). The laboratory accepts all major credit cards, ACH transactions, checks and cash. New clients must pay for all services rendered prior to sample collection and/or in some cases report processing. Clients must contact the MJRA accounting department to pursue a credit-based account. MJRA reserves the right to terminate the client's credit account and to refuse to perform additional services on a credit basis if any balance is outstanding for more than 60 days.

Warranty & Litigation

MJRA does not guarantee any results of its services but has agreed to use its best efforts, in accordance with the standards and practices of the industry, to cause such results to be accurate and complete. We disclaim any other warranties, expressed or implied, including a warranty of fitness for a particular purpose and warranty of merchantability. Clients agree that they shall reimburse MJRA for any and all fees, cost and litigation expenses, including reasonable attorney fees incurred by MJRA in obtaining payment for the services rendered. All costs associated with compliance with any subpoena for documents, testimony, or any other purpose relating to work performed by MJRA, for a client, shall be paid by that client. MJRA's aggregate liability for negligent acts and omissions and of an intentional breach by MJRA will not exceed the fee paid for the services. Client agrees to indemnify and hold MJRA harmless for any and all liabilities in excess of said amount. Neither MJRA nor the client shall be liable to the other for special, incidental consequential or punitive liability or damages included but not limited to those arising from delay, loss of use, loss of profits or revenues. MJRA will not be liable to the client unless the client has notified MJRA of the discovery of the alleged negligent act, error, omissions or breach within 30 days of the day of its discovery and within one year of the date of invoice.

Reviewed and Approved by:

Richard A Wheeler
Director of Field Services

Certificate of Analysis

M.J. Reider Associates, Inc.
ENVIRONMENTAL TESTING LABORATORY
U.S. EPA/PA DEP #06-00003

Laboratory No.: 2119108
Report: 07/07/21
Lab Contact: Richard A Wheeler

Attention: David Wertz
Reported To: Tetra Tech
USACE, Phila Dist. Env.Resources Branch 100 Penn Square E.
Arlington, VA 22201

Project: 2021 - Blue Marsh Reservoir

Lab ID: 2119108-01 **Collected By:** Client **Sampled:** 06/28/21 07:35 **Received:** 06/28/21 13:55
Sample Desc: BM-1S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.02	mg/l		0.01	SM 4500-P F	06/29/21	Q-11, G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	128	mg CaCO3/L		2	SM 2320 B	06/29/21		MPB
Ammonia as N	0.09	mg/l	0.05	0.10	ASTM D6919-03	06/29/21	J	RCE
Biochemical Oxygen Demand	2.4	mg/l	2.0	2.0	SM 5210 B	06/29/21 13:45	C-37	SWA
Nitrate as N	3.43	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/28/21 15:27		TML
Nitrite as N	0.10	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/28/21 15:27	J	TML
Nitrate+Nitrite as N	3.53	mg/l	0.108	1.10	CALCULATED	06/28/21 15:27		TML
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/30/21	U	SNF
Phosphorus as P, Total	0.01	mg/l	0.01	0.01	SM 4500-P F	06/29/21		SNF
Solids, Total Dissolved	214	mg/l	4	5	SM 2540 C	06/29/21		TMH
Total Organic Carbon	2.5	mg/l	0.3	0.5	SM 5310 C	06/30/21		ALD
Solids, Total Suspended	6	mg/l	1	1	SM 2540 D	06/29/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	4	mpn/100ml	1	SM 9223 B/Quantitray	6/28/21 14:26	6/29/21 8:58		JMW
Total Coliform	1990	mpn/100ml	1	SM 9223 B/Quantitray	6/28/21 14:26	6/29/21 8:58		JMW

Lab ID: 2119108-02 **Collected By:** Client **Sampled:** 06/28/21 09:50 **Received:** 06/28/21 13:55
Sample Desc: BM-2S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.02	mg/l		0.01	SM 4500-P F	06/29/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	102	mg CaCO3/L		2	SM 2320 B	06/29/21		MPB
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	06/28/21	U	RCE
Biochemical Oxygen Demand	2.9	mg/l	2.0	2.0	SM 5210 B	06/29/21 15:35	C-37b	SWA
Nitrate as N	3.49	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/28/21 15:44		TML
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/28/21 15:44	U	TML
Nitrate+Nitrite as N	<3.50	mg/l	0.108	1.10	CALCULATED	06/28/21 15:44		TML
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/30/21	U	SNF
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	06/29/21		SNF
Solids, Total Dissolved	189	mg/l	4	5	SM 2540 C	06/29/21		TMH
Total Organic Carbon	2.5	mg/l	0.3	0.5	SM 5310 C	06/30/21		ALD
Solids, Total Suspended	4	mg/l	1	1	SM 2540 D	06/29/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	1	mpn/100ml	1	SM 9223 B/Quantitray	6/28/21 14:26	6/29/21 8:58		JMW
Total Coliform	79	mpn/100ml	1	SM 9223 B/Quantitray	6/28/21 14:26	6/29/21 8:58		JMW

Lab ID: 2119108-03 **Collected By:** Client **Sampled:** 06/28/21 09:50 **Received:** 06/28/21 13:55
Sample Desc: BM-2M **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.01	mg/l		0.01	SM 4500-P F	06/29/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	135	mg CaCO3/L		2	SM 2320 B	06/29/21		MPB
Ammonia as N	0.14	mg/l	0.05	0.10	ASTM D6919-03	06/29/21		RCE
Biochemical Oxygen Demand	2.2	mg/l	2.0	2.0	SM 5210 B	06/29/21 13:45	C-37	SWA
Nitrate as N	3.72	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/28/21 17:25		TML
Nitrite as N	0.14	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/28/21 17:25		TML
Nitrate+Nitrite as N	3.86	mg/l	0.108	1.10	CALCULATED	06/28/21 17:25		TML
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/30/21	U	SNF
Phosphorus as P, Total	0.02	mg/l	0.01	0.01	SM 4500-P F	06/29/21		SNF
Solids, Total Dissolved	231	mg/l	4	5	SM 2540 C	06/29/21		TMH
Total Organic Carbon	2.1	mg/l	0.3	0.5	SM 5310 C	06/30/21		ALD
Solids, Total Suspended	5	mg/l	1	1	SM 2540 D	06/29/21		ALD

Lab ID: 2119108-04 **Collected By:** Client **Sampled:** 06/28/21 09:50 **Received:** 06/28/21 13:55
Sample Desc: BM-2D **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.02	mg/l		0.01	SM 4500-P F	06/29/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	149	mg CaCO3/L		2	SM 2320 B	06/29/21		MPB
Ammonia as N	0.15	mg/l	0.05	0.10	ASTM D6919-03	06/29/21		RCE
Biochemical Oxygen Demand	2.6	mg/l	2.0	2.0	SM 5210 B	06/29/21 13:45	C-37	SWA
Nitrate as N	2.93	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/28/21 16:34		TML
Nitrite as N	0.15	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/28/21 16:34		TML
Nitrate+Nitrite as N	3.08	mg/l	0.108	1.10	CALCULATED	06/28/21 16:34		TML
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/30/21	U	SNF
Phosphorus as P, Total	0.01	mg/l	0.01	0.01	SM 4500-P F	06/29/21		SNF
Solids, Total Dissolved	255	mg/l	4	5	SM 2540 C	06/29/21		TMH
Total Organic Carbon	1.9	mg/l	0.3	0.5	SM 5310 C	06/30/21		ALD
Solids, Total Suspended	1	mg/l	1	1	SM 2540 D	06/29/21		ALD

Lab ID: 2119108-05 **Collected By:** Client **Sampled:** 06/28/21 13:00 **Received:** 06/28/21 13:55
Sample Desc: BM-5S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.05	mg/l		0.01	SM 4500-P F	06/29/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	200	mg CaCO3/L		2	SM 2320 B	06/29/21		MPB
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	06/29/21	U	RCE
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	06/29/21 12:41	C-37a	SWA
Nitrate as N	7.10	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/28/21 15:10		TML
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/28/21 15:10	U	TML
Nitrate+Nitrite as N	<7.11	mg/l	0.108	1.10	CALCULATED	06/28/21 15:10		TML
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/30/21	U	SNF
Phosphorus as P, Total	0.05	mg/l	0.01	0.01	SM 4500-P F	06/29/21		SNF
Solids, Total Dissolved	357	mg/l	4	5	SM 2540 C	06/29/21		TMH
Total Organic Carbon	1.5	mg/l	0.3	0.5	SM 5310 C	06/30/21		ALD
Solids, Total Suspended	<1	mg/l	1	1	SM 2540 D	06/29/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	236	mpn/100ml	1	SM 9223 B/Quantitray	6/28/21 14:26	6/29/21 8:58		JMW
Total Coliform	>2420	mpn/100ml	1	SM 9223 B/Quantitray	6/28/21 14:26	6/29/21 8:58		JMW

Lab ID: 2119108-06 **Collected By:** Client **Sampled:** 06/28/21 09:00 **Received:** 06/28/21 13:55
Sample Desc: BM-6S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.01	mg/l		0.01	SM 4500-P F	06/29/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	97	mg CaCO3/L		2	SM 2320 B	06/29/21		MPB
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	06/29/21	U	RCE
Biochemical Oxygen Demand	2.9	mg/l	2.0	2.0	SM 5210 B	06/29/21 15:35	C-37b	SWA
Nitrate as N	3.43	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/28/21 14:53		TML
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/28/21 14:53	U	TML
Nitrate+Nitrite as N	<3.44	mg/l	0.108	1.10	CALCULATED	06/28/21 14:53		TML
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/30/21	U	SNF
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	06/29/21		SNF
Solids, Total Dissolved	191	mg/l	4	5	SM 2540 C	06/29/21		TMH
Total Organic Carbon	2.5	mg/l	0.3	0.5	SM 5310 C	06/30/21		ALD
Solids, Total Suspended	<1	mg/l	1	1	SM 2540 D	06/29/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	28	mpn/100ml	1	SM 9223 B/Quantitray	6/28/21 14:26	6/29/21 8:58		JMW
Total Coliform	816	mpn/100ml	1	SM 9223 B/Quantitray	6/28/21 14:26	6/29/21 8:58		JMW

Lab ID: 2119108-07 **Collected By:** Client **Sampled:** 06/28/21 09:00 **Received:** 06/28/21 13:55
Sample Desc: BM-6M **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.01	mg/l		0.01	SM 4500-P F	06/29/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	108	mg CaCO3/L		2	SM 2320 B	06/29/21		MPB
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	06/29/21	U	RCE
Biochemical Oxygen Demand	2.1	mg/l	2.0	2.0	SM 5210 B	06/29/21 12:41	C-37a	SWA
Nitrate as N	3.34	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/28/21 17:41		TML
Nitrite as N	0.09	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/28/21 17:41	J	TML
Nitrate+Nitrite as N	3.43	mg/l	0.108	1.10	CALCULATED	06/28/21 17:41		TML
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/30/21	U	SNF
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	06/29/21		SNF
Solids, Total Dissolved	213	mg/l	4	5	SM 2540 C	06/29/21		TMH
Total Organic Carbon	2.3	mg/l	0.3	0.5	SM 5310 C	06/30/21		ALD
Solids, Total Suspended	3	mg/l	1	1	SM 2540 D	06/29/21		ALD

Lab ID: 2119108-08 **Collected By:** Client **Sampled:** 06/28/21 09:00 **Received:** 06/28/21 13:55
Sample Desc: BM-6D **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.02	mg/l		0.01	SM 4500-P F	06/29/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	144	mg CaCO3/L		2	SM 2320 B	06/29/21		MPB
Ammonia as N	0.23	mg/l	0.05	0.10	ASTM D6919-03	06/29/21		RCE
Biochemical Oxygen Demand	2.7	mg/l	2.0	2.0	SM 5210 B	06/29/21 12:41	C-37a	SWA
Nitrate as N	2.57	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/28/21 17:58		TML
Nitrite as N	0.12	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/28/21 17:58		TML
Nitrate+Nitrite as N	2.69	mg/l	0.108	1.10	CALCULATED	06/28/21 17:58		TML
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/30/21	U	SNF
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	06/29/21		SNF
Solids, Total Dissolved	248	mg/l	4	5	SM 2540 C	06/29/21		TMH
Total Organic Carbon	1.8	mg/l	0.3	0.5	SM 5310 C	06/30/21		ALD
Solids, Total Suspended	2	mg/l	1	1	SM 2540 D	06/29/21		ALD

Lab ID: 2119108-09 **Collected By:** Client **Sampled:** 06/28/21 10:20 **Received:** 06/28/21 13:55
Sample Desc: BM-7S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.01	mg/l		0.01	SM 4500-P F	06/29/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	100	mg CaCO3/L		2	SM 2320 B	06/29/21		MPB
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	06/29/21	U	RCE
Biochemical Oxygen Demand	3.0	mg/l	2.0	2.0	SM 5210 B	06/29/21 15:35	C-37b	SWA
Nitrate as N	3.43	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/28/21 17:59		TML
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/28/21 17:59	U	TML
Nitrate+Nitrite as N	<3.44	mg/l	0.108	1.10	CALCULATED	06/28/21 17:59		TML
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/30/21	U	SNF
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	06/29/21		SNF
Solids, Total Dissolved	210	mg/l	4	5	SM 2540 C	06/29/21		TMH
Total Organic Carbon	2.8	mg/l	0.3	0.5	SM 5310 C	06/30/21		ALD
Solids, Total Suspended	2	mg/l	1	1	SM 2540 D	06/29/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	<1	mpn/100ml	1	SM 9223 B/Quantitray	6/28/21 14:26	6/29/21 8:58		JMW
Total Coliform	166	mpn/100ml	1	SM 9223 B/Quantitray	6/28/21 14:26	6/29/21 8:58		JMW

Lab ID: 2119108-10 **Collected By:** Client **Sampled:** 06/28/21 10:20 **Received:** 06/28/21 13:55
Sample Desc: BM-7M **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.01	mg/l		0.01	SM 4500-P F	06/29/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	135	mg CaCO3/L		2	SM 2320 B	06/29/21		MPB
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	06/28/21	U	RCE
Biochemical Oxygen Demand	3.9	mg/l	2.0	2.0	SM 5210 B	06/29/21 12:41	C-37a	SWA
Nitrate as N	3.91	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/28/21 17:26		TML
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/28/21 17:26	U	TML
Nitrate+Nitrite as N	<3.92	mg/l	0.108	1.10	CALCULATED	06/28/21 17:26		TML
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/30/21	U	SNF
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	06/29/21		SNF
Solids, Total Dissolved	234	mg/l	4	5	SM 2540 C	06/29/21		TMH
Total Organic Carbon	2.1	mg/l	0.3	0.5	SM 5310 C	06/30/21		ALD
Solids, Total Suspended	<1	mg/l	1	1	SM 2540 D	06/29/21		ALD

Lab ID: 2119108-11 **Collected By:** Client **Sampled:** 06/28/21 10:20 **Received:** 06/28/21 13:55
Sample Desc: BM-7D **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.02	mg/l		0.01	SM 4500-P F	06/29/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	147	mg CaCO3/L		2	SM 2320 B	06/29/21		MPB
Ammonia as N	0.22	mg/l	0.05	0.10	ASTM D6919-03	06/29/21		RCE
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	06/29/21 12:41	C-37a	SWA
Nitrate as N	3.23	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/28/21 18:16		TML
Nitrite as N	0.07	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/28/21 18:16	J	TML
Nitrate+Nitrite as N	3.30	mg/l	0.108	1.10	CALCULATED	06/28/21 18:16		TML
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/30/21	U	SNF
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	06/29/21		SNF
Solids, Total Dissolved	262	mg/l	4	5	SM 2540 C	06/29/21		TMH
Total Organic Carbon	1.9	mg/l	0.3	0.5	SM 5310 C	06/30/21		ALD
Solids, Total Suspended	<1	mg/l	1	1	SM 2540 D	06/29/21		ALD

Lab ID: 2119108-12 **Collected By:** Client **Sampled:** 06/28/21 11:50 **Received:** 06/28/21 13:55
Sample Desc: BM-8S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.01	mg/l		0.01	SM 4500-P F	06/29/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	96	mg CaCO3/L		2	SM 2320 B	06/29/21		MPB
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	06/28/21	U	RCE
Biochemical Oxygen Demand	4.7	mg/l	2.0	2.0	SM 5210 B	06/29/21 15:31	C-37	SWA
Nitrate as N	3.33	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/28/21 18:49		TML
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/28/21 18:49	U	TML
Nitrate+Nitrite as N	<3.34	mg/l	0.108	1.10	CALCULATED	06/28/21 18:49		TML
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/30/21	U	SNF
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	06/29/21		SNF
Solids, Total Dissolved	200	mg/l	4	5	SM 2540 C	06/29/21		TMH
Total Organic Carbon	2.6	mg/l	0.3	0.5	SM 5310 C	06/30/21		ALD
Solids, Total Suspended	<1	mg/l	1	1	SM 2540 D	06/29/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	1	mpn/100ml	1	SM 9223 B/Quantitray	6/28/21 14:26	6/29/21 8:58		JMW
Total Coliform	102	mpn/100ml	1	SM 9223 B/Quantitray	6/28/21 14:26	6/29/21 8:58		JMW

Lab ID: 2119108-13 **Collected By:** Client **Sampled:** 06/28/21 11:50 **Received:** 06/28/21 13:55
Sample Desc: BM-8M **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.02	mg/l		0.01	SM 4500-P F	06/29/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	102	mg CaCO3/L		2	SM 2320 B	06/29/21		MPB
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	06/29/21	U	RCE
Biochemical Oxygen Demand	3.4	mg/l	2.0	2.0	SM 5210 B	06/29/21 15:35	C-37b	SWA
Nitrate as N	3.40	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/28/21 18:32		TML
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/28/21 18:32	U	TML
Nitrate+Nitrite as N	<3.41	mg/l	0.108	1.10	CALCULATED	06/28/21 18:32		TML
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/30/21	U	SNF
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	06/29/21		SNF
Solids, Total Dissolved	209	mg/l	4	5	SM 2540 C	06/29/21		TMH
Total Organic Carbon	2.4	mg/l	0.3	0.5	SM 5310 C	06/30/21		ALD
Solids, Total Suspended	3	mg/l	1	1	SM 2540 D	06/29/21		ALD

Lab ID: 2119108-14 **Collected By:** Client **Sampled:** 06/28/21 11:50 **Received:** 06/28/21 13:55
Sample Desc: BM-8D **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.01	mg/l		0.01	SM 4500-P F	06/29/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	140	mg CaCO3/L		2	SM 2320 B	06/29/21		MPB
Ammonia as N	0.13	mg/l	0.05	0.10	ASTM D6919-03	06/28/21		RCE
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	06/29/21 13:45	C-37	SWA
Nitrate as N	3.90	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/28/21 17:43		TML
Nitrite as N	0.04	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/28/21 17:43	J	TML
Nitrate+Nitrite as N	3.94	mg/l	0.108	1.10	CALCULATED	06/28/21 17:43		TML
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/30/21	U	SNF
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	06/29/21		SNF
Solids, Total Dissolved	257	mg/l	4	5	SM 2540 C	06/29/21		TMH
Total Organic Carbon	2.0	mg/l	0.3	0.5	SM 5310 C	06/30/21		ALD
Solids, Total Suspended	4	mg/l	1	1	SM 2540 D	06/29/21		ALD

Lab ID: 2119108-15 **Collected By:** Client **Sampled:** 06/28/21 10:50 **Received:** 06/28/21 13:55
Sample Desc: BM-9S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.01	mg/l		0.01	SM 4500-P F	06/29/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	98	mg CaCO3/L		2	SM 2320 B	06/29/21		MPB
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	06/30/21	U	RCE
Biochemical Oxygen Demand	2.8	mg/l	2.0	2.0	SM 5210 B	06/29/21 15:35	C-37b	SWA
Nitrate as N	3.37	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/28/21 19:39		TML
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/28/21 19:39	U	TML
Nitrate+Nitrite as N	<3.38	mg/l	0.108	1.10	CALCULATED	06/28/21 19:39		TML
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/30/21	U	SNF
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	06/29/21		SNF
Solids, Total Dissolved	185	mg/l	4	5	SM 2540 C	06/29/21		TMH
Total Organic Carbon	2.6	mg/l	0.3	0.5	SM 5310 C	06/30/21		ALD
Solids, Total Suspended	2	mg/l	1	1	SM 2540 D	06/29/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	<1	mpn/100ml	1	SM 9223 B/Quantitray	6/28/21 14:26	6/29/21 8:58		JMW
Total Coliform	272	mpn/100ml	1	SM 9223 B/Quantitray	6/28/21 14:26	6/29/21 8:58		JMW

Lab ID: 2119108-16 **Collected By:** Client **Sampled:** 06/28/21 10:50 **Received:** 06/28/21 13:55
Sample Desc: BM-9M **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.01	mg/l		0.01	SM 4500-P F	06/29/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	147	mg CaCO3/L		2	SM 2320 B	06/29/21		MPB
Ammonia as N	0.13	mg/l	0.05	0.10	ASTM D6919-03	06/29/21		RCE
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	06/29/21 13:45	C-37	SWA
Nitrate as N	3.94	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/28/21 19:22		TML
Nitrite as N	0.07	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/28/21 19:22	J	TML
Nitrate+Nitrite as N	4.01	mg/l	0.108	1.10	CALCULATED	06/28/21 19:22		TML
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/30/21	U	SNF
Phosphorus as P, Total	0.01	mg/l	0.01	0.01	SM 4500-P F	06/29/21		SNF
Solids, Total Dissolved	247	mg/l	4	5	SM 2540 C	06/29/21		TMH
Total Organic Carbon	2.0	mg/l	0.3	0.5	SM 5310 C	06/30/21		ALD
Solids, Total Suspended	2	mg/l	1	1	SM 2540 D	06/29/21		ALD

Lab ID: 2119108-17 **Collected By:** Client **Sampled:** 06/28/21 10:50 **Received:** 06/28/21 13:55
Sample Desc: BM-9D **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.02	mg/l		0.01	SM 4500-P F	06/29/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	163	mg CaCO3/L		2	SM 2320 B	06/29/21		MPB
Ammonia as N	0.49	mg/l	0.05	0.10	ASTM D6919-03	06/28/21		RCE
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	06/29/21 13:45	C-37	SWA
Nitrate as N	2.35	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/28/21 18:15		TML
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/28/21 18:15	U	TML
Nitrate+Nitrite as N	<2.36	mg/l	0.108	1.10	CALCULATED	06/28/21 18:15		TML
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/30/21	U	SNF
Phosphorus as P, Total	0.02	mg/l	0.01	0.01	SM 4500-P F	06/29/21		SNF
Solids, Total Dissolved	259	mg/l	4	5	SM 2540 C	06/29/21		TMH
Total Organic Carbon	2.1	mg/l	0.3	0.5	SM 5310 C	06/30/21		ALD
Solids, Total Suspended	1	mg/l	1	1	SM 2540 D	06/29/21		ALD

Lab ID: 2119108-18 **Collected By:** Client **Sampled:** 06/28/21 11:10 **Received:** 06/28/21 13:55
Sample Desc: BM-10S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.01	mg/l		0.01	SM 4500-P F	06/29/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	94	mg CaCO3/L		2	SM 2320 B	06/29/21		MPB
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	06/29/21	U	RCE
Biochemical Oxygen Demand	3.5	mg/l	2.0	2.0	SM 5210 B	06/29/21 15:35	C-37b	SWA
Nitrate as N	3.39	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/28/21 19:06		TML
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/28/21 19:06	U	TML
Nitrate+Nitrite as N	<3.40	mg/l	0.108	1.10	CALCULATED	06/28/21 19:06		TML
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/30/21	U	SNF
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	06/29/21		SNF
Solids, Total Dissolved	188	mg/l	4	5	SM 2540 C	06/29/21		TMH
Total Organic Carbon	3.4	mg/l	0.3	0.5	SM 5310 C	06/30/21		ALD
Solids, Total Suspended	<1	mg/l	1	1	SM 2540 D	06/29/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	2	mpn/100ml	1	SM 9223 B/Quantitray	6/28/21 14:26	6/29/21 8:58		JMW
Total Coliform	166	mpn/100ml	1	SM 9223 B/Quantitray	6/28/21 14:26	6/29/21 8:58		JMW

Lab ID: 2119108-19 **Collected By:** Client **Sampled:** 06/28/21 11:10 **Received:** 06/28/21 13:55
Sample Desc: BM-10M **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.01	mg/l		0.01	SM 4500-P F	06/29/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	100	mg CaCO3/L		2	SM 2320 B	06/29/21		MPB
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	06/29/21	U	RCE
Biochemical Oxygen Demand	6.1	mg/l	2.0	2.0	SM 5210 B	06/29/21 15:31	C-37	SWA
Nitrate as N	3.56	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/28/21 18:33		TML
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/28/21 18:33	U	TML
Nitrate+Nitrite as N	<3.57	mg/l	0.108	1.10	CALCULATED	06/28/21 18:33		TML
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/30/21	U	SNF
Phosphorus as P, Total	0.01	mg/l	0.01	0.01	SM 4500-P F	06/29/21		SNF
Solids, Total Dissolved	199	mg/l	4	5	SM 2540 C	06/29/21		TMH
Total Organic Carbon	2.4	mg/l	0.3	0.5	SM 5310 C	06/30/21		ALD
Solids, Total Suspended	7	mg/l	1	1	SM 2540 D	06/29/21		ALD

Lab ID: 2119108-20 **Collected By:** Client **Sampled:** 06/28/21 11:10 **Received:** 06/28/21 13:55
Sample Desc: BM-10D **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.04	mg/l		0.01	SM 4500-P F	06/29/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	166	mg CaCO3/L		2	SM 2320 B	06/29/21		MPB
Ammonia as N	0.32	mg/l	0.05	0.10	ASTM D6919-03	06/28/21		RCE
Biochemical Oxygen Demand	2.0	mg/l	2.0	2.0	SM 5210 B	06/29/21 13:45	C-37	SWA
Nitrate as N	4.02	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/28/21 14:36		TML
Nitrite as N	0.07	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/28/21 14:36	J	TML
Nitrate+Nitrite as N	4.09	mg/l	0.108	1.10	CALCULATED	06/28/21 14:36		TML
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/30/21	U	SNF
Phosphorus as P, Total	0.08	mg/l	0.01	0.01	SM 4500-P F	06/29/21		SNF
Solids, Total Dissolved	276	mg/l	4	5	SM 2540 C	06/29/21		TMH
Total Organic Carbon	2.0	mg/l	0.3	0.5	SM 5310 C	06/30/21		ALD
Solids, Total Suspended	65	mg/l	1	1	SM 2540 D	06/29/21		ALD

Lab ID: 2119108-21 **Collected By:** Client **Sampled:** 06/28/21 13:00 **Received:** 06/28/21 13:55
Sample Desc: BM-11S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.04	mg/l		0.01	SM 4500-P F	07/03/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	119	mg CaCO3/L		2	SM 2320 B	06/29/21		MPB
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	06/29/21	U	RCE
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	06/29/21 13:45	C-37	SWA
Nitrate as N	3.95	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	06/28/21 18:50		TML
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	06/28/21 18:50	U	TML
Nitrate+Nitrite as N	<3.96	mg/l	0.108	1.10	CALCULATED	06/28/21 18:50		TML
Nitrogen, Total Kjeldahl (TKN)	<0.48	mg/l	0.48	0.50	EPA 351.2	06/30/21	U	SNF
Phosphorus as P, Total	0.04	mg/l	0.01	0.01	SM 4500-P F	06/29/21		SNF
Solids, Total Dissolved	216	mg/l	4	5	SM 2540 C	06/29/21		TMH
Total Organic Carbon	2.0	mg/l	0.3	0.5	SM 5310 C	06/30/21		ALD
Solids, Total Suspended	2	mg/l	1	1	SM 2540 D	06/29/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	435	mpn/100ml	1	SM 9223 B/Quantitray	6/28/21 14:26	6/29/21 8:58		JMW
Total Coliform	>2420	mpn/100ml	1	SM 9223 B/Quantitray	6/28/21 14:26	6/29/21 8:58		JMW

Preparation Methods

Specific Method	Preparation Method	Prep Batch	Prepared Date	Prepared By
2119108-01				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1678	06/29/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1672	06/29/2021	SNF
2119108-02				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1678	06/29/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1672	06/29/2021	SNF
2119108-03				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1678	06/29/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1672	06/29/2021	SNF
2119108-04				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1678	06/29/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1672	06/29/2021	SNF
2119108-05				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1678	06/29/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1672	06/29/2021	SNF
2119108-06				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1678	06/29/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1672	06/29/2021	SNF
2119108-07				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1678	06/29/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1672	06/29/2021	SNF
2119108-08				
Dissolved General Chemistry				

SM 4500-P F	SM 4500-P B	B1F1678	06/29/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1672	06/29/2021	SNF
2119108-09				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1678	06/29/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1672	06/29/2021	SNF
2119108-10				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1678	06/29/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1672	06/29/2021	SNF
2119108-11				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1678	06/29/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1672	06/29/2021	SNF
2119108-12				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1678	06/29/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1672	06/29/2021	SNF
2119108-13				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1678	06/29/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1672	06/29/2021	SNF
2119108-14				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1678	06/29/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1672	06/29/2021	SNF
2119108-15				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1678	06/29/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1672	06/29/2021	SNF
2119108-16				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1678	06/29/2021	SNF

General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1672	06/29/2021	SNF
2119108-17				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1678	06/29/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1672	06/29/2021	SNF
2119108-18				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1678	06/29/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1672	06/29/2021	SNF
2119108-19				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1678	06/29/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1672	06/29/2021	SNF
2119108-20				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1678	06/29/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1672	06/29/2021	SNF
2119108-21				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1G0015	07/01/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1F1672	06/29/2021	SNF

Notes and Definitions

C-37	The dissolved oxygen depletion for the dilution water blank was greater than 0.20mg/L at 0.40mg/L.
C-37a	The dissolved oxygen depletion for the dilution water blank was greater than 0.20mg/L at 0.41mg/L.
C-37b	The dissolved oxygen depletion for the dilution water blank was greater than 0.20mg/L at 0.68mg/L.
G-11	The sample was filtered after it was received at the laboratory.
G-17	The sample was preserved in the laboratory.
J	Estimated value
Q-11	The matrix spike(s) were outside acceptable limits of 85-115% recovery at 131%.
U	Analyte was not detected above the indicated value.

M.J. Reider Associates, Inc.
107 Angelica St, Reading PA, 19611
610-374-5129 www.mjreider.com

WORK ORDER
Chain of Custody

2119108

Client Code: 3157
Client: Tetra Tech
Project Manager: Richard A Wheeler
Project: 2021 - Blue Marsh Reservoir
Report To: Tetra Tech - David Wertz - USACE, Phila Dist. Env.Resources Branch 100 Penn Square E., Arlington, VA 22201
Invoice To: Tetra Tech - David Wertz - USACE, Phila Dist. Env.Resources Branch 100 Penn Square E., Arlington, VA 22201

Comments:

Collected By : (Full Name) Gregory Wacik

2119108-01 BM-1S

Matrix: Non-Potable Water
Type: Grab
Date: 6/28/21
Time: 0735

BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, TC (#) SM 9223B
Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

2119108-02 BM-2S

Matrix: Non-Potable Water
Type: Grab
Date: 6/28/21
Time: 0950

BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, TC (#) SM 9223B
Alk SM 2320B, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D, NH3-N D6919-03

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

	Date/Time		Date/Time
Relinquished By	6/28/21 1130	Received By	6-28-21 1340
Relinquished By		Received By	
Relinquished By		Received at Laboratory By	6-28-21 1355

Sample Kit Prepared By:	Date/Time
JJV / SW	6/2/21
Sample Temp (°C):	8
Samples on Ice?	Yes No NA
Approved By:	BSW
Entered By:	

Printed: 6/1/2021 11:01:22AM

Report Template: wko WorkOrder COC ls

M.J. Reider Associates, Inc.

