



2016

**MARK TWAIN LAKE
WATER QUALITY
REPORT**



**U.S. ARMY CORPS OF ENGINEERS, ST. LOUIS DISTRICT
ENVIRONMENTAL QUALITY SECTION – WATER QUALITY**

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Executive Summary

The purpose of this report is to provide an annual analysis of the water quality in the lake for the past year. Mark Twain Lake is located in northeastern Missouri in the Salt River Basin on the Salt River. Clarence Cannon Dam and the Reregulation Dam are located in Ralls County at Salt River miles 63.0 and 53.5, respectively. The purpose of this project was to provide flood control, hydroelectric power generation, water supply, fish and wildlife conservation, recreation and water quality enhancement. The Mark Twain watershed comprises 2,318 square miles, with an additional 29 square miles draining into the Reregulation Pool. Major tributaries are the North Fork, Middle Fork, Elk Fork, and South Fork. The watershed consists of a gently rolling plain in the upstream portion and hillier in the downstream reaches. High rock bluffs border the stream and lake at various locations. Hickory and oak forests are scattered among crop and grazing lands.

The water of Mark Twain Lake and the downstream river channel is generally good. The lake is a medium depth reservoir nestled in the Salt River Basin. The lake tends to stratify during the summer months.

All sampling sites met the appropriate state standards during 2016 except the phosphorous levels. Phosphorous levels have exceeded the state standard on a routine basis. Generally the tailwater levels are lower than the incoming tributary flows, which indicates that the lake is sinking the phosphorous. This is also occurring with nitrogen. The project area has little pollution potentials at present time, no major form of degradation to the lake or streams is apparent. Constant water quality monitoring will continue to check future degradation of the watershed.

WATER QUALITY MONITORING PROGRAM

1.1 GENERAL OVERVIEW

This report summarizes water quality activities of the St. Louis District for Fiscal Year 2016 in accordance with ER 1110-2-8154 Water Quality & Environmental management for Corps Civil Works Projects and ETL 1110-2-362 Environmental Engineering Initiatives for Water Management. According to the U.S. Environmental Protection Agency (USEPA) poor lakeshore habitat is the biggest problem in our nation's lakes, followed by nutrients. Shoreline vegetation provides shelter for aquatic wildlife, reduces sediment and nutrient movement. The biology of a lake is characterized by the diversity if it's organisms. The number and kinds of plant and animal species present is a direct measure of a lake's well-being. Water quality at Mark Twain Lake is directly assessed using stream and river data from 10 site locations.

Water quality monitoring remains one of the Sections major responsibilities. The objective is to maintain a reasonable environmental monitoring program for the Mississippi River and the 5 lakes under the St. Louis District's control. The District's reservoirs consist of Mark Twain and Wappapello Lakes in Missouri, and Shelbyville, Carlyle and Rend Lakes in Illinois. Water quality sampling is conducted within the lakes and their tributaries to establish trend analysis and to maintain water quality at or above state and federal regulations.

The main objective is to provide technical expertise of an environmental nature to all Corps elements requesting assistance in accordance with ER 1110-2-8154. This would include updating the water quality management priorities for the district's projects to ensure water quality meets the state and federal regulations, for protection of human health and the environment, and for the safety and economic welfare of those at Corps projects. Ongoing goals include ensuring that downstream water quality meets all state and federal regulations, is suitable for aquatic and human life; and to continue to evaluate trend analysis in relation to baseline conditions at all projects.

Water quality data is provided to the Missouri Department of Natural Resources (MDNR) to be used as a screening mechanism for the Missouri Water Quality Report which is required every two years by the Clean Water Act Sections 303(d) and 305(b). MDNR does not routinely monitor Mark Twain Lake. However, the Lakes of Missouri Volunteer Program (LMVP) in cooperation with the University of Missouri-Columbia has been taking samples at 3 sites since 1989. The LMVP only analyze for Nutrients and Chlorophyll. In 2016, the LMVP took eight samples at 3 locations at the lake. See appendix D for data.

The National Water Quality Inventory Report to Congress (305(b) report) is the primary vehicle for informing Congress and the public about general water quality conditions in the United States. This document characterizes our water quality, identifies widespread water quality problems of national significance, and describes various programs implemented to restore and protect our waters.

Under Section 303(d) of the 1972 Clean Water Act, states, territories and authorized tribes are required to develop a list of water quality limited segments. These waters on the list do not meet water quality standards, even after point sources of pollution have installed the minimum required levels of pollution control technology. The law requires that these jurisdictions establish priority rankings for water on the lists and develop action plans, called as Total Maximum Daily Loads (TMDL), to improve water quality.

The 2016 water quality report compiled by the Missouri Department of Natural Resources has listed the Salt River below the Cannon Dam and Mark Twain Lake as impaired. The Salt River is impaired by low Dissolved Oxygen and Mercury. Mark Twain Lake is impaired by Mercury. Mark Twain Lake is listed as eutrophic. Continued monitoring of the lake and its tributaries is vital in assisting the future assessment of the lake for these and other possible impairments. The water quality monitoring program represents the single metric that encompasses the overall health of the watershed as it is a direct measure of how well the environmental stewardship programs are working.

1.2 INTRODUCTION

Mark Twain Lake is located in northeast Missouri. The land surrounding the lake is used predominately for agriculture. The main agricultural contaminants into the watershed include pesticides and fertilizers. Also a concern is the high sediment loading into the lake and the colloidal characteristic of the sediments as well as low dissolved oxygen levels related to turbine generation. The lake is also susceptible to fish kills due to algal decay in the lake arms. As algae decays it uses up oxygen which reduces the amount of oxygen available to aquatic organisms.

The operating purposes for Mark Twain Lake are fish/wildlife, hydroelectric power, flood control, recreation, navigation and water supply. The water quality management program for the lake includes monitoring of baseline parameters, ecological trends and investigation of problem areas to keep the lake within state and federal standards.

Water quality monitoring was conducted during 2016 to assure safe conditions for human recreation, wildlife and aquatic life as maintained and managed within the lake system. The 2016 water quality monitoring program was funded to conduct three sampling events. The sampling sites include the following: Site 1 (MTL-1) Spillway, Site 5 (MTL-5) South Fork at Hwy D, Site 8 (MTL-8) Elk Fork at Hwy 15, Site 9 (MTL-9) Middle Fork at Hwy 15, Site 11 (MTL-11) North Fork at Hwy 36, Site 12 (MTL-12) below re-regulation dam, Site 22 (MTL-22) old river channel 1mile up lake from dam, Site 33 (MTL-33) Lick Creek at Hwy J, Site 66 (MTL-66) South Fork at Hwy 107 bridge, and Site 77 (MTL-77) North Fork at Hwy 107 bridge. During the sampling event one site was selected for quality control duplication and denoted as MTL-15. In June MTL-8 was replaced by MTL-13. MTL-13 provides a safer and easier access point. The locations of the ten sampling sites are depicted on the lake map in Figure 1.

As mentioned above, LMVP collects samples at Mark Twain Lake. This year they conducted 8 sampling events at 3 sites. Their data is in Appendix D. We have also included data from the United Water Services Clarence Cannon WTP in Appendix E and state park beach data in Appendix F.

Clarence Cannon Dam & Mark Twain Lake

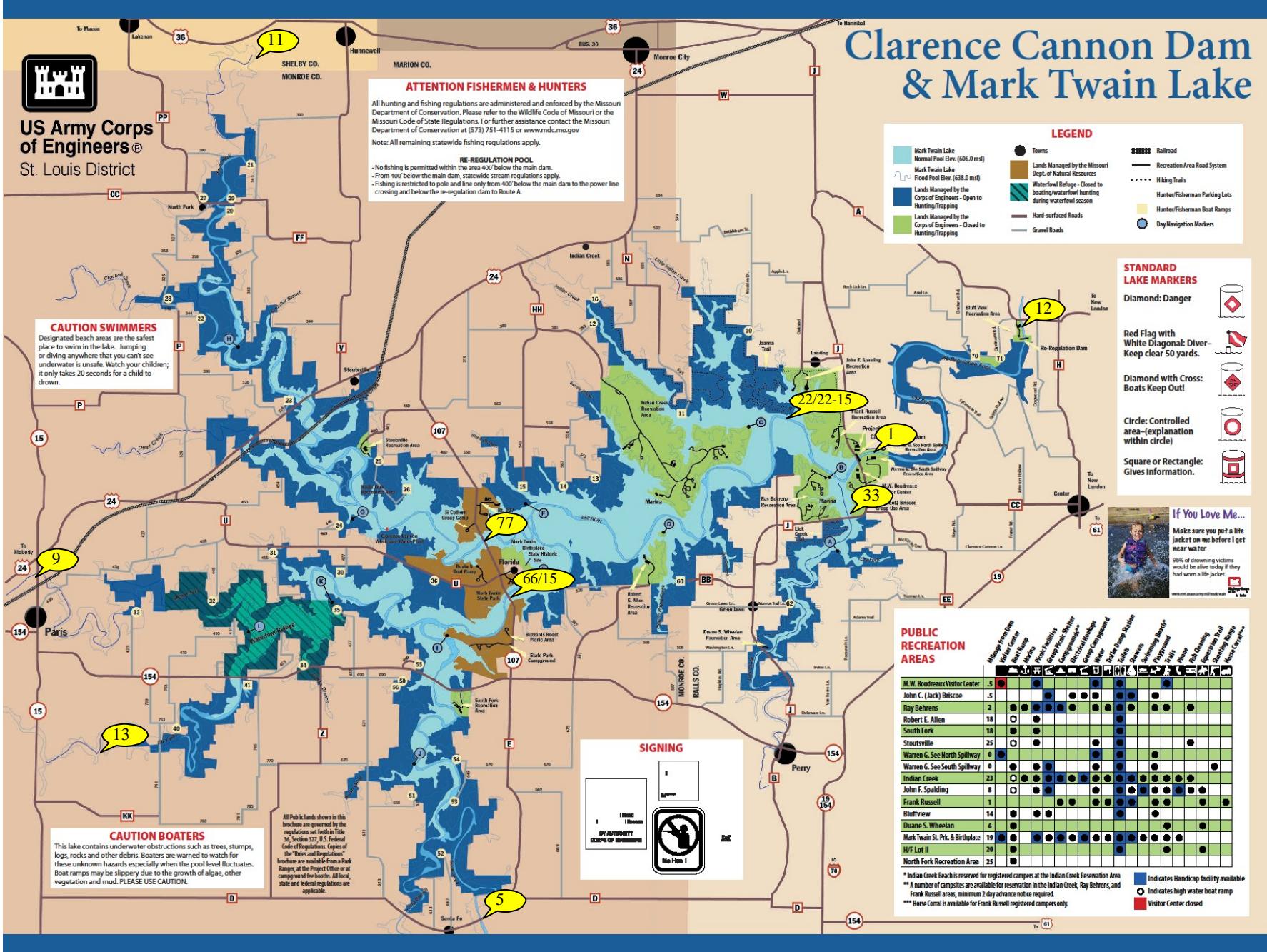


Figure 1

Sample Locations

2.1 WATER QUALITY ASSESSMENT CRITERIA

2.2 Water Quality

The water quality assessment criteria, which have been generally accepted criteria for sustaining adequate aquatic plant and animal growth were based upon the State of Missouri regulatory limits for certain contaminants. The samplings and analysis which were conducted at the Mark Twain Lake sites reflect the minimal set of parameters needed to analyze the current status of water quality for the Mark Twain Lake system.

The following parameters were analyzed in the Fiscal Year 2016 sampling at Mark Twain Lake: Total Organic Carbon (TOC), iron, manganese, ammonia-nitrogen, nitrate-nitrogen, orthophosphate, total phosphate, Total Suspended Solids (TSS), Total Volatile Suspended Solids (TVSS), escherichia coliform (E. coli), pH, temperature, dissolved oxygen, specific conductance, oxidation-reduction potential (ORP), chlorophyll, pheophytin-a, atrazine and alachlor,

The Missouri Department of Natural Resources, Code of State Regulations, Division 20, Chapter 7 classifies water quality criteria based on designated usage. These standards are used to determine the aquatic water quality of the lake. Table 2.1 provides a listing of the regulatory limits where a limit has been established for the parameters analyzed.

**TABLE 2.1
State of Missouri
Water Quality Standards**

PARAMETER	LIMIT
Temperature	20.5°C - 33°C (68°F - 90°F)
Ammonia Nitrogen	< 15 mg/L
Nitrate Nitrogen	10 mg/L
Iron	1.0 mg/L (Aquatic Life)
Manganese	0.05 mg/L (Drinking Water & GW)
Phosphorous as Phosphate	0.05 mg/L
E. Coli	Missouri standard is 235 E. coli per 100ml for single sample or 126 for geometric mean
pH	Range: 6.5 to 9.0
DO	> 5.0 mg/L
Atrazine	3ug/L ¹ , 82ug/L ² , 9ug/L ³
Alachlor	2ug/L ¹
Conductivity	1,700 uS/cm≈TDS of 1,000 mg/L
Total Suspended Solids (TSS)	116mg/L (streams); >12mg/L Lakes
Chlorpyrifos	10ug/L ¹
Cyanazine	370ug/L ² ; 30ug/L ³
Metolachlor	1.7mg/L ²
Metribuzin	200ug/L ¹ 91ug/L HRL
Pendimethalin (PROWL)	70ug/L HBSL, 20ug/L ¹
Simazine	4.0ug/L ¹

Trifluralin	26ug/L ² ; 1.1ug/L ³
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¹ Drinking Water

² Acute

³ Chronic

Health Based Screening Level (HBSL)

Health Reference Level (HRL)

Nitrogen is an essential component of proteins, genetic material, chlorophyll, and other key organic molecules. All organisms require nitrogen in order to survive. Nitrogen exists in several forms. These forms include gaseous nitrogen (N₂), nitrites (NO₂), nitrate (NO₃), ammonia nitrogen (NH₃-N), and ammonium (NH₄). Ammonia can be toxic to fish and other aquatic organisms at certain levels. Unlike ammonia, ammonium (NH₄) is not toxic to aquatic organisms and is readily available for uptake by plankton and macrophytes. Nitrogen levels have increased as human activities have accelerated the rate of fixed nitrogen being put into circulation. High nitrogen levels can cause eutrophication. Eutrophication increases biomass of phytoplankton, decreases water transparency, and causes oxygen depletion. Ammonia nitrogen is monitored so that the effects on fish spawning, hatching, growth rate and pathologic changes in gills, liver and kidney tissue can be related to the detected levels of ammonia nitrogen. Nitrate-nitrogen degrades to nitrite or produces ammonia which has a detrimental effect on aquatic life and, therefore, has been monitored to assure levels are below the regulatory "safe" limit.

Phosphate has been analyzed as phosphorus and has been monitored due to the potential for uptake by nuisance algae. Levels of phosphate can indicate the potential for rapid growth of algae (algae bloom), which can cause serious oxygen depletion during the algae decay process. Phosphorous is typically the limiting nutrient in a water body. Therefore, addition of phosphorous to the ecosystem stimulates the growth of plants and algae. Phosphorous is delivered to lakes and streams by way of storm water runoff from agricultural fields, residential property, and construction sites. Other sources of phosphorous are anaerobic decomposition of organic matter, leaking sewer systems, waterfowl, and point source pollution. The general standard for phosphorous in lake water is 0.05mg/L. Dissolved phosphorous also called ortho-phosphorous is generally found in much smaller concentrations than total phosphorous and is readily available for uptake. For this reason dissolved phosphorous concentrations are variable and difficult to use as an indicator of nutrient availability.