Client Code: 3157 **Client:** Tetra Tech

Project Manager: Richard A Wheeler **Project:** 2021 - Blue Marsh Reservoir

Comments:

Collected By : (Full Name) Gregory Wacik

2119108-03 BM-2M

Matrix: Non-Potable Water Date: 6/28/21
Type: Grab Time: 0950

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F
Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2119108-04 BM-2D

Matrix: Non-Potable Water Date: 6/28/21
Type: Grab Time: 0950

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F
Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2119108-05 BM-5S

Matrix: Non-Potable Water Date: 6/28/21
Type: Grab Time: 1300

BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, PO4-D SM 4500P-F, TC (#) SM 9223B, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2
Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

	Date/Time		Date/Time
Relinquished By	6/28/21 1530	Received By	6-28-21 1340
Relinquished By		Received By	
Relinquished By		Received at Laboratory By	6-28-21 1355

Sample Kit Prepared By:		Date/Time
JSV	SW	6/2/21
Sample Temp (°C):		8
Samples on Ice?	Yes	No NA
Approved By:		BSW
Entered By:		

Printed: 6/1/2021 11:01:22AM

Report Template: wkc WorkOrder COC ls

M.J. Reider Associates, Inc.

2119108

Client Code: 3157 **Client:** Tetra Tech

Project Manager: Richard A Wheeler **Project:** 2021 - Blue Marsh Reservoir

Comments:

Collected By : (Full Name) Gregory Dacik

2119108-06 BM-6S

Matrix: Non-Potable Water Date: 6/28/21
Type: Grab Time: 0900

TC (#) SM 9223B, BOD Stm 5210B, EC (#) SM 9223B Confirmation, PO4-D SM 4500P-F, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2
TDS SM 2540C, Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

2119108-07 BM-6M

Matrix: Non-Potable Water Date: 6/28/21
Type: Grab Time: 0900

BOD Stm 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F
NH3-N D6919-03, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D, Alk SM 2320B, PO4 SM 4500P-F, TDS SM 2540C

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2119108-08 BM-6D

Matrix: Non-Potable Water Date: 6/28/21
Type: Grab Time: 0900

NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, BOD Stm 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0
Alk SM 2320B, PO4 SM 4500P-F, TDS SM 2540C, NH3-N D6919-03, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

Relinquished By	Date/Time 6/28/21 1:30	Received By	Date/Time 6-28-21 1340
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received at Laboratory By	Date/Time 6-28-21 1355

Sample Kit Prepared By: JSV / SW	Date/Time 6/2/21
Sample Temp (°C):	8
Samples on Ice?	(Yes) No NA
Approved By:	
Entered By:	JSW

Printed: 6/1/2021 11:01:22AM

Report Template: wko WorkOrder COC ls

M.J. Reider Associates, Inc.

2119108

Client Code: 3157 **Client:** Tetra Tech

Project Manager: Richard A Wheeler **Project:** 2021 - Blue Marsh Reservoir

Comments:

Collected By : Gregory Wacik
(Full Name)

2119108-09 BM-7S

Matrix: Non-Potable Water Date: 6/28/21
Type: Grab Time: 1020

BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, TC (#) SM 9223B
TSS SM 2540D, Alk SM 2320B, NH3-N D6919-03, TDS SM 2540C, TOC SM 5310C, TKN EPA 351.2, PO4 SM 4500P-F

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

2119108-10 BM-7M

Matrix: Non-Potable Water Date: 6/28/21
Type: Grab Time: 1020

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F
Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2119108-11 BM-7D

Matrix: Non-Potable Water Date: 6/28/21
Type: Grab Time: 1020

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F
Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

Relinquished By	Date/Time	Received By	Date/Time
	6/28/21 1530		6-28-21 1340
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received at Laboratory By	Date/Time
			6-28-21 1255

Sample Kit Prepared By: JSV / SM	Date/Time 6/2/21
Sample Temp (°C):	8
Samples on Ice?	Yes No NA
Approved By:	BSW
Entered By:	

M.J. Reider Associates, Inc.

2119108

Client Code: 3157 **Client:** Tetra Tech

Project Manager: Richard A Wheeler **Project:** 2021 - Blue Marsh Reservoir

Comments:

Collected By : (Full Name) Gregory Wacik

2119108-12 BM-8S

Matrix: Non-Potable Water Date: 6/28/21
Type: Grab Time: 1150

BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, TC (#) SM 9223B
Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

2119108-13 BM-8M

Matrix: Non-Potable Water Date: 6/28/21
Type: Grab Time: 1150

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F
Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2119108-14 BM-8D

Matrix: Non-Potable Water Date: 6/28/21
Type: Grab Time: 1150

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F
Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TOC SM 5310C, TSS SM 2540D, TKN EPA 351.2

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

Relinquished By	6/28/21 1:30 Date/Time	Received By	6-28-21 1340 Date/Time
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received at Laboratory By	6-28-21 1355 Date/Time

Sample Kit Prepared By: JSV / GW	Date/Time 6/2/21
Sample Temp (°C): 8	
Samples on Ice? Yes No NA	
Approved By: BSW	
Entered By:	

M.J. Reider Associates, Inc.

Client Code: 3157 **Client:** Tetra Tech

Project Manager: Richard A Wheeler **Project:** 2021 - Blue Marsh Reservoir

Comments:

Collected By : (Full Name) Gregory Wacik

2119108-15 BM-9S

Matrix: Non-Potable Water Date: 6/28/21
Type: Grab Time: 1050

BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, TC (#) SM 9223B
TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D, Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

2119108-16 BM-9M

Matrix: Non-Potable Water Date: 6/28/21
Type: Grab Time: 1050

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F
Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2119108-17 BM-9D

Matrix: Non-Potable Water Date: 6/28/21
Type: Grab Time: 1050

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F
Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TOC SM 5310C, TSS SM 2540D, TKN EPA 351.2

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

Relinquished By	6/28/21 1:30 Date/Time	Received By	6-28-21 1340 Date/Time
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received at Laboratory By	6-28-21 1355 Date/Time

Sample Kit Prepared By:	Date/Time
JSV / GW	6/2/21
Sample Temp (°C):	8
Samples on Ice?	(Yes) No NA
Approved By:	
Entered By:	JSW

Printed: 6/1/2021 11:01:22AM

Report Template: wko WorkOrder COC ls

M.J. Reider Associates, Inc.

Client Code: 3157
Project Manager: Richard A Wheeler

Client: Tetra Tech
Project: 2021 - Blue Marsh Reservoir

Comments:

Collected By : (Full Name) Gregory Wacik

2119108-18 BM-10S

Matrix: Non-Potable Water
Type: Grab
Date: 6/28/21
Time: 1110

PO4-D SM 4500P-F, NO2-N EPA 300.0, NO3-N EPA 300.0, BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N, NO3-N, Combined NO3+NO2, TC (#) SM 9223B
Alk SM 2320B, PO4 SM 4500P-F, NH3-N D6919-03, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

2119108-19 BM-10M

Matrix: Non-Potable Water
Type: Grab
Date: 6/28/21
Time: 1110

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F
Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2119108-20 BM-10D

Matrix: Non-Potable Water
Type: Grab
Date: 6/28/21
Time: 1110

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F
Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

	Date/Time		Date/Time
Relinquished By	6/28/21 1:30	Received By	6-28-21 1340
Relinquished By		Received By	
Relinquished By		Received at Laboratory By	6-28-21 1355

Sample Kit Prepared By:	Date/Time
JSV 18W	6/2/21
Sample Temp (°C):	8
Samples on Ice?	Yes No NA
Approved By:	BSW
Entered By:	

Printed: 6/1/2021 11:01:22AM

Report Template: WKO WorkOrder COC 1s

M.J. Reider Associates, Inc.

2119108

Client Code: 3157
Project Manager: Richard A Wheeler

Client: Tetra Tech
Project: 2021 - Blue Marsh Reservoir

Comments:

Collected By : Gregory Wacik
(Full Name)

2119108-21 BM-11S

Matrix: Non-Potable Water
Type: Grab

Date: 6/28/21
Time: 1500

BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, NO3-N EPA 300.0, PO4-D SM 4500P-F, TC (#) SM 9223B, NO2-N, NO3-N, Combined NO3+NO2
Alk SM 2320B, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D, PO4 SM 4500P-F, NH3-N D6919-03

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

Relinquished By	Date/Time 6/28/21 1:30	Received By	Date/Time 6-28-21 1340
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received at Laboratory By	Date/Time 6-28-21 1355

Sample Kit Prepared By: JSV KSR	Date/Time 6/2/21
Sample Temp (°C):	8
Samples on Ice?	Yes No NA
Approved By:	BSW
Entered By:	

The Client, by signing (or having the client's agent sign), agrees to MJRA's Terms and Conditions and to pay for the above requested services including any additional associated fees incurred.

Printed: 6/1/2021 11:01:22AM

Report Template: wko WorkOrder COC 1s

MJRA Terms & Conditions

All samples submitted must be accompanied by signed documentation representing a Chain of Custody (COC). The COC Record acts as a contract between the client and MJRA. Signing the COC form gives approval for MJRA to perform the requested analyses and is an agreement to pay for the cost of such analyses**.** COC Records must be completed in black or blue indelible ink (must not run when wet). COC documentation begins at the time of sample collection. Client is required to document all sample details prior to releasing samples to MJRA. All samples must be placed on ice immediately after sampling and shipped or delivered to the laboratory in a manner that will maintain the sample temperature above freezing and below 6C (loose ice is preferred)**.**

Sample Submission, Sample Acceptance & Sampling Containers

Included on the COC must be the sample description, date and time of collection (including start and stop for composites), container size and type, preservative information, sample matrix, indication of whether the sample is a grab or composite, number of containers & a list of the tests to be performed. Poor sample collection technique, inappropriate sampling containers and/or improper sample preservation may lead to sample rejection. Suitable sample containers, labels, and preservatives (as applicable), along with blank COCs are provided at no additional cost.

Turnaround Times (TAT)

Average TAT for test results range from 5 to 15 working days depending on the specific analyses and time of year submitted. Faster turnaround times (*RUSH TAT) may be available depending on the current workload in a particular department and the nature of the analyses requested. We encourage you to verify requests for expedited sample results with one of our Technical Directors prior to sample submittal. Without confirmation from a Technical Director, your results may not be completed by your deadline. *RUSH TAT Surcharges are applied for expedited turnaround times.

Analytical Results, Sample Collection Integrity & Subcontracting

Analytical values are for the sample as submitted and relate only to the item tested. The value indicates a snapshot of the constituent content of the sample at the time of sample collection. Analytical results can be impacted by poor sample collection technique and/or improper preservation. All sample collection completed by MJRA was performed in accordance with applicable regulatory protocols or as specified in customer specific sampling plans. Constituent content will vary over time based on the matrix of the sample and the physical and chemical changes to its environment. All sample results and laboratory reports are strictly confidential. Results will not be available to anyone except the primary client or authorized party representing the client unless MJRA receives additional permissions from the client. When necessary, MJRA will subcontract certain analyses to a third party accredited laboratory. If client prohibits subcontracting, it must be provided in writing and include instruction on how to proceed with client samples that require third party analyses.

Payment Terms

Payment Terms are Net 30 days. Prices are subject to change without notice. A standing monthly charge of 1.5% of the clients over-30-day-unpaid balance may be added to the balance after 30 days and each month thereafter (day 31, 61, 91 etc.). The laboratory accepts all major credit cards, ACH transactions, checks and cash. New clients must pay for all services rendered prior to sample collection and/or in some cases report processing. Clients must contact the MJRA accounting department to pursue a credit-based account. MJRA reserves the right to terminate the client's credit account and to refuse to perform additional services on a credit basis if any balance is outstanding for more than 60 days.

Warranty & Litigation

MJRA does not guarantee any results of its services but has agreed to use its best efforts, in accordance with the standards and practices of the industry, to cause such results to be accurate and complete. We disclaim any other warranties, expressed or implied, including a warranty of fitness for a particular purpose and warranty of merchantability. Clients agree that they shall reimburse MJRA for any and all fees, cost and litigation expenses, including reasonable attorney fees incurred by MJRA in obtaining payment for the services rendered. All costs associated with compliance with any subpoena for documents, testimony, or any other purpose relating to work performed by MJRA, for a client, shall be paid by that client. MJRA's aggregate liability for negligent acts and omissions and of an intentional breach by MJRA will not exceed the fee paid for the services. Client agrees to indemnify and hold MJRA harmless for any and all liabilities in excess of said amount. Neither MJRA nor the client shall be liable to the other for special, incidental consequential or punitive liability or damages included but not limited to those arising from delay, loss of use, loss of profits or revenues. MJRA will not be liable to the client unless the client has notified MJRA of the discovery of the alleged negligent act, error, omissions or breach within 30 days of the day of its discovery and within one year of the date of invoice.

Reviewed and Approved by:

Richard A Wheeler
Director of Field Services

Certificate of Analysis

M.J. Reider Associates, Inc.
ENVIRONMENTAL TESTING LABORATORY
U.S. EPA/PA DEP #06-00003

Laboratory No.: 2122140
Report: 07/29/21
Lab Contact: Richard A Wheeler

Attention: David Wertz
Reported To: Tetra Tech
USACE, Phila Dist. Env.Resources Branch 100 Penn Square E.
Arlington, VA 22201

Project: 2021 - Blue Marsh Reservoir

Lab ID: 2122140-01 **Collected By:** Client **Sampled:** 07/19/21 07:45 **Received:** 07/19/21 13:50
Sample Desc: BM-1S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.03	mg/l		0.01	SM 4500-P F	07/21/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	145	mg CaCO3/L		2	SM 2320 B	07/20/21		APR
Ammonia as N	0.34	mg/l	0.05	0.10	ASTM D6919-03	07/20/21		APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	07/20/21 14:37	C-37	SWA
Nitrate as N	2.28	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	07/19/21 16:47		JAF
Nitrite as N	0.04	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	07/19/21 16:47	J	JAF
Nitrate+Nitrite as N	2.32	mg/l	0.119	1.10	CALCULATED	07/19/21 16:47		JAF
Nitrogen, Total Kjeldahl (TKN)	0.65	mg/l	0.43	0.50	EPA 351.2	07/20/21		SNF
Phosphorus as P, Total	0.03	mg/l	0.01	0.01	SM 4500-P F	07/21/21		SNF
Solids, Total Dissolved	239	mg/l	4	5	SM 2540 C	07/20/21		TMH
Total Organic Carbon	2.7	mg/l	0.3	0.5	SM 5310 C	07/21/21		ALD
Solids, Total Suspended	3	mg/l	1	1	SM 2540 D	07/20/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	1	mpn/100ml	1	SM 9223 B/Quantitray	7/19/21 15:01	7/20/21 9:31		JMW
Total Coliform	>2420	mpn/100ml	1	SM 9223 B/Quantitray	7/19/21 15:01	7/20/21 9:31		JMW

Lab ID: 2122140-02 **Collected By:** Client **Sampled:** 07/19/21 09:15 **Received:** 07/19/21 13:50
Sample Desc: BM-2S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.02	mg/l		0.01	SM 4500-P F	07/21/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	83	mg CaCO3/L		2	SM 2320 B	07/20/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	07/20/21	U	APR
Biochemical Oxygen Demand	5.2	mg/l	2.0	2.0	SM 5210 B	07/20/21 14:37	C-37	SWA
Nitrate as N	2.65	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	07/19/21 21:16		JAF
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	07/19/21 21:16	U	JAF
Nitrate+Nitrite as N	<2.66	mg/l	0.119	1.10	CALCULATED	07/19/21 21:16		JAF
Nitrogen, Total Kjeldahl (TKN)	<0.43	mg/l	0.43	0.50	EPA 351.2	07/20/21	U	SNF
Phosphorus as P, Total	0.02	mg/l	0.01	0.01	SM 4500-P F	07/21/21		SNF
Solids, Total Dissolved	176	mg/l	4	5	SM 2540 C	07/20/21		TMH
Total Organic Carbon	2.8	mg/l	0.3	0.5	SM 5310 C	07/21/21		ALD
Solids, Total Suspended	7	mg/l	1	1	SM 2540 D	07/20/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	6	mpn/100ml	1	SM 9223 B/Quantitray	7/19/21 15:01	7/20/21 9:31		JMW
Total Coliform	2420	mpn/100ml	1	SM 9223 B/Quantitray	7/19/21 15:01	7/20/21 9:31		JMW

Lab ID: 2122140-03 **Collected By:** Client **Sampled:** 07/19/21 09:15 **Received:** 07/19/21 13:50
Sample Desc: BM-2M **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.01	mg/l		0.01	SM 4500-P F	07/21/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	139	mg CaCO3/L		2	SM 2320 B	07/20/21		APR
Ammonia as N	0.22	mg/l	0.05	0.10	ASTM D6919-03	07/20/21		APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	07/20/21 14:37	C-37	SWA
Nitrate as N	3.00	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	07/19/21 21:33		JAF
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	07/19/21 21:33	U	JAF
Nitrate+Nitrite as N	<3.01	mg/l	0.119	1.10	CALCULATED	07/19/21 21:33		JAF
Nitrogen, Total Kjeldahl (TKN)	<0.43	mg/l	0.43	0.50	EPA 351.2	07/20/21	U	SNF
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	07/21/21		SNF
Solids, Total Dissolved	214	mg/l	4	5	SM 2540 C	07/20/21		TMH
Total Organic Carbon	2.2	mg/l	0.3	0.5	SM 5310 C	07/21/21		ALD
Solids, Total Suspended	<1	mg/l	1	1	SM 2540 D	07/20/21		ALD

Lab ID: 2122140-04 **Collected By:** Client **Sampled:** 07/19/21 09:15 **Received:** 07/19/21 13:50
Sample Desc: BM-2D **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.03	mg/l		0.01	SM 4500-P F	07/21/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	166	mg CaCO3/L		2	SM 2320 B	07/20/21		APR
Ammonia as N	0.70	mg/l	0.05	0.10	ASTM D6919-03	07/20/21		APR
Biochemical Oxygen Demand	2.5	mg/l	2.0	2.0	SM 5210 B	07/20/21 14:37	C-37	SWA
Nitrate as N	1.90	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	07/19/21 20:59		JAF
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	07/19/21 20:59	U	JAF
Nitrate+Nitrite as N	<1.91	mg/l	0.119	1.10	CALCULATED	07/19/21 20:59		JAF
Nitrogen, Total Kjeldahl (TKN)	0.80	mg/l	0.43	0.50	EPA 351.2	07/20/21		SNF
Phosphorus as P, Total	0.03	mg/l	0.01	0.01	SM 4500-P F	07/21/21		SNF
Solids, Total Dissolved	266	mg/l	4	5	SM 2540 C	07/20/21		TMH
Total Organic Carbon	2.2	mg/l	0.3	0.5	SM 5310 C	07/21/21		ALD
Solids, Total Suspended	<1	mg/l	1	1	SM 2540 D	07/20/21		ALD

Lab ID: 2122140-05 **Collected By:** Client **Sampled:** 07/19/21 12:30 **Received:** 07/19/21 13:50
Sample Desc: BM-5S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.05	mg/l		0.01	SM 4500-P F	07/21/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	198	mg CaCO3/L		2	SM 2320 B	07/20/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	07/20/21	U	APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	07/20/21 14:37	C-37	SWA
Nitrate as N	6.74	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	07/19/21 17:04		JAF
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	07/19/21 17:04	U	JAF
Nitrate+Nitrite as N	<6.75	mg/l	0.119	1.10	CALCULATED	07/19/21 17:04		JAF
Nitrogen, Total Kjeldahl (TKN)	<0.43	mg/l	0.43	0.50	EPA 351.2	07/20/21	U	SNF
Phosphorus as P, Total	0.05	mg/l	0.01	0.01	SM 4500-P F	07/21/21		SNF
Solids, Total Dissolved	344	mg/l	4	5	SM 2540 C	07/20/21		TMH
Total Organic Carbon	1.7	mg/l	0.3	0.5	SM 5310 C	07/21/21		ALD
Solids, Total Suspended	12	mg/l	1	1	SM 2540 D	07/20/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	261	mpn/100ml	1	SM 9223 B/Quantitray	7/19/21 15:01	7/20/21 9:31		JMW
Total Coliform	>2420	mpn/100ml	1	SM 9223 B/Quantitray	7/19/21 15:01	7/20/21 9:31		JMW

Lab ID: 2122140-06 **Collected By:** Client **Sampled:** 07/19/21 08:30 **Received:** 07/19/21 13:50
Sample Desc: BM-6S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.01	mg/l		0.01	SM 4500-P F	07/21/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	76	mg CaCO3/L		2	SM 2320 B	07/20/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	07/20/21	U	APR
Biochemical Oxygen Demand	6.5	mg/l	2.0	2.0	SM 5210 B	07/20/21 14:37	C-37	SWA
Nitrate as N	2.65	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	07/19/21 20:43		JAF
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	07/19/21 20:43	U	JAF
Nitrate+Nitrite as N	<2.66	mg/l	0.119	1.10	CALCULATED	07/19/21 20:43		JAF
Nitrogen, Total Kjeldahl (TKN)	0.69	mg/l	0.43	0.50	EPA 351.2	07/20/21		SNF
Phosphorus as P, Total	0.01	mg/l	0.01	0.01	SM 4500-P F	07/21/21		SNF
Solids, Total Dissolved	140	mg/l	4	5	SM 2540 C	07/20/21		TMH
Total Organic Carbon	2.7	mg/l	0.3	0.5	SM 5310 C	07/21/21		ALD
Solids, Total Suspended	3	mg/l	1	1	SM 2540 D	07/20/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	3	mpn/100ml	1	SM 9223 B/Quantitray	7/19/21 15:01	7/20/21 9:31		JMW
Total Coliform	>2420	mpn/100ml	1	SM 9223 B/Quantitray	7/19/21 15:01	7/20/21 9:31		JMW

Lab ID: 2122140-07 **Collected By:** Client **Sampled:** 07/19/21 08:30 **Received:** 07/19/21 13:50
Sample Desc: BM-6M **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.01	mg/l		0.01	SM 4500-P F	07/21/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	121	mg CaCO3/L		2	SM 2320 B	07/20/21		APR
Ammonia as N	0.16	mg/l	0.05	0.10	ASTM D6919-03	07/20/21		APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	07/20/21 14:37	C-37	SWA
Nitrate as N	3.06	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	07/20/21 0:38		JAF
Nitrite as N	0.03	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	07/20/21 0:38	J	JAF
Nitrate+Nitrite as N	3.09	mg/l	0.119	1.10	CALCULATED	07/20/21 0:38		JAF
Nitrogen, Total Kjeldahl (TKN)	0.43	mg/l	0.43	0.50	EPA 351.2	07/20/21	J	SNF
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	07/21/21		SNF
Solids, Total Dissolved	200	mg/l	4	5	SM 2540 C	07/20/21		TMH
Total Organic Carbon	2.2	mg/l	0.3	0.5	SM 5310 C	07/21/21		ALD
Solids, Total Suspended	4	mg/l	1	1	SM 2540 D	07/20/21		ALD

Lab ID: 2122140-08 **Collected By:** Client **Sampled:** 07/19/21 08:30 **Received:** 07/19/21 13:50
Sample Desc: BM-6D **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.02	mg/l		0.01	SM 4500-P F	07/21/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	158	mg CaCO3/L		2	SM 2320 B	07/20/21		APR
Ammonia as N	0.58	mg/l	0.05	0.10	ASTM D6919-03	07/20/21		APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	07/20/21 14:37	C-37	SWA
Nitrate as N	1.92	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	07/19/21 22:57		JAF
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	07/19/21 22:57	U	JAF
Nitrate+Nitrite as N	<1.93	mg/l	0.119	1.10	CALCULATED	07/19/21 22:57		JAF
Nitrogen, Total Kjeldahl (TKN)	0.61	mg/l	0.43	0.50	EPA 351.2	07/20/21		SNF
Phosphorus as P, Total	0.02	mg/l	0.01	0.01	SM 4500-P F	07/21/21		SNF
Solids, Total Dissolved	239	mg/l	4	5	SM 2540 C	07/20/21		TMH
Total Organic Carbon	2.2	mg/l	0.3	0.5	SM 5310 C	07/21/21		ALD
Solids, Total Suspended	1	mg/l	1	1	SM 2540 D	07/20/21		ALD

Lab ID: 2122140-09 **Collected By:** Client **Sampled:** 07/19/21 10:15 **Received:** 07/19/21 13:50
Sample Desc: BM-7S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.01	mg/l		0.01	SM 4500-P F	07/21/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	82	mg CaCO3/L		2	SM 2320 B	07/20/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	07/20/21	U	APR
Biochemical Oxygen Demand	6.3	mg/l	2.0	2.0	SM 5210 B	07/20/21 14:37	C-37	SWA
Nitrate as N	2.57	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	07/19/21 17:37		JAF
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	07/19/21 17:37	U	JAF
Nitrate+Nitrite as N	<2.58	mg/l	0.119	1.10	CALCULATED	07/19/21 17:37		JAF
Nitrogen, Total Kjeldahl (TKN)	<0.43	mg/l	0.43	0.50	EPA 351.2	07/20/21	U	SNF
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	07/21/21		SNF
Solids, Total Dissolved	166	mg/l	4	5	SM 2540 C	07/20/21		TMH
Total Organic Carbon	2.8	mg/l	0.3	0.5	SM 5310 C	07/21/21		ALD
Solids, Total Suspended	5	mg/l	1	1	SM 2540 D	07/20/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	3	mpn/100ml	1	SM 9223 B/Quantitray	7/19/21 15:01	7/20/21 9:31		JMW
Total Coliform	>2420	mpn/100ml	1	SM 9223 B/Quantitray	7/19/21 15:01	7/20/21 9:31		JMW

Lab ID: 2122140-10 **Collected By:** Client **Sampled:** 07/19/21 10:15 **Received:** 07/19/21 13:50
Sample Desc: BM-7M **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.01	mg/l		0.01	SM 4500-P F	07/21/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	111	mg CaCO3/L		2	SM 2320 B	07/20/21		APR
Ammonia as N	0.15	mg/l	0.05	0.10	ASTM D6919-03	07/20/21		APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	07/20/21 13:19	C-37	SWA
Nitrate as N	2.94	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	07/19/21 23:31		JAF
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	07/19/21 23:31	U	JAF
Nitrate+Nitrite as N	<2.95	mg/l	0.119	1.10	CALCULATED	07/19/21 23:31		JAF
Nitrogen, Total Kjeldahl (TKN)	<0.43	mg/l	0.43	0.50	EPA 351.2	07/20/21	U	SNF
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	07/21/21		SNF
Solids, Total Dissolved	191	mg/l	4	5	SM 2540 C	07/20/21		TMH
Total Organic Carbon	2.8	mg/l	0.3	0.5	SM 5310 C	07/21/21		ALD
Solids, Total Suspended	<1	mg/l	1	1	SM 2540 D	07/20/21		ALD

Lab ID: 2122140-11 **Collected By:** Client **Sampled:** 07/19/21 10:15 **Received:** 07/19/21 13:50
Sample Desc: BM-7D **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.02	mg/l		0.01	SM 4500-P F	07/21/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	137	mg CaCO3/L		2	SM 2320 B	07/20/21		APR
Ammonia as N	0.52	mg/l	0.05	0.10	ASTM D6919-03	07/20/21		APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	07/20/21 13:19	C-37	SWA
Nitrate as N	2.52	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	07/20/21 0:21		JAF
Nitrite as N	0.03	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	07/20/21 0:21	J	JAF
Nitrate+Nitrite as N	2.55	mg/l	0.119	1.10	CALCULATED	07/20/21 0:21		JAF
Nitrogen, Total Kjeldahl (TKN)	0.73	mg/l	0.43	0.50	EPA 351.2	07/20/21		SNF
Phosphorus as P, Total	0.03	mg/l	0.01	0.01	SM 4500-P F	07/21/21		SNF
Solids, Total Dissolved	216	mg/l	4	5	SM 2540 C	07/20/21		TMH
Total Organic Carbon	2.6	mg/l	0.3	0.5	SM 5310 C	07/21/21		ALD
Solids, Total Suspended	4	mg/l	1	1	SM 2540 D	07/20/21		ALD

Lab ID: 2122140-12 **Collected By:** Client **Sampled:** 07/19/21 11:35 **Received:** 07/19/21 13:50
Sample Desc: BM-8S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.01	mg/l		0.01	SM 4500-P F	07/21/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	78	mg CaCO3/L		2	SM 2320 B	07/20/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	07/20/21	U	APR
Biochemical Oxygen Demand	5.8	mg/l	2.0	2.0	SM 5210 B	07/20/21 14:37	C-37	SWA
Nitrate as N	2.51	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	07/19/21 20:09		JAF
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	07/19/21 20:09	U	JAF
Nitrate+Nitrite as N	<2.52	mg/l	0.119	1.10	CALCULATED	07/19/21 20:09		JAF
Nitrogen, Total Kjeldahl (TKN)	<0.43	mg/l	0.43	0.50	EPA 351.2	07/20/21	U	SNF
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	07/21/21		SNF
Solids, Total Dissolved	94	mg/l	4	5	SM 2540 C	07/20/21		TMH
Total Organic Carbon	2.8	mg/l	0.3	0.5	SM 5310 C	07/21/21		ALD
Solids, Total Suspended	5	mg/l	1	1	SM 2540 D	07/20/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	1	mpn/100ml	1	SM 9223 B/Quantitray	7/19/21 15:01	7/20/21 9:31		JMW
Total Coliform	649	mpn/100ml	1	SM 9223 B/Quantitray	7/19/21 15:01	7/20/21 9:31		JMW

Lab ID: 2122140-13 **Collected By:** Client **Sampled:** 07/19/21 11:35 **Received:** 07/19/21 13:50
Sample Desc: BM-8M **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.01	mg/l		0.01	SM 4500-P F	07/21/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	103	mg CaCO3/L		2	SM 2320 B	07/20/21		APR
Ammonia as N	0.16	mg/l	0.05	0.10	ASTM D6919-03	07/20/21		APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	07/20/21 14:37	C-37	SWA
Nitrate as N	2.75	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	07/19/21 20:26		JAF
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	07/19/21 20:26	U	JAF
Nitrate+Nitrite as N	<2.76	mg/l	0.119	1.10	CALCULATED	07/19/21 20:26		JAF
Nitrogen, Total Kjeldahl (TKN)	0.57	mg/l	0.43	0.50	EPA 351.2	07/20/21		SNF
Phosphorus as P, Total	0.02	mg/l	0.01	0.01	SM 4500-P F	07/21/21		SNF
Solids, Total Dissolved	189	mg/l	4	5	SM 2540 C	07/20/21		TMH
Total Organic Carbon	2.8	mg/l	0.3	0.5	SM 5310 C	07/21/21		ALD
Solids, Total Suspended	<1	mg/l	1	1	SM 2540 D	07/20/21		ALD

Lab ID: 2122140-14 **Collected By:** Client **Sampled:** 07/19/21 11:35 **Received:** 07/19/21 13:50
Sample Desc: BM-8D **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.07	mg/l		0.01	SM 4500-P F	07/21/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	116	mg CaCO3/L		2	SM 2320 B	07/20/21		APR
Ammonia as N	0.48	mg/l	0.05	0.10	ASTM D6919-03	07/20/21		APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	07/20/21 14:37	C-37	SWA
Nitrate as N	2.36	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	07/19/21 19:18		JAF
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	07/19/21 19:18	U	JAF
Nitrate+Nitrite as N	<2.37	mg/l	0.119	1.10	CALCULATED	07/19/21 19:18		JAF
Nitrogen, Total Kjeldahl (TKN)	0.69	mg/l	0.43	0.50	EPA 351.2	07/20/21		SNF
Phosphorus as P, Total	0.10	mg/l	0.01	0.01	SM 4500-P F	07/21/21		SNF
Solids, Total Dissolved	210	mg/l	4	5	SM 2540 C	07/20/21		TMH
Total Organic Carbon	3.6	mg/l	0.3	0.5	SM 5310 C	07/21/21		ALD
Solids, Total Suspended	2	mg/l	1	1	SM 2540 D	07/20/21		ALD

Lab ID: 2122140-15 **Collected By:** Client **Sampled:** 07/19/21 10:35 **Received:** 07/19/21 13:50
Sample Desc: BM-9S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.02	mg/l		0.01	SM 4500-P F	07/21/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	77	mg CaCO3/L		2	SM 2320 B	07/20/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	07/20/21	U	APR
Biochemical Oxygen Demand	6.8	mg/l	2.0	2.0	SM 5210 B	07/20/21 14:37	C-37	SWA
Nitrate as N	2.50	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	07/19/21 17:21		JAF
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	07/19/21 17:21	U	JAF
Nitrate+Nitrite as N	<2.51	mg/l	0.119	1.10	CALCULATED	07/19/21 17:21		JAF
Nitrogen, Total Kjeldahl (TKN)	0.80	mg/l	0.43	0.50	EPA 351.2	07/20/21		SNF
Phosphorus as P, Total	0.01	mg/l	0.01	0.01	SM 4500-P F	07/21/21		SNF
Solids, Total Dissolved	174	mg/l	4	5	SM 2540 C	07/20/21		TMH
Total Organic Carbon	3.2	mg/l	0.3	0.5	SM 5310 C	07/21/21		ALD
Solids, Total Suspended	3	mg/l	1	1	SM 2540 D	07/20/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	1	mpn/100ml	1	SM 9223 B/Quantitray	7/19/21 15:01	7/20/21 9:31		JMW
Total Coliform	816	mpn/100ml	1	SM 9223 B/Quantitray	7/19/21 15:01	7/20/21 9:31		JMW

Lab ID: 2122140-16 **Collected By:** Client **Sampled:** 07/19/21 10:35 **Received:** 07/19/21 13:50
Sample Desc: BM-9M **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.01	mg/l		0.01	SM 4500-P F	07/21/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	121	mg CaCO3/L		2	SM 2320 B	07/20/21		APR
Ammonia as N	0.18	mg/l	0.05	0.10	ASTM D6919-03	07/20/21		APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	07/20/21 14:37	C-37	SWA
Nitrate as N	3.09	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	07/19/21 23:14		JAF
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	07/19/21 23:14	U	JAF
Nitrate+Nitrite as N	<3.10	mg/l	0.119	1.10	CALCULATED	07/19/21 23:14		JAF
Nitrogen, Total Kjeldahl (TKN)	<0.43	mg/l	0.43	0.50	EPA 351.2	07/20/21	U	SNF
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	07/21/21		SNF
Solids, Total Dissolved	190	mg/l	4	5	SM 2540 C	07/20/21		TMH
Total Organic Carbon	3.0	mg/l	0.3	0.5	SM 5310 C	07/21/21		ALD
Solids, Total Suspended	<1	mg/l	1	1	SM 2540 D	07/20/21		ALD

Lab ID: 2122140-17 **Collected By:** Client **Sampled:** 07/19/21 10:35 **Received:** 07/19/21 13:50
Sample Desc: BM-9D **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.05	mg/l		0.01	SM 4500-P F	07/21/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	140	mg CaCO3/L		2	SM 2320 B	07/20/21		APR
Ammonia as N	0.79	mg/l	0.05	0.10	ASTM D6919-03	07/20/21		APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	07/20/21 13:19	C-37	SWA
Nitrate as N	2.34	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	07/19/21 22:07		JAF
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	07/19/21 22:07	U	JAF
Nitrate+Nitrite as N	<2.35	mg/l	0.119	1.10	CALCULATED	07/19/21 22:07		JAF
Nitrogen, Total Kjeldahl (TKN)	1.09	mg/l	0.43	0.50	EPA 351.2	07/20/21		SNF
Phosphorus as P, Total	0.06	mg/l	0.01	0.01	SM 4500-P F	07/21/21		SNF
Solids, Total Dissolved	227	mg/l	4	5	SM 2540 C	07/20/21		TMH
Total Organic Carbon	3.3	mg/l	0.3	0.5	SM 5310 C	07/21/21		ALD
Solids, Total Suspended	3	mg/l	1	1	SM 2540 D	07/20/21	Q-19	ALD

Lab ID: 2122140-18 **Collected By:** Client **Sampled:** 07/19/21 11:10 **Received:** 07/19/21 13:50
Sample Desc: BM-10S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.01	mg/l		0.01	SM 4500-P F	07/21/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	87	mg CaCO3/L		2	SM 2320 B	07/20/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	07/20/21	U	APR
Biochemical Oxygen Demand	6.8	mg/l	2.0	2.0	SM 5210 B	07/20/21 14:37	C-37	SWA
Nitrate as N	2.67	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	07/19/21 19:02		JAF
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	07/19/21 19:02	U	JAF
Nitrate+Nitrite as N	<2.68	mg/l	0.119	1.10	CALCULATED	07/19/21 19:02		JAF
Nitrogen, Total Kjeldahl (TKN)	0.63	mg/l	0.43	0.50	EPA 351.2	07/20/21		SNF
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	07/21/21		SNF
Solids, Total Dissolved	192	mg/l	4	5	SM 2540 C	07/20/21		TMH
Total Organic Carbon	2.8	mg/l	0.3	0.5	SM 5310 C	07/21/21		ALD
Solids, Total Suspended	1	mg/l	1	1	SM 2540 D	07/20/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	10	mpn/100ml	1	SM 9223 B/Quantitray	7/19/21 15:01	7/20/21 9:31		JMW
Total Coliform	866	mpn/100ml	1	SM 9223 B/Quantitray	7/19/21 15:01	7/20/21 9:31		JMW

Lab ID: 2122140-19 **Collected By:** Client **Sampled:** 07/19/21 11:10 **Received:** 07/19/21 13:50
Sample Desc: BM-10M **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.01	mg/l		0.01	SM 4500-P F	07/21/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	126	mg CaCO3/L		2	SM 2320 B	07/20/21		APR
Ammonia as N	0.07	mg/l	0.05	0.10	ASTM D6919-03	07/20/21	J	APR
Biochemical Oxygen Demand	2.7	mg/l	2.0	2.0	SM 5210 B	07/20/21 14:37	C-37	SWA
Nitrate as N	3.79	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	07/19/21 17:54		JAF
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	07/19/21 17:54	U	JAF
Nitrate+Nitrite as N	<3.80	mg/l	0.119	1.10	CALCULATED	07/19/21 17:54		JAF
Nitrogen, Total Kjeldahl (TKN)	<0.43	mg/l	0.43	0.50	EPA 351.2	07/20/21	U	SNF
Phosphorus as P, Total	0.02	mg/l	0.01	0.01	SM 4500-P F	07/21/21		SNF
Solids, Total Dissolved	224	mg/l	4	5	SM 2540 C	07/20/21		TMH
Total Organic Carbon	2.3	mg/l	0.3	0.5	SM 5310 C	07/21/21		ALD
Solids, Total Suspended	1	mg/l	1	1	SM 2540 D	07/20/21		ALD

Lab ID: 2122140-20 **Collected By:** Client **Sampled:** 07/19/21 11:10 **Received:** 07/19/21 13:50
Sample Desc: BM-10D **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.02	mg/l		0.01	SM 4500-P F	07/21/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	148	mg CaCO3/L		2	SM 2320 B	07/20/21		APR
Ammonia as N	0.12	mg/l	0.05	0.10	ASTM D6919-03	07/20/21		APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	07/20/21 13:19	C-37	SWA
Nitrate as N	4.58	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	07/19/21 21:50		JAF
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	07/19/21 21:50	U	JAF
Nitrate+Nitrite as N	<4.59	mg/l	0.119	1.10	CALCULATED	07/19/21 21:50		JAF
Nitrogen, Total Kjeldahl (TKN)	<0.43	mg/l	0.43	0.50	EPA 351.2	07/20/21	U	SNF
Phosphorus as P, Total	0.03	mg/l	0.01	0.01	SM 4500-P F	07/21/21		SNF
Solids, Total Dissolved	253	mg/l	4	5	SM 2540 C	07/20/21		TMH
Total Organic Carbon	2.1	mg/l	0.3	0.5	SM 5310 C	07/21/21		ALD
Solids, Total Suspended	21	mg/l	1	1	SM 2540 D	07/20/21		ALD

Lab ID: 2122140-21 **Collected By:** Client **Sampled:** 07/19/21 12:30 **Received:** 07/19/21 13:50
Sample Desc: BM-11S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.05	mg/l		0.01	SM 4500-P F	07/21/21	G-11, G-17	SNF
General Chemistry								
Alkalinity, Total to pH 4.5	136	mg CaCO3/L		2	SM 2320 B	07/20/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	07/20/21	U	APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	07/20/21 13:19	C-37	SWA
Nitrate as N	4.73	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	07/19/21 16:30		JAF
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	07/19/21 16:30	U	JAF
Nitrate+Nitrite as N	<4.74	mg/l	0.119	1.10	CALCULATED	07/19/21 16:30		JAF
Nitrogen, Total Kjeldahl (TKN)	<0.43	mg/l	0.43	0.50	EPA 351.2	07/20/21	U	SNF
Phosphorus as P, Total	0.04	mg/l	0.01	0.01	SM 4500-P F	07/21/21		SNF
Solids, Total Dissolved	240	mg/l	4	5	SM 2540 C	07/20/21		TMH
Total Organic Carbon	2.2	mg/l	0.3	0.5	SM 5310 C	07/21/21		ALD
Solids, Total Suspended	10	mg/l	1	1	SM 2540 D	07/20/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	365	mpn/100ml	1	SM 9223 B/Quantitray	7/19/21 15:01	7/20/21 9:31		JMW
Total Coliform	>2420	mpn/100ml	1	SM 9223 B/Quantitray	7/19/21 15:01	7/20/21 9:31		JMW

Preparation Methods

Specific Method	Preparation Method	Prep Batch	Prepared Date	Prepared By
2122140-01				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1024	07/20/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1066	07/20/2021	SNF
2122140-02				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1024	07/20/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1066	07/20/2021	SNF
2122140-03				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1024	07/20/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1066	07/20/2021	SNF
2122140-04				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1024	07/20/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1066	07/20/2021	SNF
2122140-05				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1024	07/20/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1066	07/20/2021	SNF
2122140-06				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1024	07/20/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1066	07/20/2021	SNF
2122140-07				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1024	07/20/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1066	07/20/2021	SNF
2122140-08				
Dissolved General Chemistry				

SM 4500-P F	SM 4500-P B	B1G1024	07/20/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1066	07/20/2021	SNF
2122140-09				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1024	07/20/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1066	07/20/2021	SNF
2122140-10				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1024	07/20/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1066	07/20/2021	SNF
2122140-11				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1024	07/20/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1066	07/20/2021	SNF
2122140-12				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1024	07/20/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1066	07/20/2021	SNF
2122140-13				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1024	07/20/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1066	07/20/2021	SNF
2122140-14				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1024	07/20/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1066	07/20/2021	SNF
2122140-15				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1024	07/20/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1066	07/20/2021	SNF
2122140-16				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1024	07/20/2021	SNF

General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1066	07/20/2021	SNF
2122140-17				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1024	07/20/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1066	07/20/2021	SNF
2122140-18				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1024	07/20/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1066	07/20/2021	SNF
2122140-19				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1024	07/20/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1066	07/20/2021	SNF
2122140-20				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1024	07/20/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1066	07/20/2021	SNF
2122140-21				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1024	07/20/2021	SNF
General Chemistry				
SM 4500-P F	SM 4500-P B	B1G1066	07/20/2021	SNF

Notes and Definitions

C-37	The dissolved oxygen depletion for the dilution water blank was greater than 0.20mg/L at 0.4mg/L.
G-11	The sample was filtered after it was received at the laboratory.
G-17	The sample was preserved in the laboratory.
J	Estimated value
Q-19	The duplicate RPD was greater than 10% at 40.0%.
U	Analyte was not detected above the indicated value.

M.J. Reider Associates, Inc.
107 Angelica St, Reading PA, 19611
610-374-5129 www.mjreider.com

WORK ORDER
Chain of Custody

2122140

Client Code: 3157 **Client:** Tetra Tech
Project Manager: Richard A Wheeler **Project:** 2021 - Blue Marsh Reservoir
Report To: Tetra Tech - David Wertz - USACE, Phila Dist. Env.Resources Branch 100 Penn Square E., Arlington, VA 22201
Invoice To: Tetra Tech - David Wertz - USACE, Phila Dist. Env.Resources Branch 100 Penn Square E., Arlington, VA 22201

Bottles correctly Labled BSW 7-19-21

Comments: ~~Sample 7M and 7D switched with 9M and 9D~~

Collected By : (Full Name) Gregory Wacik

2122140-01 BM-1S

Matrix: Non-Potable Water Date: 7/19/21
Type: Grab Time: 0745

BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, TC (#) SM 9223B
Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

2122140-02 BM-2S

Matrix: Non-Potable Water Date: 7/19/21
Type: Grab Time: 0915

BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, TC (#) SM 9223B
Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

Relinquished By	Date/Time 7/19/21 1:10	Received By	Date/Time 7-19-21 1325
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received at Laboratory By	Date/Time 7-19-21 1350

Sample Kit Prepared By: JSV	Date/Time 6-24-21
Sample Temp (°C):	8
Samples on Ice?	Yes No NA
Approved By:	
Entered By:	

M.J. Reider Associates, Inc.

2122140

Client Code: 3157 **Client:** Tetra Tech

Project Manager: Richard A Wheeler **Project:** 2021 - Blue Marsh Reservoir

Comments:

Collected By : (Full Name) Gregory Wacik

2122140-03 BM-2M

NO2-N EPA 300.0, NO3-N EPA 300.0, BOD SM 5210B, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F

Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

Matrix: Non-Potable Water Date: 7/19/21
Type: Grab Time: 0915

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2122140-04 BM-2D

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F

Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

Matrix: Non-Potable Water Date: 7/19/21
Type: Grab Time: 0915

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2122140-05 BM-5S

BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, NO3-N EPA 300.0, PO4-D SM 4500P-F, NO2-N, NO3-N, Combined NO3+NO2, TC (#) SM 9223B

Alk SM 2320B, NH3-N D6919-03, TSS SM 2540D, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C

Matrix: Non-Potable Water Date: 7/19/21
Type: Grab Time: 1230

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

Relinquished By	7/19/21 1:10 Date/Time	Received By	7-19-21 1325 Date/Time
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received at Laboratory By	7-19-21 1350 Date/Time

Sample Kit Prepared By: JV	Date/Time 6-24-21
Sample Temp (°C):	8
Samples on Ice?	Yes No NA
Approved By:	BSW
Entered By:	

Printed: 6/22/2021 1:37:26PM

Report Template: wko WorkOrder COC ls

M.J. Reider Associates, Inc.

Client Code: 3157 **Client:** Tetra Tech

Project Manager: Richard A Wheeler **Project:** 2021 - Blue Marsh Reservoir

Comments:

Collected By : (Full Name) Gregory Wacik

2122140-06 BM-6S

TC (#) SM 9223B, NO3-N EPA 300.0, NO2-N EPA 300.0, BOD SM 5210B, EC (#) SM 9223B Confirmation, PO4-D SM 4500P-F, NO2-N, NO3-N, Combined NO3+NO2
Alk SM 2320B, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C

Matrix: Non-Potable Water Date: 7/19/21
Type: Grab Time: 0830

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

2122140-07 BM-6M

NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0
Alk SM 2320B, PO4 SM 4500P-F, TDS SM 2540C, NH3-N D6919-03, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

Matrix: Non-Potable Water Date: 7/19/21
Type: Grab Time: 0830

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2122140-08 BM-6D

NO2-N EPA 300.0, NO3-N EPA 300.0, BOD SM 5210B, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F
NH3-N D6919-03, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D, Alk SM 2320B, PO4 SM 4500P-F, TDS SM 2540C

Matrix: Non-Potable Water Date: 7/19/21
Type: Grab Time: 0830

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

Relinquished By	7/19/21 1900 Date/Time	Received By	7-19-21 1325 Date/Time
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received at Laboratory By	7-19-21 1350 Date/Time

Sample Kit Prepared By: JSV	Date/Time 6-24-21
Sample Temp (°C):	8
Samples on Ice?	Yes No NA
Approved By:	
Entered By:	JSV

M.J. Reider Associates, Inc.

Client Code: 3157 **Client:** Tetra Tech

Project Manager: Richard A Wheeler **Project:** 2021 - Blue Marsh Reservoir

Comments:

Collected By : (Full Name) Gregory Wadik

2122140-09 BM-7S

BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, TC (#) SM 9223B

Alk SM 2320B, NH3-N D6919-03, TDS SM 2540C, TOC SM 5310C, TSS SM 2540D, TKN EPA 351.2, PO4 SM 4500P-F

Matrix: Non-Potable Water Date: 7/19/21
Type: Grab Time: 1015

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

2122140-10 BM-7M

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F

Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

~~7m Results/sample is 9M~~ BSW 7-19-21

Matrix: Non-Potable Water Date: 7/19/21
Type: Grab Time: 1015

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2122140-11 BM-7D

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F

Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

~~7D Results/sample is 9D~~ 7-19-21 BSW

Matrix: Non-Potable Water Date: 7/19/21
Type: Grab Time: 1015

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

	Date/Time		Date/Time
Relinquished By	7/19/21 1:10	Received By	7-19-21 1325
Relinquished By		Received By	
Relinquished By		Received at Laboratory By	7-19-21 1350

Sample Kit Prepared By:	Date/Time
JSV	6-24-21
Sample Temp (°C):	8
Samples on Ice?	(Yes) No NA
Approved By:	BSW
Entered By:	

Printed: 6/22/2021 1:37:26PM

Report Template: wkd WorkOrder COC ls

M.J. Reider Associates, Inc.

Client Code: 3157 **Client:** Tetra Tech

Project Manager: Richard A Wheeler **Project:** 2021 - Blue Marsh Reservoir

Comments:

Collected By : (Full Name) Gregory Wacik

2122140-12 BM-8S

PO4-D SM 4500P-F, TC (#) SM 9223B, BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2

TSS SM 2540D, TDS SM 2540C, TOC SM 5310C, Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TKN EPA 351.2

Matrix: Non-Potable Water Date: 7/19/21
Type: Grab Time: 1135

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

2122140-13 BM-8M

NO2-N EPA 300.0, BOD SM 5210B, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F

Alk SM 2320B, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D, NH3-N D6919-03

Matrix: Non-Potable Water Date: 7/19/21
Type: Grab Time: 1135

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2122140-14 BM-8D

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F

Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

Matrix: Non-Potable Water Date: 7/19/21
Type: Grab Time: 1135

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

Relinquished By	Date/Time 7/19/21 1:10	Received By	Date/Time 7-19-21 1325
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received at Laboratory By	Date/Time 7-19-21 1350

Sample Kit Prepared By: JSV	Date/Time 6-24-21
Sample Temp (°C): 8	
Samples on Ice? Yes No NA	
Approved By:	
Entered By:	

Printed: 6/22/2021 1:37:26PM

Report Template: wko WorkOrder COC is

M.J. Reider Associates, Inc.

Client Code: 3157 **Client:** Tetra Tech

Project Manager: Richard A Wheeler **Project:** 2021 - Blue Marsh Reservoir

Comments:

Collected By : (Full Name) Gregory Wacik

2122140-15 BM-9S

JAF JAF 1

BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, TC (#) SM 9223B

Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

Matrix: Non-Potable Water Date: 7/19/21
Type: Grab Time: 1035

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

2122140-16 BM-9M

JAF JAF

NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, BOD SM 5210B, NO2-N EPA 300.0

PO4 SM 4500P-F, Alk SM 2320B, NH3-N D6919-03, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

~~9M Sample Results are 7M~~ BSW 7-19-21

Matrix: Non-Potable Water Date: 7/19/21
Type: Grab Time: 1035

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2122140-17 BM-9D

JAF JAF

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F

Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TOC SM 5310C, TSS SM 2540D, TKN EPA 351.2

~~9D Sample Results are 7D~~ BSW 7-19-21

Matrix: Non-Potable Water Date: 7/19/21
Type: Grab Time: 1035

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

Relinquished By	7/19/21 1:10 Date/Time	Received By	7-19-21 1325 Date/Time
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received at Laboratory By	7-19-21 1350 Date/Time

Sample Kit Prepared By: JSW	Date/Time: 6-24-21
Sample Temp (°C):	8
Samples on Ice?	(Yes) No NA
Approved By:	BSW
Entered By:	

Printed: 6/22/2021 1:37:26PM

Report Template: ~~wko WorkOrder COC~~ ls

M.J. Reider Associates, Inc.

2122140

Client Code: 3157 **Client:** Tetra Tech

Project Manager: Richard A Wheeler **Project:** 2021 - Blue Marsh Reservoir

Comments:

Collected By : (Full Name) Gregory Warik

2122140-18 BM-10S

JAF JAF

BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, TC (#) SM 9223B

Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

Matrix: Non-Potable Water Date: 7/19/21
Type: Grab Time: 1110

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

2122140-19 BM-10M

JAF JAF

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F

Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

Matrix: Non-Potable Water Date: 7/19/21
Type: Grab Time: 1110

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2122140-20 BM-10D

JAF JAF

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F

Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TSS SM 2540D, TDS SM 2540C, TOC SM 5310C, TKN EPA 351.2

Matrix: Non-Potable Water Date: 7/19/21
Type: Grab Time: 1110

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

Relinquished By: Gregory Warik	Date/Time: 7/19/21 1:10	Received By: Benj Nieft	Date/Time: 7-19-21 1325
Relinquished By:	Date/Time:	Received By:	Date/Time:
Relinquished By:	Date/Time:	Received at Laboratory By: Benj Nieft	Date/Time: 7-19-21 1350

Sample Kit Prepared By: JSV (W)	Date/Time: 6-24-21
Sample Temp (°C):	8
Samples on Ice?	(Yes) No N/A
Approved By:	BSW
Entered By:	

Printed: 6/22/2021 1:37:26PM

Report Template: ~~MJR WorkOrder COC 18~~

M.J. Reider Associates, Inc.

2122140

Client Code: 3157 **Client:** Tetra Tech

Project Manager: Richard A Wheeler **Project:** 2021 - Blue Marsh Reservoir

Comments:

Collected By : Gregory Wacik
(Full Name)

2122140-21 BM-11S

PO4-D SM 4500P-F, NO3-N EPA 300.0, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, BOD SM 5210B, NO2-N, NO3-N, Combined NO3+NO2, TC (#) SM 9223B
Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

Matrix: Non-Potable Water
Type: Grab

Date: 7/19/21
Time: 1230

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

Relinquished By	7/19/21 1410 Date/Time	Received By	7-19-21 1325 Date/Time
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received at Laboratory By	7-19-21 1350 Date/Time

Sample Kit Prepared By: SJV (N)	Date/Time 6-24-21
Sample Temp (°C):	8
Samples on Ice?	Yes No NA
Approved By:	
Entered By:	

Printed: 6/22/2021 1:37:26PM

Report Template: wko WorkOrder COC ls

MJRA Terms & Conditions

All samples submitted must be accompanied by signed documentation representing a Chain of Custody (COC). The COC Record acts as a contract between the client and MJRA. Signing the COC form gives approval for MJRA to perform the requested analyses and is an agreement to pay for the cost of such analyses**.** COC Records must be completed in black or blue indelible ink (must not run when wet). COC documentation begins at the time of sample collection. Client is required to document all sample details prior to releasing samples to MJRA. All samples must be placed on ice immediately after sampling and shipped or delivered to the laboratory in a manner that will maintain the sample temperature above freezing and below 6C (loose ice is preferred)**.**

Sample Submission, Sample Acceptance & Sampling Containers

Included on the COC must be the sample description, date and time of collection (including start and stop for composites), container size and type, preservative information, sample matrix, indication of whether the sample is a grab or composite, number of containers & a list of the tests to be performed. Poor sample collection technique, inappropriate sampling containers and/or improper sample preservation may lead to sample rejection. Suitable sample containers, labels, and preservatives (as applicable), along with blank COCs are provided at no additional cost.

Turnaround Times (TAT)

Average TAT for test results range from 5 to 15 working days depending on the specific analyses and time of year submitted. Faster turnaround times (*RUSH TAT) may be available depending on the current workload in a particular department and the nature of the analyses requested. We encourage you to verify requests for expedited sample results with one of our Technical Directors prior to sample submittal. Without confirmation from a Technical Director, your results may not be completed by your deadline. *RUSH TAT Surcharges are applied for expedited turnaround times.

Analytical Results, Sample Collection Integrity & Subcontracting

Analytical values are for the sample as submitted and relate only to the item tested. The value indicates a snapshot of the constituent content of the sample at the time of sample collection. Analytical results can be impacted by poor sample collection technique and/or improper preservation. All sample collection completed by MJRA was performed in accordance with applicable regulatory protocols or as specified in customer specific sampling plans. Constituent content will vary over time based on the matrix of the sample and the physical and chemical changes to its environment. All sample results and laboratory reports are strictly confidential. Results will not be available to anyone except the primary client or authorized party representing the client unless MJRA receives additional permissions from the client. When necessary, MJRA will subcontract certain analyses to a third party accredited laboratory. If client prohibits subcontracting, it must be provided in writing and include instruction on how to proceed with client samples that require third party analyses.

Payment Terms

Payment Terms are Net 30 days. Prices are subject to change without notice. A standing monthly charge of 1.5% of the clients over-30-day-unpaid balance may be added to the balance after 30 days and each month thereafter (day 31, 61, 91 etc.). The laboratory accepts all major credit cards, ACH transactions, checks and cash. New clients must pay for all services rendered prior to sample collection and/or in some cases report processing. Clients must contact the MJRA accounting department to pursue a credit-based account. MJRA reserves the right to terminate the client's credit account and to refuse to perform additional services on a credit basis if any balance is outstanding for more than 60 days.

Warranty & Litigation

MJRA does not guarantee any results of its services but has agreed to use its best efforts, in accordance with the standards and practices of the industry, to cause such results to be accurate and complete. We disclaim any other warranties, expressed or implied, including a warranty of fitness for a particular purpose and warranty of merchantability. Clients agree that they shall reimburse MJRA for any and all fees, cost and litigation expenses, including reasonable attorney fees incurred by MJRA in obtaining payment for the services rendered. All costs associated with compliance with any subpoena for documents, testimony, or any other purpose relating to work performed by MJRA, for a client, shall be paid by that client. MJRA's aggregate liability for negligent acts and omissions and of an intentional breach by MJRA will not exceed the fee paid for the services. Client agrees to indemnify and hold MJRA harmless for any and all liabilities in excess of said amount. Neither MJRA nor the client shall be liable to the other for special, incidental consequential or punitive liability or damages included but not limited to those arising from delay, loss of use, loss of profits or revenues. MJRA will not be liable to the client unless the client has notified MJRA of the discovery of the alleged negligent act, error, omissions or breach within 30 days of the day of its discovery and within one year of the date of invoice.