The metals manganese and iron are nutrients for both plants and animals. Living organisms require trace amounts of metals. However, excessive amounts can be harmful to the organism. Heavy metals exist in surface waters in three forms, colloidal, particulate, and dissolved. Water chemistry determines the rate of adsorption and desorption of metals to and from sediment. Metals are desorbed from the sediment if the water experiences increases in salinity, decreases in redox potential, or decreases in pH. Metals in surface waters can be from natural or human sources. Currently human sources contribute more metals than natural sources. Metals levels in surface water may pose a health risk to humans and the environment.

Photosynthetic activity can be hindered by the levels of total suspended solids. Total suspended solids concentrations, which cause the photosynthetic activity to be reduced by more

than 10% from the seasonably established norm, can have a detrimental effect on aquatic life. Soil particles, organic material, and other debris comprise suspended solids in the water column. Secchi disk measurements are inverse to suspended solid measurements. As total suspended solids (TSS) increases, the secchi disk depth or water transparency decreases. Total suspended solids can be an important indicator of the type and degree of turbidity. TSS measurements represent a combination volatile suspended solids (VSS), that consist of organic material and nonvolatile suspended solids (NVSS) which is comprised of inorganic mineral particles in the water. In order to more accurately determine the types and amounts of suspended solids, volatile suspended solids (VSS) are analyzed. VSS concentration represents the organic portion of the total suspended solids. Organic material often includes plankton and additional plant and animal debris that are present in water. Total volatile solids indicate the presence of organics in suspension; and therefore, show additional demand levels of oxygen. Missouri does not currently have a standard for TSS or TVSS. However, IEPA literature suggests that NVSS above 15mg/L could highly impair recreational lake use. A NVSS of 3 to 7mg/L might cause slight impairment.

Chlorophyll and pheophytin *a* are monitored to provide indicators of algae growth and, therefore, potential oxygen depletion activity. Chlorophyll is measured in lakes to estimate the type and amount of algal productivity in the water column. Chlorophyll *a* is present in green algae, blue-green algae, and in diatoms. Chlorophyll *a* is often used to indicate the degree of eutrophication. Chlorophyll *b* and *c* are used to estimate the extent of algal diversity and productivity. Chlorophyll *b* is common in green algae and is used as an auxiliary pigment for photosynthesis. Chlorophyll *c* is most common in diatom species and serves as an auxiliary pigment. Algal productivity and diversity can be determined by the concentrations of the individual pigments. For example high concentrations of chlorophyll *a* and *b* would indicate that green algae is abundant. High concentrations of chlorophyll *a* would indicate abundance of blue-green algae and concentrations of chlorophyll *a* and *c* would indicate diatoms are the dominant species. Chlorophyll production is currently being connected with hypoxia. EPA's current guidance as of December 2016 for recreational Ambient Water Quality Criteria (AWQC) for Cyanotoxins is 4ug/L for microcystins and 8ug/L for Cylindrospermopsin. Mark Twain Lake was in the moderate risk of exposure category for chlorophyll.

Fecal coliform bacteria is monitored for the protection of human health as it relates to full body contact of recreational waters. People can be exposed to disease-causing organisms, such as bacteria, viruses and protozoa in beach and recreational waters mainly through accidental ingestion of contaminated water or through skin contact. These organisms, called pathogens, usually come from the feces of humans and other warm-blooded animals. If taken into the body, pathogens can cause various illnesses and on rare occasions, even death. Waterborne illnesses include diseases resulting from bacteria infection such as cholera, salmonellosis, and gastroenteritis, viral infections such as hepatitis, gastroenteritis, and intestinal diseases, and protozoan infections such as ameobic dysentery and giardiasis. The most commonly monitored recreational water indicator organisms are fecal coliform, Escherichia coli, (E. coli) and enterococci. Fecal coliform are bacteria that live in the intestinal tracts of warm-blooded animals. The Missouri standard for fecal coliform is less than 200 colonies per 100ml of sample water calculated as a geometric mean. Fecal coliform was originally recommended in 1968 by the Federal Water Pollution Control Administration (predecessor to EPA) as an effective water

quality indicator organism for recreational waters. Recent studies indicate that fecal coliform show less correlation to illness than other indicator organisms such as E. coli and enterococci. The Environmental Protection Agency (EPA) currently recommends E. coli or enterococci as an indicator organism for fresh waters. Since 2009 the St. Louis District has been using E. coli as the standard indicator.

Atrazine and Alachlor herbicides are commonly used agricultural chemicals which can be readily transported by rainfall runoff. Both compounds are suspected of causing cancer; and therefore, were monitored for the protection of human and aquatic health. Organic compounds include many pesticides. A pesticide can be any substance that is intended to prevent, destroy, repel, or mitigate any pest. This includes insecticides, herbicides, fungicides, fumigants, algaecides and other substances. Herbicides which are pesticides used to kill vegetation are the most widely used and sampled. Ten of the most frequently used herbicides detected in water are Atrazine, Metolachlor, Alachlor, 2,4-D, Trifluralin, Glyphosate, Dicamba, Cyanazine, Simazine, and 2,4,5-T. Two of the most widely used pesticides are Atrazine and Alachlor. Atrazine is a preemergence or postemergence herbicide use to control broadleaf weeds and annual grasses. Atrazine is most commonly detected in ground and surface water due to its wide use, and its ability to persist in soil and move in water. Alachlor is a Restricted Use Pesticide (RUP) due to the potential to contaminate groundwater. The drinking water standard for Atrazine is 0.003mg/L and 0.002 mg/L for Alachlor.

Temperature, dissolved oxygen and pH are monitored for the protection of aquatic life. Temperature is important because it controls several aspects of water quality. Colder water hold more dissolved oxygen which is required by aquatic organisms. Plants grow more rapidly and use more oxygen in warmer water. Decomposition of organic matter which uses oxygen is accelerated in warmer water. Temperature can also determine the availability of toxic compounds such as ammonia. Since aquatic organisms are cold blooded, water temperature regulates their metabolism and ability to survive. The number and kinds of organisms that are found in streams or lakes is directly related to temperature. Certain organisms require a specific temperature range, such as trout, which require water temperatures below 20°C. Most aquatic organisms require a minimum concentration of dissolved oxygen to survive. In spring, surface waters of the lake mix with the water below through wind and thermal action. This mixing diminishes as the upper layer of water becomes warmer and less dense. Solar insulation during the summer months stratifies the lake into three zones. The upper warmer water zone is called the epilimnion and the lower cooler water zone is called the hypolimnion. The epilimnion and the hypolimnion zones are divided by a transition zone known as the metalimnion. The thermocline located within the metalimnion exhibits a rapid change in water temperature. During the summer months the hypolimnion may become anaerobic. In this anaerobic zone, chemical reduction of iron and manganese, or the production of methane and sulfides can occur. Iron rapidly oxidizes in aerobic environments, but manganese oxidizes slowly and can remain in the reduced state for long distances down stream even in aerobic environments. The degree of acidity of water is measured by a logarithmic scale ranging from 0 to 14 and is known as the pH scale. A reading of 7 indicates neutrality and readings below seven are acidic and above are alkaline. Most Missouri lakes range from 6 to 9 on the pH scale. The buffering capacity of water is the ability to neutralize acid better known as alkalinity. A high alkalinity concentration indicates an increased ability to neutralize pH and resist changes; whereas a low alkalinity

concentration indicates that a water body is vulnerable to changes in pH.

Conductivity is a measure of water's ability to conduct an electrical current. The ability to carry a current is often driven by the dissolved materials present in a water column. These materials can include dissolved ions and other materials in the water and thus are directly proportional to the concentration of total dissolved solids (TDS) present in the water column. Typically TDS concentrations represent 50-60% of the conductivity measurements.

Conductivity is also affected by water temperature. The warmer the water, the higher the conductivity. Conductivity in streams and rivers is affected by the geology of the area. Streams running through granite areas tend to have lower conductivity due to granite being composed of inert material, materials that do not ionize or dissolve into ionic compounds in water. On the other hand streams that run through areas of limestone or clay soils tend to have higher conductivity readings because of the presence of materials that ionize. Conductivity is useful as a general measure of water quality. A stream tends to have a relatively constant range of conductivity that once establish can be used as a baseline. Significant changes, either high or low, might indicate a source of pollution has been introduced into the water. The pollution source could be a treatment plant, which raises the conductivity; or an oil spill, which would lower the conductivity.

Redox or Oxidation-Reduction Potential (ORP) is a measure of a water system's capacity to either release or gain electrons. Oxidation involves an exchange of electrons between 2 atoms. The atom that loses an electron is oxidized and the one that gains an electron is reduced. ORP sensors measure the electrochemical potential between the solution and a reference electrode. Readings are expressed in millivolts. Positive readings indicate increased oxidizing potential and negative readings increased reduction. The ORP probe is essentially a millivolt meter, measuring the voltage across 2 electrodes with the water in between. ORP values are used much like pH values to determine water quality. While pH readings characterize the state of a system relative to the receiving or donating hydrogen ions (base or acid), ORP readings characterize the relative state of losing or gaining electrons. The conversion of ammonia (NH_3) requires an oxidizing environment to convert it into nitrites (NO_2) and nitrates (NO_3). Ammonia levels as low as 0.002mg/L can be harmful to fish. Generally ORP readings above 400mV are harmful to aquatic life. However, ORP is a non-specific measurement, which is a reflection of a combination of effects of all the dissolved materials in the water. Therefore, the measurement of ORP in relatively clean water has only limited utility unless a predominant redox-active material is known to be present.

Water clarity is intuitively used by the public to judge water quality. Secchi depth has been used for many years as a limnological characterization tool for characterizing water clarity. Secchi depth is a measure of light penetration into a waterbody and is a function of the absorption and scattering of light in the water. There are three characteristics of water which affect the penetration of light: (1) color of water, (2) amount of phytoplankton in the water column, and (3) amount of inorganic material in the water column. Secchi depth integrates the combined impacts of all three of these factors. Water transparency was measured using a Secchi disk. Secchi disk readings were taken at all lake sites.

2.3 Sediment

In accordance with EM-1110-2-1201, sediment samples should be taken to monitor and assess potential impacts to aquatic and human health. To assess ecological risk, sample values were compared against toxicity information published in the National Oceanic Atmospheric Administrations (NOAA) Screening Quick Reference Tables (SQRT) or similar references for ecological receptors in freshwater sediment. Without standards or other widely applicable numerical tools, NOAA scientists found it difficult to estimate the possible toxicological significance of chemical concentrations in sediment. Therefore, numerical sediment quality guidelines (SQG's) were developed as informal, interpretive tools. The SQGs were not promulgated as regulatory standards, but rather as informal, non-regulatory guidelines for interpreting chemical data from analyses of sediments. For potential ecological risk from inorganic contaminants, seven metals are typically of "most concern" with regards to fish and wildlife: Arsenic, Copper, Cadmium, Selenium, Mercury, Lead, and Zinc. Avian species are thought to be particularly sensitive to arsenic, and is also considered a carcinogenic, mutagenic, and teratogenic contaminant in a variety of species in elevated doses over time. Avian species are also known to be particularly sensitive to lead in the environment with effects ranging from mortality, reduced growth and reproductive output, behavior changes, blood chemistry alterations, and lesions of major organs. Finally, the embryo stages in fish and avian species are known to be the most sensitive to selenium affecting reproductive success.

For potential human health risk, there are no known values in Missouri for sediments. While not a direct correlation, sample results are compared against Missouri Risk Based Corrective Action (MRBCA) lowest default target levels for all soil types and exposure pathways for soils.

3.1 SUMMARY OF MONITORING RESULTS

3.2 Water Quality Summary

The monitoring program for Mark Twain Lake during Fiscal Year 2016 revealed good water quality when compared to limits established by the MDNR for general use, secondary contact, and indigenous aquatic life. Agricultural nutrient runoffs were primary concerns for the lake's water quality. Better land management practices, erosion control and buffering zones are methods used to reduce such contaminants from entering the lake. The St. Louis District personnel are available to work with lake personnel, area communities, and other agencies in the implementation of educational programs and planning to bring about the use of better management techniques to improve the lake's water quality. Due to unsafe conditions (high winds and heavy rain) on the lake on April 26, 2016 sample sites MTL-13, MTL-5 and MTL-77 were taken on May 6, 2016.

E. coli were sampled at the marinas to ensure that the marina areas are not being contaminated by boats with restroom facilities. Bacteria levels for both marinas were well below the Missouri standard of 235. We currently do not take enough samples in a month to calculate a geometric mean, so we mainly look at a high reading of 235/100ml of sample to trigger additional investigations. E. coli beach sample results for the Corps beaches were received from

the project office, and data for the state beach was received from MDNR were incorporated into this report. Beach samples were taken weekly during the recreation season. No Corps beach samples were above the Missouri standard for beaches. The state park beach did exceed the 235 limit on May 31, July 11, July 26, August 8, and August 15. However, the state uses a weekly geometric mean to determine beach status. In accordance with state law, the Missouri Department of Natural Resources will post signs notifying visitors that swimming is not recommended if the geometric mean of the weekly water quality sample results exceeds the equivalent of 190 E. coli colonies per 100 milliliters of water (190 mpn/100 ml). The state reserves the right to close a beach in the event of a documented health risk including things such as but not limited to wastewater bypass, extremely high sampling values, spills of hazardous chemicals, or localized outbreaks of an infectious disease.

Total iron and total manganese are sampled above the dam near the bottom of the channel (MTL-22-15), below the re-regulation dam (MTL-12), and in the spillway area (MTL-1). As was previously stated living organisms require trace amounts of metals, however excessive amounts can be harmful to the organism. Iron cycling is a function of oxidation-reduction processes. Iron oxidizes relatively rapidly (minutes to hours); therefore any iron released through the spillway will normally be oxidized in a short period of time. Iron did exceed the state standard at MTL-1 and MTL-22-15 on April 26. Manganese oxidizes slower and can persist in the reduced state long distances downstream even in aerobic environments. Missouri's standard for manganese is for drinking water and groundwater. Missouri does not have a manganese standard for aquatic life.

Nitrogen and phosphates are sampled at all sites. All sites exceeded the total phosphorous 0.05 mg/l standard at least once during the sampling period. Phosphorous levels at the lake sites were higher in April than in July or September. Approximately 0.28 inches of rain fell on April 26, 2016. This rain event may be the cause of the elevated levels for these sample sites. Phosphorous levels at sites MTL-11, MTL-1, and MTL-9 in July were higher than MTL-5 the other tributary and lake sites during that time frame. There was 0.32 inches of rain recorded the day prior to the sampling date, but no rain the day the sample was taken. Site MTL-66 was the most stable of the lake sites and MTL-1 and MTL-12 (below main dam and below re-reg dam) had the lowest total phosphorous results. This may be the result of the lake and re-regulation pool using phosphorous before reaching the dams. Total Phosphates are used or locked up as water travels down the lake. Because phosphorous in water is not considered directly toxic to humans and animals no drinking water standards have been established for phosphorous. However, phosphorous can cause health threats through the stimulation of toxic algal blooms and the resulting oxygen depletion. Nitrates can pose a threat to human and animal health. Nitrate in water is toxic at high levels and has been linked to toxic effects of livestock and to blue baby disease (methemoglobinemia) in infants. The Maximum Contaminant Level (MCL) for nitrate-N in drinking water is 10mg/L to protect babies 3 to 6 months of age. The Missouri Water Quality Standard for ammonia nitrogen ($\text{NH}_3\text{-N}$) is 15mg/L. Nitrate-Nitrogen did not exceed the 10mg/L standard at any site. The highest value recorded was 1.7mg/L at site MTL-13 (Elk Fork). Ammonia-Nitrogen tends to be constant throughout the lake. The increased levels of phosphate in combination with nitrogen and other lake conditions, such as temperature, pH and stagnant lake conditions, can lead to increased algae growth. Eutrophication is currently the most widespread water quality problem in the U.S. and many

other countries. Restoration of eutrophic waters requires the reduction of nonpoint inputs of phosphorous and nitrogen. The resulting detrimental effects of algae toxins and oxygen depletion could result in health problems for fish and other aquatic species as well as land animals utilizing the water supply. There were no signs of any of these effects during the site visits in 2016.