Reviewed and Approved by:

Richard A Wheeler
Director of Field Services

Certificate of Analysis

M.J. Reider Associates, Inc.
ENVIRONMENTAL TESTING LABORATORY
U.S. EPA/PA DEP #06-00003

Laboratory No.: 2125187
Report: 08/27/21
Lab Contact: Richard A Wheeler

Attention: David Wertz
Reported To: Tetra Tech
USACE, Phila Dist. Env.Resources Branch 100 Penn Square E.
Arlington, VA 22201

Project: 2021 - Blue Marsh Reservoir

Lab ID: 2125187-01 **Collected By:** Client **Sampled:** 08/16/21 07:50 **Received:** 08/16/21 14:00
Sample Desc: BM-1S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.09	mg/l		0.01	SM 4500-P F	08/17/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	154	mg CaCO3/L		2	SM 2320 B	08/17/21		APR
Ammonia as N	1.35	mg/l	0.05	0.10	ASTM D6919-03	08/17/21		APR
Biochemical Oxygen Demand	3.0	mg/l	2.0	2.0	SM 5210 B	08/17/21 13:25	C-37	SWA
Nitrate as N	1.16	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	08/17/21 0:49		JAF
Nitrite as N	0.12	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	08/17/21 0:49		JAF
Nitrate+Nitrite as N	1.28	mg/l	0.119	1.10	CALCULATED	08/17/21 0:49		JAF
Nitrogen, Total Kjeldahl (TKN)	1.62	mg/l	0.43	0.50	EPA 351.2	08/18/21		TML
Phosphorus as P, Total	0.13	mg/l	0.01	0.01	SM 4500-P F	08/18/21		TML
Solids, Total Dissolved	236	mg/l	4	5	SM 2540 C	08/17/21		TMH
Total Organic Carbon	2.8	mg/l	0.3	0.5	SM 5310 C	08/17/21		ALD
Solids, Total Suspended	8	mg/l	1	1	SM 2540 D	08/17/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	5	mpn/100ml	1	SM 9223 B/Quantitray	8/16/21 15:09	8/17/21 9:18		JMW
Total Coliform	2420	mpn/100ml	1	SM 9223 B/Quantitray	8/16/21 15:09	8/17/21 9:18		JMW

Lab ID: 2125187-02 **Collected By:** Client **Sampled:** 08/16/21 09:30 **Received:** 08/16/21 14:00
Sample Desc: BM-2S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.01	mg/l		0.01	SM 4500-P F	08/17/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	91	mg CaCO3/L		2	SM 2320 B	08/17/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	08/17/21	U	APR
Biochemical Oxygen Demand	4.3	mg/l	2.0	2.0	SM 5210 B	08/17/21 13:25	C-37	SWA
Nitrate as N	1.86	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	08/16/21 18:39		JAF
Nitrite as N	0.09	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	08/16/21 18:39	J	JAF
Nitrate+Nitrite as N	1.95	mg/l	0.119	1.10	CALCULATED	08/16/21 18:39		JAF
Nitrogen, Total Kjeldahl (TKN)	<0.43	mg/l	0.43	0.50	EPA 351.2	08/18/21	U	TML
Phosphorus as P, Total	0.02	mg/l	0.01	0.01	SM 4500-P F	08/18/21		TML
Solids, Total Dissolved	151	mg/l	4	5	SM 2540 C	08/17/21		TMH
Total Organic Carbon	2.7	mg/l	0.3	0.5	SM 5310 C	08/17/21		ALD
Solids, Total Suspended	3	mg/l	1	1	SM 2540 D	08/17/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	<1	mpn/100ml	1	SM 9223 B/Quantitray	8/16/21 15:09	8/17/21 9:18		JMW
Total Coliform	>2420	mpn/100ml	1	SM 9223 B/Quantitray	8/16/21 15:09	8/17/21 9:18		JMW

Lab ID: 2125187-03 **Collected By:** Client **Sampled:** 08/16/21 09:30 **Received:** 08/16/21 14:00
Sample Desc: BM-2M **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.06	mg/l		0.01	SM 4500-P F	08/17/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	118	mg CaCO3/L		2	SM 2320 B	08/17/21		APR
Ammonia as N	0.21	mg/l	0.05	0.10	ASTM D6919-03	08/17/21		APR
Biochemical Oxygen Demand	3.1	mg/l	2.0	2.0	SM 5210 B	08/17/21 13:25	C-37	SWA
Nitrate as N	1.95	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	08/16/21 22:18		JAF
Nitrite as N	0.11	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	08/16/21 22:18		JAF
Nitrate+Nitrite as N	2.06	mg/l	0.119	1.10	CALCULATED	08/16/21 22:18		JAF
Nitrogen, Total Kjeldahl (TKN)	<0.43	mg/l	0.43	0.50	EPA 351.2	08/18/21	U	TML
Phosphorus as P, Total	0.01	mg/l	0.01	0.01	SM 4500-P F	08/18/21		TML
Solids, Total Dissolved	181	mg/l	4	5	SM 2540 C	08/17/21		TMH
Total Organic Carbon	2.3	mg/l	0.3	0.5	SM 5310 C	08/17/21		ALD
Solids, Total Suspended	3	mg/l	1	1	SM 2540 D	08/17/21		ALD

Lab ID: 2125187-04 **Collected By:** Client **Sampled:** 08/16/21 09:30 **Received:** 08/16/21 14:00
Sample Desc: BM-2D **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.03	mg/l		0.01	SM 4500-P F	08/17/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	143	mg CaCO3/L		2	SM 2320 B	08/17/21		APR
Ammonia as N	0.88	mg/l	0.05	0.10	ASTM D6919-03	08/17/21		APR
Biochemical Oxygen Demand	4.7	mg/l	2.0	2.0	SM 5210 B	08/17/21 13:25	C-37	SWA
Nitrate as N	1.75	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	08/16/21 20:03		JAF
Nitrite as N	0.11	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	08/16/21 20:03		JAF
Nitrate+Nitrite as N	1.86	mg/l	0.119	1.10	CALCULATED	08/16/21 20:03		JAF
Nitrogen, Total Kjeldahl (TKN)	0.99	mg/l	0.43	0.50	EPA 351.2	08/18/21		TML
Phosphorus as P, Total	0.03	mg/l	0.01	0.01	SM 4500-P F	08/18/21		TML
Solids, Total Dissolved	202	mg/l	4	5	SM 2540 C	08/17/21		TMH
Total Organic Carbon	2.3	mg/l	0.3	0.5	SM 5310 C	08/17/21		ALD
Solids, Total Suspended	5	mg/l	1	1	SM 2540 D	08/17/21		ALD

Lab ID: 2125187-05 **Collected By:** Client **Sampled:** 08/16/21 01:05 **Received:** 08/16/21 14:00
Sample Desc: BM-5S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.05	mg/l		0.01	SM 4500-P F	08/17/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	188	mg CaCO3/L		2	SM 2320 B	08/17/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	08/17/21	U	APR
Biochemical Oxygen Demand	5.3	mg/l	2.0	2.0	SM 5210 B	08/17/21 13:25	C-37	SWA
Nitrate as N	5.07	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	08/16/21 20:20		JAF
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	08/16/21 20:20	U	JAF
Nitrate+Nitrite as N	<5.08	mg/l	0.119	1.10	CALCULATED	08/16/21 20:20		JAF
Nitrogen, Total Kjeldahl (TKN)	<0.43	mg/l	0.43	0.50	EPA 351.2	08/18/21	U	TML
Phosphorus as P, Total	0.06	mg/l	0.01	0.01	SM 4500-P F	08/18/21		TML
Solids, Total Dissolved	267	mg/l	4	5	SM 2540 C	08/17/21		TMH
Total Organic Carbon	2.3	mg/l	0.3	0.5	SM 5310 C	08/17/21		ALD
Solids, Total Suspended	14	mg/l	1	1	SM 2540 D	08/17/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	96	mpn/100ml	1	SM 9223 B/Quantitray	8/16/21 15:09	8/17/21 9:18		JMW
Total Coliform	>2420	mpn/100ml	1	SM 9223 B/Quantitray	8/16/21 15:09	8/17/21 9:18		JMW

Lab ID: 2125187-06 **Collected By:** Client **Sampled:** 08/16/21 09:00 **Received:** 08/16/21 14:00
Sample Desc: BM-6S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.01	mg/l		0.01	SM 4500-P F	08/17/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	88	mg CaCO3/L		2	SM 2320 B	08/17/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	08/17/21	U	APR
Biochemical Oxygen Demand	2.5	mg/l	2.0	2.0	SM 5210 B	08/17/21 13:25	C-37	SWA
Nitrate as N	1.91	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	08/17/21 0:16		JAF
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	08/17/21 0:16	U	JAF
Nitrate+Nitrite as N	<1.92	mg/l	0.119	1.10	CALCULATED	08/17/21 0:16		JAF
Nitrogen, Total Kjeldahl (TKN)	<0.43	mg/l	0.43	0.50	EPA 351.2	08/18/21	U	TML
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	08/18/21		TML
Solids, Total Dissolved	143	mg/l	4	5	SM 2540 C	08/17/21		TMH
Total Organic Carbon	2.6	mg/l	0.3	0.5	SM 5310 C	08/17/21		ALD
Solids, Total Suspended	5	mg/l	1	1	SM 2540 D	08/17/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	12	mpn/100ml	1	SM 9223 B/Quantitray	8/16/21 15:09	8/17/21 9:18		JMW
Total Coliform	>2420	mpn/100ml	1	SM 9223 B/Quantitray	8/16/21 15:09	8/17/21 9:18		JMW

Lab ID: 2125187-07 **Collected By:** Client **Sampled:** 08/16/21 09:00 **Received:** 08/16/21 14:00
Sample Desc: BM-6M **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.01	mg/l		0.01	SM 4500-P F	08/17/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	144	mg CaCO3/L		2	SM 2320 B	08/17/21		APR
Ammonia as N	0.54	mg/l	0.05	0.10	ASTM D6919-03	08/17/21		APR
Biochemical Oxygen Demand	2.1	mg/l	2.0	2.0	SM 5210 B	08/17/21 13:25	C-37	SWA
Nitrate as N	1.81	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	08/16/21 22:35		JAF
Nitrite as N	0.07	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	08/16/21 22:35	J	JAF
Nitrate+Nitrite as N	1.88	mg/l	0.119	1.10	CALCULATED	08/16/21 22:35		JAF
Nitrogen, Total Kjeldahl (TKN)	0.58	mg/l	0.43	0.50	EPA 351.2	08/18/21		TML
Phosphorus as P, Total	0.01	mg/l	0.01	0.01	SM 4500-P F	08/18/21		TML
Solids, Total Dissolved	216	mg/l	4	5	SM 2540 C	08/17/21		TMH
Total Organic Carbon	2.4	mg/l	0.3	0.5	SM 5310 C	08/17/21		ALD
Solids, Total Suspended	2	mg/l	1	1	SM 2540 D	08/17/21		ALD

Lab ID: 2125187-08 **Collected By:** Client **Sampled:** 08/16/21 09:00 **Received:** 08/16/21 14:00
Sample Desc: BM-6D **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.04	mg/l		0.01	SM 4500-P F	08/17/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	149	mg CaCO3/L		2	SM 2320 B	08/17/21		APR
Ammonia as N	1.22	mg/l	0.05	0.10	ASTM D6919-03	08/17/21		APR
Biochemical Oxygen Demand	4.3	mg/l	2.0	2.0	SM 5210 B	08/17/21 13:25	C-37	SWA
Nitrate as N	1.12	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	08/17/21 0:33		JAF
Nitrite as N	0.15	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	08/17/21 0:33		JAF
Nitrate+Nitrite as N	1.27	mg/l	0.119	1.10	CALCULATED	08/17/21 0:33		JAF
Nitrogen, Total Kjeldahl (TKN)	1.37	mg/l	0.43	0.50	EPA 351.2	08/18/21		TML
Phosphorus as P, Total	0.05	mg/l	0.01	0.01	SM 4500-P F	08/18/21		TML
Solids, Total Dissolved	219	mg/l	4	5	SM 2540 C	08/17/21		TMH
Total Organic Carbon	2.5	mg/l	0.3	0.5	SM 5310 C	08/17/21		ALD
Solids, Total Suspended	1	mg/l	1	1	SM 2540 D	08/17/21		ALD

Lab ID: 2125187-09 **Collected By:** Client **Sampled:** 08/16/21 10:10 **Received:** 08/16/21 14:00
Sample Desc: BM-7S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.01	mg/l		0.01	SM 4500-P F	08/17/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	91	mg CaCO3/L		2	SM 2320 B	08/17/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	08/17/21	U	APR
Biochemical Oxygen Demand	2.5	mg/l	2.0	2.0	SM 5210 B	08/17/21 13:25	C-37	SWA
Nitrate as N	1.88	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	08/16/21 18:22		JAF
Nitrite as N	0.08	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	08/16/21 18:22	J	JAF
Nitrate+Nitrite as N	1.96	mg/l	0.119	1.10	CALCULATED	08/16/21 18:22		JAF
Nitrogen, Total Kjeldahl (TKN)	<0.43	mg/l	0.43	0.50	EPA 351.2	08/18/21	U	TML
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	08/18/21		TML
Solids, Total Dissolved	163	mg/l	4	5	SM 2540 C	08/17/21		TMH
Total Organic Carbon	2.7	mg/l	0.3	0.5	SM 5310 C	08/17/21		ALD
Solids, Total Suspended	1	mg/l	1	1	SM 2540 D	08/17/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	1	mpn/100ml	1	SM 9223 B/Quantitray	8/16/21 15:09	8/17/21 9:18		JMW
Total Coliform	>2420	mpn/100ml	1	SM 9223 B/Quantitray	8/16/21 15:09	8/17/21 9:18		JMW

Lab ID: 2125187-10 **Collected By:** Client **Sampled:** 08/16/21 10:10 **Received:** 08/16/21 14:00
Sample Desc: BM-7M **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.01	mg/l		0.01	SM 4500-P F	08/17/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	104	mg CaCO3/L		2	SM 2320 B	08/17/21		APR
Ammonia as N	0.18	mg/l	0.05	0.10	ASTM D6919-03	08/17/21		APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	08/17/21 12:10		SWA
Nitrate as N	2.24	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	08/16/21 22:01		JAF
Nitrite as N	0.05	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	08/16/21 22:01	J	JAF
Nitrate+Nitrite as N	2.29	mg/l	0.119	1.10	CALCULATED	08/16/21 22:01		JAF
Nitrogen, Total Kjeldahl (TKN)	0.61	mg/l	0.43	0.50	EPA 351.2	08/18/21		TML
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	08/18/21		TML
Solids, Total Dissolved	168	mg/l	4	5	SM 2540 C	08/17/21		TMH
Total Organic Carbon	2.4	mg/l	0.3	0.5	SM 5310 C	08/17/21		ALD
Solids, Total Suspended	4	mg/l	1	1	SM 2540 D	08/17/21		ALD

Lab ID: 2125187-11 **Collected By:** Client **Sampled:** 08/16/21 10:10 **Received:** 08/16/21 14:00
Sample Desc: BM-7D **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.03	mg/l		0.01	SM 4500-P F	08/17/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	132	mg CaCO3/L		2	SM 2320 B	08/17/21		APR
Ammonia as N	0.47	mg/l	0.05	0.10	ASTM D6919-03	08/17/21		APR
Biochemical Oxygen Demand	3.9	mg/l	2.0	2.0	SM 5210 B	08/17/21 12:10		SWA
Nitrate as N	2.00	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	08/16/21 19:46		JAF
Nitrite as N	0.15	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	08/16/21 19:46		JAF
Nitrate+Nitrite as N	2.15	mg/l	0.119	1.10	CALCULATED	08/16/21 19:46		JAF
Nitrogen, Total Kjeldahl (TKN)	0.65	mg/l	0.43	0.50	EPA 351.2	08/18/21		TML
Phosphorus as P, Total	0.04	mg/l	0.01	0.01	SM 4500-P F	08/18/21		TML
Solids, Total Dissolved	181	mg/l	4	5	SM 2540 C	08/17/21		TMH
Total Organic Carbon	2.2	mg/l	0.3	0.5	SM 5310 C	08/17/21		ALD
Solids, Total Suspended	4	mg/l	1	1	SM 2540 D	08/17/21		ALD

Lab ID: 2125187-12 **Collected By:** Client **Sampled:** 08/16/21 11:40 **Received:** 08/16/21 14:00
Sample Desc: BM-8S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.01	mg/l		0.01	SM 4500-P F	08/17/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	76	mg CaCO3/L		2	SM 2320 B	08/17/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	08/17/21	U	APR
Biochemical Oxygen Demand	5.1	mg/l	2.0	2.0	SM 5210 B	08/17/21 13:25	C-37	SWA
Nitrate as N	1.73	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	08/16/21 19:13		JAF
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	08/16/21 19:13	U	JAF
Nitrate+Nitrite as N	<1.74	mg/l	0.119	1.10	CALCULATED	08/16/21 19:13		JAF
Nitrogen, Total Kjeldahl (TKN)	0.57	mg/l	0.43	0.50	EPA 351.2	08/18/21		TML
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	08/18/21		TML
Solids, Total Dissolved	138	mg/l	4	5	SM 2540 C	08/17/21		TMH
Total Organic Carbon	2.7	mg/l	0.3	0.5	SM 5310 C	08/17/21		ALD
Solids, Total Suspended	5	mg/l	1	1	SM 2540 D	08/17/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	1	mpn/100ml	1	SM 9223 B/Quantitray	8/16/21 15:09	8/17/21 9:18		JMW
Total Coliform	>2420	mpn/100ml	1	SM 9223 B/Quantitray	8/16/21 15:09	8/17/21 9:18		JMW

Lab ID: 2125187-13 **Collected By:** Client **Sampled:** 08/16/21 11:40 **Received:** 08/16/21 14:00
Sample Desc: BM-8M **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.01	mg/l		0.01	SM 4500-P F	08/17/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	86	mg CaCO3/L		2	SM 2320 B	08/17/21		APR
Ammonia as N	0.11	mg/l	0.05	0.10	ASTM D6919-03	08/17/21		APR
Biochemical Oxygen Demand	2.2	mg/l	2.0	2.0	SM 5210 B	08/17/21 13:25	C-37	SWA
Nitrate as N	1.84	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	08/16/21 23:42		JAF
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	08/16/21 23:42	U	JAF
Nitrate+Nitrite as N	<1.85	mg/l	0.119	1.10	CALCULATED	08/16/21 23:42		JAF
Nitrogen, Total Kjeldahl (TKN)	0.66	mg/l	0.43	0.50	EPA 351.2	08/18/21		TML
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	08/18/21		TML
Solids, Total Dissolved	172	mg/l	4	5	SM 2540 C	08/17/21		TMH
Total Organic Carbon	2.5	mg/l	0.3	0.5	SM 5310 C	08/17/21		ALD
Solids, Total Suspended	5	mg/l	1	1	SM 2540 D	08/17/21		ALD

Lab ID: 2125187-14 **Collected By:** Client **Sampled:** 08/16/21 11:40 **Received:** 08/16/21 14:00
Sample Desc: BM-8D **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.05	mg/l		0.01	SM 4500-P F	08/17/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	100	mg CaCO3/L		2	SM 2320 B	08/17/21		APR
Ammonia as N	0.35	mg/l	0.05	0.10	ASTM D6919-03	08/17/21		APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	08/17/21 13:25	C-37	SWA
Nitrate as N	1.87	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	08/16/21 23:25		JAF
Nitrite as N	0.12	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	08/16/21 23:25		JAF
Nitrate+Nitrite as N	1.99	mg/l	0.119	1.10	CALCULATED	08/16/21 23:25		JAF
Nitrogen, Total Kjeldahl (TKN)	0.55	mg/l	0.43	0.50	EPA 351.2	08/18/21		TML
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	08/18/21		TML
Solids, Total Dissolved	188	mg/l	4	5	SM 2540 C	08/17/21		TMH
Total Organic Carbon	2.4	mg/l	0.3	0.5	SM 5310 C	08/17/21		ALD
Solids, Total Suspended	3	mg/l	1	1	SM 2540 D	08/17/21		ALD

Lab ID: 2125187-15 **Collected By:** Client **Sampled:** 08/16/21 10:35 **Received:** 08/16/21 14:00
Sample Desc: BM-9S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.01	mg/l		0.01	SM 4500-P F	08/17/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	85	mg CaCO3/L		2	SM 2320 B	08/17/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	08/17/21	U	APR
Biochemical Oxygen Demand	4.4	mg/l	2.0	2.0	SM 5210 B	08/17/21 13:25	C-37	SWA
Nitrate as N	1.79	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	08/17/21 1:57		JAF
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	08/17/21 1:57	U	JAF
Nitrate+Nitrite as N	<1.80	mg/l	0.119	1.10	CALCULATED	08/17/21 1:57		JAF
Nitrogen, Total Kjeldahl (TKN)	<0.43	mg/l	0.43	0.50	EPA 351.2	08/18/21	U	TML
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	08/18/21		TML
Solids, Total Dissolved	171	mg/l	4	5	SM 2540 C	08/17/21		TMH
Total Organic Carbon	2.7	mg/l	0.3	0.5	SM 5310 C	08/17/21		ALD
Solids, Total Suspended	4	mg/l	1	1	SM 2540 D	08/17/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	1	mpn/100ml	1	SM 9223 B/Quantitray	8/16/21 15:09	8/17/21 9:18		JMW
Total Coliform	>2420	mpn/100ml	1	SM 9223 B/Quantitray	8/16/21 15:09	8/17/21 9:18		JMW

Lab ID: 2125187-16 **Collected By:** Client **Sampled:** 08/16/21 10:35 **Received:** 08/16/21 14:00
Sample Desc: BM-9M **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.01	mg/l		0.01	SM 4500-P F	08/17/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	122	mg CaCO3/L		2	SM 2320 B	08/17/21		APR
Ammonia as N	0.35	mg/l	0.05	0.10	ASTM D6919-03	08/17/21		APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	08/17/21 13:25	C-37	SWA
Nitrate as N	2.65	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	08/16/21 19:30		JAF
Nitrite as N	0.09	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	08/16/21 19:30	J	JAF
Nitrate+Nitrite as N	2.74	mg/l	0.119	1.10	CALCULATED	08/16/21 19:30		JAF
Nitrogen, Total Kjeldahl (TKN)	0.46	mg/l	0.43	0.50	EPA 351.2	08/18/21	J	TML
Phosphorus as P, Total	<0.01	mg/l	0.01	0.01	SM 4500-P F	08/18/21		TML
Solids, Total Dissolved	204	mg/l	4	5	SM 2540 C	08/17/21		TMH
Total Organic Carbon	2.2	mg/l	0.3	0.5	SM 5310 C	08/17/21		ALD
Solids, Total Suspended	1	mg/l	1	1	SM 2540 D	08/17/21		ALD

Lab ID: 2125187-17 **Collected By:** Client **Sampled:** 08/16/21 10:35 **Received:** 08/16/21 14:00
Sample Desc: BM-9D **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.02	mg/l		0.01	SM 4500-P F	08/17/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	122	mg CaCO3/L		2	SM 2320 B	08/17/21		APR
Ammonia as N	0.53	mg/l	0.05	0.10	ASTM D6919-03	08/17/21		APR
Biochemical Oxygen Demand	<2.0	mg/l	2.0	2.0	SM 5210 B	08/17/21 13:25	C-37	SWA
Nitrate as N	2.06	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	08/16/21 23:59		JAF
Nitrite as N	0.11	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	08/16/21 23:59		JAF
Nitrate+Nitrite as N	2.17	mg/l	0.119	1.10	CALCULATED	08/16/21 23:59		JAF
Nitrogen, Total Kjeldahl (TKN)	0.66	mg/l	0.43	0.50	EPA 351.2	08/18/21		TML
Phosphorus as P, Total	0.03	mg/l	0.01	0.01	SM 4500-P F	08/18/21		TML
Solids, Total Dissolved	209	mg/l	4	5	SM 2540 C	08/17/21		TMH
Total Organic Carbon	2.2	mg/l	0.3	0.5	SM 5310 C	08/17/21		ALD
Solids, Total Suspended	6	mg/l	1	1	SM 2540 D	08/17/21	Q-19	ALD

Lab ID: 2125187-18 **Collected By:** Client **Sampled:** 08/16/21 11:15 **Received:** 08/16/21 14:00
Sample Desc: BM-10S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	<0.01	mg/l		0.01	SM 4500-P F	08/17/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	77	mg CaCO3/L		2	SM 2320 B	08/17/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	08/17/21	U	APR
Biochemical Oxygen Demand	5.0	mg/l	2.0	2.0	SM 5210 B	08/17/21 13:25	C-37	SWA
Nitrate as N	1.64	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	08/16/21 20:37		JAF
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	08/16/21 20:37	U	JAF
Nitrate+Nitrite as N	<1.65	mg/l	0.119	1.10	CALCULATED	08/16/21 20:37		JAF
Nitrogen, Total Kjeldahl (TKN)	0.60	mg/l	0.43	0.50	EPA 351.2	08/18/21		TML
Phosphorus as P, Total	0.02	mg/l	0.01	0.01	SM 4500-P F	08/18/21		TML
Solids, Total Dissolved	158	mg/l	4	5	SM 2540 C	08/17/21		TMH
Total Organic Carbon	2.9	mg/l	0.3	0.5	SM 5310 C	08/17/21		ALD
Solids, Total Suspended	8	mg/l	1	1	SM 2540 D	08/17/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	4	mpn/100ml	1	SM 9223 B/Quantitray	8/16/21 15:09	8/17/21 9:18		JMW
Total Coliform	>2420	mpn/100ml	1	SM 9223 B/Quantitray	8/16/21 15:09	8/17/21 9:18		JMW

Lab ID: 2125187-19 **Collected By:** Client **Sampled:** 08/16/21 11:15 **Received:** 08/16/21 14:00
Sample Desc: BM-10M **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.01	mg/l		0.01	SM 4500-P F	08/17/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	137	mg CaCO3/L		2	SM 2320 B	08/17/21		APR
Ammonia as N	0.15	mg/l	0.05	0.10	ASTM D6919-03	08/17/21		APR
Biochemical Oxygen Demand	4.1	mg/l	2.0	2.0	SM 5210 B	08/17/21 13:25	C-37	SWA
Nitrate as N	3.05	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	08/16/21 21:44		JAF
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	08/16/21 21:44	U	JAF
Nitrate+Nitrite as N	<3.06	mg/l	0.119	1.10	CALCULATED	08/16/21 21:44		JAF
Nitrogen, Total Kjeldahl (TKN)	0.48	mg/l	0.43	0.50	EPA 351.2	08/18/21	J	TML
Phosphorus as P, Total	0.03	mg/l	0.01	0.01	SM 4500-P F	08/18/21		TML
Solids, Total Dissolved	224	mg/l	4	5	SM 2540 C	08/17/21		TMH
Total Organic Carbon	2.6	mg/l	0.3	0.5	SM 5310 C	08/17/21		ALD
Solids, Total Suspended	9	mg/l	1	1	SM 2540 D	08/17/21		ALD

Lab ID: 2125187-20 **Collected By:** Client **Sampled:** 08/16/21 11:15 **Received:** 08/16/21 14:00
Sample Desc: BM-10D **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.01	mg/l		0.01	SM 4500-P F	08/17/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	121	mg CaCO3/L		2	SM 2320 B	08/17/21		APR
Ammonia as N	0.12	mg/l	0.05	0.10	ASTM D6919-03	08/17/21		APR
Biochemical Oxygen Demand	2.4	mg/l	2.0	2.0	SM 5210 B	08/17/21 12:10		SWA
Nitrate as N	2.70	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	08/17/21 1:40		JAF
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	08/17/21 1:40	U	JAF
Nitrate+Nitrite as N	<2.71	mg/l	0.119	1.10	CALCULATED	08/17/21 1:40		JAF
Nitrogen, Total Kjeldahl (TKN)	0.64	mg/l	0.43	0.50	EPA 351.2	08/18/21		TML
Phosphorus as P, Total	0.02	mg/l	0.01	0.01	SM 4500-P F	08/18/21		TML
Solids, Total Dissolved	209	mg/l	4	5	SM 2540 C	08/17/21		TMH
Total Organic Carbon	2.7	mg/l	0.3	0.5	SM 5310 C	08/17/21		ALD
Solids, Total Suspended	12	mg/l	1	1	SM 2540 D	08/17/21		ALD

M.J. Reider Associates, Inc.

Lab ID: 2125187-21 **Collected By:** Client **Sampled:** 08/16/21 12:54 **Received:** 08/16/21 14:00
Sample Desc: BM-11S **Sample Type:** Grab

	Result	Unit	MDL	Rep. Limit	Analysis Method	Analyzed	Notes	Analyst
Dissolved General Chemistry								
Phosphorus as P, Dissolved	0.09	mg/l		0.01	SM 4500-P F	08/19/21	G-11, G-17	TML
General Chemistry								
Alkalinity, Total to pH 4.5	144	mg CaCO3/L		2	SM 2320 B	08/17/21		APR
Ammonia as N	<0.05	mg/l	0.05	0.10	ASTM D6919-03	08/17/21	U	APR
Biochemical Oxygen Demand	15.7	mg/l	2.0	2.0	SM 5210 B	08/17/21 13:25	C-37	SWA
Nitrate as N	3.06	mg/l	0.10	1.00	EPA 300.0 Rev 2.1	08/16/21 18:56		JAF
Nitrite as N	<0.01	mg/l	0.01	0.10	EPA 300.0 Rev 2.1	08/16/21 18:56	U	JAF
Nitrate+Nitrite as N	<3.07	mg/l	0.119	1.10	CALCULATED	08/16/21 18:56		JAF
Nitrogen, Total Kjeldahl (TKN)	1.36	mg/l	0.43	0.50	EPA 351.2	08/18/21		TML
Phosphorus as P, Total	0.09	mg/l	0.01	0.01	SM 4500-P F	08/18/21		TML
Solids, Total Dissolved	246	mg/l	4	5	SM 2540 C	08/17/21		TMH
Total Organic Carbon	3.4	mg/l	0.3	0.5	SM 5310 C	08/18/21		ALD
Solids, Total Suspended	44	mg/l	1	1	SM 2540 D	08/17/21		ALD

	Result	Unit	Rep. Limit	Analysis Method	Incubated	Analyzed	Notes	Analyst
Microbiology								
Escherichia coli	64	mpn/100ml	1	SM 9223 B/Quantitray	8/16/21 15:09	8/17/21 9:18		JMW
Total Coliform	>2420	mpn/100ml	1	SM 9223 B/Quantitray	8/16/21 15:09	8/17/21 9:18		JMW

Preparation Methods

Specific Method	Preparation Method	Prep Batch	Prepared Date	Prepared By
2125187-01				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0895	08/16/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0953	08/17/2021	TML
2125187-02				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0895	08/16/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0953	08/17/2021	TML
2125187-03				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0895	08/16/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0953	08/17/2021	TML
2125187-04				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0895	08/16/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0953	08/17/2021	TML
2125187-05				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0895	08/16/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0953	08/17/2021	TML
2125187-06				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0895	08/16/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0953	08/17/2021	TML
2125187-07				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0895	08/16/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0953	08/17/2021	TML
2125187-08				
Dissolved General Chemistry				

SM 4500-P F	SM 4500-P B	B1H0895	08/16/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0953	08/17/2021	TML
2125187-09				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0895	08/16/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0953	08/17/2021	TML
2125187-10				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0895	08/16/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0953	08/17/2021	TML
2125187-11				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0895	08/16/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0953	08/17/2021	TML
2125187-12				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0895	08/16/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0953	08/17/2021	TML
2125187-13				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0895	08/16/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0953	08/17/2021	TML
2125187-14				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0895	08/16/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0953	08/17/2021	TML
2125187-15				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0895	08/16/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0953	08/17/2021	TML
2125187-16				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0895	08/16/2021	TML

General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0953	08/17/2021	TML
2125187-17				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0895	08/16/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0953	08/17/2021	TML
2125187-18				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0895	08/16/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0953	08/17/2021	TML
2125187-19				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0895	08/16/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0953	08/17/2021	TML
2125187-20				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0895	08/16/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0953	08/17/2021	TML
2125187-21				
Dissolved General Chemistry				
SM 4500-P F	SM 4500-P B	B1H1042	08/18/2021	TML
General Chemistry				
SM 4500-P F	SM 4500-P B	B1H0953	08/17/2021	TML

Notes and Definitions

C-37	The dissolved oxygen depletion for the dilution water blank was greater than 0.20mg/L at 0.85mg/L.
G-11	The sample was filtered after it was received at the laboratory.
G-17	The sample was preserved in the laboratory.
J	Estimated value
Q-19	The duplicate RPD was greater than 10% at 15.4%.
U	Analyte was not detected above the indicated value.

M.J. Reider Associates, Inc.
107 Angelica St, Reading PA, 19611
610-374-5129 www.mjreider.com

WORK ORDER
Chain of Custody

2125187

Client Code: 3157
Client: Tetra Tech
Project Manager: Richard A Wheeler
Project: 2021 - Blue Marsh Reservoir
Report To: Tetra Tech - David Wertz - USACE, Phila Dist. Env.Resources Branch 100 Penn Square E., Arlington, VA 22201
Invoice To: Tetra Tech - David Wertz - USACE, Phila Dist. Env.Resources Branch 100 Penn Square E., Arlington, VA 22201

Collected By : (Full Name) Gregory Wacik

Comments:

2125187-01 BM-1S

BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4 D SM 4500P-F, TC (#) SM 9223B
Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

Matrix: Non-Potable Water
Type: Grab
Date: 8/16/21
Time: 0750

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

2125187-02 BM-2S

BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4 D SM 4500P-F, TC (#) SM 9223B
Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

Matrix: Non-Potable Water
Type: Grab
Date: 8/16/21
Time: 0930

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

Relinquished By	8/16/21 1:30 Date/Time	Received By	8-16-21 1345 Date/Time
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received at Laboratory	8-16-21 1400 Date/Time

Sample Kit Prepared By:	Date/Time
JSV	7-20-21
Sample Temp (°C):	E
Samples on Ice?	(Yes) No NA
Approved By:	BBW
Entered By:	

Printed: 7/15/2021 9:32:28AM

Report Template: wko WorkOrder COC ls

M.J. Reider Associates, Inc.

2125187

Client Code: 3157 **Client:** Tetra Tech

Project Manager: Richard A Wheeler **Project:** 2021 - Blue Marsh Reservoir

Comments:

Collected By : (Full Name) Gregory Wacik

2125187-03 BM-2M

JAC JAC #59 MW

NO2-N EPA 300.0, NO3-N EPA 300.0, BOD SM 5210B, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F

Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

Matrix: Non-Potable Water Date: 8/16/21
Type: Grab Time: 0930

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2125187-04 BM-2D

#59 JAC JAC MW

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F

Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

Matrix: Non-Potable Water Date: 8/16/21
Type: Grab Time: 0930

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2125187-05 BM-5S

#59 JAC JAC MW

BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, NO3-N EPA 300.0, PO4-D SM 4500P-F, NO2-N, NO3-N, Combined NO3+NO2, TC (#) SM 9223B

Alk SM 2320B, NH3-N D6919-03, TSS SM 2540D, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C

Matrix: Non-Potable Water Date: 8/16/21
Type: Grab Time: 1105

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

Relinquished By	Date/Time	Received By	Date/Time
[signature]	8/16/21 1:30	[signature]	8-16-21 1345
Relinquished By	Date/Time	Received By	Date/Time
		[signature]	
Relinquished By	Date/Time	Received at Laboratory By	Date/Time
		[signature]	8-16-21 1400

Sample Kit Prepared By: JSV	Date/Time 7-20-21
Sample Temp (°C): 8	
Samples on Ice? Yes No NA	
Approved By:	
Entered By: JSV	

M.J. Reider Associates, Inc.

Client Code: 3157 **Client:** Tetra Tech

Project Manager: Richard A Wheeler **Project:** 2021 - Blue Marsh Reservoir

Comments:

Collected By : (Full Name) Gregory Wacik

2125187-06 BM-6S

JAC JAC ASD JW

TC (#) SM 9223B, NO3-N EPA 300.0, NO2-N EPA 300.0, BOD SM 5210B, EC (#) SM 9223B Confirmation, PO4-D SM 4500P-F, NO2-N, NO3-N, Combined NO3+NO2
Alk SM 2320B, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C

Matrix: Non-Potable Water Date: 8/16/21
Type: Grab Time: 0900

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

2125187-07 BM-6M

JW ASD JAC JAC

NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0
Alk SM 2320B, PO4 SM 4500P-F, TDS SM 2540C, NH3-N D6919-03, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

Matrix: Non-Potable Water Date: 8/16/21
Type: Grab Time: 0900

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2125187-08 BM-6D

JAC JAC ASD JW

NO2-N EPA 300.0, NO3-N EPA 300.0, BOD SM 5210B, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F
NH3-N D6919-03, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D, Alk SM 2320B, PO4 SM 4500P-F, TDS SM 2540C

Matrix: Non-Potable Water Date: 8/16/21
Type: Grab Time: 0900

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

	Date/Time		Date/Time
Relinquished By	8/16/21 1:30	Received By	8-16-21 1345
Relinquished By		Received By	
Relinquished By		Received at Laboratory By	8-16-21 1400

Sample Kit Prepared By: JV	Date/Time 7-20-21
Sample Temp (°C):	8
Samples on Ice?	(Yes) No NA
Approved By:	JSV
Entered By:	AA

Printed: 7/15/2021 9:32:28AM

Report Template: wko WorkOrder COC ls

M.J. Reider Associates, Inc.

Client Code: 3157 **Client:** Tetra Tech

Project Manager: Richard A Wheeler **Project:** 2021 - Blue Marsh Reservoir

Comments:

Collected By : (Full Name) Gregory Wacik

2125187-09 BM-7S

BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, TC (#) SM 9223B
Alk SM 2320B, NH3-N D6919-03, TDS SM 2540C, TOC SM 5310C, TSS SM 2540D, TKN EPA 351.2, PO4 SM 4500P-F

Matrix: Non-Potable Water Date: 8/16/21
Type: Grab Time: 1010

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

2125187-10 BM-7M

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F
Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

Matrix: Non-Potable Water Date: 8/16/21
Type: Grab Time: 1010

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2125187-11 BM-7D

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F
Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

Matrix: Non-Potable Water Date: 8/16/21
Type: Grab Time: 1010

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

	Date/Time		Date/Time
Relinquished By	8/16/21 1:30	Received By	8-16-21 1345
Relinquished By		Received By	
Relinquished By		Received at Laboratory By	8/16/21 1400

Sample Kit Prepared By:	Date/Time
JSV	7-20-21

Sample Temp (°C): 8
Samples on Ice? Yes No NA
Approved By:
Entered By:

The Client, by signing (or having the client's agent sign), agrees to MJRA's Terms and Conditions and to pay for the above requested services including any additional associated fees incurred.

Printed: 7/15/2021 9:32:28AM

Report Template: wko WorkOrder COC ls

M.J. Reider Associates, Inc.

Client Code: 3157 **Client:** Tetra Tech

Project Manager: Richard A Wheeler **Project:** 2021 - Blue Marsh Reservoir

Comments:

Collected By : (Full Name) Gregory Wacik

2125187-12 BM-8S

Matrix: Non-Potable Water Date: 8/16/21
Type: Grab Time: 1140

PO4-D SM 4500P-F, TC (#) SM 9223B, BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2
TSS SM 2540D, TDS SM 2540C, TOC SM 5310C, Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TKN EPA 351.2

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

2125187-13 BM-8M

Matrix: Non-Potable Water Date: 8/16/21
Type: Grab Time: 1140

NO2-N EPA 300.0, BOD SM 5210B, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F
Alk SM 2320B, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D, NH3-N D6919-03

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2125187-14 BM-8D

Matrix: Non-Potable Water Date: 8/16/21
Type: Grab Time: 1140

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F
Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

Relinquished By	8/16/21 1:30 Date/Time	Received By	8-16-21 1345 Date/Time
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received at Laboratory By	8/16/21 1400 Date/Time

Sample Kit Prepared By: JSV	Date/Time 7-20-21
Sample Temp (°C):	8
Samples on Ice?	(Yes) No NA
Approved By:	
Entered By:	

Printed: 7/15/2021 9:32:28AM

Report Template: wko WorkOrder COC ls

M.J. Reider Associates, Inc.

Client Code: 3157 **Client:** Tetra Tech

Project Manager: Richard A Wheeler **Project:** 2021 - Blue Marsh Reservoir

Comments:

Collected By : (Full Name) Gregory Wacik

2125187-15 BM-9S

BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, TC (#) SM 9223B
Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

Matrix: Non-Potable Water Date: 8/16/21
Type: Grab Time: 1035

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

2125187-16 BM-9M

NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, BOD SM 5210B, NO2-N EPA 300.0
PO4 SM 4500P-F, Alk SM 2320B, NH3-N D6919-03, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

Matrix: Non-Potable Water Date: 8/16/21
Type: Grab Time: 1035

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2125187-17 BM-9D

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F
Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TOC SM 5310C, TSS SM 2540D, TKN EPA 351.2

Matrix: Non-Potable Water Date: 8/16/21
Type: Grab Time: 1035

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

	Date/Time		Date/Time
Relinquished By	8/16/21 1:30	Received By	8-16-21 1345
Relinquished By		Received By	
Relinquished By		Received at Laboratory By	8-16-21 1400

Sample Kit Prepared By: JV	Date/Time 7-20-21
Sample Temp (°C):	8
Samples on Ice?	Yes No NA
Approved By:	
Entered By:	

M.J. Reider Associates, Inc.

Client Code: 3157 **Client:** Tetra Tech

Project Manager: Richard A Wheeler **Project:** 2021 - Blue Marsh Reservoir

Comments:

Collected By : (Full Name) Gregory Wacik

2125187-18 BM-10S

Matrix: Non-Potable Water Date: 8/16/21
Type: Grab Time: 1115

BOD SM 5210B, EC (#) SM 9223B Confirmation, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, TC (#) SM 9223B
Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

2125187-19 BM-10M

Matrix: Non-Potable Water Date: 8/16/21
Type: Grab Time: 1115

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F
Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

2125187-20 BM-10D

Matrix: Non-Potable Water Date: 8/16/21
Type: Grab Time: 1115

BOD SM 5210B, NO2-N EPA 300.0, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F
Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TSS SM 2540D, TDS SM 2540C, TOC SM 5310C, TKN EPA 351.2

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Pl 500ml H2SO4
D - Pl 250ml NP
E - Pl 500ml Lab Filtered
F - Vial Amber 40ml H3PO4, minimal hdspc
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc

	Date/Time		Date/Time
Relinquished By	8/16/21 1:30	Received By	8-16-21 1345
Relinquished By		Received By	
Relinquished By		Received at Laboratory By	8-16-21 1400

Sample Kit Prepared By:	Date/Time
JV	7-28-21
Sample Temp (°C):	6
Samples on Ice?	Yes No NA
Approved By:	BSW
Entered By:	

Printed: 7/15/2021 9:32:28AM

Report Template: wko WorkOrder COC ls

M.J. Reider Associates, Inc.

Client Code: 3157
Project Manager: Richard A Wheeler
Collected By : (Full Name) Tony Wacik

Client: Tetra Tech
Project: 2021 - Blue Marsh Reservoir
Comments:

2125187-21 BM-11S

NO2-N EPA 300.0, EC (#) SM 9223B Confirmation, BOD SM 5210B, NO3-N EPA 300.0, NO2-N, NO3-N, Combined NO3+NO2, PO4-D SM 4500P-F, TC (#) SM 9223B
Alk SM 2320B, NH3-N D6919-03, PO4 SM 4500P-F, TDS SM 2540C, TKN EPA 351.2, TOC SM 5310C, TSS SM 2540D

Matrix: Non-Potable Water
Type: Grab
Date: 8/10/21
Time: 1254

A - Pl 500ml NP, minimal hdspc
B - Pl Liter NP
C - Sterile Pl 125ml NaThio
D - Pl 500ml H2SO4
E - Pl 250ml NP
F - Pl 500ml Lab Filtered
G - Vial Amber 40ml H3PO4, minimal hdspc
H - Vial Amber 40ml H3PO4, minimal hdspc
I - Vial Amber 40ml H3PO4, minimal hdspc

Relinquished By: Tony Wacik	Date/Time: 8/10/21 1:30	Received By: Benj Nash	Date/Time: 8-16-21 1345
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received at Laboratory By: Benj Nash	Date/Time: 8-16-21 1400

Sample Kit Prepared By: JSV	Date/Time: 7-22-21
Sample Temp (°C): 8	
Samples on Ice? Yes / No / NA	Yes
Approved By: BSW	
Entered By:	

Printed: 7/15/2021 9:32:28AM

Report Template: wko WorkOrder COC 1s

MJRA Terms & Conditions

All samples submitted must be accompanied by signed documentation representing a Chain of Custody (COC). The COC Record acts as a contract between the client and MJRA. Signing the COC form gives approval for MJRA to perform the requested analyses and is an agreement to pay for the cost of such analyses**.** COC Records must be completed in black or blue indelible ink (must not run when wet). COC documentation begins at the time of sample collection. Client is required to document all sample details prior to releasing samples to MJRA. All samples must be placed on ice immediately after sampling and shipped or delivered to the laboratory in a manner that will maintain the sample temperature above freezing and below 6C (loose ice is preferred)**.**

Sample Submission, Sample Acceptance & Sampling Containers

Included on the COC must be the sample description, date and time of collection (including start and stop for composites), container size and type, preservative information, sample matrix, indication of whether the sample is a grab or composite, number of containers & a list of the tests to be performed. Poor sample collection technique, inappropriate sampling containers and/or improper sample preservation may lead to sample rejection. Suitable sample containers, labels, and preservatives (as applicable), along with blank COCs are provided at no additional cost.

Turnaround Times (TAT)

Average TAT for test results range from 5 to 15 working days depending on the specific analyses and time of year submitted. Faster turnaround times (*RUSH TAT) may be available depending on the current workload in a particular department and the nature of the analyses requested. We encourage you to verify requests for expedited sample results with one of our Technical Directors prior to sample submittal. Without confirmation from a Technical Director, your results may not be completed by your deadline. *RUSH TAT Surcharges are applied for expedited turnaround times.

Analytical Results, Sample Collection Integrity & Subcontracting

Analytical values are for the sample as submitted and relate only to the item tested. The value indicates a snapshot of the constituent content of the sample at the time of sample collection. Analytical results can be impacted by poor sample collection technique and/or improper preservation. All sample collection completed by MJRA was performed in accordance with applicable regulatory protocols or as specified in customer specific sampling plans. Constituent content will vary over time based on the matrix of the sample and the physical and chemical changes to its environment. All sample results and laboratory reports are strictly confidential. Results will not be available to anyone except the primary client or authorized party representing the client unless MJRA receives additional permissions from the client. When necessary, MJRA will subcontract certain analyses to a third party accredited laboratory. If client prohibits subcontracting, it must be provided in writing and include instruction on how to proceed with client samples that require third party analyses.

Payment Terms

Payment Terms are Net 30 days. Prices are subject to change without notice. A standing monthly charge of 1.5% of the clients over-30-day-unpaid balance may be added to the balance after 30 days and each month thereafter (day 31, 61, 91 etc.). The laboratory accepts all major credit cards, ACH transactions, checks and cash. New clients must pay for all services rendered prior to sample collection and/or in some cases report processing. Clients must contact the MJRA accounting department to pursue a credit-based account. MJRA reserves the right to terminate the client's credit account and to refuse to perform additional services on a credit basis if any balance is outstanding for more than 60 days.

Warranty & Litigation

MJRA does not guarantee any results of its services but has agreed to use its best efforts, in accordance with the standards and practices of the industry, to cause such results to be accurate and complete. We disclaim any other warranties, expressed or implied, including a warranty of fitness for a particular purpose and warranty of merchantability. Clients agree that they shall reimburse MJRA for any and all fees, cost and litigation expenses, including reasonable attorney fees incurred by MJRA in obtaining payment for the services rendered. All costs associated with compliance with any subpoena for documents, testimony, or any other purpose relating to work performed by MJRA, for a client, shall be paid by that client. MJRA's aggregate liability for negligent acts and omissions and of an intentional breach by MJRA will not exceed the fee paid for the services. Client agrees to indemnify and hold MJRA harmless for any and all liabilities in excess of said amount. Neither MJRA nor the client shall be liable to the other for special, incidental consequential or punitive liability or damages included but not limited to those arising from delay, loss of use, loss of profits or revenues. MJRA will not be liable to the client unless the client has notified MJRA of the discovery of the alleged negligent act, error, omissions or breach within 30 days of the day of its discovery and within one year of the date of invoice.

Reviewed and Approved by:

Richard A Wheeler
Director of Field Services

Anatoxin-a, Cylindrospermopsin, Adda Microcystins/Nodularins, & Saxitoxins Report

Project: Pennsylvania Dept. of Environmental Protection

Submitted to: Jeffery Butt
Organization: Pennsylvania Dept. of Environmental Protection
Address: 400 Market St. 11th Floor RCSOB, Harrisburg, PA 17101
Email: jbutt@pa.gov

Sample Receipt Date: 10 September 2021
Sample Condition: 7.4 ºC upon arrival
Report# 210908_PADEP
Date Prepared: 14 September 2021
Prepared by: Kamil Cieslik

Table 1: Samples analyzed

Sample ID	Description/Site	Date	Time
20210908-1322-DWitmer	Blue Marsh Lake – Stilling Basin	8 September 2021	1322
20210908-1059-DWitmer	Blue Marsh Lake – Dam Tower Keep	8 September 2021	1059
20210908-1134-DWitmer	Blue Marsh Lake – Spring Creek	8 September 2021	1134
20210908-1054-DWitmer	Blue Marsh Lake – Dam Tower	8 September 2021	1054
20210908-1109-DWitmer	Blue Marsh Lake – SHBL	8 September 2021	1109
20210908-1202-DWitmer	Blue Marsh Lake – Licking Creek	8 September 2021	1202
20210908-1230-DWitmer	Blue Marsh Lake – Church Rd Bridge	8 September 2021	1230

Analytes: Anatoxin-a (ATX), Cylindrospermopsin (CYN), Adda Microcystins/Nodularins (MCs/NODs), Saxitoxin (STX/PSTs)

Abbreviations

NA	Not Applicable	LFSM	Lab Fortified Sample Matrix
MDL	Method Detection Limit	LFSMD	Lab Fortified Sample Matrix Duplicate
MQL	Method Quantification Limit	LD	Lab Duplicate
ND	Not Detected above the MDL	IS	Internal Standard
Blank	Regent Water free from interferences	—	Not Analyzed
LFB	Lab Fortified Blank	MRL	Method Reporting Limit
CCC	Continued Calibration Check	CV	Low-range calibration verification

Sample Preparation

Water Sample Freeze-Thaw

The samples were thawed and inverted for 60 seconds to mix. A subset from each sample was transferred to a 15 mL vial. Two additional freeze-thaw cycles were employed prior to additional sample preparation and subsequent analysis.

Analytical Techniques

Enzyme-Linked Immunosorbent Assay (ELISA)

MCs/NODs

A microcystins/nodularins Adda ELISA (Abraxis) was utilized for the quantitative and sensitive congener-independent detection of MCs/NODs (US EPA Method 546 & Ohio EPA DES 701.0). The current method reporting limit is 0.30 ng/mL (ppb) based on kit sensitivity, dilution factors, and initial demonstration of capability.

STX

A saxitoxin specific ELISA (Abraxis PN 52255B) was utilized for the detection and quantification of saxitoxin and related analogs (paralytic shellfish toxins – PSTs). The current method reporting limit is 0.05 ng/mL (ppb) based on kit sensitivity and dilution factors. Based on manufacture instructions, the STX ELISA is less cross-reactive to other PSTs and will likely underestimate total PSTs/Saxitoxins. Reported cross-reactivities are as follows: NEO (1.3%), dcSTX (29%), GTX2/3 (23%), GTX5 (23%), dcGTX2/3 (1.4%), dcNEO (0.6%) & GTX1/4 (<0.2%).

Liquid chromatography mass spectrometry/mass spectrometry (LC-MS/MS)

ATX & CYN

High performance chromatography coupled with tandem mass spectrometry was used for a targeted anatoxin-a and cylindrospermopsin analysis. The $[M+H]^+$ ion for ATX (*m/z* 166) was fragmented and the product ions (*m/z* 91, 131, 149) were monitored. The $[M+H]^+$ ion for CYN (*m/z* 416) was fragmented and the product ions (*m/z* 194, 274, 336) were monitored. The $[M+H]^+$ ion for the internal standard $[^{13}C_4]$ATX (*m/z* 171) was fragmented and the product ion (*m/z* 153) was monitored. The $[M+H]^+$ ion for the internal standard $[^{15}N_5]$CYN (421 *m/z*) was fragmented and the product ion (*m/z* 341) was monitored. The internal standard method was utilized for quantification.

Quality Control

Table 2: LFSM and IS QC samples prepared for analyses pre-extraction (unless otherwise noted). Additional Quality Control/Quality Assurance checks included method blanks, continued calibration checks, LFBs, and external curves.

Analyte	Concentration (ng/mL)	Sample ID	QC Type	Return
MC-LR	1.0	20210908-1322-DWitmer	LFSM	97%
MC-LR	1.0	20210908-1202-DWitmer	LFSM	91%
CYN	0.1	20210908-1109-DWitmer	LFSM	108%
$[^{15}N_5]$-CYN	1.0	20210908-1109-DWitmer & LFSM	IS	69 ± 0.2%
ATX	0.5	20210908-1109-DWitmer	LFSM	80%
$[^{13}C_4]$-ATX	1.0	all aliquots	IS	74 ± 5%
STX	0.2	20210908-1109-DWitmer	LFSM	93%

**Control limits: water LFSM ± 30%; complicated matrix LFSM and when LFSM within 2x MDL ±50%; IS ± 50%*

Table 3: Adda MC-ELISA Quality Control Value Table

Date Analyzed:	**14 September 2021**	**Requirement**	**Pass/Fail**
R^2 value:	0.998	≥0.98	PASS
%CV range STDs:	1.1-11.5%	≤15%	PASS
LFB (1 ppb) recovery:	89%	±40% True Value	PASS
%CV range LFB:	6.8%	<20%	PASS
Low CCC (0.15 ppb) recovery:	90%	±50% True Value	PASS
LRB	<0.08	<0.08	PASS

Table 4: STX-ELISA Quality Control Value Table

Date Analyzed:	**14 September 2021**	**Requirement**	**Pass/Fail**
R^2 value:	1.000	≥0.98	PASS
%CV range STDs:	0.1-2.5%	≤15%	PASS
LFB (0.2 ppb) recovery:	80%	±40% True Value	PASS
%CV range LFB:	0.1%	<20%	PASS
Low CCC (0.05 ppb) recovery:	100%	±50% True Value	PASS
LRB	<0.03	<0.03	PASS

Table 5: Raw ELISA Data

Sample ID	Analyte	Dilution Factor	Assay Values (ng/mL)	%CV	Concentration (ng/mL)	Average (ng/mL)
20210908-1322-DWitmer	MCs/NODs	1	0.00	0.0	<0.30	**ND**
		1	0.00		<0.30	
20210908-1322-DWitmer LFSM	MCs/NODs	1	1.02	7.4	1.02	**0.97**
		1	0.92		0.92	
20210908-1059-DWitmer	MCs/NODs	1	0.00	0.0	<0.30	**ND**
		1	0.00		<0.30	
20210908-1134-DWitmer	MCs/NODs	1	1.47	1.9	1.47	**1.49**
		1	1.51		1.51	
20210908-1054-DWitmer	MCs/NODs	1	0.39	28.0	0.39	**0.33[J]**
		1	0.26		<0.30	
20210908-1109-DWitmer	MCs/NODs	1	0.58	16.0	0.58	**0.52**
		1	0.46		0.46	
20210908-1202-DWitmer	MCs/NODs	1	0.71	9.5	0.71	**0.67**
		1	0.62		0.62	
20210908-1202-DWitmer LFSM	MCs/NODs	1	1.82	21.7	1.82	**1.58**
		1	1.33		1.33	
20210908-1230-DWitmer	MCs/NODs	1	0.86	4.5	0.86	**0.89**
		1	0.92		0.92	
20210908-1109-DWitmer	STX	1	0.04	8.2	<0.05	**ND**
		1	0.04		<0.05	
20210908-1109-DWitmer LFSM	STX	1	0.22	3.7	0.22	**0.23**
		1	0.23		0.23	

Qualifier	Flag
CL	Analytical result is estimated due to ineffective quenching.
J	Analyte was positively identified; the associated numerical value is estimated.
PT	The reported result is estimated because the sample was not analyzed within required holding time.
B	Analytical result is estimated. Analyte was detected in associated reagent blank as well as the samples.
E	Analytical result is estimated. Values achieved were outside calibration range.
N	Spiked sample control was outside limits
T	The reported result is estimated because the sample exceeded temperature threshold when received

Summary of Results

Table 6: Summary of results in ng/mL

Sample ID	MCs/NODs (ng/mL)	CYN (ng/mL)	ATX (ng/mL)	STX (ng/mL)
20210908-1322-DWitmer	ND	—	ND	—
20210908-1059-DWitmer	ND	—	ND	—
20210908-1134-DWitmer	**1.49**	—	**0.52**	—
20210908-1054-DWitmer	**0.33**[J]	—	**0.65**	—
20210908-1109-DWitmer	**0.52**	ND	**0.57**	ND
20210908-1202-DWitmer	**0.67**	—	**0.68**	—
20210908-1230-DWitmer	**0.89**	—	**0.72**	—
MRL (ng/mL)	*0.30*	*0.05*	*0.05*	*0.05*
Analyst Initials	*KC*	*MA*	*MA*	*KC*
Date Analyzed	*9/14/2021*	*9/13/2021*	*9/13/2021* *9/14/2021*	*9/14/2021*

Interpretations:

The levels of Adda MCs/NODs detected in the submitted samples do not exceed the current 'Draft EPA Recommended Value for Recreational Criteria and Swimming Advisory', which is currently 8 ng/mL (ppb) total microcystins. The WHO recreational guidance value for microcystin is currently 24 ng/mL (ppb) (World Health Organization (WHO), 2020a).

The US EPA does not currently have guidelines for anatoxin-a, but the WHO has a provisional recreational guidance value of 59 ng/mL for ATX (World Health Organization (WHO), 2020b). Dihydroanatoxin-a (dhATX) has been recently shown to be of comparable in toxicity to ATX when ingested (oral route) (Puddick et al., 2020) and thereby at a level considered to be potentially harmful in samples exceeding this level.

World Health Organization (WHO), 2020a. Cyanobacterial toxins: microcystins. Guidel. Drink. Qual. Guidel. Safe Recreat. Water Environ. 63.
World Health Organization (WHO), 2020b. Cyanobacterial toxins: anatoxin-a and analogues. Guidel. Drink. Qual. Guidel. Safe Recreat. Water Environ.

Submitted by: Mark T. Aubel, Ph.D.
Lab Director
Date: September 14, 2021

Anatoxin-a, Cylindrospermopsin, Adda Microcystins/Nodularins, & Saxitoxins Report

Project: Pennsylvania Dept. of Environmental Protection

Submitted to:	Jeffery Butt
Organization:	Pennsylvania Dept. of Environmental Protection
Address:	400 Market St. 11th Floor RCSOB, Harrisburg, PA 17101
Email:	jbutt@pa.gov
Sample Receipt Date:	24 September 2021
Sample Condition:	6.8 ºC upon arrival
Report#	210915_PADEP_Blue_Marsh_Lake
Date Prepared:	29 September 2021
Prepared by:	Kamil Cieslik

Table 1: Samples analyzed

Sample ID	Description/Site	Date	Time
20210915-0000-JPiscanio	Blue Marsh Lake Beach Grab	15 September 2021	0000
20210915-0944-JPiscanio	Blue Marsh Lake Beach Trans	15 September 2021	0944

Analytes: Anatoxin-a (ATX), Cylindrospermopsin (CYN), Adda Microcystins/Nodularins (MCs/NODs), Saxitoxin (STX/PSTs)

Abbreviations

NA	Not Applicable	LFSM	Lab Fortified Sample Matrix
MDL	Method Detection Limit	LFSMD	Lab Fortified Sample Matrix Duplicate
MQL	Method Quantification Limit	LD	Lab Duplicate
ND	Not Detected above the MDL	IS	Internal Standard
Blank	Regent Water free from interferences	—	Not Analyzed
LFB	Lab Fortified Blank	MRL	Method Reporting Limit
CCC	Continued Calibration Check	CV	Low-range calibration verification

Sample Preparation

Water Sample Freeze-Thaw

The samples were thawed and inverted for 60 seconds to mix. A subset from each sample was transferred to a 15 mL vial. Two additional freeze-thaw cycles were employed prior to additional sample preparation and subsequent analysis.

Analytical Techniques

Enzyme-Linked Immunosorbent Assay (ELISA)

MCs/NODs

A microcystins/nodularins Adda ELISA (Abraxis) was utilized for the quantitative and sensitive congener-independent detection of MCs/NODs (US EPA Method 546 & Ohio EPA DES 701.0). The current method reporting limit is 0.30 ng/mL (ppb) based on kit sensitivity, dilution factors, and initial demonstration of capability.

STX

A saxitoxin specific ELISA (Abraxis PN 52255B) was utilized for the detection and quantification of saxitoxin and related analogs (paralytic shellfish toxins – PSTs). The current method reporting limit is 0.05 ng/mL (ppb) based on kit sensitivity and dilution factors. Based on manufacture instructions, the STX ELISA is less cross-reactive to other PSTs and will likely underestimate total PSTs/Saxitoxins. Reported cross-reactivities are as follows: NEO (1.3%), dcSTX (29%), GTX2/3 (23%), GTX5 (23%), dcGTX2/3 (1.4%), dcNEO (0.6%) & GTX1/4 (<0.2%).

Liquid chromatography mass spectrometry/mass spectrometry (LC-MS/MS)

ATX & CYN

High performance chromatography coupled with tandem mass spectrometry was used for a targeted anatoxin-a and cylindrospermopsin analysis. The $[M+H]^+$ ion for ATX (*m/z* 166) was fragmented and the product ions (*m/z* 91, 131, 149) were monitored. The $[M+H]^+$ ion for CYN (*m/z* 416) was fragmented and the product ions (*m/z* 194, 274, 336) were monitored. The $[M+H]^+$ ion for the internal standard $[^{13}C_4]$ATX (*m/z* 171) was fragmented and the product ion (*m/z* 153) was monitored. The $[M+H]^+$ ion for the internal standard $[^{15}N_5]$CYN (421 *m/z*) was fragmented and the product ion (*m/z* 341) was monitored. The internal standard method was utilized for quantification.

Quality Control

Table 2: LFSM and IS QC samples prepared for analyses pre-extraction (unless otherwise noted). Additional Quality Control/Quality Assurance checks included method blanks, continued calibration checks, LFBs, and external curves.

Analyte	Concentration (ng/mL)	Sample ID	QC Type	Return
MC-LR	1.0	20210915-0944-JPiscanio	LFSM	79%
CYN	0.1	20210915-0000-JPiscanio	LFSM	114%
[$^{15}N_5$]-CYN	1.0	all aliquots	IS	86 ± 9%
ATX	0.1	20210915-0000-JPiscanio	LFSM	112%
[$^{13}C_4$]-ATX	1.0	all aliquots	IS	80 ± 2%
STX	0.2	20210915-0000-JPiscanio	LFSM	105%

**Control limits: water LFSM ± 30%; complicated matrix LFSM and when LFSM within 2x MDL ±50%; IS ± 50%*

Table 3: Raw ELISA Data

Sample ID	Analyte	Dilution Factor	Assay Values (ng/mL)	%CV	Concentration (ng/mL)	Average (ng/mL)
20210915-0000-JPiscanio	MCs/NODs	5	0.55	7.7	2.75	**2.60**
		5	0.49		2.45	
20210915-0944-JPiscanio	MCs/NODs	1	1.79	6.4	1.79	**1.88**
		1	1.96		1.96	
20210915-0944-JPiscanio LFSM	MCs/NODs	1	2.75	4.5	2.75	**2.67**
		1	2.58		2.58	
20210915-0000-JPiscanio	STX	1	0.06	14.2	0.06	**0.07**
		1	0.08		0.08	
20210915-0000-JPiscanio LFSM	STX	1	0.28	0.5	0.28	**0.28**
		1	0.28		0.28	
20210915-0944-JPiscanio	STX	1	0.06	16.3	0.06	**0.07**
		1	0.07		0.07	

Qualifier	Flag
CL	Analytical result is estimated due to ineffective quenching.
J	Analyte was positively identified; the associated numerical value is estimated.
PT	The reported result is estimated because the sample was not analyzed within required holding time.
B	Analytical result is estimated. Analyte was detected in associated reagent blank as well as the samples.
E	Analytical result is estimated. Values achieved were outside calibration range.
N	Spiked sample control was outside limits
T	The reported result is estimated because the sample exceeded temperature threshold when received

Table 4: Adda MC-ELISA Quality Control Value Table

Date Analyzed:	28 September 2021	Requirement	Pass/Fail
R^2 value:	0.999	≥0.98	PASS
%CV range STDs:	0.0-6.5%	≤15%	PASS
LFB (1 ppb) recovery:	93%	±40% True Value	PASS
%CV range LFB:	13.1%	<20%	PASS
Low CCC (0.15 ppb) recovery:	77%	±50% True Value	PASS
LRB	<0.08	<0.08	PASS

Table 5: Adda MC-ELISA Quality Control Value Table

Date Analyzed:	29 September 2021	Requirement	Pass/Fail
R^2 value:	0.999	≥0.98	PASS
%CV range STDs:	0.1-10.4%	≤15%	PASS
LFB (1 ppb) recovery:	107%	±40% True Value	PASS
%CV range LFB:	6.4%	<20%	PASS
Low CCC (0.15 ppb) recovery:	73%	±50% True Value	PASS
LRB	<0.08	<0.08	PASS

Table 6: STX-ELISA Quality Control Value Table

Date Analyzed:	28 September 2021	Requirement	Pass/Fail
R^2 value:	1.000	≥0.98	PASS
%CV range STDs:	0.1-3.5%	≤15%	PASS
LFB (0.2 ppb) recovery:	96%	±40% True Value	PASS
%CV range LFB:	8.1%	<20%	PASS
Low CCC (0.05 ppb) recovery:	80%	±50% True Value	PASS
LRB	<0.03	<0.03	PASS

Table 7: STX-ELISA Quality Control Value Table

Date Analyzed:	29 September 2021	Requirement	Pass/Fail
R^2 value:	0.999	≥0.98	PASS
%CV range STDs:	0.5-4.2%	≤15%	PASS
LFB (0.2 ppb) recovery:	93%	±40% True Value	PASS
%CV range LFB:	1.1%	<20%	PASS
Low CCC (0.05 ppb) recovery:	70%	±50% True Value	PASS
LRB	<0.03	<0.03	PASS

Summary of Results

Table 8: Summary of results in ng/mL

Sample ID	MCs/NODs (ng/mL)	CYN (ng/mL)	ATX (ng/mL)	STX (ng/mL)
20210915-0000-JPiscanio	**2.60**	ND	**1.43**	**0.07**
20210915-0944-JPiscanio	**2.67**	—	**1.54**	**0.07**
MRL (ng/mL)	*0.30*	*0.05*	*0.05*	*0.05*
Analyst Initials	*KC*	*MA*	*MA*	*KC*
Date Analyzed	*9/28/2021 9/29/2021*	*9/28/2021*	*9/28/2021*	*9/28/2021 9/29/2021*

Interpretations:

The levels of Adda MCs/NODs detected in the submitted samples do not exceed the current 'Draft EPA Recommended Value for Recreational Criteria and Swimming Advisory', which is currently 8 ng/mL (ppb) total microcystins. The WHO recreational guidance value for microcystin is currently 24 ng/mL (ppb) (World Health Organization (WHO), 2020a).