Chlorophyll *a* was sampled at 4 sites, MTL-22, MTL-33, MTL-66 and MTL-77. MTL-15 is a duplicate sample of MTL-66. Chlorophyll *a* is a green pigment found in plants. Missouri does not currently have a standard for chlorophyll. Chlorophyll *a* concentrations are an indicator of phytoplankton abundance and biomass. They can be an effective measure of trophic status, and used as a measure of water quality. High levels often indicate poor water quality and low levels suggest good conditions. However, elevated levels are not necessarily bad. It is the long term persistence of elevated levels that is the problem. It is natural for chlorophyll *a* levels to fluctuate over time. Chlorophyll *a* tends to be higher after storm events and during the summer months when water temperatures and light levels are elevated. Chlorophyll can reduce the clarity of the water and the amount of oxygen available to other organisms. Chlorophyll concentrations and cyanobacteria cell counts serve as proxies for the actual presence of algal toxins. Exposure to cyanobacteria or their toxins may produce allergic reactions such as skin rashes, eye irritations, respiratory symptoms, and in some cases more severe health effects. Microcystin is currently believed to be the most common cyanotoxin in lakes. EPA's current guidance as of December 2016 for recreational Ambient Water Quality Criteria (AWQC) for Cyanotoxins is 4ug/L for microcystins and 8ug/L for Cylindrospermopsin. Mark Twain Lake was in the moderate risk of exposure category for chlorophyll.

Seventy percent of the Mark Twain Lake watershed is used for agriculture and 50% of this is used for cropland. Atrazine and Alachlor are pesticides that were sampled at all sites. These chemicals are herbicides used to control weed growth. The state standard of 3.0ug/L for atrazine was exceeded on April 26, 2016 at MTL-9 and on May 6, 2016 at sites MTL-5 and MTL-13. All other sites were below the state standard on this date and all were below the state standards for the other sampling events. Stormwater runoff as a result of precipitation on April 26, may attribute to the higher levels on this date. There was no rain prior to May 6, 2016 to attribute higher levels at MTL-5 and MTL-13. These substances can enter water bodies as a result of drift during spraying, surface runoff, and leaching through soil. Cyanizine, Metolachlor, Trifluralin and Simazine are also analyzed as part of the pesticide screening. In order to eliminate pesticide contamination of waters it is important for the public to be educated and institute best management practices when using these chemicals.

Total Suspended Solids (TSS) and Total Volatile Suspended Solids (TVSS) samples are collected at all sites. Solids can affect water quality by increasing temperature through the absorption of sunlight by the particles in the water, which also affects the clarity of the water. This can then affect the amount of oxygen in the water. Total Suspended Solids in the tributaries were highest at site MTL-13 (Elk Fork) on July 14 and in the lake at MTL-66 on April 26. Precipitation prior to these sampling events may have contributed to these higher readings. Missouri does not currently have a standard for TSS or TVSS. However, literature suggests that Nonvolatile Suspended Solids (NVSS) which is a subdivision of TSS above 15mg/L could highly impair recreational lake use and a NVSS of 3 to 7mg/L might cause slight impairment.

Total Organic Carbon (TOC) is collected at all sites. TOC is an indicator of the organic character of water. The larger the carbon or organic content, the more oxygen is consumed. TOC tends to be higher in the summer months which may be a result of plant material, which had grown all summer and begins to decay. TOC was fairly consistent within the lake ranging from 4.5 to 6.6mg/L and in the tributaries from 4.2 to 9mg/L. Missouri does not currently have a standard for TOC.

Temperature and dissolved oxygen levels were taken at all sites. Measurements were taken at 1 meter intervals at the lake sites. During the summer months the lake stratifies and a boundary is formed between the upper warmer water and the lower cooler water. This transition area is known as the thermocline, the area where the temperature drops significantly. Oxygen levels can also change drastically as a function of depth. This area where the oxygen level significantly drops is called the oxycline. The depth of the thermocline and oxycline can have an effect on the aquatic organisms. Occasionally the thermocline and oxycline are at or near the same depth. The DO graphs for the sondes at the tailwater and re-reg dam is located in appendix C on pages C22 to C24.

pH is taken at all sites and at 1 meter intervals at lake sites. All sites were within the 6 to 9 pH range. Variances in pH can be caused by a rainfall event.

Conductivity and redox are taken at all sites and at 1 meter intervals at lake sites. Recommended standard for conductivity is 1,700 μ S/cm. Missouri does not currently have a standard for redox.

Secchi disk readings at sites 22 (above dam) and 33 (Lick Creek Arm near Hwy J) indicate that these sites tend to have better water clarity than the rest of the lake. This would seem to be reasonable since these sites are located closer to the dam which allows solids time to settle out of the water column as they travel down the lake. Readings could not be taken on April 26, 2016 at sites MTL-22 and MTL-66 due to weather conditions.

3.3 Sediment Summary

Sediment sampling was not conducted in 2016. Sediment sampling is normally conducted every 5 years if funding is available. Sediment sampling was last conducted in 2007.

It is recommended that the next round of sediment samples focus on organochlorines in freshwater sediment to assess potential chronic aquatic impacts (e.g. aldrin, chlordane, endrin, endosulfan, DDT, methoxychlor).

4.0 PLANNED 2017 STUDIES

The Mark Twain Lake water quality monitoring will continue in Fiscal Year 2017. A slight increase in funding will allow 4 sampling events in 2017. A restored number of sampling events would provide the ability to better evaluate water quality trends, better defend project

operations (lake levels, releases, maintenance projects, construction projects, etc.), to better confirm that we meet state water quality standards, and to better confirm that human health and safety are adequately protected. The sampling events are planned to be conducted between March and September in 2017. Mark Twain Lake provides drinking water to many communities and is a high usage recreational lake. The monitoring of water quality is imperative to assure the water quality is within acceptable limits for the designated usage.

The sampling sites include the following: Site 1 (MTL-1) Spillway, Site 5 (MTL-5) South Fork at Hwy D, Site 13 (MTL-13) Elk Fork at 715, Site 9 (MTL-9) Middle Fork at Hwy 15, Site 11 (MTL-11) North Fork at Hwy 36, Site 12 (MTL-12) below re-regulation dam, Site 22 (MTL-22) old river channel 1 mile up lake from dam, Site 33 (MTL-33) Lick Creek at Hwy J, Site 66 (MTL-66) South Fork at Hwy 107 bridge, and Site 77 (MTL-77) North Fork at Hwy 107 bridge. This combination of sites effectively represents the incoming contaminants and their effects on the lake.

A remote sensor was installed several years ago in the spillway to allow the project as well as water quality personnel to remotely monitor temperature and oxygen readings to avoid fish kills. During low flow, water is discharged through the after bay. This water is low in oxygen and can create a low oxygen area below the dam. The sensor allows the project to track oxygen levels below the dam and make appropriate adjustments to avoid a possible fish kill. Normally allowing water to spill through the tainter gates will alleviate low oxygen levels below the dam. In 2009 a remote sensor was installed in the re-reg pool near the re-reg dam to monitor the lower portion of the re-reg pool. Water quality personnel will continue to maintain and monitor these probes. A water quality monitoring station was installed in 2016, but was not fully operational. This pontoon was moored just upstream of the main dam in the lake. It will be installed again in 2017 and record the dissolved oxygen and temperature profile of the water column daily as well as anytime as needed. This will allow staff to identify the depth of the stratification layer and the depth at which the oxygen decreases. This information will allow staff to better understand the relationships between the lake levels, low dissolved oxygen depth, temperature control weir, and downstream (Re Regulation Pool) water quality during low flow conditions and power generation.

Sediment sampling will be conducted if funding is available.

APPENDIX A

DATA

LAB DATA

Site	Collection Date	Reported Result	Flag	Units	Parameter	MDL	PQL
MTL-1	4/26/16	0.20	<	UG/L	Alachlor	0.20	0.20
MTL-1	7/14/16	0.22	<	UG/L	Alachlor	0.22	0.22
MTL-1	9/7/16	0.22	<	UG/L	Alachlor	0.22	0.22
MTL-11	4/26/16	0.20	<	UG/L	Alachlor	0.20	0.20
MTL-11	7/14/16	0.20	<	UG/L	Alachlor	0.20	0.20
MTL-11	9/7/16	0.20	<	UG/L	Alachlor	0.20	0.20
MTL-12	4/26/16	0.20	<	UG/L	Alachlor	0.20	0.20
MTL-12	7/14/16	0.21	<	UG/L	Alachlor	0.21	0.21
MTL-12	9/7/16	0.20	<	UG/L	Alachlor	0.20	0.20
MTL-13	5/6/16	0.24	<	UG/L	Alachlor	0.24	0.24
MTL-13	7/14/16	0.20	<	UG/L	Alachlor	0.20	0.20
MTL-13	9/7/16	0.20	<	UG/L	Alachlor	0.20	0.20
MTL-15	4/26/16	0.21	<	UG/L	Alachlor	0.21	0.21
MTL-15	7/14/16	0.20	<	UG/L	Alachlor	0.20	0.20
MTL-15	9/7/16	0.20	<	UG/L	Alachlor	0.20	0.20
MTL-22	4/26/16	0.20	<	UG/L	Alachlor	0.20	0.20
MTL-22	7/14/16	0.20	<	UG/L	Alachlor	0.20	0.20
MTL-22	9/7/16	0.22	<	UG/L	Alachlor	0.22	0.22
MTL-33	4/26/16	0.20	<	UG/L	Alachlor	0.20	0.20
MTL-33	7/14/16	0.20	<	UG/L	Alachlor	0.20	0.20
MTL-33	9/7/16	0.22	<	UG/L	Alachlor	0.22	0.22
MTL-5	5/6/16	0.25	<	UG/L	Alachlor	0.25	0.25
MTL-5	7/14/16	0.22	<	UG/L	Alachlor	0.22	0.22
MTL-5	9/7/16	0.20	<	UG/L	Alachlor	0.20	0.20
MTL-66	4/26/16	0.20	<	UG/L	Alachlor	0.20	0.20
MTL-66	7/14/16	0.22	<	UG/L	Alachlor	0.22	0.22
MTL-66	9/7/16	0.20	<	UG/L	Alachlor	0.20	0.20
MTL-77	5/6/16	0.22	<	UG/L	Alachlor	0.22	0.22
MTL-77	7/14/16	0.20	<	UG/L	Alachlor	0.20	0.20
MTL-77	9/7/16	0.20	<	UG/L	Alachlor	0.20	0.20
MTL-9	4/26/16	0.20	<	UG/L	Alachlor	0.20	0.20
MTL-9	7/14/16	0.20	<	UG/L	Alachlor	0.20	0.20
MTL-9	9/7/16	0.20	<	UG/L	Alachlor	0.20	0.20
MTL-1	4/26/16	0.065		MG/L	Ammonia Nitrogen	0.030	0.030
MTL-1	7/14/16	0.25		MG/L	Ammonia Nitrogen	0.030	0.030
MTL-1	9/7/16	0.060		MG/L	Ammonia Nitrogen	0.030	0.030
MTL-11	4/26/16	0.054		MG/L	Ammonia Nitrogen	0.030	0.030
MTL-11	7/14/16	0.14		MG/L	Ammonia Nitrogen	0.030	0.030
MTL-11	9/7/16	0.041		MG/L	Ammonia Nitrogen	0.030	0.030
MTL-12	4/26/16	0.066		MG/L	Ammonia Nitrogen	0.030	0.030
MTL-12	7/14/16	0.14		MG/L	Ammonia Nitrogen	0.030	0.030
MTL-12	9/7/16	0.065		MG/L	Ammonia Nitrogen	0.030	0.030
MTL-13	5/6/16	0.16		MG/L	Ammonia Nitrogen	0.030	0.030
MTL-13	7/14/16	0.16		MG/L	Ammonia Nitrogen	0.030	0.030
MTL-13	9/7/16	0.061		MG/L	Ammonia Nitrogen	0.030	0.030
MTL-15	4/26/16	0.17		MG/L	Ammonia Nitrogen	0.030	0.030
MTL-15	7/14/16	0.10		MG/L	Ammonia Nitrogen	0.030	0.030
MTL-15	9/7/16	0.093		MG/L	Ammonia Nitrogen	0.030	0.030

Site	Collection Date	Reported Result	Flag	Units	Parameter	MDL	PQL
MTL-22	4/26/16	0.069		MG/L	Ammonia Nitrogen	0.030	0.030
MTL-22	7/14/16	0.089		MG/L	Ammonia Nitrogen	0.030	0.030
MTL-22	9/7/16	0.048		MG/L	Ammonia Nitrogen	0.030	0.030
MTL-22-15	4/26/16	0.048		MG/L	Ammonia Nitrogen	0.030	0.030
MTL-22-15	7/14/16	0.11		MG/L	Ammonia Nitrogen	0.030	0.030
MTL-22-15	9/7/16	0.10		MG/L	Ammonia Nitrogen	0.030	0.030
MTL-33	4/26/16	0.062		MG/L	Ammonia Nitrogen	0.030	0.030
MTL-33	7/14/16	0.10		MG/L	Ammonia Nitrogen	0.030	0.030
MTL-33	9/7/16	0.088		MG/L	Ammonia Nitrogen	0.030	0.030
MTL-5	5/6/16	0.28		MG/L	Ammonia Nitrogen	0.030	0.030
MTL-5	7/14/16	0.10		MG/L	Ammonia Nitrogen	0.030	0.030
MTL-5	9/7/16	0.074		MG/L	Ammonia Nitrogen	0.030	0.030
MTL-66	4/26/16	0.066		MG/L	Ammonia Nitrogen	0.030	0.030
MTL-66	7/14/16	0.085		MG/L	Ammonia Nitrogen	0.030	0.030
MTL-66	9/7/16	0.058		MG/L	Ammonia Nitrogen	0.030	0.030
MTL-77	5/6/16	0.20		MG/L	Ammonia Nitrogen	0.030	0.030
MTL-77	7/14/16	0.078		MG/L	Ammonia Nitrogen	0.030	0.030
MTL-77	9/7/16	0.12		MG/L	Ammonia Nitrogen	0.030	0.030
MTL-9	4/26/16	0.13		MG/L	Ammonia Nitrogen	0.030	0.030
MTL-9	7/14/16	0.20		MG/L	Ammonia Nitrogen	0.030	0.030
MTL-9	9/7/16	0.062		MG/L	Ammonia Nitrogen	0.030	0.030
MTL-1	4/26/16	0.20	<	UG/L	Atrazine	0.20	0.20
MTL-1	7/14/16	0.43		UG/L	Atrazine	0.22	0.22
MTL-1	9/7/16	0.22	<	UG/L	Atrazine	0.22	0.22
MTL-11	4/26/16	1.1		UG/L	Atrazine	0.20	0.20
MTL-11	7/14/16	0.43		UG/L	Atrazine	0.20	0.20
MTL-11	9/7/16	0.20	<	UG/L	Atrazine	0.20	0.20
MTL-12	4/26/16	0.20	<	UG/L	Atrazine	0.20	0.20
MTL-12	7/14/16	0.37		UG/L	Atrazine	0.21	0.21
MTL-12	9/7/16	0.20	<	UG/L	Atrazine	0.20	0.20
MTL-13	5/6/16	5.3		UG/L	Atrazine	0.24	0.24
MTL-13	7/14/16	0.24		UG/L	Atrazine	0.20	0.20
MTL-13	9/7/16	0.20	<	UG/L	Atrazine	0.20	0.20
MTL-15	4/26/16	0.75		UG/L	Atrazine	0.21	0.21
MTL-15	7/14/16	0.40		UG/L	Atrazine	0.20	0.20
MTL-15	9/7/16	0.20	<	UG/L	Atrazine	0.20	0.20
MTL-22	4/26/16	0.20	<	UG/L	Atrazine	0.20	0.20
MTL-22	7/14/16	0.40		UG/L	Atrazine	0.20	0.20
MTL-22	9/7/16	0.22	<	UG/L	Atrazine	0.22	0.22
MTL-33	4/26/16	0.20	<	UG/L	Atrazine	0.20	0.20
MTL-33	7/14/16	0.37		UG/L	Atrazine	0.20	0.20
MTL-33	9/7/16	0.22	<	UG/L	Atrazine	0.22	0.22
MTL-5	5/6/16	14.1		UG/L	Atrazine	0.50	0.50
MTL-5	7/14/16	0.50		UG/L	Atrazine	0.22	0.22
MTL-5	9/7/16	0.20	<	UG/L	Atrazine	0.20	0.20
MTL-66	4/26/16	0.84		UG/L	Atrazine	0.20	0.20
MTL-66	7/14/16	0.39		UG/L	Atrazine	0.22	0.22
MTL-66	9/7/16	0.20	<	UG/L	Atrazine	0.20	0.20