The US EPA does not currently have guidelines for anatoxin-a, but the WHO has a provisional recreational guidance value of 59 ng/mL for ATX (World Health Organization (WHO), 2020b).

Saxitoxin was detected in the submitted samples above the method reporting limit. The US EPA does not currently have guidelines for saxitoxins, but the WHO has a provisional recreational guidance value of 30 ng/mL for saxitoxin (WHO, 2019). The submitted samples do not exceed the provisional recreational guidance value.

World Health Organization (WHO), 2020a. Cyanobacterial toxins: microcystins. Guidel. Drink. Qual. Guidel. Safe Recreat. Water Environ. 63.

World Health Organization (WHO), 2020b. Cyanobacterial toxins: anatoxin-a and analogues. Guidel. Drink. Qual. Guidel. Safe Recreat. Water Environ.

WHO, 2019. Cyanobacterial toxins: Saxitoxins. Guidel. Drink. Qual. Guidel. Safe Recreat. Water Environ. 1–19.

Submitted by: 

Mark T. Aubel, Ph.D.
Lab Director

Date: September 29, 2021

Anatoxin-a, Cylindrospermopsin, Adda Microcystins/Nodularins & Saxitoxins Report

Project: Pennsylvania Dept. of Environmental Protection

Submitted to: Jeffery Butt
Organization: Pennsylvania Dept. of Environmental Protection
Address: 400 Market St. 11th Floor RCSOB, Harrisburg, PA 17101
Email: jbutt@pa.gov

Sample Receipt Date: 1 October 2021
Sample Condition: 5.5 ºC upon arrival
Report# 210929_PADEP
Date Prepared: 5 October 2021
Prepared by: Kamil Cieslik

Table 1: Samples analyzed

Sample ID	Description/Site	Date	Time
20210929-1049-JPiscanio	BML Church Rd Bridge	29 September 2021	1049
20210929-1140-JPiscanio	BML Licking Creek	29 September 2021	1140
20210929-1219-JPiscanio	BML Spring Creek	29 September 2021	1219
20210929-1244-JPiscanio	BML Bloom Grab Sp Creek	29 September 2021	1244
20210929-1258-JPiscanio	BML Main Pool SHBL	29 September 2021	1258
20210929-1345-JPiscanio	BML Beach Transect	29 September 2021	1345
20210929-1349-JPiscanio	BML Beach Grab	29 September 2021	1349
20210929-1402-JPiscanio	BML Tower Depth	29 September 2021	1402
20210929-1411-JPiscanio	BML Tower Grab (surface)	29 September 2021	1411

Analytes: Anatoxin-a (ATX), Cylindrospermopsin (CYN), Adda Microcystins/Nodularins (MCs/NODs), Saxitoxin (STX/PSTs)

Abbreviations

NA	Not Applicable	LFSM	Lab Fortified Sample Matrix
MDL	Method Detection Limit	LFSMD	Lab Fortified Sample Matrix Duplicate
MQL	Method Quantification Limit	LD	Lab Duplicate
ND	Not Detected above the MDL	IS	Internal Standard
Blank	Regent Water free from interferences	—	Not Analyzed
LFB	Lab Fortified Blank	MRL	Method Reporting Limit
CCC	Continued Calibration Check	CV	Low-range calibration verification

Sample Preparation

Water Sample Freeze-Thaw

The samples were thawed and inverted for 60 seconds to mix. A subset from each sample was transferred to a 15 mL vial. Two additional freeze-thaw cycles were employed prior to additional sample preparation and subsequent analysis.

Analytical Techniques

Enzyme-Linked Immunosorbent Assay (ELISA)

MCs/NODs

A microcystins/nodularins Adda ELISA (Abraxis) was utilized for the quantitative and sensitive congener-independent detection of MCs/NODs (US EPA Method 546 & Ohio EPA DES 701.0). The current method reporting limit is 0.30 ng/mL (ppb) based on kit sensitivity, dilution factors, and initial demonstration of capability.

STX

A saxitoxin specific ELISA (Abraxis PN 52255B) was utilized for the detection and quantification of saxitoxin and related analogs (paralytic shellfish toxins – PSTs). The current method reporting limit is 0.05 ng/mL (ppb) based on kit sensitivity and dilution factors. Based on manufacture instructions, the STX ELISA is less cross-reactive to other PSTs and will likely underestimate total PSTs/Saxitoxins. Reported cross-reactivities are as follows: NEO (1.3%), dcSTX (29%), GTX2/3 (23%), GTX5 (23%), dcGTX2/3 (1.4%), dcNEO (0.6%) & GTX1/4 (<0.2%).

Liquid chromatography mass spectrometry/mass spectrometry (LC-MS/MS)

ATX & CYN

High performance chromatography coupled with tandem mass spectrometry was used for a targeted anatoxin-a and cylindrospermopsin analysis. The $[M+H]^+$ ion for ATX (*m/z* 166) was fragmented and the product ions (*m/z* 91, 131, 149) were monitored. The $[M+H]^+$ ion for CYN (*m/z* 416) was fragmented and the product ions (*m/z* 194, 274, 336) were monitored. The $[M+H]^+$ ion for the internal standard $[^{13}C_4]$ATX (*m/z* 171) was fragmented and the product ion (*m/z* 153) was monitored. The $[M+H]^+$ ion for the internal standard $[^{15}N_5]$CYN (421 *m/z*) was fragmented and the product ion (*m/z* 341) was monitored. The internal standard method was utilized for quantification.

Quality Control

Table 2: LFSM and IS QC samples prepared for analyses pre-extraction (unless otherwise noted). Additional Quality Control/Quality Assurance checks included method blanks, continued calibration checks, LFBs, and external curves.

Analyte	Concentration (ng/mL)	Sample ID	QC Type	Return
MC-LR	1.0	20210929-1049-JPiscanio	LFSM	149%^{N}
MC-LR	1.0	20210929-1345-JPiscanio	LFSM	124%
ATX	0.1	20210929-1258-JPiscanio	LFSM	80%
[$^{13}C_4$]-ATX	1.0	all aliquots	IS	71 ± 13%
STX	0.2	20210929-1140-JPiscanio	LFSM	113%

**Control limits: water LFSM ± 30%; complicated matrix LFSM and when LFSM within 2x MDL ±50%; IS ± 50%*

Table 3: Adda MC-ELISA Quality Control Value Table

Date Analyzed:	**5 October 2021**	**Requirement**	**Pass/Fail**
R^2 value:	1.000	≥0.98	PASS
%CV range STDs:	1.1-5.0%	≤15%	PASS
LFB (1 ppb) recovery:	85%	±40% True Value	PASS
%CV range LFB:	4.5%	<20%	PASS
Low CCC (0.15 ppb) recovery:	90%	±50% True Value	PASS
LRB	<0.08	<0.08	PASS

Table 4: STX-ELISA Quality Control Value Table

Date Analyzed:	**5 October 2021**	**Requirement**	**Pass/Fail**
R^2 value:	0.998	≥0.98	PASS
%CV range STDs:	2.2-10.0%	≤15%	PASS
LFB (0.2 ppb) recovery:	104%	±40% True Value	PASS
%CV range LFB:	4.8%	<20%	PASS
Low CCC (0.05 ppb) recovery:	70%	±50% True Value	PASS
LRB	<0.03	<0.03	PASS

Table 5: Raw ELISA Data

Sample ID	Analyte	Dilution Factor	Assay Values (ng/mL)	%CV	Concentration (ng/mL)	Average (ng/mL)
20210929-1049-JPiscanio	MCs/NODs	1	0.56	8.6	0.56	**0.60**
		1	0.63		0.63	
20210929-1049-JPiscanio LFSM	MCs/NODs	1	2.01	5.1	2.01	**2.09**
		1	2.16		2.16	
20210929-1140-JPiscanio	MCs/NODs	1	1.24	8.7	1.24	**1.32**
		1	1.40		1.40	
20210929-1219-JPiscanio	MCs/NODs	1	0.93	4.7	0.93	**0.96**
		1	0.99		0.99	
20210929-1244-JPiscanio	MCs/NODs	1	1.51	9.3	1.51	**1.62**
		1	1.72		1.72	
20210929-1258-JPiscanio	MCs/NODs	1	0.89	2.1	0.89	**0.91**
		1	0.92		0.92	
20210929-1345-JPiscanio	MCs/NODs	1	0.74	0.5	0.74	**0.74**
		1	0.74		0.74	
20210929-1345-JPiscanio LFSM	MCs/NODs	1	1.73	17.8	1.73	**1.98**
		1	2.23		2.23	
20210929-1349-JPiscanio	MCs/NODs	1	0.61	15.8	0.61	**0.69**
		1	0.76		0.76	
20210929-1402-JPiscanio	MCs/NODs	1	0.24	33.8	0.24	**0.32**
		1	0.39		0.39	
20210929-1411-JPiscanio	MCs/NODs	1	0.61	19.4	0.61	**0.71**
		1	0.81		0.81	
20210929-1140-JPiscanio	STX	1	0.02	21.4	<0.05	**ND**
		1	0.03		<0.05	
20210929-1140-JPiscanio LFSM	STX	1	0.26	5.6	0.26	**0.25**
		1	0.24		0.24	

Qualifier	Flag
CL	Analytical result is estimated due to ineffective quenching.
J	Analyte was positively identified; the associated numerical value is estimated.
PT	The reported result is estimated because the sample was not analyzed within required holding time.
B	Analytical result is estimated. Analyte was detected in associated reagent blank as well as the samples.
E	Analytical result is estimated. Values achieved were outside calibration range.
N	Spiked sample control was outside limits
T	The reported result is estimated because the sample exceeded temperature threshold when received

Summary of Results

Table 6: Summary of results in ng/mL

Sample ID	MCs/NODs (ng/mL)	CYN (ng/mL)	ATX (ng/mL)	STX (ng/mL)
20210929-1049-JPiscanio	**0.60**	—	**0.35**	—
20210929-1140-JPiscanio	**1.32**	ND	**0.29**	ND
20210929-1219-JPiscanio	**0.96**	—	**0.43**	—
20210929-1244-JPiscanio	**1.62**	—	**0.32**	—
20210929-1258-JPiscanio	**0.91**	—	**0.33**	—
20210929-1345-JPiscanio	**0.74**	—	**0.23**	—
20210929-1349-JPiscanio	**0.69**	—	**0.24**	—
20210929-1402-JPiscanio	**0.32**	—	**0.07**	—
20210929-1411-JPiscanio	**0.71**	—	**0.19**	—
MRL (ng/mL)	*0.30*	*0.05*	*0.05*	*0.05*
Analyst Initials	*KC*	*MA*	*MA*	*KC*
Date Analyzed	*10/5/2021*	*10/5/2021*	*10/5/2021*	*10/5/2021*

Interpretations:

The levels of Adda MCs/NODs detected in the submitted samples do not exceed the current 'Draft EPA Recommended Value for Recreational Criteria and Swimming Advisory', which is currently 8 ng/mL (ppb) total microcystins. The WHO recreational guidance value for microcystin is currently 24 ng/mL (ppb) (World Health Organization (WHO), 2020a).

The US EPA does not currently have guidelines for anatoxin-a, but the WHO has a provisional recreational guidance value of 59 ng/mL for ATX (World Health Organization (WHO), 2020b).

World Health Organization (WHO), 2020a. Cyanobacterial toxins: microcystins. Guidel. Drink. Qual. Guidel. Safe Recreat. Water Environ. 63.

World Health Organization (WHO), 2020b. Cyanobacterial toxins: anatoxin-a and analogues. Guidel. Drink. Qual. Guidel. Safe Recreat. Water Environ.

Submitted by: 

Mark T. Aubel, Ph.D.
Lab Director

Date: October 6, 2021

Anatoxin-a, Cylindrospermopsin, Adda Microcystins/Nodularins & Saxitoxins Report

Project: Pennsylvania Dept. of Environmental Protection

Submitted to: Jeffery Butt
Organization: Pennsylvania Dept. of Environmental Protection
Address: 400 Market St. 11th Floor RCSOB, Harrisburg, PA 17101
Email: jbutt@pa.gov

Sample Receipt Date: 8 October 2021
Sample Condition: 2.8 ºC upon arrival
Report# 211005-06_PADEP
Date Prepared: 14 October 2021
Prepared by: Kamil Cieslik

Table 1: Samples analyzed

Sample ID	Description/Site	Date	Time
20211005-0930-JGrassi	Conneaut Lake Firemans Beach	5 October 2021	0930
20211005-0950-JGrassi	Conneaut Lake Midlake	5 October 2021	0950
20211005-1040-JGrassi	Conneaut Lake Inflow	5 October 2021	1040
20211006-0803-BTreichler	Blue Marsh Lake Beach Grab	6 October 2021	0803
20211006-0805-BTreichler	Blue Marsh Lake Beach Transect	6 October 2021	0805
20211006-0824-BTreichler	Blue Marsh Lake Licking Crk Scum Grab	6 October 2021	0824

Analytes: Anatoxin-a (ATX), Cylindrospermopsin (CYN), Adda Microcystins/Nodularins (MCs/NODs), Saxitoxin (STX/PSTs)

Abbreviations

NA	Not Applicable	LFSM	Lab Fortified Sample Matrix
MDL	Method Detection Limit	LFSMD	Lab Fortified Sample Matrix Duplicate
MQL	Method Quantification Limit	LD	Lab Duplicate
ND	Not Detected above the MDL	IS	Internal Standard
Blank	Regent Water free from interferences	—	Not Analyzed
LFB	Lab Fortified Blank	MRL	Method Reporting Limit
CCC	Continued Calibration Check	CV	Low-range calibration verification

Sample Preparation

Water Sample Freeze-Thaw

The samples were thawed and inverted for 60 seconds to mix. A subset from each sample was transferred to a 15 mL vial. Two additional freeze-thaw cycles were employed prior to additional sample preparation and subsequent analysis.

Analytical Techniques

Enzyme-Linked Immunosorbent Assay (ELISA)

MCs/NODs

A microcystins/nodularins Adda ELISA (Abraxis) was utilized for the quantitative and sensitive congener-independent detection of MCs/NODs (US EPA Method 546 & Ohio EPA DES 701.0). The current method reporting limit is 0.30 ng/mL (ppb) based on kit sensitivity, dilution factors, and initial demonstration of capability.

STX

A saxitoxin specific ELISA (Abraxis PN 52255B) was utilized for the detection and quantification of saxitoxin and related analogs (paralytic shellfish toxins – PSTs). The current method reporting limit is 0.05 ng/mL (ppb) based on kit sensitivity and dilution factors. Based on manufacture instructions, the STX ELISA is less cross-reactive to other PSTs and will likely underestimate total PSTs/Saxitoxins. Reported cross-reactivities are as follows: NEO (1.3%), dcSTX (29%), GTX2/3 (23%), GTX5 (23%), dcGTX2/3 (1.4%), dcNEO (0.6%) & GTX1/4 (<0.2%).

Liquid chromatography mass spectrometry/mass spectrometry (LC-MS/MS)

ATX & CYN

High performance chromatography coupled with tandem mass spectrometry was used for a targeted anatoxin-a and cylindrospermopsin analysis. The $[M+H]^+$ ion for ATX (*m/z* 166) was fragmented and the product ions (*m/z* 91, 131, 149) were monitored. The $[M+H]^+$ ion for CYN (*m/z* 416) was fragmented and the product ions (*m/z* 194, 274, 336) were monitored. The $[M+H]^+$ ion for the internal standard $[^{13}C_4]$ATX (*m/z* 171) was fragmented and the product ion (*m/z* 153) was monitored. The $[M+H]^+$ ion for the internal standard $[^{15}N_5]$CYN (421 *m/z*) was fragmented and the product ion (*m/z* 341) was monitored. The internal standard method was utilized for quantification.

Quality Control

Table 2: LFSM and IS QC samples prepared for analyses pre-extraction (unless otherwise noted). Additional Quality Control/Quality Assurance checks included method blanks, continued calibration checks, LFBs, and external curves.

Analyte	Concentration (ng/mL)	Sample ID	QC Type	Return
MC-LR	1.0	20211005-0930-JGrassi	LFSM	101%
MC-LR	20	20211006-0824-BTreichler	LFSM	103%
CYN	0.1	20211005-0930-JGrassi	LFSM	105%
[$^{15}N_5$]-CYN	1.0	all aliquots	IS	107 ±1%
ATX	0.1	20211005-0930-JGrassi	LFSM	98%
[$^{13}C_4$]-ATX	1.0	all aliquots	IS	84 ± 11%
STX	0.2	20211005-0930-JGrassi	LFSM	113%

**Control limits: water LFSM ± 30%; complicated matrix LFSM and when LFSM within 2x MDL ±50%; IS ± 50%*

Qualifier	Flag
CL	Analytical result is estimated due to ineffective quenching.
J	Analyte was positively identified; the associated numerical value is estimated.
PT	The reported result is estimated because the sample was not analyzed within required holding time.
B	Analytical result is estimated. Analyte was detected in associated reagent blank as well as the samples.
E	Analytical result is estimated. Values achieved were outside calibration range.
N	Spiked sample control was outside limits
T	The reported result is estimated because the sample exceeded temperature threshold when received

Table 3: Raw ELISA Data

Sample ID	Analyte	Dilution Factor	Assay Values (ng/mL)	%CV	Concentration (ng/mL)	Average (ng/mL)
20211005-0930-JGrassi	MCs/NODs	1	0.24	16.0	<0.30	**ND**
		1	0.19		<0.30	
20211005-0930-JGrassi	MCs/NODs	1	1.36	15.6	1.36	**1.23**
LFSM		1	1.09		1.09	
20211005-0950-JGrassi	MCs/NODs	1	0.01	0.0	<0.30	**ND**
		1	0.00		<0.30	
20211005-1040-JGrassi	MCs/NODs	1	0.02	87.6	<0.30	**ND**
		1	0.09		<0.30	
20211006-0803-BTreichler	MCs/NODs	1	1.04	0.1	1.04	**1.04**
		1	1.04		1.04	
20211006-0805-BTreichler	MCs/NODs	1	0.41	6.9	0.41	**0.40**
		1	0.38		0.38	
20211006-0824-BTreichler	MCs/NODs	5	1.71	0.1	8.55	**8.55**
		5	1.71		8.55	
20211006-0824-BTreichler	MCs/NODs	20	0.25	5.2	5.0	**4.8**
		20	0.23		4.6	
20211006-0824-BTreichler	MCs/NODs	20	1.24	2.6	24.8	**25.3**
LFSM		20	1.29		25.8	
20211005-0930-JGrassi	STX	1	0.00	0.0	<0.05	**ND**
		1	0.00		<0.05	
20211005-0930-JGrassi	STX	1	0.25	13.6	0.25	**0.23**
LFSM		1	0.20		0.20	

Table 4: Adda MC-ELISA Quality Control Value Table

Date Analyzed:	13 October 2021	Requirement	Pass/Fail
R^2 value:	0.998	≥0.98	PASS
%CV range STDs:	0.6-4.8%	≤15%	PASS
LFB (1 ppb) recovery:	92%	±40% True Value	PASS
%CV range LFB:	4.6%	≤20%	PASS
Low CCC (0.15 ppb) recovery:	90%	±50% True Value	PASS
LRB	<0.08	<0.08	PASS

Table 5: Adda MC-ELISA Quality Control Value Table

Date Analyzed:	14 October 2021	Requirement	Pass/Fail
R^2 value:	0.997	≥0.98	PASS
%CV range STDs:	0.0-4.8%	≤15%	PASS
LFB (1 ppb) recovery:	102%	±40% True Value	PASS
%CV range LFB:	13.4%	≤20%	PASS
Low CCC (0.15 ppb) recovery:	97%	±50% True Value	PASS
LRB	<0.08	<0.08	PASS

Table 6: STX-ELISA Quality Control Value Table

Date Analyzed:	13 October 2021	Requirement	Pass/Fail
R^2 value:	0.998	≥0.98	PASS
%CV range STDs:	0.1-3.8%	≤15%	PASS
LFB (0.2 ppb) recovery:	90%	±40% True Value	PASS
%CV range LFB:	8.5%	≤20%	PASS
Low CCC (0.05 ppb) recovery:	60%	±50% True Value	PASS
LRB	<0.03	<0.03	PASS

Summary of Results

Table 7: Summary of results in ng/mL

Sample ID	MCs/NODs (ng/mL)	CYN (ng/mL)	ATX (ng/mL)	STX (ng/mL)
20211005-0930-JGrassi	ND	ND	ND	ND
20211005-0950-JGrassi	ND	—	—	—
20211005-1040-JGrassi	ND	—	—	—
20211006-0803-BTreichler	**1.04**	—	**0.40**	—
20211006-0805-BTreichler	**0.40**	—	**0.39**	—
20211006-0824-BTreichler	**6.7**	—	**0.31**	—
MRL (ng/mL)	*0.30*	*0.05*	*0.05*	*0.05*
Analyst Initials	*KC*	*MA*	*MA*	*KC*
Date Analyzed	*10/13/2021 10/14/2021*	*10/12/2021*	*10/12/2021*	*10/13/2021*

Interpretations:

The levels of Adda MCs/NODs detected in the Blue Marsh Lake samples do not exceed the current 'Draft EPA Recommended Value for Recreational Criteria and Swimming Advisory', which is currently 8 ng/mL (ppb) total microcystins. The WHO recreational guidance value for microcystin is currently 24 ng/mL (ppb) (World Health Organization (WHO), 2020a).

The US EPA does not currently have guidelines for anatoxin-a, but the WHO has a provisional recreational guidance value of 59 ng/mL for ATX (World Health Organization (WHO), 2020b).

World Health Organization (WHO), 2020a. Cyanobacterial toxins: microcystins. Guidel. Drink. Qual. Guidel. Safe Recreat. Water Environ. 63.

World Health Organization (WHO), 2020b. Cyanobacterial toxins: anatoxin-a and analogues. Guidel. Drink. Qual. Guidel. Safe Recreat. Water Environ.

Submitted by: 

Mark T. Aubel, Ph.D.
Lab Director

Date: October 14, 2021

Anatoxin-a, Cylindrospermopsin, Adda Microcystins/Nodularins, & Saxitoxins Report

Project: Pennsylvania Dept of Environmental Protection

Submitted to:	Jeffery Butt
Organization:	Pennsylvania Dept of Environmental Protection
Address:	400 Market St. 11th Floor RCSOB, Harrisburg, PA 17101
Email:	jbutt@pa.gov
Sample Receipt Date:	19 October 2021
Sample Condition:	5.0 ºC upon arrival
Report#	211013-14_PADEP
Date Prepared:	22 October 2021
Prepared by:	Kamil Cieslik

Table 1: Samples analyzed

Sample ID	Description/Site	Date	Time
20211013-0846-JPiscanio	Blue Marsh Lake – Beach Grab	13 October 2021	0846
20211013-0858-JPiscanio	Blue Marsh Lake – Beach Transect	13 October 2021	0858
20211014-0825-ABlascovich	Opossum Lake – BLU	14 October 2021	0825
20211014-0842-ABlascovich	Opossum Lake – BLL	14 October 2021	0842
20211014-0900-RSpear	Twins Lake – Lower	14 October 2021	0900
20211014-1115-RSpear	Green Lick Lake – Boat Ramp	14 October 2021	1115
20211014-1200-RSpear	Green Lick Lake – East End	14 October 2021	1200
20211014-1230-RSpear	Green Lick Lake – Midlake	14 October 2021	1230

Analytes: Anatoxin-a (ATX), Cylindrospermopsin (CYN), Adda Microcystins/Nodularins (MCs/NODs), Saxitoxin (STX/PSTs)

Sample Preparation

Water Sample Freeze-Thaw

The samples were thawed and inverted for 60 seconds to mix. A subset from each sample was transferred to a 15 mL vial. Two additional freeze-thaw cycles were employed prior to additional sample preparation and subsequent analysis.

Analytical Techniques

Enzyme-Linked Immunosorbent Assay (ELISA)

MCs/NODs

A microcystins/nodularins Adda ELISA (Abraxis) was utilized for the quantitative and sensitive congener-independent detection of MCs/NODs (US EPA Method 546 & Ohio EPA DES 701.0). The current method reporting limit is 0.30 ng/mL (ppb) based on kit sensitivity, dilution factors, and initial demonstration of capability.

STX

A saxitoxin specific ELISA (Abraxis PN 52255B) was utilized for the detection and quantification of saxitoxin and related analogs (paralytic shellfish toxins – PSTs). The current method reporting limit is 0.05 ng/mL (ppb) based on kit sensitivity and dilution factors. Based on manufacture instructions, the STX ELISA is less cross-reactive to other PSTs and will likely underestimate total PSTs/Saxitoxins. Reported cross-reactivities are as follows: NEO (1.3%), dcSTX (29%), GTX2/3 (23%), GTX5 (23%), dcGTX2/3 (1.4%), dcNEO (0.6%) & GTX1/4 (<0.2%).

Liquid chromatography mass spectrometry/mass spectrometry (LC-MS/MS)

ATX & CYN

High performance chromatography coupled with tandem mass spectrometry was used for a targeted anatoxin-a and cylindrospermopsin analysis. The $[M+H]^+$ ion for ATX (*m/z* 166) was fragmented and the product ions (*m/z* 91, 131, 149) were monitored. The $[M+H]^+$ ion for CYN (*m/z* 416) was fragmented and the product ions (*m/z* 194, 274, 336) were monitored. The $[M+H]^+$ ion for the internal standard $[^{13}C_4]$ATX (*m/z* 171) was fragmented and the product ion (*m/z* 153) was monitored. The $[M+H]^+$ ion for the internal standard $[^{15}N_5]$CYN (421 *m/z*) was fragmented and the product ion (*m/z* 341) was monitored. The internal standard method was utilized for quantification.

Quality Control

Table 2: LFSM and IS QC samples prepared for analyses pre-extraction (unless otherwise noted). Additional Quality Control/Quality Assurance checks included method blanks, continued calibration checks, LFBs, and external curves.

Analyte	Concentration (ng/mL)	Sample ID	QC Type	Return
MC-LR	1.0	20211013-0846-JPiscanio	LFSM	97%
MC-LR	1.0	20211014-1115-RSpear	LFSM	114%
CYN	0.1	20211014-0825-ABlascovich	LFSM	95%
[$^{15}N_5$]CYN	1.0	all aliquots	IS	127 ± 18%
ATX	0.1	20211014-0825-ABlascovich	LFSM	128%
[$^{13}C_4$]ATX	1.0	all aliquots	IS	87 ± 28%
STX	0.2	20211014-0825-ABlascovich	LFSM	103%

**Control limits: water LFSM ± 30%; complicated matrix LFSM and when LFSM within 2x MDL ±50%; IS ± 50%*

Qualifier	Flag
CL	Analytical result is estimated due to ineffective quenching.
J	Analyte was positively identified; the associated numerical value is estimated.
PT	The reported result is estimated because the sample was not analyzed within required holding time.
B	Analytical result is estimated. Analyte was detected in associated reagent blank as well as the samples.
E	Analytical result is estimated. Values achieved were outside calibration range.
N	Spiked sample control was outside limits
T	The reported result is estimated because the sample exceeded temperature threshold when received

Abbreviations

NA	Not Applicable	LFSM	Lab Fortified Sample Matrix
MDL	Method Detection Limit	LFSMD	Lab Fortified Sample Matrix Duplicate
MQL	Method Quantification Limit	LD	Lab Duplicate
ND	Not Detected above the MDL	IS	Internal Standard
Blank	Regent Water free from interferences	—	Not Analyzed
LFB	Lab Fortified Blank	MRL	Method Reporting Limit
CCC	Continued Calibration Check	CV	Low-range calibration verification

Table 3: Raw ELISA Data

Sample ID	Analyte	Dilution Factor	Assay Values (ng/mL)	%CV	Concentration (ng/mL)	Average (ng/mL)
20211013-0846-JPiscanio	MCs/NODs	1	0.27	12.6	<0.30	**0.30[J]**
		1	0.32		0.32	
20211013-0846-JPiscanio LFSM	MCs/NODs	1	1.25	1.0	1.25	**1.26**
		1	1.27		1.27	
20211013-0858-JPiscanio	MCs/NODs	1	0.28	12.8	<0.30	**0.31[J]**
		1	0.34		0.34	
20211014-0825-ABlascovich	MCs/NODs	1	0.16	35.2	<0.30	**ND**
		1	0.26		<0.30	
20211014-0842-ABlascovich	MCs/NODs	1	0.02	99.7	<0.30	**ND**
		1	0.12		<0.30	
20211014-0900-RSpear	MCs/NODs	1	0.27	1.8	<0.30	**ND**
		1	0.26		<0.30	
20211014-1115-RSpear	MCs/NODs	1	0.22	1.5	<0.30	**ND**
		1	0.22		<0.30	
20211014-1115-RSpear LFSM	MCs/NODs	1	1.30	6.4	<0.30	**ND**
		1	1.42		<0.30	
20211014-0825-ABlascovich	STX	1	0.03	4.1	<0.05	**ND**
		1	0.03		<0.05	
20211014-0825-ABlascovich LFSM	STX	1	0.24	2.5	0.24	**0.24**
		1	0.23		0.23	
20211014-0900-RSpear	STX	1	0.02	6.2	<0.05	**ND**
		1	0.02		<0.05	
20211014-1200-RSpear	STX	1	0.00	18.1	<0.05	**ND**
		1	0.00		<0.05	
20211014-1230-RSpear	STX	1	0.01	7.4	<0.05	**ND**
		1	0.01		<0.05	

Table 4: Adda MC-ELISA Quality Control Value Table

Date Analyzed:	22 October 2021	Requirement	Pass/Fail
R^2 value:	1.000	≥0.98	PASS
%CV range STDs:	0.0-11.9%	≤15%	PASS
LFB (1 ppb) recovery:	118%	±40% True Value	PASS
%CV range LFB:	11.5%	≤20%	PASS
Low CCC (0.15 ppb) recovery:	103%	±50% True Value	PASS
LRB	<0.08	<0.08	PASS

Table 5: STX-ELISA Quality Control Value Table

Date Analyzed:	22 October 2021	Requirement	Pass/Fail
R^2 value:	0.998	≥0.98	PASS
%CV range STDs:	0.2-5.5%	≤15%	PASS
LFB (0.2 ppb) recovery:	98%	±40% True Value	PASS
%CV range LFB:	0.8%	≤20%	PASS
Low CCC (0.05 ppb) recovery:	80%	±50% True Value	PASS
LRB	<0.03	<0.03	PASS

Summary of Results

Table 6: Summary of results in ng/mL

Sample ID	MCs/NODs (ng/mL)	CYN (ng/mL)	ATX (ng/mL)	STX (ng/mL)
20211013-0846-JPiscanio	**0.30**^{J}	—	**0.50**	—
20211013-0858-JPiscanio	**0.31**^{J}	—	**0.49**	—
20211014-0825-ABlascovich	ND	ND	ND	ND
20211014-0842-ABlascovich	ND	—	—	—
20211014-0900-RSpear	ND	—	—	ND
20211014-1115-RSpear	ND	—	—	—
20211014-1200-RSpear	—	—	—	ND
20211014-1230-RSpear	—	—	—	ND
MRL (ng/mL)	*0.30*	*0.05*	*0.05*	*0.05*
Analyst Initials	*KC*	*AF*	*AF*	*KC*
Date Analyzed	*10/22/2021*	*10/22/2021*	*10/22/2021*	*10/22/2021*

Interpretations:

The levels of Adda MCs/NODs detected in the Blue Marsh Lake samples do not exceed the current 'Draft EPA Recommended Value for Recreational Criteria and Swimming Advisory', which is currently 8 ng/mL (ppb) total microcystins. The WHO recreational guidance value for microcystin is currently 24 ng/mL (ppb) (World Health Organization, 2020a). A low level of ATX was detected in the Blue Marsh samples, well below the current provisional WHO recreational guideline of 59 ng/mL(ppb) (World Health Organization, 2020b).