Site	Collection Date	Reported Result	Flag	Units	Parameter	MDL	PQL
MTL-77	5/6/16	0.31		UG/L	Atrazine	0.22	0.22
MTL-77	7/14/16	0.34		UG/L	Atrazine	0.20	0.20
MTL-77	9/7/16	0.20	<	UG/L	Atrazine	0.20	0.20
MTL-9	4/26/16	5.7		UG/L	Atrazine	0.20	0.20
MTL-9	7/14/16	0.20	<	UG/L	Atrazine	0.20	0.20
MTL-9	9/7/16	0.20	<	UG/L	Atrazine	0.20	0.20
MTL-15	4/26/16	51.3		MG/CU.M.	Chlorophyll a	1.0	1.0
MTL-15	7/14/16	12.1		MG/CU.M.	Chlorophyll a	2.0	2.0
MTL-15	9/7/16	31.6		MG/CU.M.	Chlorophyll a	1.0	1.0
MTL-22	4/26/16	35.2		MG/CU.M.	Chlorophyll a	1.0	1.0
MTL-22	7/14/16	12.1		MG/CU.M.	Chlorophyll a	2.0	2.0
MTL-22	9/7/16	18.4		MG/CU.M.	Chlorophyll a	1.0	1.0
MTL-33	4/26/16	15.3		MG/CU.M.	Chlorophyll a	1.0	1.0
MTL-33	7/14/16	12.1		MG/CU.M.	Chlorophyll a	2.0	2.0
MTL-33	9/7/16	17.5		MG/CU.M.	Chlorophyll a	1.0	1.0
MTL-66	4/26/16	49.6		MG/CU.M.	Chlorophyll a	1.0	1.0
MTL-66	7/14/16	12.1		MG/CU.M.	Chlorophyll a	2.0	2.0
MTL-66	9/7/16	27.3		MG/CU.M.	Chlorophyll a	1.0	1.0
MTL-77	5/6/16	12.8		MG/CU.M.	Chlorophyll a	1.0	1.0
MTL-77	7/14/16	10.7		MG/CU.M.	Chlorophyll a	2.0	2.0
MTL-77	9/7/16	20.9		MG/CU.M.	Chlorophyll a	1.0	1.0
MTL-1	4/26/16	0.20	<	UG/L	Chlorpyrifos	0.20	0.20
MTL-1	7/14/16	0.22	<	UG/L	Chlorpyrifos	0.22	0.22
MTL-1	9/7/16	0.22	<	UG/L	Chlorpyrifos	0.22	0.22
MTL-11	4/26/16	0.20	<	UG/L	Chlorpyrifos	0.20	0.20
MTL-11	7/14/16	0.20	<	UG/L	Chlorpyrifos	0.20	0.20
MTL-11	9/7/16	0.20	<	UG/L	Chlorpyrifos	0.20	0.20
MTL-12	4/26/16	0.20	<	UG/L	Chlorpyrifos	0.20	0.20
MTL-12	7/14/16	0.21	<	UG/L	Chlorpyrifos	0.21	0.21
MTL-12	9/7/16	0.20	<	UG/L	Chlorpyrifos	0.20	0.20
MTL-13	5/6/16	0.24	<	UG/L	Chlorpyrifos	0.24	0.24
MTL-13	7/14/16	0.20	<	UG/L	Chlorpyrifos	0.20	0.20
MTL-13	9/7/16	0.20	<	UG/L	Chlorpyrifos	0.20	0.20
MTL-15	4/26/16	0.21	<	UG/L	Chlorpyrifos	0.21	0.21
MTL-15	7/14/16	0.20	<	UG/L	Chlorpyrifos	0.20	0.20
MTL-15	9/7/16	0.20	<	UG/L	Chlorpyrifos	0.20	0.20
MTL-22	4/26/16	0.20	<	UG/L	Chlorpyrifos	0.20	0.20
MTL-22	7/14/16	0.20	<	UG/L	Chlorpyrifos	0.20	0.20
MTL-22	9/7/16	0.22	<	UG/L	Chlorpyrifos	0.22	0.22
MTL-33	4/26/16	0.20	<	UG/L	Chlorpyrifos	0.20	0.20
MTL-33	7/14/16	0.20	<	UG/L	Chlorpyrifos	0.20	0.20
MTL-33	9/7/16	0.22	<	UG/L	Chlorpyrifos	0.22	0.22
MTL-5	5/6/16	0.25	<	UG/L	Chlorpyrifos	0.25	0.25
MTL-5	7/14/16	0.22	<	UG/L	Chlorpyrifos	0.22	0.22
MTL-5	9/7/16	0.20	<	UG/L	Chlorpyrifos	0.20	0.20
MTL-66	4/26/16	0.20	<	UG/L	Chlorpyrifos	0.20	0.20
MTL-66	7/14/16	0.22	<	UG/L	Chlorpyrifos	0.22	0.22
MTL-66	9/7/16	0.20	<	UG/L	Chlorpyrifos	0.20	0.20
MTL-77	5/6/16	0.22	<	UG/L	Chlorpyrifos	0.22	0.22
MTL-77	7/14/16	0.20	<	UG/L	Chlorpyrifos	0.20	0.20

Site	Collection Date	Reported Result	Flag	Units	Parameter	MDL	PQL
MTL-77	9/7/16	0.20	<	UG/L	Chlorpyrifos	0.20	0.20
MTL-9	4/26/16	0.20	<	UG/L	Chlorpyrifos	0.20	0.20
MTL-9	7/14/16	0.20	<	UG/L	Chlorpyrifos	0.20	0.20
MTL-9	9/7/16	0.20	<	UG/L	Chlorpyrifos	0.20	0.20
MTL-1	4/26/16	0.20	<	UG/L	Cyanazine	0.20	0.20
MTL-1	7/14/16	0.22	<	UG/L	Cyanazine	0.22	0.22
MTL-1	9/7/16	0.22	<	UG/L	Cyanazine	0.22	0.22
MTL-11	4/26/16	0.20	<	UG/L	Cyanazine	0.20	0.20
MTL-11	7/14/16	0.20	<	UG/L	Cyanazine	0.20	0.20
MTL-11	9/7/16	0.20	<	UG/L	Cyanazine	0.20	0.20
MTL-12	4/26/16	0.20	<	UG/L	Cyanazine	0.20	0.20
MTL-12	7/14/16	0.21	<	UG/L	Cyanazine	0.21	0.21
MTL-12	9/7/16	0.20	<	UG/L	Cyanazine	0.20	0.20
MTL-13	5/6/16	0.24	<	UG/L	Cyanazine	0.24	0.24
MTL-13	7/14/16	0.20	<	UG/L	Cyanazine	0.20	0.20
MTL-13	9/7/16	0.20	<	UG/L	Cyanazine	0.20	0.20
MTL-15	4/26/16	0.21	<	UG/L	Cyanazine	0.21	0.21
MTL-15	7/14/16	0.20	<	UG/L	Cyanazine	0.20	0.20
MTL-15	9/7/16	0.20	<	UG/L	Cyanazine	0.20	0.20
MTL-22	4/26/16	0.20	<	UG/L	Cyanazine	0.20	0.20
MTL-22	7/14/16	0.20	<	UG/L	Cyanazine	0.20	0.20
MTL-22	9/7/16	0.22	<	UG/L	Cyanazine	0.22	0.22
MTL-33	4/26/16	0.20	<	UG/L	Cyanazine	0.20	0.20
MTL-33	7/14/16	0.20	<	UG/L	Cyanazine	0.20	0.20
MTL-33	9/7/16	0.22	<	UG/L	Cyanazine	0.22	0.22
MTL-5	5/6/16	0.25	<	UG/L	Cyanazine	0.25	0.25
MTL-5	7/14/16	0.22	<	UG/L	Cyanazine	0.22	0.22
MTL-5	9/7/16	0.20	<	UG/L	Cyanazine	0.20	0.20
MTL-66	4/26/16	0.20	<	UG/L	Cyanazine	0.20	0.20
MTL-66	7/14/16	0.22	<	UG/L	Cyanazine	0.22	0.22
MTL-66	9/7/16	0.20	<	UG/L	Cyanazine	0.20	0.20
MTL-77	5/6/16	0.22	<	UG/L	Cyanazine	0.22	0.22
MTL-77	7/14/16	0.20	<	UG/L	Cyanazine	0.20	0.20
MTL-77	9/7/16	0.20	<	UG/L	Cyanazine	0.20	0.20
MTL-9	4/26/16	0.20	<	UG/L	Cyanazine	0.20	0.20
MTL-9	7/14/16	0.20	<	UG/L	Cyanazine	0.20	0.20
MTL-9	9/7/16	0.20	<	UG/L	Cyanazine	0.20	0.20
BJ				COL/100			
MARINA	7/14/16	7.0		ML	E. Coliform	1.0	1.0
BJ				COL/100			
MARINA	9/7/16	2.0		ML	E. Coliform	1.0	1.0
IC				COL/100			
MARINA	7/14/16	1.0		ML	E. Coliform	1.0	1.0
IC				COL/100			
MARINA	9/7/16	3.0		ML	E. Coliform	1.0	1.0
MTL-1	4/26/16	2.5		MG/L	Iron	0.050	0.10
MTL-1	7/14/16	0.35		MG/L	Iron	0.050	0.10
MTL-1	9/7/16	0.14		MG/L	Iron	0.050	0.10
MTL-12	4/26/16	1.9		MG/L	Iron	0.050	0.10
MTL-12	7/14/16	0.66		MG/L	Iron	0.050	0.10
MTL-12	9/7/16	0.23		MG/L	Iron	0.050	0.10

Site	Collection Date	Reported Result	Flag	Units	Parameter	MDL	PQL
MTL-22-15	4/26/16	2.5		MG/L	Iron	0.050	0.10
MTL-22-15	7/14/16	0.13		MG/L	Iron	0.050	0.10
MTL-22-15	9/7/16	0.11		MG/L	Iron	0.050	0.10
MTL-1	4/26/16	0.048		MG/L	Manganese	0.0050	0.010
MTL-1	7/14/16	0.018		MG/L	Manganese	0.0050	0.010
MTL-1	9/7/16	0.051		MG/L	Manganese	0.0050	0.010
MTL-12	4/26/16	0.16		MG/L	Manganese	0.0050	0.010
MTL-12	7/14/16	0.063		MG/L	Manganese	0.0050	0.010
MTL-12	9/7/16	0.066		MG/L	Manganese	0.0050	0.010
MTL-22-15	4/26/16	0.042		MG/L	Manganese	0.0050	0.010
MTL-22-15	7/14/16	0.020		MG/L	Manganese	0.0050	0.010
MTL-22-15	9/7/16	0.020		MG/L	Manganese	0.0050	0.010
MTL-1	4/26/16	0.20 <		UG/L	Metolachlor	0.20	0.20
MTL-1	7/14/16	1.8		UG/L	Metolachlor	0.22	0.22
MTL-1	9/7/16	0.68		UG/L	Metolachlor	0.22	0.22
MTL-11	4/26/16	0.30		UG/L	Metolachlor	0.20	0.20
MTL-11	7/14/16	1.5		UG/L	Metolachlor	0.20	0.20
MTL-11	9/7/16	0.20 <		UG/L	Metolachlor	0.20	0.20
MTL-12	4/26/16	0.20 <		UG/L	Metolachlor	0.20	0.20
MTL-12	7/14/16	1.5		UG/L	Metolachlor	0.21	0.21
MTL-12	9/7/16	0.57		UG/L	Metolachlor	0.20	0.20
MTL-13	5/6/16	2.2		UG/L	Metolachlor	0.24	0.24
MTL-13	7/14/16	0.80		UG/L	Metolachlor	0.20	0.20
MTL-13	9/7/16	0.20 <		UG/L	Metolachlor	0.20	0.20
MTL-15	4/26/16	0.25		UG/L	Metolachlor	0.21	0.21
MTL-15	7/14/16	2.0		UG/L	Metolachlor	0.20	0.20
MTL-15	9/7/16	0.31		UG/L	Metolachlor	0.20	0.20
MTL-22	4/26/16	0.20 <		UG/L	Metolachlor	0.20	0.20
MTL-22	7/14/16	1.5		UG/L	Metolachlor	0.20	0.20
MTL-22	9/7/16	0.62		UG/L	Metolachlor	0.22	0.22
MTL-33	4/26/16	0.20 <		UG/L	Metolachlor	0.20	0.20
MTL-33	7/14/16	1.4		UG/L	Metolachlor	0.20	0.20
MTL-33	9/7/16	0.67		UG/L	Metolachlor	0.22	0.22
MTL-5	5/6/16	6.8		UG/L	Metolachlor	0.25	0.25
MTL-5	7/14/16	1.2		UG/L	Metolachlor	0.22	0.22
MTL-5	9/7/16	0.20 <		UG/L	Metolachlor	0.20	0.20
MTL-66	4/26/16	0.28		UG/L	Metolachlor	0.20	0.20
MTL-66	7/14/16	2.0		UG/L	Metolachlor	0.22	0.22
MTL-66	9/7/16	0.28		UG/L	Metolachlor	0.20	0.20
MTL-77	5/6/16	0.22 <		UG/L	Metolachlor	0.22	0.22
MTL-77	7/14/16	2.0		UG/L	Metolachlor	0.20	0.20
MTL-77	9/7/16	0.46		UG/L	Metolachlor	0.20	0.20
MTL-9	4/26/16	1.1		UG/L	Metolachlor	0.20	0.20
MTL-9	7/14/16	0.57		UG/L	Metolachlor	0.20	0.20
MTL-9	9/7/16	0.57		UG/L	Metolachlor	0.20	0.20
MTL-1	4/26/16	0.20 <		UG/L	Metribuzin	0.20	0.20

Site	Collection Date	Reported Result	Flag	Units	Parameter	MDL	PQL
MTL-1	7/14/16	0.22	<	UG/L	Metribuzin	0.22	0.22
MTL-1	9/7/16	0.22	<	UG/L	Metribuzin	0.22	0.22
MTL-11	4/26/16	0.20	<	UG/L	Metribuzin	0.20	0.20
MTL-11	7/14/16	0.20	<	UG/L	Metribuzin	0.20	0.20
MTL-11	9/7/16	0.20	<	UG/L	Metribuzin	0.20	0.20
MTL-12	4/26/16	0.20	<	UG/L	Metribuzin	0.20	0.20
MTL-12	7/14/16	0.21	<	UG/L	Metribuzin	0.21	0.21
MTL-12	9/7/16	0.20	<	UG/L	Metribuzin	0.20	0.20
MTL-13	5/6/16	0.24	<	UG/L	Metribuzin	0.24	0.24
MTL-13	7/14/16	0.20	<	UG/L	Metribuzin	0.20	0.20
MTL-13	9/7/16	0.20	<	UG/L	Metribuzin	0.20	0.20
MTL-15	4/26/16	0.21	<	UG/L	Metribuzin	0.21	0.21
MTL-15	7/14/16	0.20	<	UG/L	Metribuzin	0.20	0.20
MTL-15	9/7/16	0.20	<	UG/L	Metribuzin	0.20	0.20
MTL-22	4/26/16	0.20	<	UG/L	Metribuzin	0.20	0.20
MTL-22	7/14/16	0.20	<	UG/L	Metribuzin	0.20	0.20
MTL-22	9/7/16	0.22	<	UG/L	Metribuzin	0.22	0.22
MTL-33	4/26/16	0.20	<	UG/L	Metribuzin	0.20	0.20
MTL-33	7/14/16	0.20	<	UG/L	Metribuzin	0.20	0.20
MTL-33	9/7/16	0.22	<	UG/L	Metribuzin	0.22	0.22
MTL-5	5/6/16	0.39		UG/L	Metribuzin	0.25	0.25
MTL-5	7/14/16	0.22	<	UG/L	Metribuzin	0.22	0.22
MTL-5	9/7/16	0.20	<	UG/L	Metribuzin	0.20	0.20
MTL-66	4/26/16	0.20	<	UG/L	Metribuzin	0.20	0.20
MTL-66	7/14/16	0.22	<	UG/L	Metribuzin	0.22	0.22
MTL-66	9/7/16	0.20	<	UG/L	Metribuzin	0.20	0.20
MTL-77	5/6/16	0.22	<	UG/L	Metribuzin	0.22	0.22
MTL-77	7/14/16	0.20	<	UG/L	Metribuzin	0.20	0.20
MTL-77	9/7/16	0.20	<	UG/L	Metribuzin	0.20	0.20
MTL-9	4/26/16	0.20	<	UG/L	Metribuzin	0.20	0.20
MTL-9	7/14/16	0.20	<	UG/L	Metribuzin	0.20	0.20
MTL-9	9/7/16	0.20	<	UG/L	Metribuzin	0.20	0.20
MTL-1	4/26/16	1.1		MG/L	Nitrate as Nitrogen	0.040	0.040
MTL-1	7/14/16	0.71		MG/L	Nitrate as Nitrogen	0.040	0.040
MTL-1	9/7/16	0.049		MG/L	Nitrate as Nitrogen	0.020	0.020
MTL-11	4/26/16	0.074		MG/L	Nitrate as Nitrogen	0.040	0.040
MTL-11	7/14/16	0.31		MG/L	Nitrate as Nitrogen	0.040	0.040
MTL-11	9/7/16	0.020	<	MG/L	Nitrate as Nitrogen	0.020	0.020
MTL-12	4/26/16	1.0		MG/L	Nitrate as Nitrogen	0.040	0.040
MTL-12	7/14/16	0.70		MG/L	Nitrate as Nitrogen	0.040	0.040
MTL-12	9/7/16	0.064		MG/L	Nitrate as Nitrogen	0.020	0.020
MTL-13	5/6/16	1.7		MG/L	Nitrate as Nitrogen	0.040	0.040
MTL-13	7/14/16	0.42		MG/L	Nitrate as Nitrogen	0.040	0.040
MTL-13	9/7/16	0.53		MG/L	Nitrate as Nitrogen	0.020	0.020
MTL-15	4/26/16	0.47		MG/L	Nitrate as Nitrogen	0.040	0.040
MTL-15	7/14/16	0.64		MG/L	Nitrate as Nitrogen	0.040	0.040
MTL-15	9/7/16	0.020	<	MG/L	Nitrate as Nitrogen	0.020	0.020
MTL-22	4/26/16	1.1		MG/L	Nitrate as Nitrogen	0.040	0.040
MTL-22	7/14/16	0.89		MG/L	Nitrate as Nitrogen	0.040	0.040
MTL-22	9/7/16	0.020	<	MG/L	Nitrate as Nitrogen	0.020	0.020

Site	Collection Date	Reported Result	Flag	Units	Parameter	MDL	PQL
MTL-22-15	4/26/16	1.1		MG/L	Nitrate as Nitrogen	0.040	0.040
MTL-22-15	7/14/16	0.77		MG/L	Nitrate as Nitrogen	0.040	0.040
MTL-22-15	9/7/16	0.020	<	MG/L	Nitrate as Nitrogen	0.020	0.020
MTL-33	4/26/16	1.1		MG/L	Nitrate as Nitrogen	0.040	0.040
MTL-33	7/14/16	0.57		MG/L	Nitrate as Nitrogen	0.040	0.040
MTL-33	9/7/16	0.020	<	MG/L	Nitrate as Nitrogen	0.020	0.020
MTL-5	5/6/16	1.3		MG/L	Nitrate as Nitrogen	0.040	0.040
MTL-5	7/14/16	0.73		MG/L	Nitrate as Nitrogen	0.040	0.040
MTL-5	9/7/16	0.020	<	MG/L	Nitrate as Nitrogen	0.020	0.020
MTL-66	4/26/16	0.50		MG/L	Nitrate as Nitrogen	0.040	0.040
MTL-66	7/14/16	0.84		MG/L	Nitrate as Nitrogen	0.040	0.040
MTL-66	9/7/16	0.020	<	MG/L	Nitrate as Nitrogen	0.020	0.020
MTL-77	5/6/16	0.86		MG/L	Nitrate as Nitrogen	0.040	0.040
MTL-77	7/14/16	0.52		MG/L	Nitrate as Nitrogen	0.040	0.040
MTL-77	9/7/16	0.020	<	MG/L	Nitrate as Nitrogen	0.020	0.020
MTL-9	4/26/16	0.60		MG/L	Nitrate as Nitrogen	0.040	0.040
MTL-9	7/14/16	0.32		MG/L	Nitrate as Nitrogen	0.040	0.040
MTL-9	9/7/16	0.52		MG/L	Nitrate as Nitrogen	0.020	0.020
MTL-1	4/26/16	0.20	<	UG/L	Pendimethalin	0.20	0.20
MTL-1	7/14/16	0.22	<	UG/L	Pendimethalin	0.22	0.22
MTL-1	9/7/16	0.22	<	UG/L	Pendimethalin	0.22	0.22
MTL-11	4/26/16	0.20	<	UG/L	Pendimethalin	0.20	0.20
MTL-11	7/14/16	0.20	<	UG/L	Pendimethalin	0.20	0.20
MTL-11	9/7/16	0.20	<	UG/L	Pendimethalin	0.20	0.20
MTL-12	4/26/16	0.20	<	UG/L	Pendimethalin	0.20	0.20
MTL-12	7/14/16	0.21	<	UG/L	Pendimethalin	0.21	0.21
MTL-12	9/7/16	0.20	<	UG/L	Pendimethalin	0.20	0.20
MTL-13	5/6/16	0.24	<	UG/L	Pendimethalin	0.24	0.24
MTL-13	7/14/16	0.20	<	UG/L	Pendimethalin	0.20	0.20
MTL-13	9/7/16	0.20	<	UG/L	Pendimethalin	0.20	0.20
MTL-15	4/26/16	0.21	<	UG/L	Pendimethalin	0.21	0.21
MTL-15	7/14/16	0.20	<	UG/L	Pendimethalin	0.20	0.20
MTL-15	9/7/16	0.20	<	UG/L	Pendimethalin	0.20	0.20
MTL-22	4/26/16	0.20	<	UG/L	Pendimethalin	0.20	0.20
MTL-22	7/14/16	0.20	<	UG/L	Pendimethalin	0.20	0.20
MTL-22	9/7/16	0.22	<	UG/L	Pendimethalin	0.22	0.22
MTL-33	4/26/16	0.20	<	UG/L	Pendimethalin	0.20	0.20
MTL-33	7/14/16	0.20	<	UG/L	Pendimethalin	0.20	0.20
MTL-33	9/7/16	0.22	<	UG/L	Pendimethalin	0.22	0.22
MTL-5	5/6/16	0.25	<	UG/L	Pendimethalin	0.25	0.25
MTL-5	7/14/16	0.22	<	UG/L	Pendimethalin	0.22	0.22
MTL-5	9/7/16	0.20	<	UG/L	Pendimethalin	0.20	0.20
MTL-66	4/26/16	0.20	<	UG/L	Pendimethalin	0.20	0.20
MTL-66	7/14/16	0.22	<	UG/L	Pendimethalin	0.22	0.22
MTL-66	9/7/16	0.20	<	UG/L	Pendimethalin	0.20	0.20
MTL-77	5/6/16	0.22	<	UG/L	Pendimethalin	0.22	0.22
MTL-77	7/14/16	0.20	<	UG/L	Pendimethalin	0.20	0.20
MTL-77	9/7/16	0.20	<	UG/L	Pendimethalin	0.20	0.20

Site	Collection Date	Reported Result	Flag	Units	Parameter	MDL	PQL
MTL-9	4/26/16	0.20	<	UG/L	Pendimethalin	0.20	0.20
MTL-9	7/14/16	0.20	<	UG/L	Pendimethalin	0.20	0.20
MTL-9	9/7/16	0.20	<	UG/L	Pendimethalin	0.20	0.20
MTL-15	4/26/16	6.7		MG/C.U.M.	Pheophytin a	1.0	1.0
MTL-15	7/14/16	2.0	<	MG/C.U.M.	Pheophytin a	2.0	2.0
MTL-15	9/7/16	3.7		MG/C.U.M.	Pheophytin a	1.0	1.0
MTL-22	4/26/16	1.9		MG/C.U.M.	Pheophytin a	1.0	1.0
MTL-22	7/14/16	2.0	<	MG/C.U.M.	Pheophytin a	2.0	2.0
MTL-22	9/7/16	3.2		MG/C.U.M.	Pheophytin a	1.0	1.0
MTL-33	4/26/16	1.2		MG/C.U.M.	Pheophytin a	1.0	1.0
MTL-33	7/14/16	2.0	<	MG/C.U.M.	Pheophytin a	2.0	2.0
MTL-33	9/7/16	3.1		MG/C.U.M.	Pheophytin a	1.0	1.0
MTL-66	4/26/16	6.7		MG/C.U.M.	Pheophytin a	1.0	1.0
MTL-66	7/14/16	2.0	<	MG/C.U.M.	Pheophytin a	2.0	2.0
MTL-66	9/7/16	4.4		MG/C.U.M.	Pheophytin a	1.0	1.0
MTL-77	5/6/16	1.8		MG/C.U.M.	Pheophytin a	1.0	1.0
MTL-77	7/14/16	2.0	<	MG/C.U.M.	Pheophytin a	2.0	2.0
MTL-77	9/7/16	3.9		MG/C.U.M.	Pheophytin a	1.0	1.0
MTL-1	4/26/16	0.26		MG/L	Phosphorus	0.010	0.010
MTL-1	7/14/16	0.052		MG/L	Phosphorus	0.010	0.010
MTL-1	9/7/16	0.044		MG/L	Phosphorus	0.010	0.010
MTL-11	4/26/16	0.20		MG/L	Phosphorus	0.010	0.010
MTL-11	7/14/16	0.53		MG/L	Phosphorus	0.010	0.010
MTL-11	9/7/16	0.36		MG/L	Phosphorus	0.010	0.010
MTL-12	4/26/16	0.30		MG/L	Phosphorus	0.010	0.010
MTL-12	7/14/16	0.090		MG/L	Phosphorus	0.010	0.010
MTL-12	9/7/16	0.069		MG/L	Phosphorus	0.010	0.010
MTL-13	5/6/16	0.30		MG/L	Phosphorus	0.010	0.010
MTL-13	7/14/16	1.5		MG/L	Phosphorus	0.010	0.010
MTL-13	9/7/16	0.18		MG/L	Phosphorus	0.010	0.010
MTL-15	4/26/16	0.12		MG/L	Phosphorus	0.010	0.010
MTL-15	7/14/16	0.077		MG/L	Phosphorus	0.010	0.010
MTL-15	9/7/16	0.098		MG/L	Phosphorus	0.010	0.010
MTL-22	4/26/16	0.24		MG/L	Phosphorus	0.010	0.010
MTL-22	7/14/16	0.036		MG/L	Phosphorus	0.010	0.010
MTL-22	9/7/16	0.044		MG/L	Phosphorus	0.010	0.010
MTL-22-							
15	4/26/16	0.21		MG/L	Phosphorus	0.010	0.010
MTL-22-							
15	7/14/16	0.031		MG/L	Phosphorus	0.010	0.010
MTL-22-							
15	9/7/16	0.049		MG/L	Phosphorus	0.010	0.010
MTL-33	4/26/16	0.26		MG/L	Phosphorus	0.010	0.010
MTL-33	7/14/16	0.010	<	MG/L	Phosphorus	0.010	0.010
MTL-33	9/7/16	0.054		MG/L	Phosphorus	0.010	0.010
MTL-5	5/6/16	0.28		MG/L	Phosphorus	0.010	0.010
MTL-5	7/14/16	0.25		MG/L	Phosphorus	0.010	0.010
MTL-5	9/7/16	0.12		MG/L	Phosphorus	0.010	0.010
MTL-66	4/26/16	0.12		MG/L	Phosphorus	0.010	0.010
MTL-66	7/14/16	0.11		MG/L	Phosphorus	0.010	0.010
MTL-66	9/7/16	0.098		MG/L	Phosphorus	0.010	0.010