World Health Organization, 2020a. Cyanobacterial toxins: microcystins. Guidel. Drink. Qual. Guidel. Safe Recreat. Water Environ. 63.

World Health Organization, 2020b. Cyanobacterial toxins: anatoxin-a and analogues. Guidel. Drink. Qual. Guidel. Safe Recreat. Water Environ.

Submitted by: 

Mark T. Aubel, Ph.D.
Lab Director

Date: October 22, 2021

Potentially Toxigenic (PTOX) Cyanobacteria Screen

Project: Pennsylvania Department of Environmental Protection
Bureau of Clean Water

Submitted to:	Jeffery Butt
Organization:	PA DEP Bureau of Clean Water
Address:	400 Market St., 11th Floor RCSOB, Harrisburg, PA, 17101
Email:	jbutt@pa.gov

Sample Receipt Date:	08 October 2021
Sample Condition:	17.5 ºC upon arrival
Report#	211006_PTOX_ PADEP-BML
Date Prepared:	08 October 2021
Prepared by:	Alyssa Garvey

Sample ID	Site	Collected
20211006-0803-BTreichler	Blue Marsh Lake Beach Grab	06 October 2021
20211006-0805-BTreichler	Blue Marsh Lake Beach Transect	06 October 2021
20211006-0824-BTreichler	Blue Marsh Lake Licking Ck Scum Grab	06 October 2021

Method

A Sedgewick Rafter cell was prepared for each sample (formalin preserved; 1 mL) and scanned at 100X for the presence of potentially toxigenic (PTOX) cyanobacteria using a Nikon TE200 Inverted Microscope equipped with phase contrast optics. Higher magnification was used as necessary for identification and micrographs.

Results

20211006-0803-BTreichler

The sample was dominated by filamentous potentially toxigenic (PTOX) cyanobacteria, many indistinguishable from each other due to a lack of specialized cells. PTOX cyanobacteria observed included *Raphidiopsis* sp. (dominant), *Aphanizomenon* sp., *Planktothrix* sp., and *Cuspidothrix* sp. The PTOX cyanobacteria *Microcystis* spp. (≥5 colonies per mL; including *M. wesenbergii*) were also observed. *Pseudanabaena* sp. was also prevalent, but toxigenic evidence is limited. *Limnoraphis birgei* was also observed, but is not currently considered PTOX.

20211006-0805-BTreichler
The sample was dominated by filamentous PTOX cyanobacteria at similar densities to the **20211006-0803-BTreicherl** sample. PTOX cyanobacteria observed included *Raphidiopsis* sp. (dominant), *Aphanizomenon* sp., *Cuspidothrix* sp., *Planktothrix* sp., and *Microcystis* sp. (≥3 colonies per mL). *Limnoraphis birgei* was also observed.

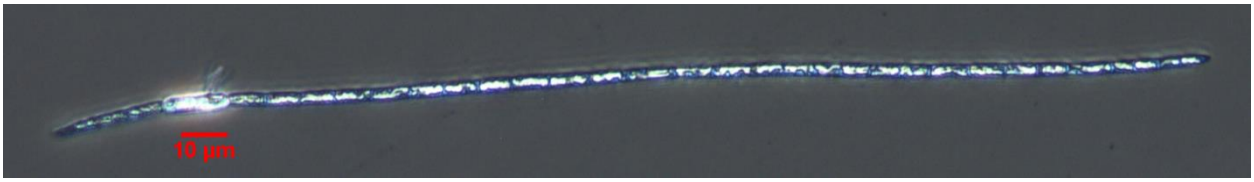
20211006-0824-BTreichler
The sample was dominated by the PTOX cyanobacterium *Aphanizomenon* sp. (bloom levels). Other PTOX cyanobacteria observed included *Microcystis* sp. (>50 colonies per mL), *Planktothrix* sp. (>10 filaments per mL), *Cuspidothrix* sp. (≥10 filaments per mL), *Woronichinia naegeliana* (≥4 colonies per mL), and *Dolichospermum* sp. (1 filament per mL). This sample contained the **highest** observed density of PTOX cyanobacteria for the Blue Marsh Lake sample collection.

Potential toxin producing genera observed include:

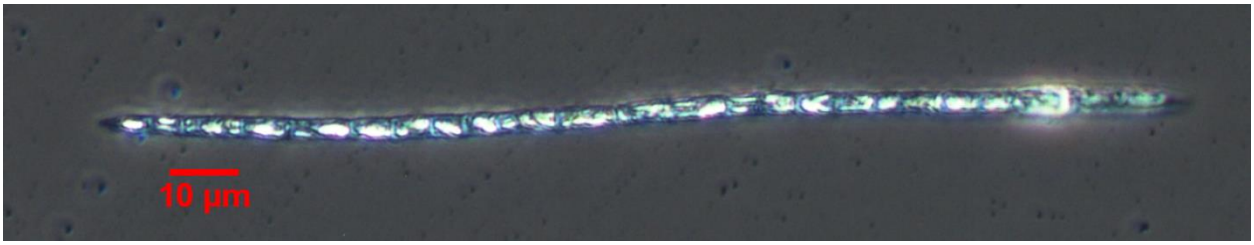
Microcystins	Saxitoxins	Anatoxin-a	Cylindrospermopsin
Microcystis	*Aphanizomenon*	*Aphanizomenon*	*Aphanizomenon*
Dolichospermum	*Raphidiopsis*	*Raphidiopsis*	*Raphidiopsis*
Woronichinia	*Dolichospermum*	*Dolichospermum*	*Dolichospermum*
Planktothrix	*Planktothrix*	*Planktothrix*	*Cuspidothrix*
	Cuspidothrix	*Cuspidothrix*	

Recommendations:
Based on these observations and previous toxin analysis data, microcystins and anatoxin-a analyses are recommended for **all** samples.

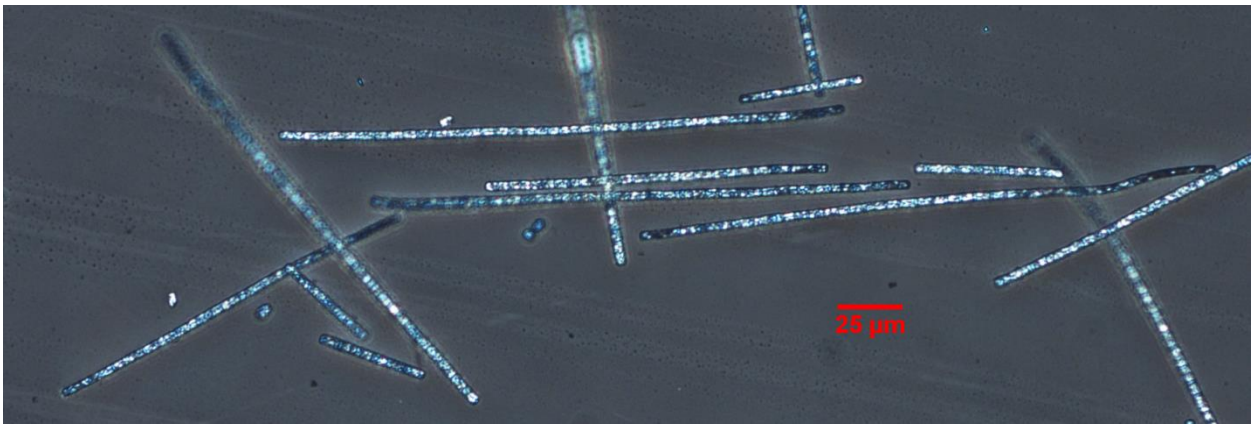
Micrographs



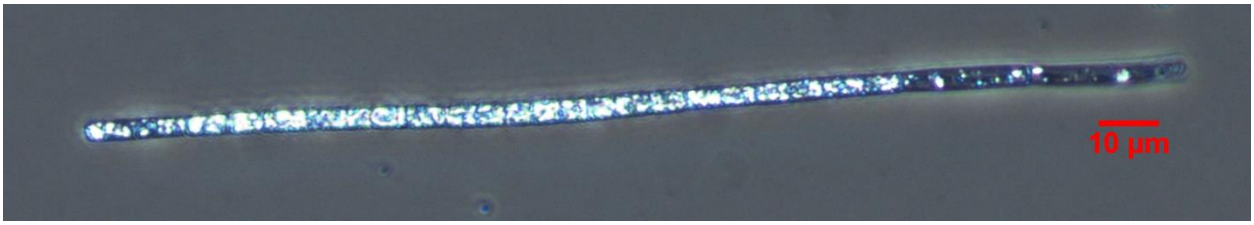
Raphidiopsis sp. at 400X (**20211006-0803-JTreichler**)



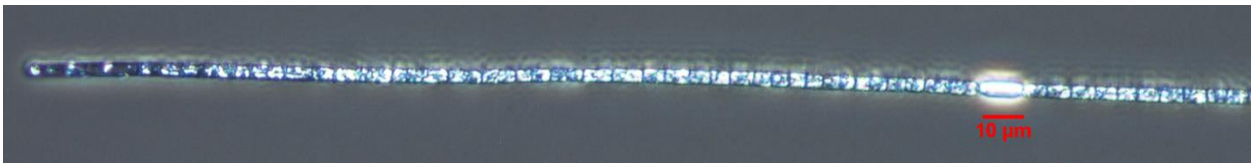
Raphidiopsis sp. at 400X (**20211006-0805-JTreichler**)



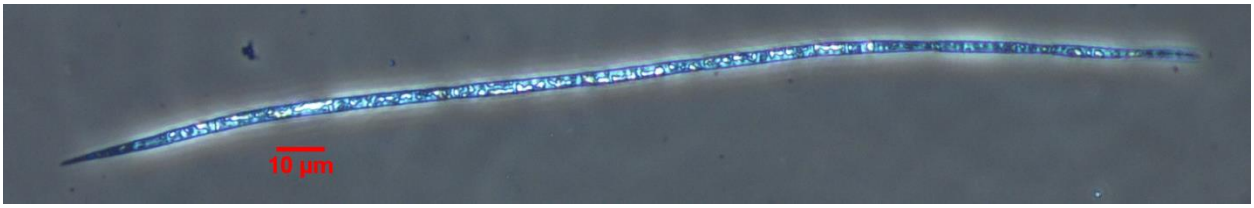
Aphanizomenon sp. at 200X (**20211006-0824-BTreichler**)



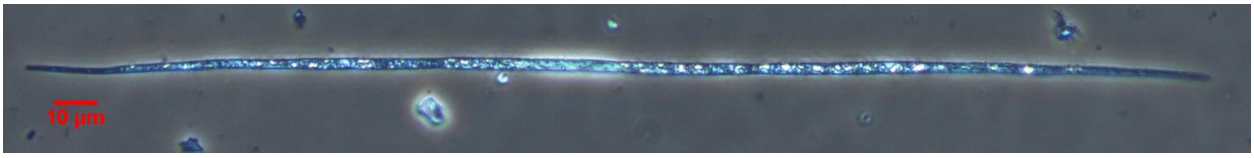
Aphanizomenon sp. at 400X (**20211006-0824-BTreichler**)



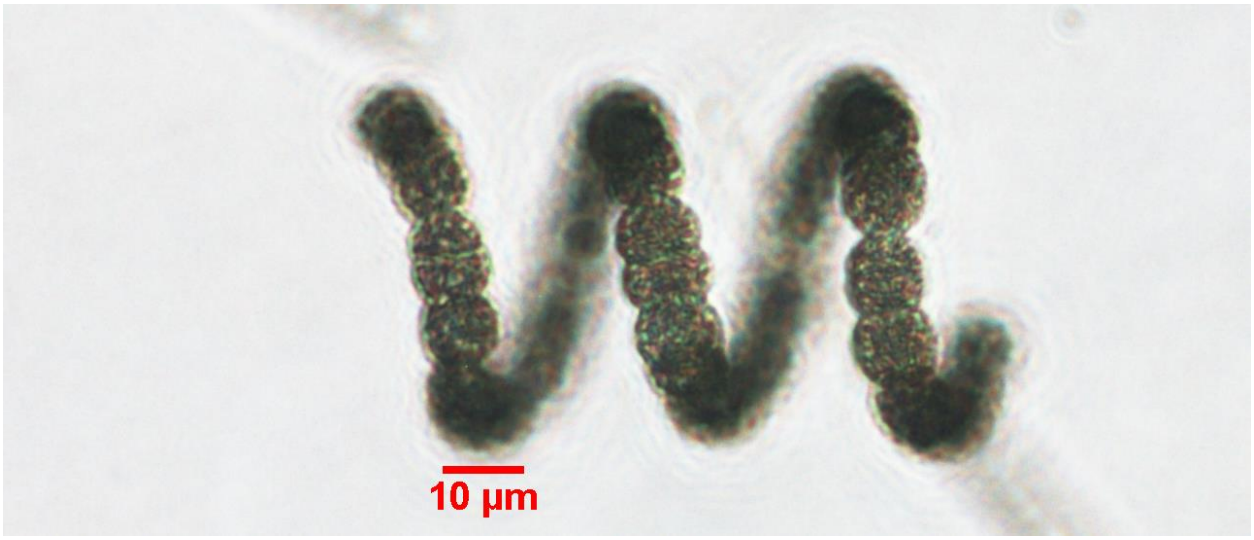
Aphanizomenon sp. at 400X (**20211006-0803-BTreichler**)



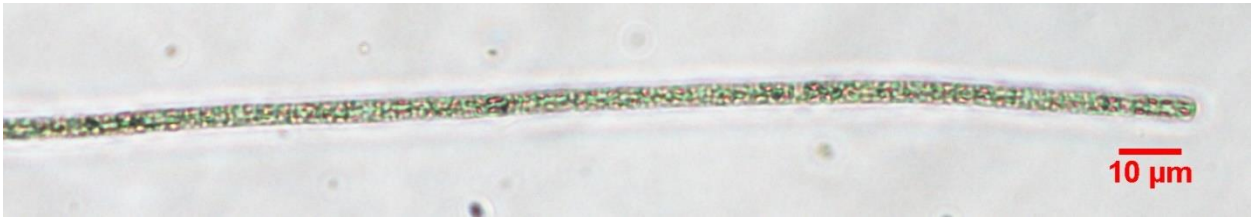
Cuspidothrix sp. at 400X (**20211006-0824-BTreichler**)



Cuspidothrix sp. at 400X (**20211006-0803-BTreichler**)



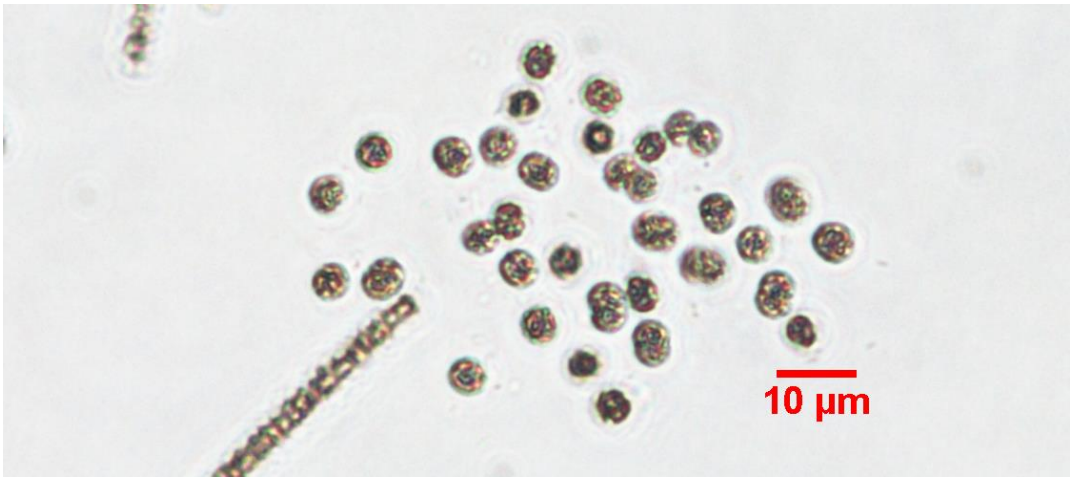
Dolichospermum sp. at 400X (**20211006-0824-BTreichler**)



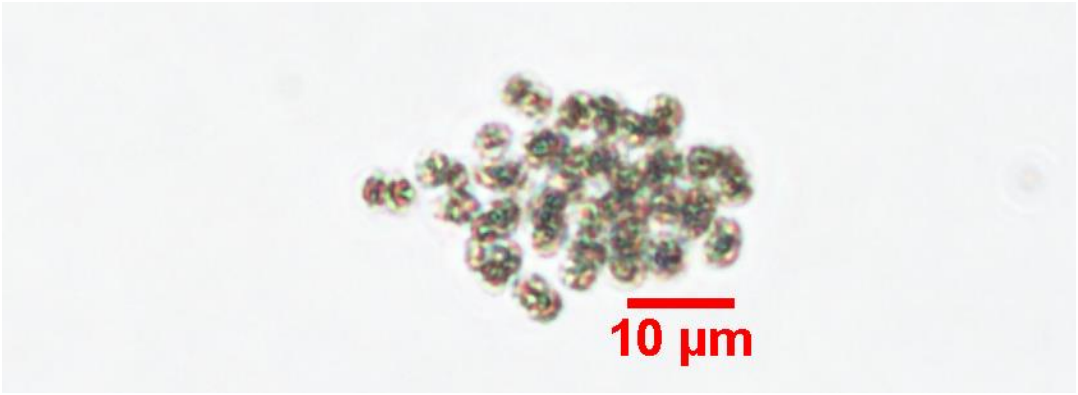
Planktothrix sp. at 400X (**20211006-0824-BTreichler**)

Planktothrix sp. at 400X (**20211006-0803-BTreichler**)

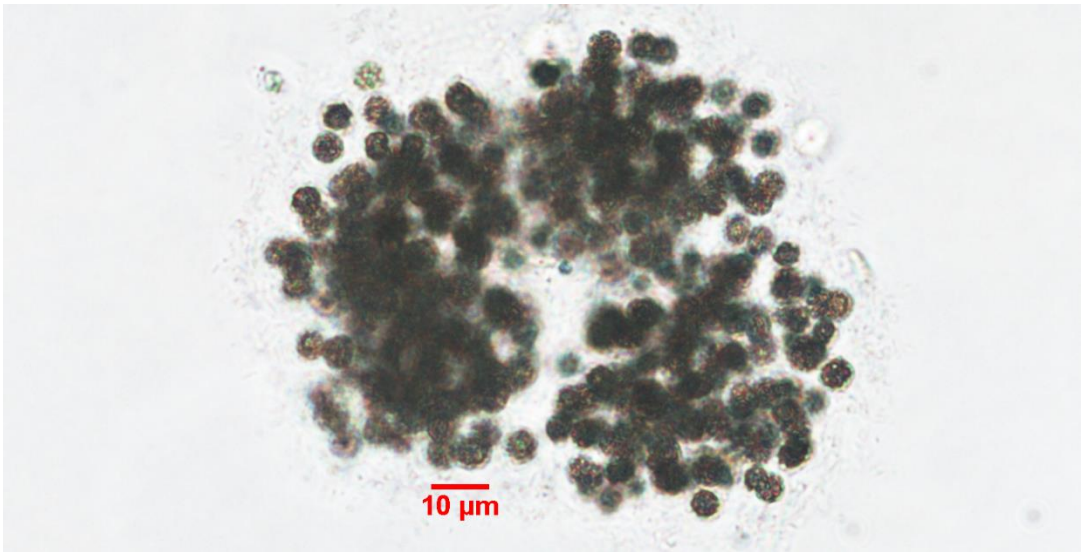
Planktothrix sp. at 400X (**20211006-0805-BTreichler**)



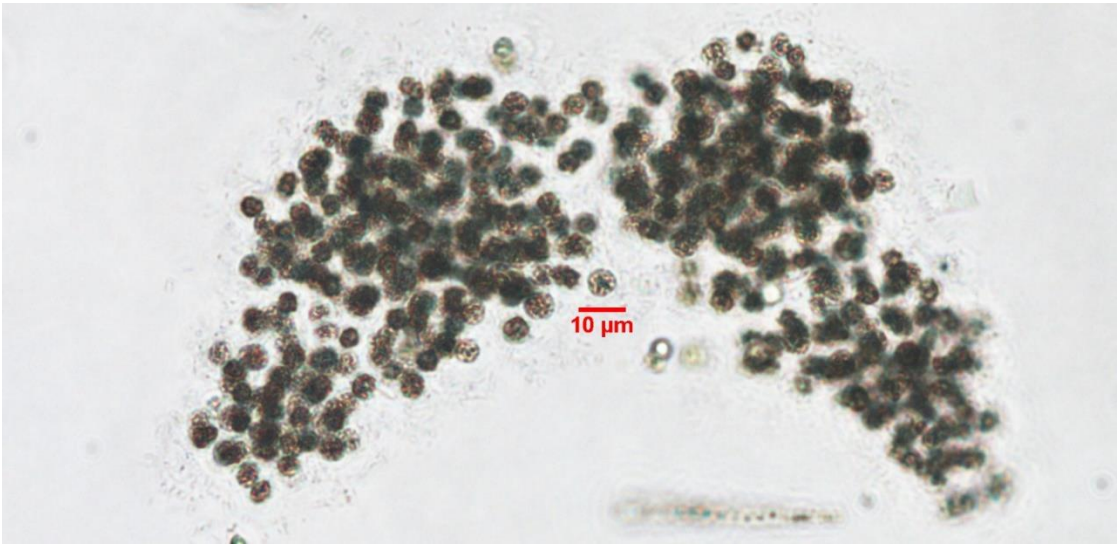
Microcystis sp. at 400X (**20211006-0824-BTreichler**)



Microcystis sp. at 400X (**20211006-0803-BTreichler**)

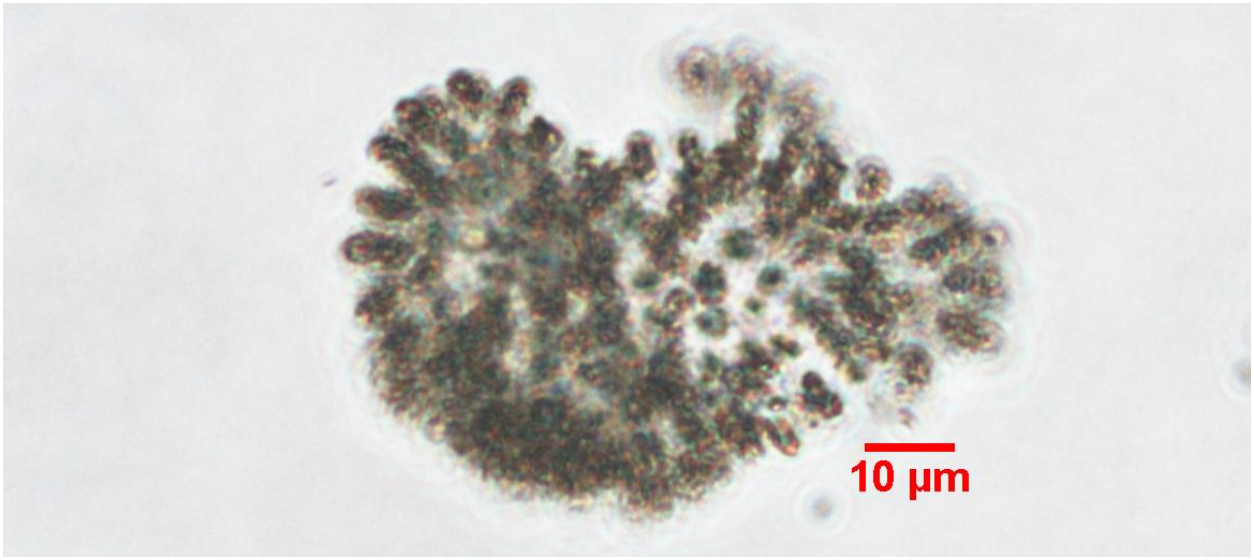


Microcystis sp. at 400X (**20211006-0803-BTreichler**)

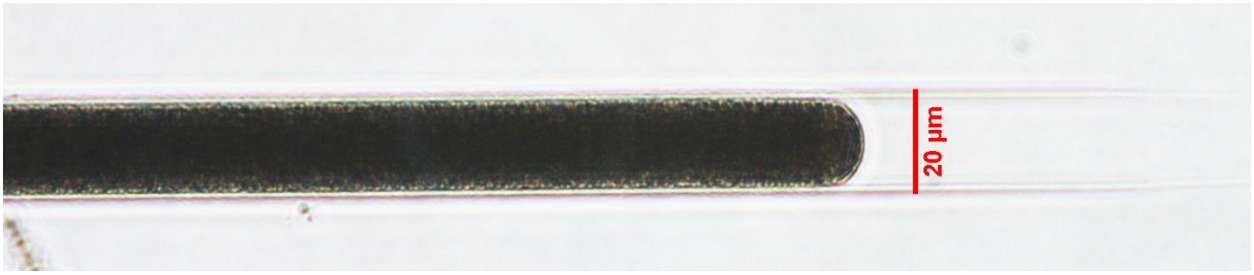


Microcystis sp. at 400X (**20211006-0824-BTreichler**)

Microcystis wesenbergii at 400X (**20211006-0803-BTreichler**)



Woronichinia naegeliana at 400X (**20211006-0824-BTreichler**)



Limnoraphis birgei at 400X (**20211006-0803-BTreichler**)

Submitted by: Amanda Foss Date: October 11, 2021

Amanda Foss, M.S.

The results in this report relate only to the samples listed above.
This report shall not be reproduced except in full without written approval of the laboratory.

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Potentially Toxigenic (PTOX) Cyanobacteria Screen

Project: Pennsylvania Department of Environmental Protection
Bureau of Clean Water

Submitted to:	Jeffery Butt
Organization:	PA DEP Bureau of Clean Water
Address:	400 Market St., 11th Floor RCSOB, Harrisburg, PA, 17101
Email:	jbutt@pa.gov
Sample Receipt Date:	19 October 2021
Sample Condition:	16.4 ºC upon arrival
Report#	211013_PTOX_ PADEP-BML
Date Prepared:	19 October 2021
Prepared by:	Alyssa Garvey

Sample ID	Site	Collected
20211013-0846-JPiscanio	Blue Marsh Lake - Beach Grab	13 October 2021
20211013-0858-JPiscanio	Blue Marsh Lake - Beach Transect	13 October 2021

Method

A Sedgewick Rafter cell was prepared for each sample (formalin preserved; 1 mL) and scanned at 100X for the presence of potentially toxigenic (PTOX) cyanobacteria using a Nikon TE200 Inverted Microscope equipped with phase contrast optics. Higher magnification was used as necessary for identification and micrographs.

Results

20211013-0846-JPiscanio

The potentially toxigenic (PTOX) cyanobacteria observed included *Raphidiopsis* sp. (>500 filaments per mL), *Cuspidothrix* sp. (>15 filaments per mL), *Aphanizomenon* sp. (>10 filaments per mL), *Planktothrix* sp. (>5 filaments per mL), *Dolichospermum* sp. (1 filament per mL), and *Microcystis* sp. (1 colony per mL).

20211013-0858-JPiscanio

The PTOX cyanobacteria observed included *Raphidiopsis* sp. (>300 filaments per mL), *Cuspidothrix* sp. (>30 filaments per mL), *Planktothrix* sp. (>10 filaments per mL), *Aphanizomenon* sp. (>5 filaments per mL), and *Microcystis* sp. (≥5 colonies per mL).

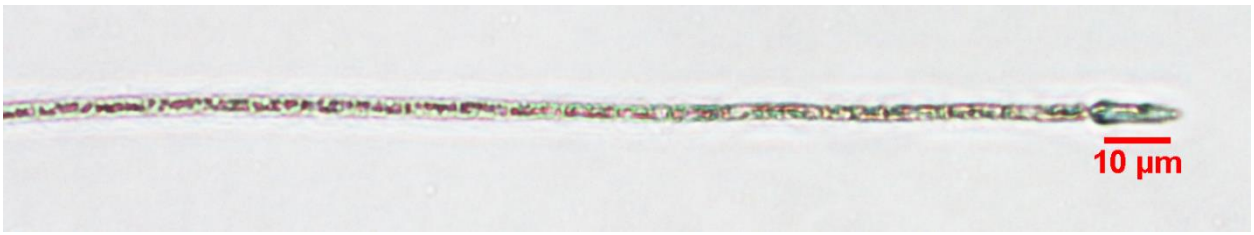
Potential toxin producing genera observed include:

Microcystins	Saxitoxins	Anatoxin-a	Cylindrospermopsin
Planktothrix	*Raphidiopsis*	*Raphidiopsis*	*Raphidiopsis*
Dolichospermum	*Cuspidothrix*	*Cuspidothrix*	*Cuspidothrix*
Microcystis	*Aphanizomenon*	*Aphanizomenon*	*Aphanizomenon*
	Planktothrix	*Planktothrix*	*Dolichospermum*
	Dolichospermum	*Dolichospermum*	

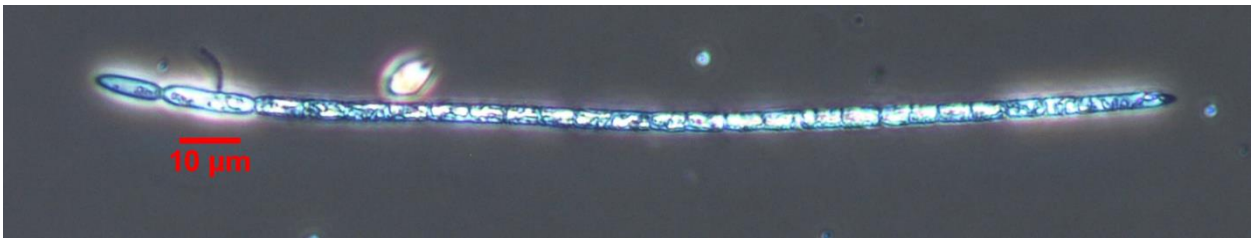
Recommendations:

Based on these observations and previous toxin analysis data, microcystins and anatoxin-a analyses are recommended for **both** samples.