Site	Collection Date	Reported Result	Flag	Units	Parameter	MDL	PQL	
MTL-77	5/6/16	0.22		MG/L	Phosphorus	0.010	0.010	
MTL-77	7/14/16	0.098		MG/L	Phosphorus	0.010	0.010	
MTL-77	9/7/16	0.073		MG/L	Phosphorus	0.010	0.010	
MTL-9	4/26/16	0.45		MG/L	Phosphorus	0.010	0.010	
MTL-9	7/14/16	0.72		MG/L	Phosphorus	0.010	0.010	
MTL-9	9/7/16	0.28		MG/L	Phosphorus	0.010	0.010	
MTL-1	4/26/16	0.095		MG/L	Phosphorus, -ortho	0.010	0.010	
MTL-1	7/14/16	0.010	<	MG/L	Phosphorus, -ortho	0.010	0.010	
MTL-1	9/7/16	0.010	<	MG/L	Phosphorus, -ortho	0.010	0.010	
MTL-11	4/26/16	0.012		MG/L	Phosphorus, -ortho	0.010	0.010	
MTL-11	7/14/16	0.10		MG/L	Phosphorus, -ortho	0.010	0.010	
MTL-11	9/7/16	0.024		MG/L	Phosphorus, -ortho	0.010	0.010	
MTL-12	4/26/16	0.064		MG/L	Phosphorus, -ortho	0.010	0.010	
MTL-12	7/14/16	0.010	<	MG/L	Phosphorus, -ortho	0.010	0.010	
MTL-12	9/7/16	0.16		MG/L	Phosphorus, -ortho	0.010	0.010	
MTL-13	5/6/16	0.045		MG/L	Phosphorus, -ortho	0.010	0.010	
MTL-13	7/14/16	0.13		MG/L	Phosphorus, -ortho	0.010	0.010	
MTL-13	9/7/16	0.070		MG/L	Phosphorus, -ortho	0.010	0.010	
MTL-15	4/26/16	0.010	<	MG/L	Phosphorus, -ortho	0.010	0.010	
MTL-15	7/14/16	0.010		MG/L	Phosphorus, -ortho	0.010	0.010	
MTL-15	9/7/16	0.010	<	MG/L	Phosphorus, -ortho	0.010	0.010	
MTL-22	4/26/16	0.095		MG/L	Phosphorus, -ortho	0.010	0.010	
MTL-22	7/14/16	0.010	<	MG/L	Phosphorus, -ortho	0.010	0.010	
MTL-22	9/7/16	0.010	<	MG/L	Phosphorus, -ortho	0.010	0.010	
MTL-22-	15	4/26/16	0.11	MG/L	Phosphorus, -ortho	0.010	0.010	
MTL-22-	15	7/14/16	0.010	<	MG/L	Phosphorus, -ortho	0.010	0.010
MTL-22-	15	9/7/16	0.010	<	MG/L	Phosphorus, -ortho	0.010	0.010
MTL-33	4/26/16	0.095		MG/L	Phosphorus, -ortho	0.010	0.010	
MTL-33	7/14/16	0.010	<	MG/L	Phosphorus, -ortho	0.010	0.010	
MTL-33	9/7/16	0.010	<	MG/L	Phosphorus, -ortho	0.010	0.010	
MTL-5	5/6/16	0.072		MG/L	Phosphorus, -ortho	0.010	0.010	
MTL-5	7/14/16	0.13		MG/L	Phosphorus, -ortho	0.010	0.010	
MTL-5	9/7/16	0.029		MG/L	Phosphorus, -ortho	0.010	0.010	
MTL-66	4/26/16	0.010	<	MG/L	Phosphorus, -ortho	0.010	0.010	
MTL-66	7/14/16	0.013		MG/L	Phosphorus, -ortho	0.010	0.010	
MTL-66	9/7/16	0.010	<	MG/L	Phosphorus, -ortho	0.010	0.010	
MTL-77	5/6/16	0.047		MG/L	Phosphorus, -ortho	0.010	0.010	
MTL-77	7/14/16	0.010	<	MG/L	Phosphorus, -ortho	0.010	0.010	
MTL-77	9/7/16	0.010	<	MG/L	Phosphorus, -ortho	0.010	0.010	
MTL-9	4/26/16	0.053		MG/L	Phosphorus, -ortho	0.010	0.010	
MTL-9	7/14/16	0.100		MG/L	Phosphorus, -ortho	0.010	0.010	
MTL-9	9/7/16	0.064		MG/L	Phosphorus, -ortho	0.010	0.010	
					Solids, Total			
MTL-1	4/26/16	9.3		MG/L	Suspended Solids, Total	2.2	2.2	
MTL-1	7/14/16	5.2		MG/L	Suspended Solids, Total	2.0	2.0	
MTL-1	9/7/16	2.8		MG/L	Suspended Solids, Total	1.7	1.7	

Site	Collection Date	Reported Result	Flag	Units	Parameter	MDL	PQL
MTL-11	4/26/16	45.2		MG/L	Solids, Total Suspended Solids, Total	4.0	4.0
MTL-11	7/14/16	128		MG/L	Suspended Solids, Total	10.0	10.0
MTL-11	9/7/16	38.7		MG/L	Suspended Solids, Total	6.7	6.7
MTL-12	4/26/16	31.2		MG/L	Suspended Solids, Total	4.0	4.0
MTL-12	7/14/16	14.8		MG/L	Suspended Solids, Total	2.5	2.5
MTL-12	9/7/16	3.8		MG/L	Suspended Solids, Total	1.7	1.7
MTL-13	5/6/16	24.9		MG/L	Suspended Solids, Total	2.9	2.9
MTL-13	7/14/16	695		MG/L	Suspended Solids, Total	24.4	24.4
MTL-13	9/7/16	10.4		MG/L	Suspended Solids, Total	2.0	2.0
MTL-15	4/26/16	14.4		MG/L	Suspended Solids, Total	2.0	2.0
MTL-15	7/14/16	7.4		MG/L	Suspended Solids, Total	2.0	2.0
MTL-15	9/7/16	8.8		MG/L	Suspended Solids, Total	2.5	2.5
MTL-22	4/26/16	9.6		MG/L	Suspended Solids, Total	2.0	2.0
MTL-22	7/14/16	4.4		MG/L	Suspended Solids, Total	2.0	2.0
MTL-22	9/7/16	3.8		MG/L	Suspended Solids, Total	2.0	2.0
MTL-22-15	4/26/16	7.1		MG/L	Suspended Solids, Total	1.3	1.3
MTL-22-15	7/14/16	3.8		MG/L	Suspended Solids, Total	2.0	2.0
MTL-22-15	9/7/16	4.0		MG/L	Suspended Solids, Total	2.0	2.0
MTL-33	4/26/16	8.1		MG/L	Suspended Solids, Total	1.3	1.3
MTL-33	7/14/16	3.4		MG/L	Suspended Solids, Total	2.0	2.0
MTL-33	9/7/16	4.2		MG/L	Suspended Solids, Total	2.0	2.0
MTL-5	5/6/16	26.6		MG/L	Suspended Solids, Total	2.0	2.0
MTL-5	7/14/16	22.0		MG/L	Suspended Solids, Total	5.0	5.0
MTL-5	9/7/16	13.2		MG/L	Suspended Solids, Total	2.0	2.0
MTL-66	4/26/16	13.6		MG/L	Suspended Solids, Total	2.0	2.0
MTL-66	7/14/16	7.0		MG/L	Suspended Solids, Total	3.3	3.3
MTL-66	9/7/16	8.2		MG/L	Suspended Solids, Total	2.5	2.5
MTL-77	5/6/16	12.0		MG/L	Suspended Solids, Total	2.5	2.5

Site	Collection Date	Reported Result	Flag	Units	Parameter	MDL	PQL
MTL-77	7/14/16	9.0		MG/L	Solids, Total Suspended Solids, Total	2.5	2.5
MTL-77	9/7/16	5.8		MG/L	Suspended Solids, Total	2.0	2.0
MTL-9	4/26/16	125		MG/L	Suspended Solids, Total	7.7	7.7
MTL-9	7/14/16	138		MG/L	Suspended Solids, Total	10.0	10.0
MTL-9	9/7/16	27.3		MG/L	Suspended Solids, Volatile	3.3	3.3
MTL-1	4/26/16	2.2 <		MG/L	Suspended Solids, Volatile	2.2	2.2
MTL-1	7/14/16	2.0 <		MG/L	Suspended Solids, Volatile	2.0	2.0
MTL-1	9/7/16	1.7 <		MG/L	Suspended Solids, Volatile	1.7	1.7
MTL-11	4/26/16	6.8		MG/L	Suspended Solids, Volatile	4.0	4.0
MTL-11	7/14/16	10.0		MG/L	Suspended Solids, Volatile	10.0	10.0
MTL-11	9/7/16	8.0		MG/L	Suspended Solids, Volatile	6.7	6.7
MTL-12	4/26/16	4.4		MG/L	Suspended Solids, Volatile	4.0	4.0
MTL-12	7/14/16	2.5 <		MG/L	Suspended Solids, Volatile	2.5	2.5
MTL-12	9/7/16	1.7 <		MG/L	Suspended Solids, Volatile	1.7	1.7
MTL-13	5/6/16	2.9 <		MG/L	Suspended Solids, Volatile	2.9	2.9
MTL-13	7/14/16	53.7		MG/L	Suspended Solids, Volatile	24.4	24.4
MTL-13	9/7/16	2.0 <		MG/L	Suspended Solids, Volatile	2.0	2.0
MTL-15	4/26/16	3.6		MG/L	Suspended Solids, Volatile	2.0	2.0
MTL-15	7/14/16	2.0 <		MG/L	Suspended Solids, Volatile	2.0	2.0
MTL-15	9/7/16	3.2		MG/L	Suspended Solids, Volatile	2.5	2.5
MTL-22	4/26/16	2.2		MG/L	Suspended Solids, Volatile	2.0	2.0
MTL-22	7/14/16	2.0 <		MG/L	Suspended Solids, Volatile	2.0	2.0
MTL-22	9/7/16	2.8		MG/L	Suspended Solids, Volatile	2.0	2.0
MTL-22-15	4/26/16	1.3 <		MG/L	Suspended Solids, Volatile	1.3	1.3
MTL-22-15	7/14/16	2.0 <		MG/L	Suspended Solids, Volatile	2.0	2.0
MTL-22-15	9/7/16	2.2		MG/L	Suspended Solids, Volatile	2.0	2.0
MTL-33	4/26/16	1.3 <		MG/L	Suspended Solids, Volatile	1.3	1.3
MTL-33	7/14/16	2.0 <		MG/L	Suspended Solids, Volatile	2.0	2.0

Site	Collection Date	Reported Result	Flag	Units	Parameter	MDL	PQL
MTL-33	9/7/16	2.8		MG/L	Solids, Volatile Suspended Solids, Volatile	2.0	2.0
MTL-5	5/6/16	2.2		MG/L	Suspended Solids, Volatile	2.0	2.0
MTL-5	7/14/16	5.0 <		MG/L	Suspended Solids, Volatile	5.0	5.0
MTL-5	9/7/16	2.4		MG/L	Suspended Solids, Volatile	2.0	2.0
MTL-66	4/26/16	3.2		MG/L	Suspended Solids, Volatile	2.0	2.0
MTL-66	7/14/16	3.3 <		MG/L	Suspended Solids, Volatile	3.3	3.3
MTL-66	9/7/16	2.8		MG/L	Suspended Solids, Volatile	2.5	2.5
MTL-77	5/6/16	2.5 <		MG/L	Suspended Solids, Volatile	2.5	2.5
MTL-77	7/14/16	2.5 <		MG/L	Suspended Solids, Volatile	2.5	2.5
MTL-77	9/7/16	2.0		MG/L	Suspended Solids, Volatile	2.0	2.0
MTL-9	4/26/16	13.1		MG/L	Suspended Solids, Volatile	7.7	7.7
MTL-9	7/14/16	13.0		MG/L	Suspended Solids, Volatile	10.0	10.0
MTL-9	9/7/16	4.3		MG/L	Suspended Total Organic	3.3	3.3
MTL-1	4/26/16	4.9		MG/L	Total Organic Carbon	1.0	1.0
MTL-1	7/14/16	5.4		MG/L	Total Organic Carbon	1.0	1.0
MTL-1	9/7/16	4.7		MG/L	Total Organic Carbon	2.0	2.0
MTL-11	4/26/16	6.2		MG/L	Total Organic Carbon	1.0	1.0
MTL-11	7/14/16	7.9		MG/L	Total Organic Carbon	1.0	1.0
MTL-11	9/7/16	5.6		MG/L	Total Organic Carbon	2.0	2.0
MTL-12	4/26/16	5.4		MG/L	Total Organic Carbon	1.0	1.0
MTL-12	7/14/16	5.6		MG/L	Total Organic Carbon	1.0	1.0
MTL-12	9/7/16	4.2		MG/L	Total Organic Carbon	2.0	2.0
MTL-13	5/6/16	8.0		MG/L	Total Organic Carbon	1.0	1.0
MTL-13	7/14/16	8.4		MG/L	Total Organic Carbon	1.0	1.0
MTL-13	9/7/16	5.4		MG/L	Total Organic Carbon	2.0	2.0
MTL-15	4/26/16	5.5		MG/L	Total Organic Carbon	1.0	1.0
MTL-15	7/14/16	6.6		MG/L	Total Organic Carbon	1.0	1.0
MTL-15	9/7/16	5.0		MG/L	Total Organic Carbon	2.0	2.0

Site	Collection Date	Reported Result	Flag	Units	Parameter	MDL	PQL
MTL-22	4/26/16	5.3		MG/L	Total Organic Carbon	1.0	1.0
MTL-22	7/14/16	5.8		MG/L	Total Organic Carbon	1.0	1.0
MTL-22	9/7/16	4.7		MG/L	Total Organic Carbon	2.0	2.0
MTL-22-15	4/26/16	5.2		MG/L	Total Organic Carbon	1.0	1.0
MTL-22-15	7/14/16	5.5		MG/L	Total Organic Carbon	1.0	1.0
MTL-22-15	9/7/16	4.7		MG/L	Total Organic Carbon	2.0	2.0
MTL-33	4/26/16	5.4		MG/L	Total Organic Carbon	1.0	1.0
MTL-33	7/14/16	5.6		MG/L	Total Organic Carbon	1.0	1.0
MTL-33	9/7/16	4.5		MG/L	Total Organic Carbon	2.0	2.0
MTL-5	5/6/16	6.6		MG/L	Total Organic Carbon	1.0	1.0
MTL-5	7/14/16	7.5		MG/L	Total Organic Carbon	1.0	1.0
MTL-5	9/7/16	4.4		MG/L	Total Organic Carbon	2.0	2.0
MTL-66	4/26/16	5.0		MG/L	Total Organic Carbon	1.0	1.0
MTL-66	7/14/16	6.5		MG/L	Total Organic Carbon	1.0	1.0
MTL-66	9/7/16	4.9		MG/L	Total Organic Carbon	2.0	2.0
MTL-77	5/6/16	5.0		MG/L	Total Organic Carbon	1.0	1.0
MTL-77	7/14/16	6.1		MG/L	Total Organic Carbon	1.0	1.0
MTL-77	9/7/16	4.7		MG/L	Total Organic Carbon	2.0	2.0
MTL-9	4/26/16	7.4		MG/L	Total Organic Carbon	1.0	1.0
MTL-9	7/14/16	9.0		MG/L	Total Organic Carbon	1.0	1.0
MTL-9	9/7/16	6.2		MG/L	Total Organic Carbon	2.0	2.0
MTL-1	4/26/16	0.20	<	UG/L	Trifluralin	0.20	0.20
MTL-1	7/14/16	0.22	<	UG/L	Trifluralin	0.22	0.22
MTL-1	9/7/16	0.22	<	UG/L	Trifluralin	0.22	0.22
MTL-11	4/26/16	0.20	<	UG/L	Trifluralin	0.20	0.20
MTL-11	7/14/16	0.20	<	UG/L	Trifluralin	0.20	0.20
MTL-11	9/7/16	0.20	<	UG/L	Trifluralin	0.20	0.20
MTL-12	4/26/16	0.20	<	UG/L	Trifluralin	0.20	0.20
MTL-12	7/14/16	0.21	<	UG/L	Trifluralin	0.21	0.21
MTL-12	9/7/16	0.20	<	UG/L	Trifluralin	0.20	0.20
MTL-13	5/6/16	0.24	<	UG/L	Trifluralin	0.24	0.24
MTL-13	7/14/16	0.20	<	UG/L	Trifluralin	0.20	0.20
MTL-13	9/7/16	0.20	<	UG/L	Trifluralin	0.20	0.20

Site	Collection Date	Reported Result	Flag	Units	Parameter	MDL	PQL
MTL-15	4/26/16	0.21	<	UG/L	Trifluralin	0.21	0.21
MTL-15	7/14/16	0.20	<	UG/L	Trifluralin	0.20	0.20
MTL-15	9/7/16	0.20	<	UG/L	Trifluralin	0.20	0.20
MTL-22	4/26/16	0.20	<	UG/L	Trifluralin	0.20	0.20
MTL-22	7/14/16	0.20	<	UG/L	Trifluralin	0.20	0.20
MTL-22	9/7/16	0.22	<	UG/L	Trifluralin	0.22	0.22
MTL-33	4/26/16	0.20	<	UG/L	Trifluralin	0.20	0.20
MTL-33	7/14/16	0.20	<	UG/L	Trifluralin	0.20	0.20
MTL-33	9/7/16	0.22	<	UG/L	Trifluralin	0.22	0.22
MTL-5	5/6/16	0.25	<	UG/L	Trifluralin	0.25	0.25
MTL-5	7/14/16	0.22	<	UG/L	Trifluralin	0.22	0.22
MTL-5	9/7/16	0.20	<	UG/L	Trifluralin	0.20	0.20
MTL-66	4/26/16	0.20	<	UG/L	Trifluralin	0.20	0.20
MTL-66	7/14/16	0.22	<	UG/L	Trifluralin	0.22	0.22
MTL-66	9/7/16	0.20	<	UG/L	Trifluralin	0.20	0.20
MTL-77	5/6/16	0.22	<	UG/L	Trifluralin	0.22	0.22
MTL-77	7/14/16	0.20	<	UG/L	Trifluralin	0.20	0.20
MTL-77	9/7/16	0.20	<	UG/L	Trifluralin	0.20	0.20
MTL-9	4/26/16	0.20	<	UG/L	Trifluralin	0.20	0.20
MTL-9	7/14/16	0.20	<	UG/L	Trifluralin	0.20	0.20
MTL-9	9/7/16	0.20	<	UG/L	Trifluralin	0.20	0.20

U Analyte was not detected

J Estimated value between Method Detection Limit (MDL) and Practical Quantitation Limit (PQL)

FIELD DATA

Site	Date	Depth	Water Temp (oC)	Redox (mv)	Cond (uS)	DO %	DO mg/l	pH	Time	Seechi (in)
MTL-1	4/26/16	0.1	15.46	250	170	102.4	9.91	7.87	1022	
MTL-1	7/14/16	0.2	25.23	321	221	72.8	5.84	7.95	1050	
MTL-1	9/7/16	0.4	25.9	355	164.9	88.4	7.05	7.89	947	
MTL-11	4/26/16	0.2	19	267	369	86	8.6	8	1210	
MTL-11	7/14/16	0.1	25.71	351	200	79.6	6.33	7.54	1143	
MTL-11	9/7/16	0.3	27.1	330	239.4	94.2	7.52	7.7	1145	
MTL-12	4/26/16	0.1	17.16	229	172	109	10.29	7.89	1000	
MTL-12	7/14/16	0.7	25.7	327	225	80.5	6.4	7.7	928	
MTL-12	9/7/16	0.2	26.4	361	115.5	74	5.87	7.82	947	
MTL-13	5/5/16	0.11	16.01	299	274	97.4	9.41	7.79	1251	
MTL-13	7/14/16	0.3	24	342	126	74.1	6.1	7.6	1249	
MTL-13	9/7/16	0.3	27.4	318	310	102.6	7.94	7.89	1255	
MTL-22	4/26/16	0.3	16.84	318	169	111.1	10.4	7.89	1119	
MTL-22		1	16.77	321	169	110.3	10.45	7.87	1119	
MTL-22		2	16.62	322	169.9	109.2	10.31	7.84	1119	
MTL-22		3	15.49	322	173.1	109.6	10.54	7.78	1119	
MTL-22		4	14.94	323	173.4	107.7	10.58	7.73	1119	
MTL-22		5	14.43	324	172.9	107.5	10.66	7.71	1119	
MTL-22		6	14.18	325	172	106.3	10.59	7.7	1119	
MTL-22		7	13.54	326	171	104.9	10.55	7.67	1119	
MTL-22		8	11.88	327	169.8	101.6	10.68	7.61	1119	
MTL-22		9	10.77	329	167.5	98.3	10.59	7.54	1119	
MTL-22	7/14/16	0.4	23	314	231	112	8.5	8.7	1120	42
MTL-22		1.4	27.2	313	230	113	8.7	8.8	1120	
MTL-22		2	27.1	313	230	107	8.1	8.7	1120	
MTL-22		3	26.8	314	231	104	8.1	8.7	1120	
MTL-22		4	26.7	315	232	99	7.7	8.6	1120	
MTL-22		5	26	317	235	89	7	8.4	1120	
MTL-22		6	25	322	233	53	4	7.9	1120	
MTL-22		7.3	22	330	226	19	1.6	7.7	1120	
MTL-22		8	22	332	217	0	0	7.6	1120	
MTL-22		9.1	19	335	228	0	0	7.4	1120	

Site	Date	Depth	Water Temp (oC)	Redox (mv)	Cond (uS)	DO %	DO mg/l	pH	Time	Seechi (in)
MTL-22		10	16	337	218	0	0	7.3	1120	
MTL-22	9/7/16	0.2	26.67	249	157	106	8.33	8.39	1115	36
MTL-22		1	26.59	249	158	106	8.37	8.39	1115	
MTL-22		2	26.53	250	160	105	8.25	8.35	1115	
MTL-22		3	26.54	249	161	104	8.19	8.34	1115	
MTL-22		4	26.23	250	162	90	7.05	8.1	1115	
MTL-22		5	26.02	253	161	77	6.13	7.93	1115	
MTL-22		6	25.4	254	154	67.5	5.42	7.82	1115	
MTL-22		7	24.1	258	155	21	1.7	7.55	1115	
MTL-22		8	22.5	256	156	0	0	7.54	1115	
MTL-33	4/26/16	0.3	16.82	291	169	109.8	10.37	7.85	1056	10
MTL-33		1	16.72	295	169	109.2	10.28	7.79	1056	
MTL-33		2	16.4	298	170	108	10.26	7.78	1056	
MTL-33		3	16.25	300	172	108.9	10.31	7.77	1056	
MTL-33		4	15.99	301	176	109.3	10.47	7.79	1056	
MTL-33		5	15.82	302	175	108.7	10.42	7.78	1056	
MTL-33		6	15.18	304	172	106.5	10.37	7.75	1056	
MTL-33		7	13.86	305	167	102.9	10.31	7.68	1056	
MTL-33		8	13.08	308	166	100.9	10.31	7.62	1056	
MTL-33		9	11.47	309	164	97.4	10.26	7.57	1056	
MTL-33		10	10.03	312	164	92.3	10.11	7.54	1056	
MTL-33	7/14/16	0.4	27.4	336	229	109	8.4	8.7	1015	54
MTL-33		2.2	27	329	228	107	8.3	8.7	1015	
MTL-33		3	26.9	329	228	100	7.8	8.6	1015	
MTL-33		4.2	26.6	329	223	85	6.6	8.4	1015	
MTL-33		5.2	26	332	228	71	5.6	8.1	1015	
MTL-33		6	24	337	210	36	3	7.8	1015	
MTL-33		7.3	23	341	204	20	1.7	7.5	1015	
MTL-33		8	22	341	182	15	1.3	7.4	1015	
MTL-33		9.2	19	343	177	0	0	7.3	1015	
MTL-33		10.3	16	345	202	1.9	0.1	7.2	1015	
MTL-33		11	14	345	200	1.9	1.8	7.1	1015	
MTL-33	9/7/16	0.3	26.4	241	174	99.5	7.83	8.07	1046	30
MTL-33		1	26.3	239	174	100	7.93	8.14	1046	
MTL-33		2	26.2	239	174	97	7.64	8.09	1046	

Site	Date	Depth	Water Temp (oC)	Redox (mv)	Cond (uS)	DO %	DO mg/l	pH	Time	Seechi (in)
MTL-33		3	26.2	240	174	90	7.1	8.02	1046	
MTL-33		4	26	242	172	84	6.67	7.9	1046	
MTL-33		5	25	244	162	63	5.19	7.72	1046	
MTL-33		6	24	246	156	38	3.18	7.55	1046	
MTL-33		7	24	248	154	13.3	0.9	7.41	1046	
MTL-5	5/5/16	0.14	18.76	288	393	114.7	10.46	8.06	1310	
MTL-5	7/14/16	0.2	29.15	308	249	124	9.3	8.19	1321	
MTL-5	9/7/16	0.3	30.24	321	274	150	11	8.5	1330	
MTL-66	4/26/16	0.2	17.46	336	118.8	122.6	11.44	8.64	1145	
MTL-66		1	17.36	331	270	122.8	11.44	8.65	1145	
MTL-66		2	16.86	332	264.5	116.3	10.92	8.48	1145	
MTL-66		3	16.28	333	252.6	117.6	10.61	8.29	1145	
MTL-66		4	15.19	335	237	104.2	10.23	8.07	1145	
MTL-66		5	12.69	336	197.6	88.8	9.08	7.79	1145	
MTL-66		6	11.09	337	190.9	83.1	8.85	7.61	1145	
MTL-66		7	10.47	338	186.8	78.8	8.46	7.51	1145	
MTL-66		8	10.32	339	185.9	76.5	8.29	7.45	1145	
MTL-66		9	10.21	340	186.2	75.5	8.25	7.42	1145	
MTL-66		10	10.01	340	185.2	72.8	7.94	7.36	1145	
MTL-66	7/14/16	0	28.3	329	216	95	7.3	8	1230	22
MTL-66		1	26	332	209	83	6.4	7.8	1230	
MTL-66		2	25	334	212	69	5.5	7.7	1230	
MTL-66		3	25.7	334	215	68	5.4	7.6	1230	
MTL-66		4	25	335	221	61	4.8	7.6	1230	
MTL-66		5	25	335	222	51	4	7.5	1230	
MTL-66		6	24.2	338	222	28	2.2	7.4	1230	
MTL-66		7	22.7	340	221	1.5	0.2	7.2	1230	
MTL-66		8	20	342	218	0	0	7.1	1230	
MTL-66		9	17	339	222	0	0	7	1230	
MTL-66	9/7/16	0.2	26.3	311	145	88.6	7	7.84	1225	12
MTL-66		1	26.2	304	145	87.6	6.96	7.76	1225	
MTL-66		2	26	301	144	83.4	6.63	7.71	1225	
MTL-66		3	26	298	144	75	6.04	7.68	1225	
MTL-66		4	25.62	296	142	68.6	5.47	7.55	1225	
MTL-66		5	24.8	297	142	38.9	3.17	7.4	1225	

Site	Date	Depth	Water Temp (oC)	Redox (mv)	Cond (uS)	DO %	DO mg/l	pH	Time	Seechi (in)
MTL-66		6	24.5	297	142	38.8	2.85	7.33	1225	
MTL-66		7	24.08	297	148	6.6	0.55	7.22	1225	
MTL-77	5/5/16	0.26	17.2	280	240	119.8	11.24	8.33	1232	8
MTL-77	7/14/16	0.4	27.2	317	215	95	7.3	8.1	1215	24
MTL-77		1	26.3	319	215	83	6.6	8.8	1215	
MTL-77		2	26	320	216	73.8	5.8	7.8	1215	
MTL-77		3	25	321	217	74	5.9	7.8	1215	
MTL-77		4	25.5	323	222	62	5	7.7	1215	
MTL-77		5	25.2	324	226	53	4.3	7.6	1215	
MTL-77		6	24.2	8	230	32	2.6	7.4	1215	
MTL-77		7.2	22	326	230	8.3	0.5	7.3	1215	
MTL-77		8	20	329	222	0	0	7.1	1215	
MTL-77		9	17	332	231	0	0	7.2	1215	
MTL-77		10	14.9	333	227	0	0	7	1215	
MTL-77	9/7/16	0.2	26.15	266	143	88.3	6.99	7.81	1208	18
MTL-77		1	26.06	265	142	88.5	6.99	7.79	1208	
MTL-77		2	25.98	265	142	85.5	6.79	7.77	1208	
MTL-77		3	25.7	265	142	80	6.46	7.21	1208	
MTL-77		4	25.52	266	141	70.2	5.62	7.61	1208	
MTL-77		5	24.9	268	140	51.8	4.18	7.51	1208	
MTL-77		6	24.39	269	142	32.2	2.65	7.41	1208	
MTL-77		7	23.5	272	146	1.6	0.16	7.3	1208	
MTL-77		8	20	162	167	0	0	7.11	1208	
MTL-9	4/26/16	0.1	18	247	305	84	7.59	8	1245	
MTL-9	7/14/16	0.1	25.61	347	188	7.05	5.63	7.51	1221	
MTL-9	9/7/16	0.3	26.7	314	301	85.7	6.75	7.7	1220	

Marina Data

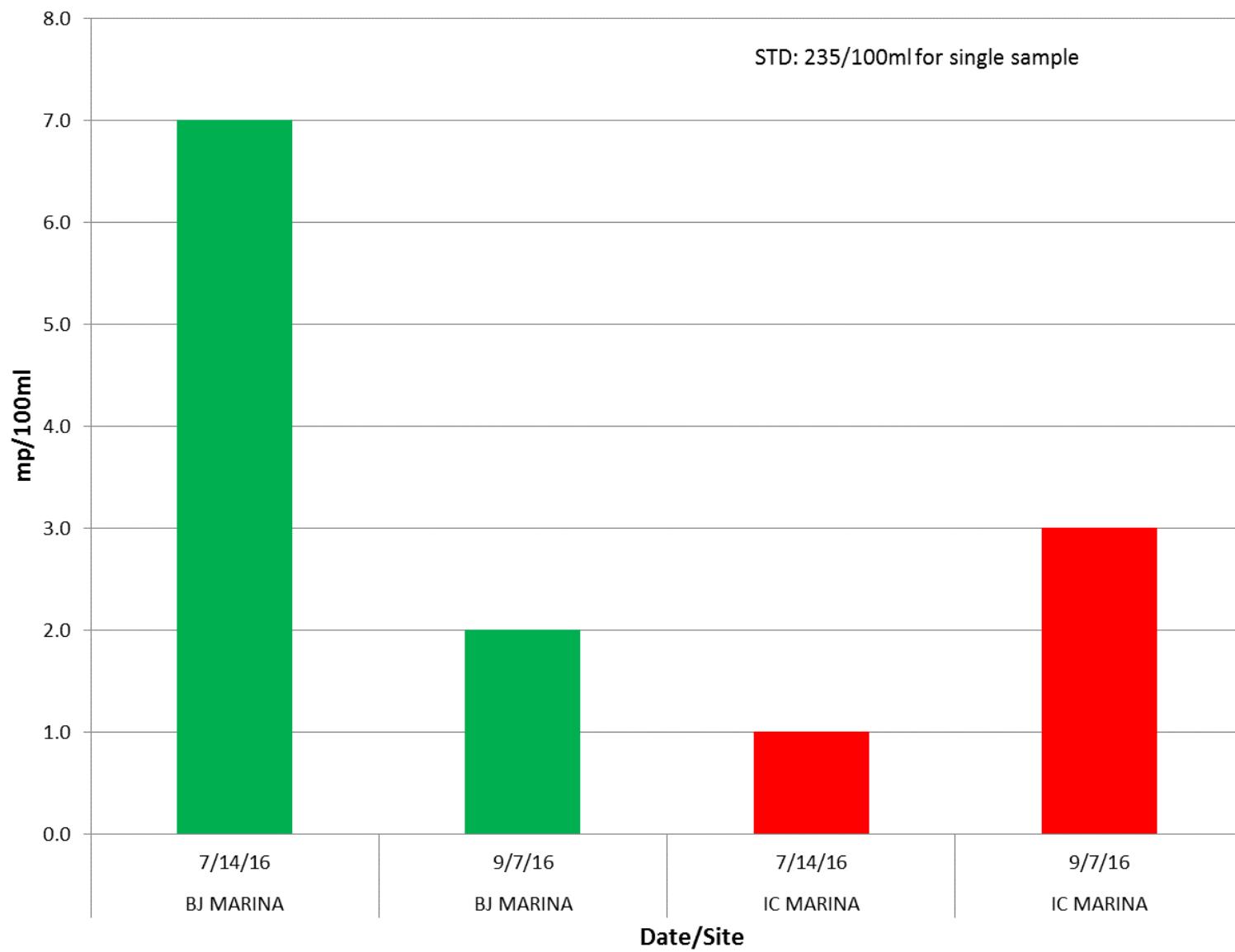
Marina	Date	Result	Qualifier	Units	Parameter
BJ MARINA	7/14/2016	7.0		COL/100 ML	E. Coliform
BJ-MARINA	9/7/2016	2.0	<	COL/100 ML	E. Coliform
IC MARINA	7/14/2016	1.0		COL/100 ML	E. Coliform
IC-MARINA	9/7/2016	3.0	<	COL/100 ML	E. Coliform