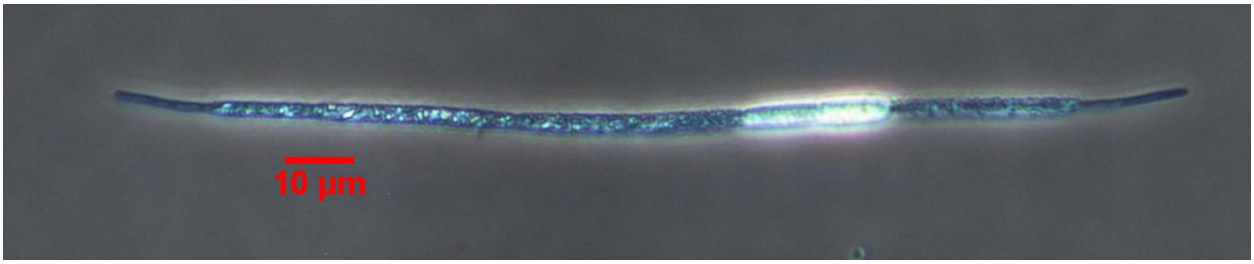
Micrographs



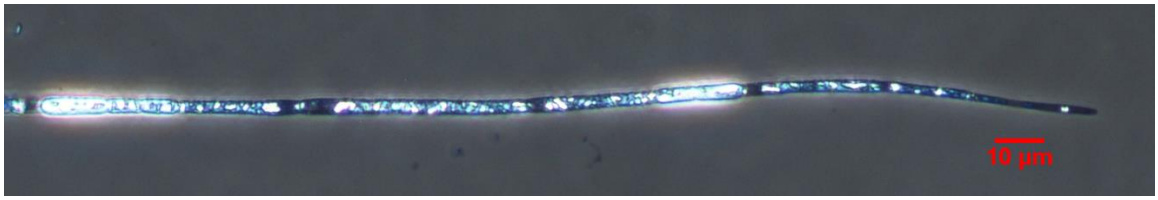
Raphidiopsis sp. at 400X (**20211013-0846-JPiscanio**)



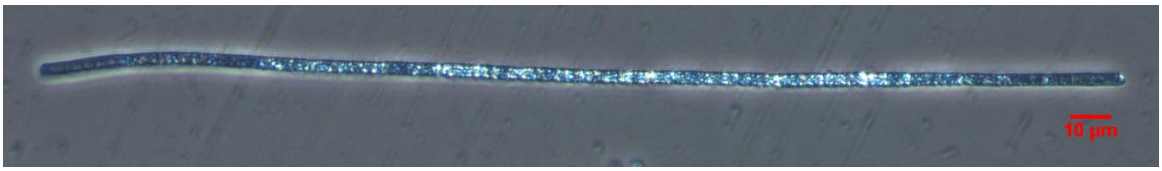
Raphidiopsis sp. at 400X (**20211013-0858-JPiscanio**)



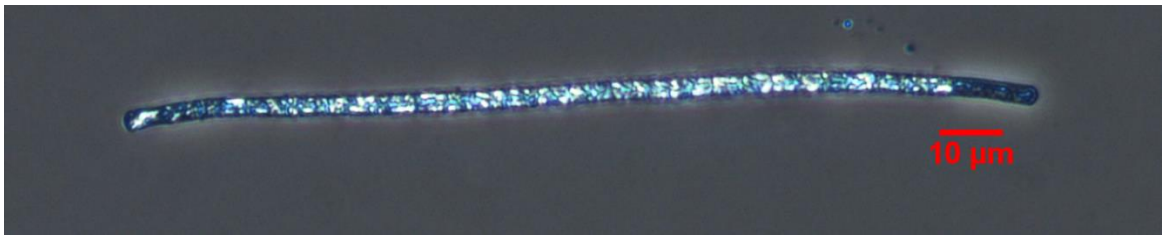
Cuspidothrix sp. at 400X (**20211013-0846-JPiscanio**)



Cuspidothrix sp. at 400X (**20211013-0858-JPiscanio**)

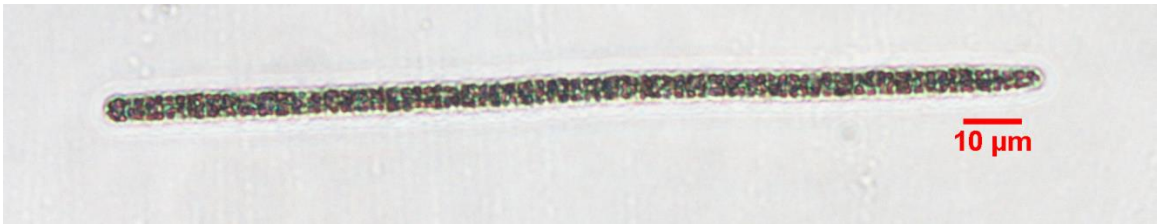


Aphanizomenon sp. at 400X (**20211013-0846-JPiscanio**)

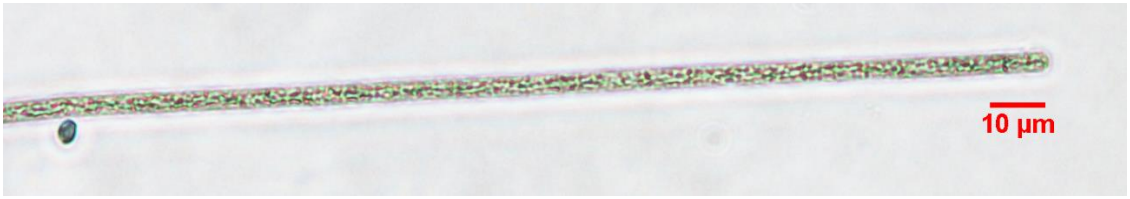


Aphanizomenon sp. at 400X (**20211013-0858-JPiscanio**)

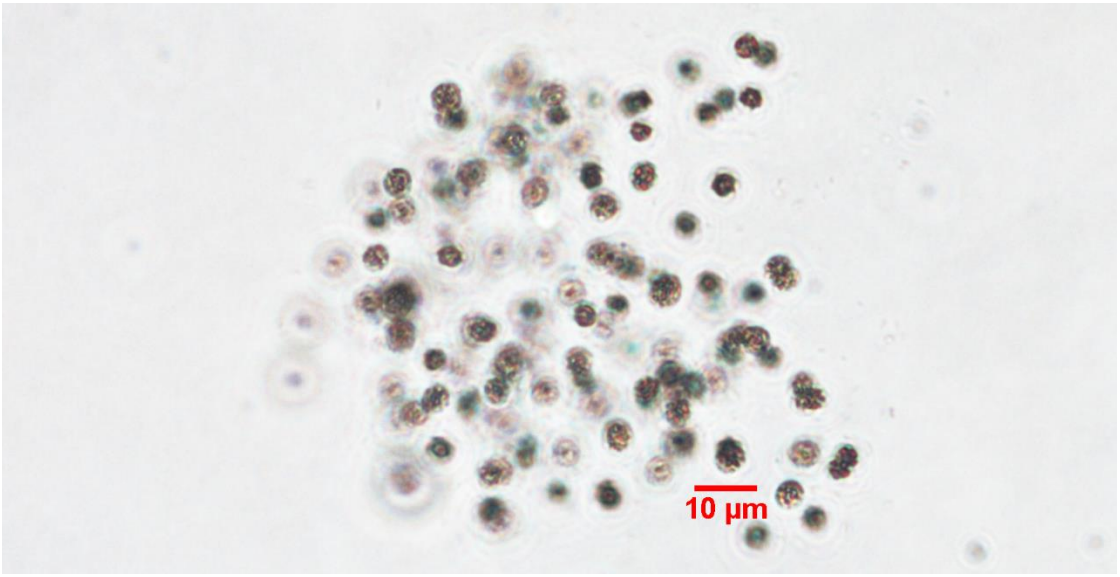
Dolichospermum sp. at 400X (**20211013-0846-JPiscanio**)



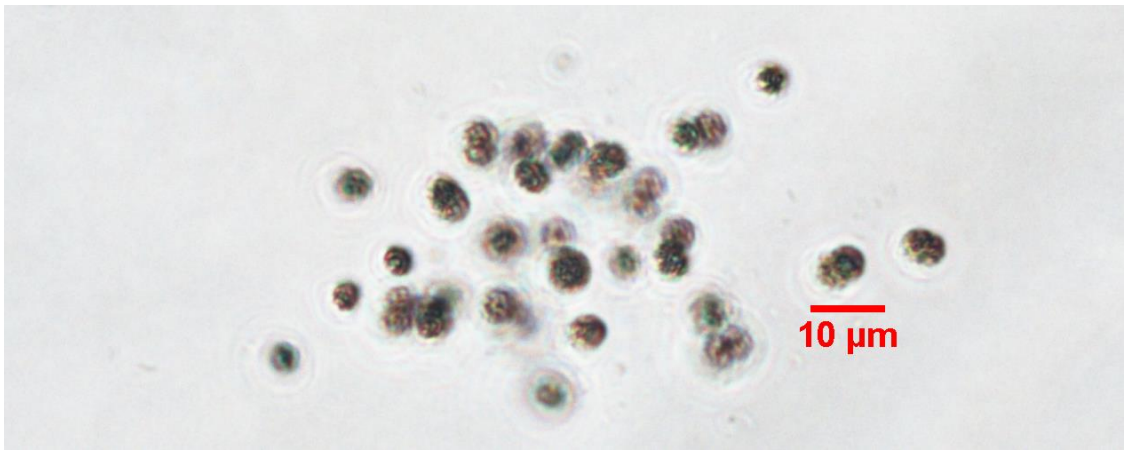
Planktothrix sp. at 400X (**20211013-0846-JPiscanio**)



Planktothrix sp. at 400X (**20211013-0858-JPiscanio**)



Microcystis sp. at 400X (**20211013-0846-JPiscanio**)



Microcystis sp. at 400X (**20211013-0858-JPiscanio**)

Submitted by: Amanda Foss Date: October 19, 2021

Amanda Foss, M.S.

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Potentially Toxigenic (PTOX) Cyanobacteria Screen

Project: Pennsylvania Department of Environmental Protection
Bureau of Clean Water

Submitted to:	Jeffery Butt
Organization:	PA DEP Bureau of Clean Water
Address:	400 Market St., 11th Floor RCSOB, Harrisburg, PA, 17101
Email:	jbutt@pa.gov

Sample Receipt Date:	05 November 2021
Sample Condition:	16.3 ºC upon arrival
Report#	211029-211101_PTOX_ PADEP
Date Prepared:	05 November 2021
Prepared by:	Alyssa Garvey

Sample ID	Site	Collected
20211029-0846-JPiscanio	BML Church Rd	29 October 2021
20211029-0939-JPiscanio	BML Licking Creek	29 October 2021
20211101-1100-JButt	BML Elev 252	01 November 2021
20211101-1105-JButt	BML Elev 243	01 November 2021
20211101-1110-JButt	BML Elev 256	01 November 2021
20211101-1115-JButt	BML Elev 269	01 November 2021
20211101-1120-JButt	BML Elev 282	01 November 2021
20211101-1230-JButt	BML Church Rd	01 November 2021

Method

A Sedgewick Rafter cell was prepared for each sample (formalin preserved; 1 mL) and scanned at 100X for the presence of potentially toxigenic (PTOX) cyanobacteria using a Nikon TE200 Inverted Microscope equipped with phase contrast optics. Higher magnification was used as necessary for identification and micrographs.

Results

20211029-0846-JPiscanio

The potentially toxigenic (PTOX) cyanobacteria observed included *Aphanizomenon* sp. (≥10 filaments per mL), *Woronichinia naegeliana* (≥5 colonies per mL), and *Microcystis* sp. (3 colonies per mL).

20211029-0939-JPiscanio
The PTOX cyanobacterium *Microcystis* sp. (1 colony per mL) was observed.

20211101-1100-JButt
The PTOX cyanobacterium *Woronichinia naegeliana* (1 colony per mL) was observed.

20211101-1105-JButt
PTOX cyanobacteria were not observed. The sample contained particulate matter, diatoms (Bacillariophyta), and green algae (Chlorophyta).

20211101-1110-JButt
PTOX cyanobacteria were not observed. The sample contained abundant particulate matter, diatoms (Bacillariophyta), and green algae (Chlorophyta).

20211101-1115-JButt
PTOX cyanobacteria were not observed. The sample contained particulate matter, diatoms (Bacillariophyta), and green algae (Chlorophyta).

20211101-1120-JButt
PTOX cyanobacteria were not observed. The sample contained particulate matter, diatoms (Bacillariophyta), and green algae (Chlorophyta).

20211101-1230-JButt
PTOX cyanobacteria were not observed. The sample contained particulate matter, diatoms (Bacillariophyta), and green algae (Chlorophyta).

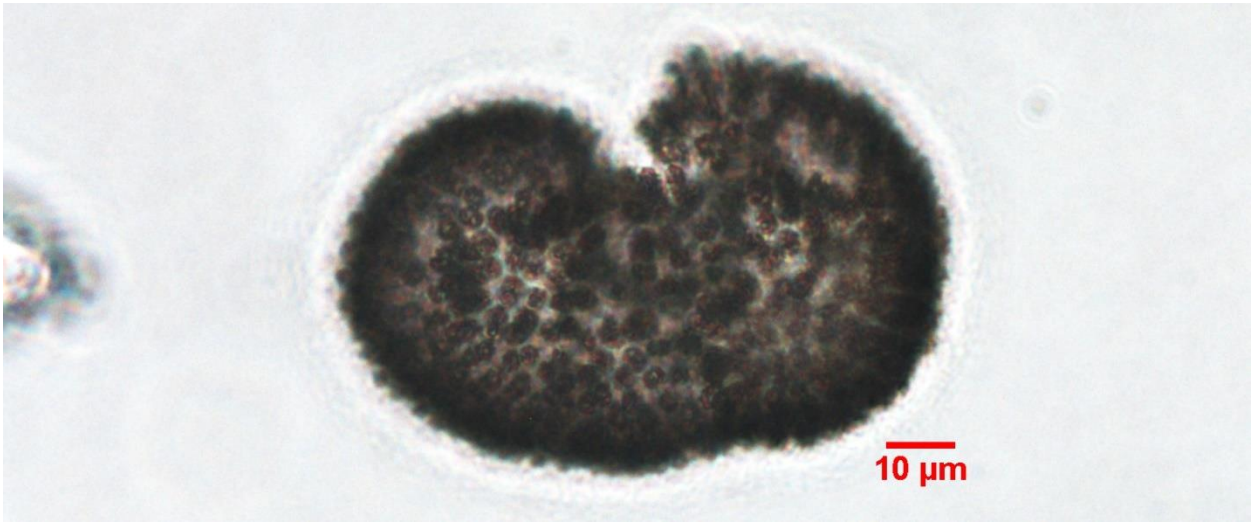
Potential toxin producing genera observed include:

Microcystins	Saxitoxins	Anatoxin-a	Cylindrospermopsin
Woronichinia *Microcystis*	*Aphanizomenon*	*Aphanizomenon*	*Aphanizomenon*

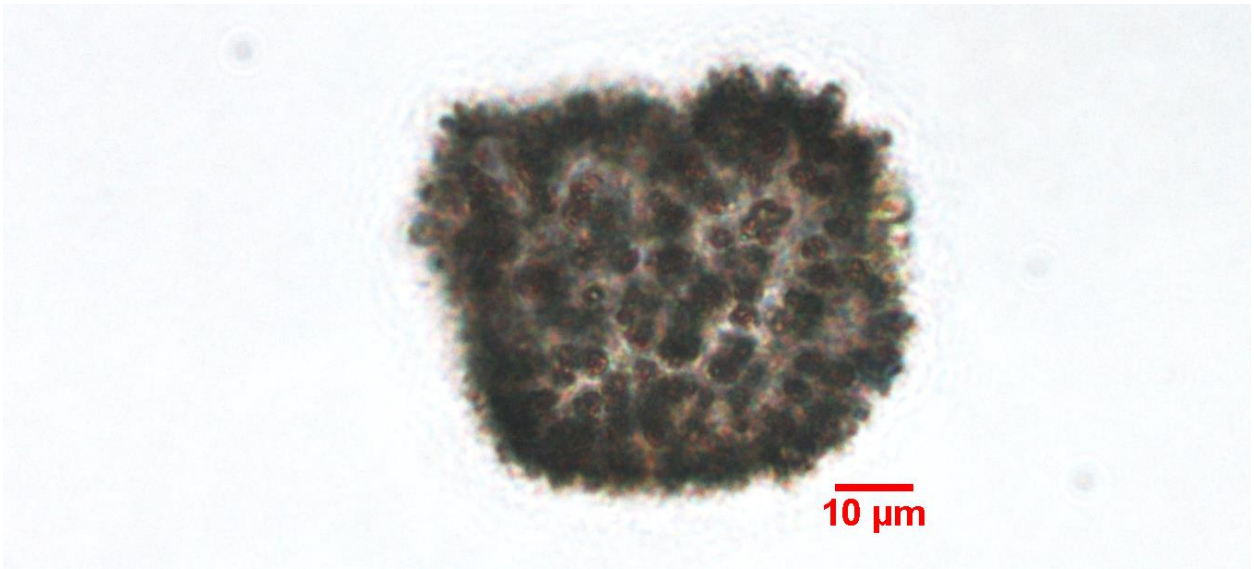
Recommendations:
Based on these observations and previous toxin analysis data, microcystins and anatoxin-a analyses are recommended for **all** samples.

Micrographs

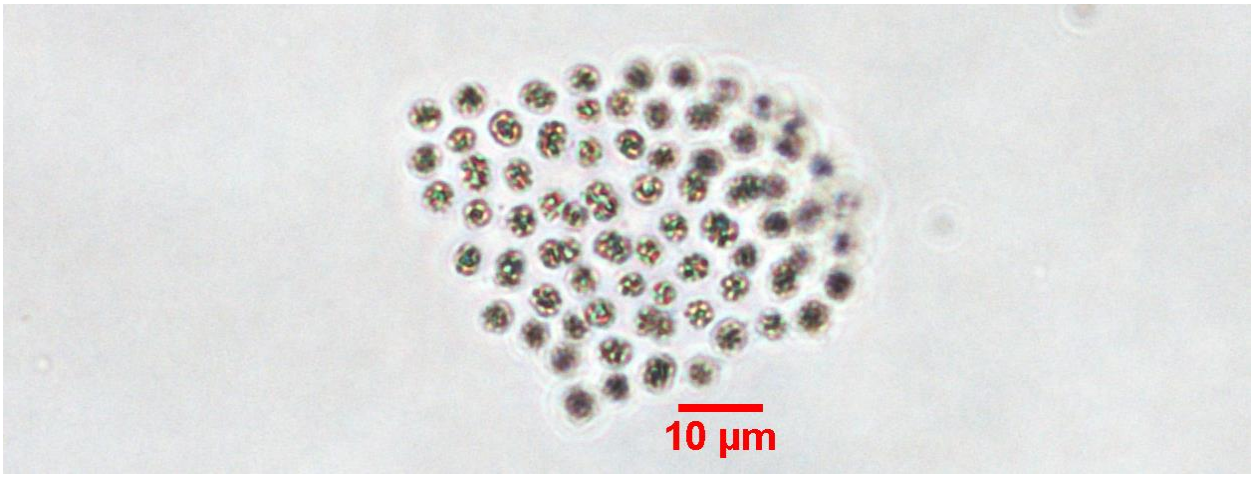
Aphanizomenon sp. at 400X (**20211029-0846-JPiscanio**)



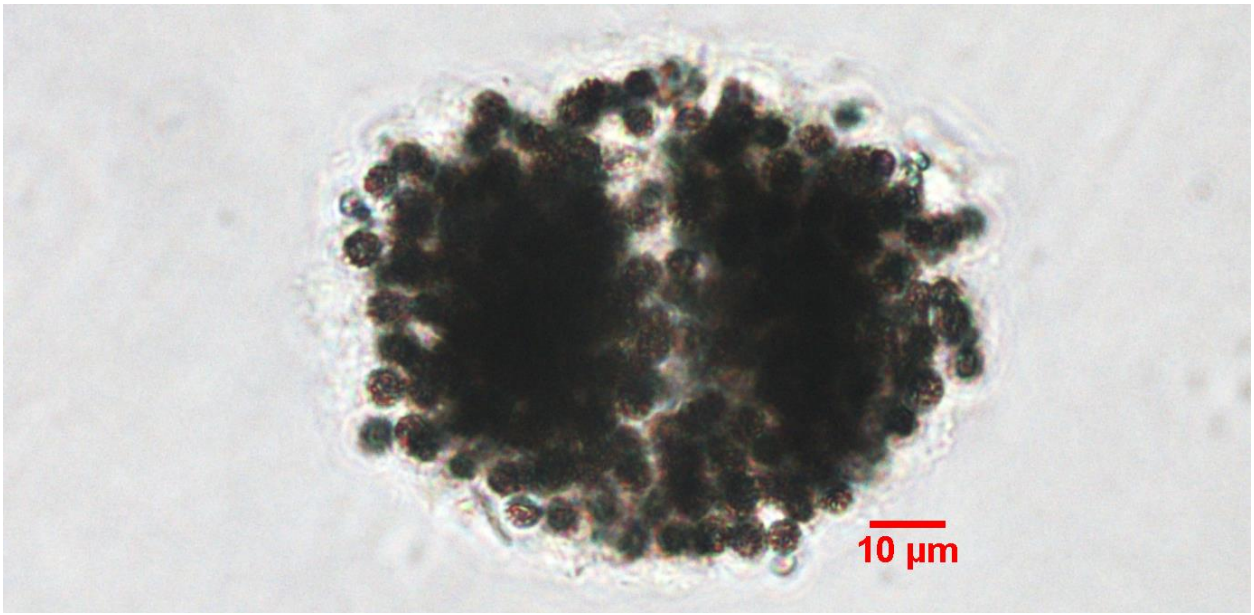
Woronichinia naegeliana at 400X (**20211029-0846-JPiscanio**)



Woronichinia naegeliana at 400X (**20211101-1100-JButt**)



Microcystis sp. at 400X (**20211029-0846-JPiscanio**)



Microcystis sp. at 400X (**20211029-0939-JPiscanio**)

Submitted by: Amanda Foss Date: November 5, 2021

Amanda Foss, M.S.

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Adda Microcystins/Nodularins & Anatoxin-a Report
Project: Pennsylvania Dept of Environmental Protection

Submitted to: Jeffery Butt
Organization: Pennsylvania Dept of Environmental Protection
Address: 400 Market St. 11th Floor RCSOB, Harrisburg, PA 17101
Email: jbutt@pa.gov

Sample Receipt Date: 5 November 2021
Sample Condition: 4.6 ºC upon arrival
Report#: 211027-211101_PADEP
Date Prepared: 9 November 2021
Prepared by: Kamil Cieslik

Table 1: Samples analyzed

Sample ID	Description/Site	Date	Time
20211027-1045-PPotti	Lake Chillisquaque Boat Launch	27 October 2021	1045
20211027-1115-PPotti	Lake Chillisquaque Heron Cove	27 October 2021	1115
20211029-0846-JPiscanio	BML Church Rd	29 October 2021	0846
20211029-0939-JPiscanio	BML Licking Creek	29 October 2021	0939
20211101-1100-JButt	BML Elev 252	1 November 2021	1100
20211101-1105-JButt	BML Elev 243	1 November 2021	1105
20211101-1110-JButt	BML Elev 256	1 November 2021	1110
20211101-1115-JButt	BML Elev 269	1 November 2021	1115
20211101-1120-JButt	BML Elev 282	1 November 2021	1120
20211101-1230-JButt	BML Church Rd	1 November 2021	1230

Analytes: Anatoxin-a (ATX), Adda Microcystins/Nodularins (MCs/NODs)

Sample Preparation

Water Sample Freeze-Thaw

The samples were thawed and inverted for 60 seconds to mix. A subset from each sample was transferred to a 15 mL vial. Two additional freeze-thaw cycles were employed prior to additional sample preparation and subsequent analysis.

Analytical Techniques

Enzyme-Linked Immunosorbent Assay (ELISA)

MCs/NODs

A microcystins/nodularins Adda ELISA (Abraxis) was utilized for the quantitative and sensitive congener-independent detection of MCs/NODs (US EPA Method 546 & Ohio EPA DES 701.0). The current method reporting limit is 0.30 ng/mL (ppb) based on kit sensitivity, dilution factors, and initial demonstration of capability.

Liquid chromatography mass spectrometry/mass spectrometry (LC-MS/MS)

ATX

High performance chromatography coupled with tandem mass spectrometry was used for a targeted anatoxin-a and cylindrospermopsin analysis. The $[M+H]^+$ ion for ATX (*m/z* 166) was fragmented and the product ions (*m/z* 91, 131, 149) were monitored. The $[M+H]^+$ ion for the internal standard $[^{13}C_4]$ATX (*m/z* 171) was fragmented and the product ion (*m/z* 153) was monitored. The internal standard method was utilized for quantification.

Quality Control

Table 2: LFSM and IS QC samples prepared for analyses pre-extraction (unless otherwise noted). Additional Quality Control/Quality Assurance checks included method blanks, continued calibration checks, LFBs, and external curves.

Analyte	Concentration (ng/mL)	Sample ID	QC Type	Return
MC-LR	1.0	20211027-1045-PPotti	LFSM	122%
MC-LR	1.0	20211029-0846-JPiscanio	LFSM	103%
ATX	0.1	20211029-0939-JPiscanio	LFSM	104%
ATX	0.1	20211101-1110-JButt	LFSM	70%
ATX	0.1	20211101-1230-JButt	LFSM	82%
[$^{13}C_4$]-ATX	1.0	all BML aliquots	IS	99 ± 5%

**Control limits: water LFSM ± 30%; complicated matrix LFSM and when LFSM within 2x MDL ±50%; IS ± 50%*

Qualifier	Flag
CL	Analytical result is estimated due to ineffective quenching.
J	Analyte was positively identified; the associated numerical value is estimated.
PT	The reported result is estimated because the sample was not analyzed within required holding time.
B	Analytical result is estimated. Analyte was detected in associated reagent blank as well as the samples.
E	Analytical result is estimated. Values achieved were outside calibration range.
N	Spiked sample control was outside limits
T	The reported result is estimated because the sample exceeded temperature threshold when received

Abbreviations

NA	Not Applicable	LFSM	Lab Fortified Sample Matrix
MDL	Method Detection Limit	LFSMD	Lab Fortified Sample Matrix Duplicate
MQL	Method Quantification Limit	LD	Lab Duplicate
ND	Not Detected above the MDL	IS	Internal Standard
Blank	Regent Water free from interferences	—	Not Analyzed
LFB	Lab Fortified Blank	MRL	Method Reporting Limit
CCC	Continued Calibration Check	CV	Low-range calibration verification

Table 3: Raw ELISA Data

Sample ID	Analyte	Dilution Factor	Assay Values (ng/mL)	%CV	Concentration (ng/mL)	Average (ng/mL)
20211027-1045-PPotti	MCs/NODs	1	0.11	6.1	<0.30	**ND**
		1	0.10		<0.30	
20211027-1045-PPotti LFSM	MCs/NODs	1	1.23	9.7	1.23	**1.32**
		1	1.41		1.41	
20211027-1115-PPotti	MCs/NODs	1	0.09	23.4	<0.30	**ND**
		1	0.13		<0.30	
20211029-0846-JPiscanio	MCs/NODs	1	1.62	3.6	1.62	**1.67**
		1	1.71		1.71	
20211029-0846-JPiscanio LFSM	MCs/NODs	1	3.05	18.8	3.05	**2.70**
		1	2.34		2.34	
20211029-0939-JPiscanio	MCs/NODs	1	0.28	2.7	<0.30	**ND**
		1	0.27		<0.30	
20211101-1100-JButt	MCs/NODs	1	0.12	37.4	<0.30	**ND**
		1	0.21		<0.30	
20211101-1105-JButt	MCs/NODs	1	0.17	6.9	<0.30	**ND**
		1	0.18		<0.30	
20211101-1110-JButt	MCs/NODs	1	0.11	32.7	<0.30	**ND**
		1	0.07		<0.30	
20211101-1115-JButt	MCs/NODs	1	0.09	24.1	<0.30	**ND**
		1	0.12		<0.30	
20211101-1120-JButt	MCs/NODs	1	0.13	3.7	<0.30	**ND**
		1	0.13		<0.30	
20211101-1230-JButt	MCs/NODs	1	0.02	0.0	<0.30	**ND**
		1	0.00		<0.30	

Table 4: Adda MC-ELISA Quality Control Value Table

Date Analyzed:	**9 November 2021**	**Requirement**	**Pass/Fail**
R^2 value:	0.999	≥0.98	PASS
%CV range STDs:	0.2-5.2%	≤15%	PASS
LFB (1 ppb) recovery:	109%	±40% True Value	PASS
%CV range LFB:	16.3%	≤20%	PASS
Low CCC (0.15 ppb) recovery:	80%	±50% True Value	PASS
LRB	<0.08	<0.08	PASS

Summary of Results

Table 5: Summary of results in ng/mL

Sample ID	MCs/NODs (ng/mL)	ATX (ng/mL)
20211027-1045-PPotti	ND	—
20211027-1115-PPotti	ND	—
20211029-0846-JPiscanio	**1.67**	ND
20211029-0939-JPiscanio	ND	ND
20211101-1100-JButt	ND	ND
20211101-1105-JButt	ND	ND
20211101-1110-JButt	ND	ND
20211101-1115-JButt	ND	ND
20211101-1120-JButt	ND	ND
20211101-1230-JButt	ND	ND
MRL (ng/mL):	*0.30*	*0.05*
Analyst Initials:	*KC*	*AF*
Date Analyzed:	*11/9/2021*	*11/9/2021*

Interpretations:
The level of Adda MCs/NODs detected in the 20211029-0846-JPiscanio sample does not exceed the current 'Draft EPA Recommended Value for Recreational Criteria and Swimming Advisory', which is currently 8 ng/mL (ppb) total microcystins. The WHO recreational guidance value for microcystin is currently 24 ng/mL (ppb) (World Health Organization (WHO), 2020a).

World Health Organization (WHO), 2020a. Cyanobacterial toxins: microcystins. Guidel. Drink. Qual. Guidel. Safe Recreat. Water Environ. 63.

Submitted by: Mark T. Aubel, Ph.D.
Lab Director
Date: November 9, 2021

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