APPENDIX B

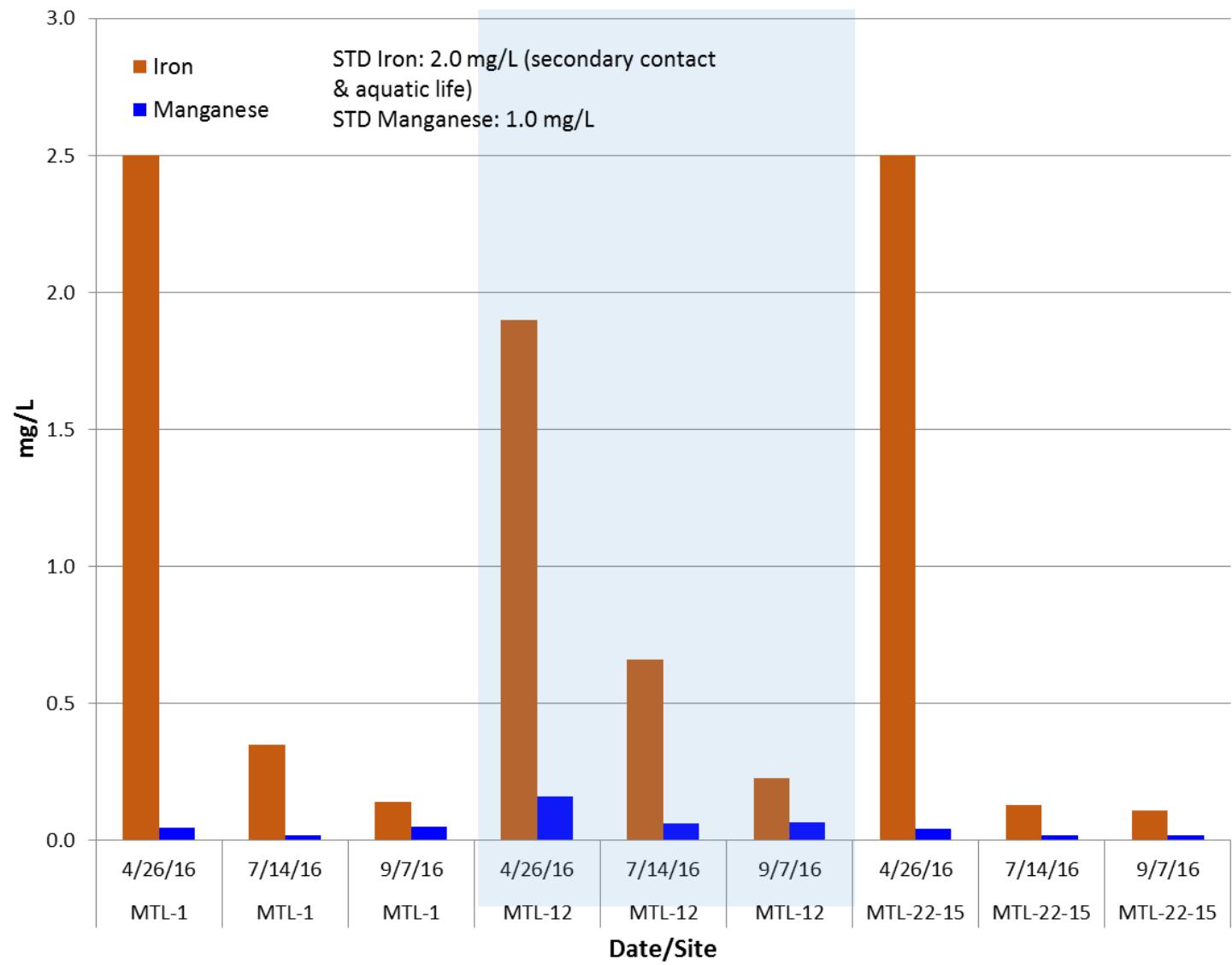
LAB DATA GRAPHS

E. coli at Marinas

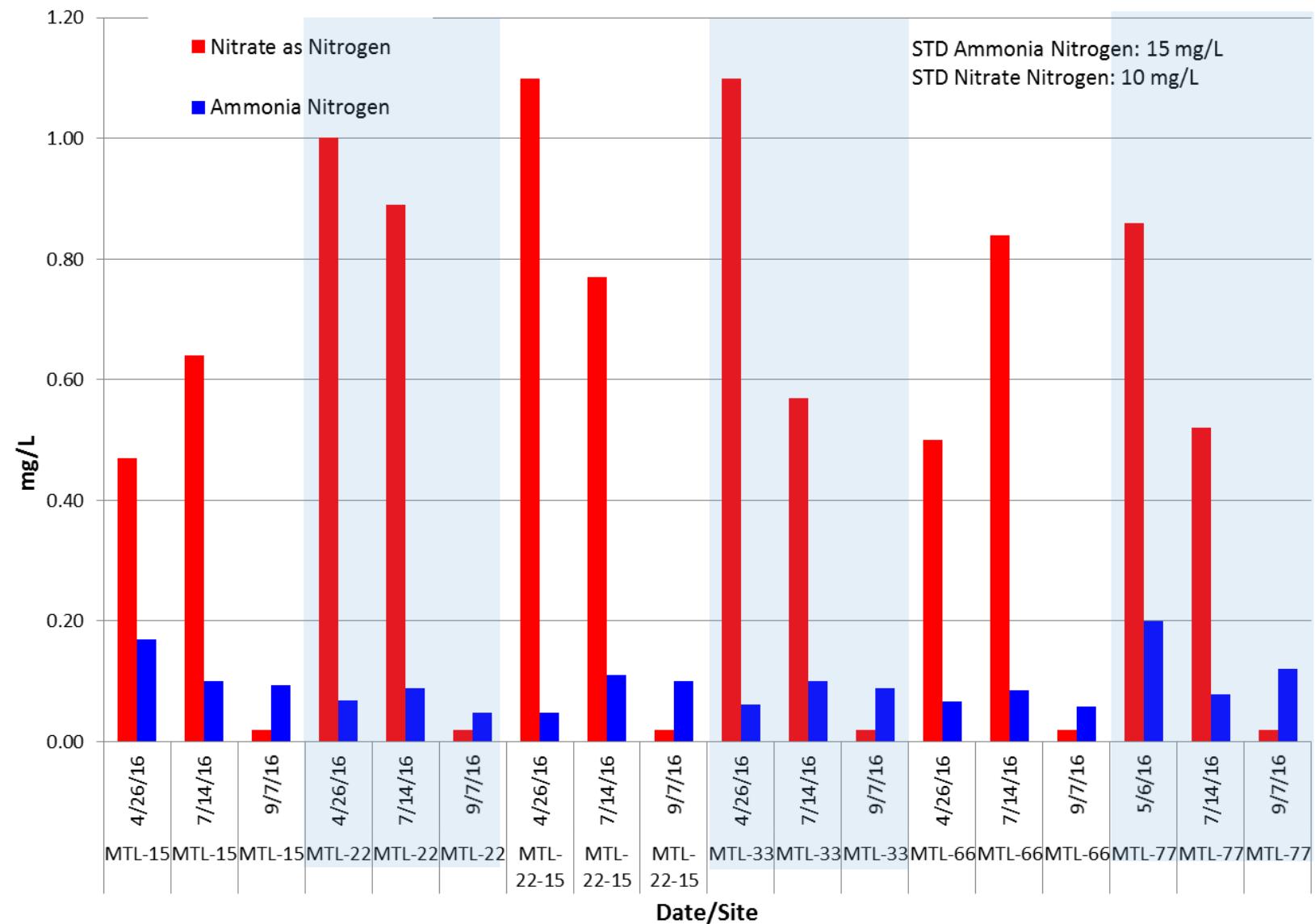
STD: 235/100ml for single sample



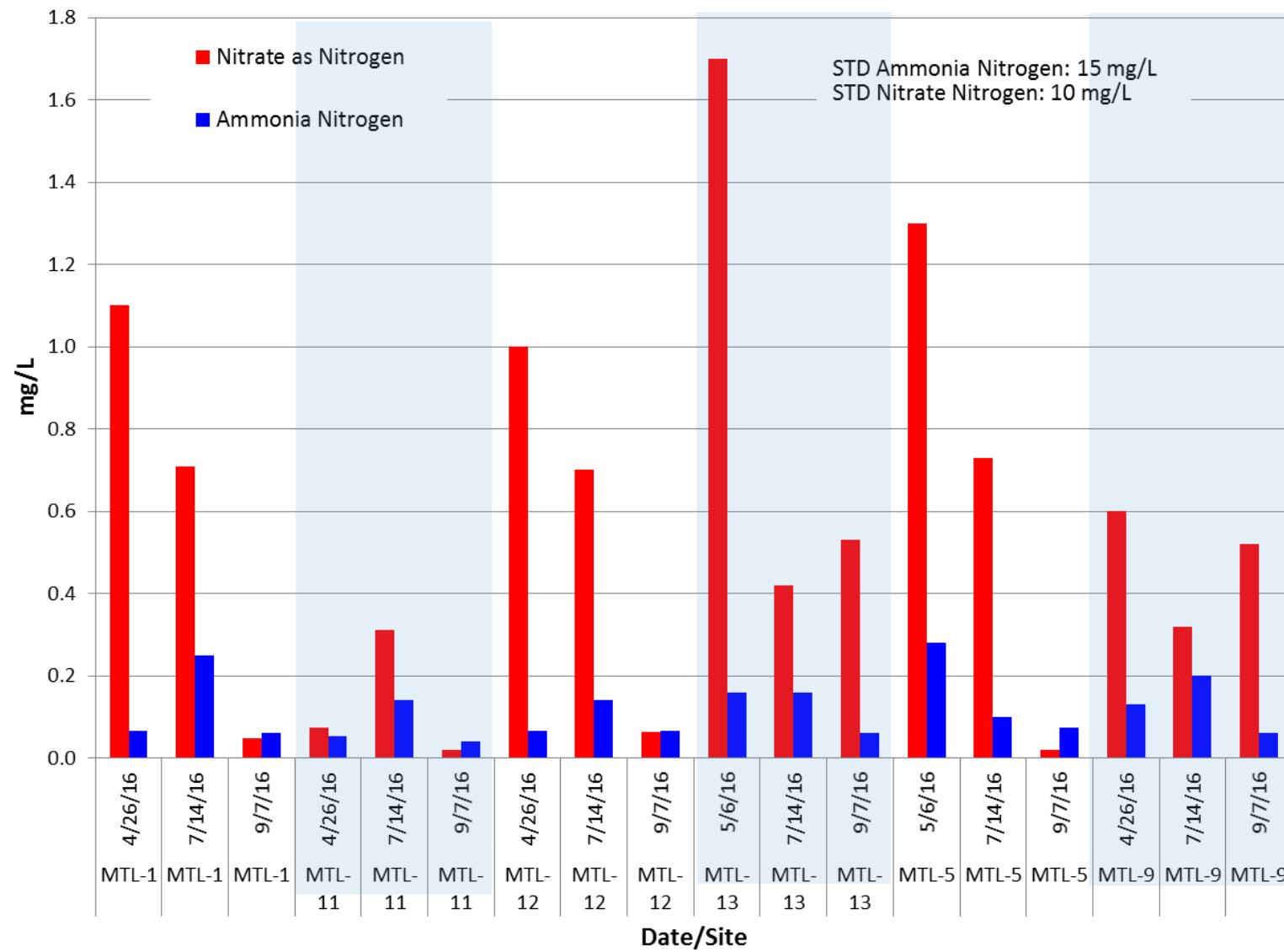
Mark Twain Iron & Manganese



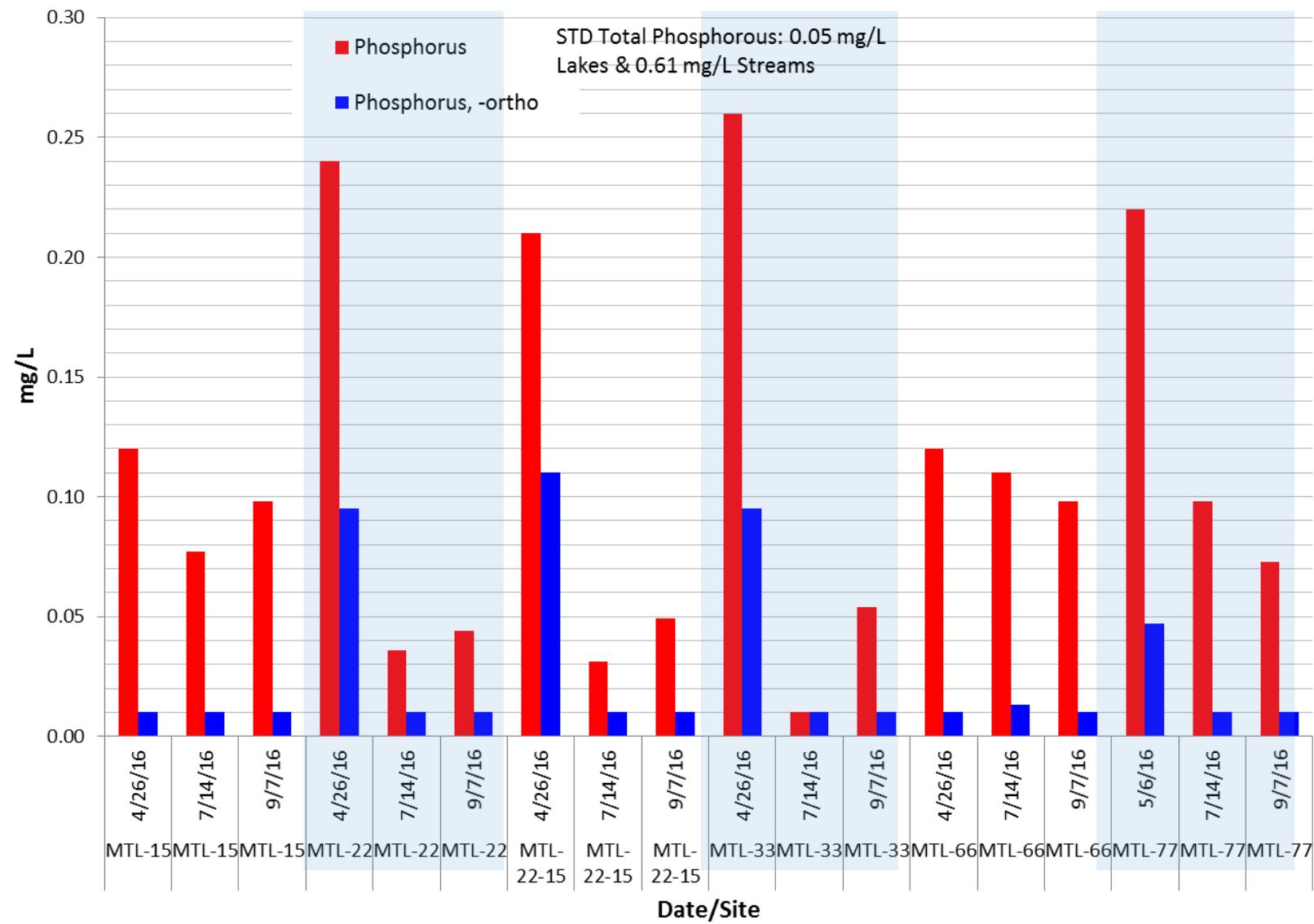
Mark Twain Lake Ammonia Nitrogen & Nitrate Nitrogen

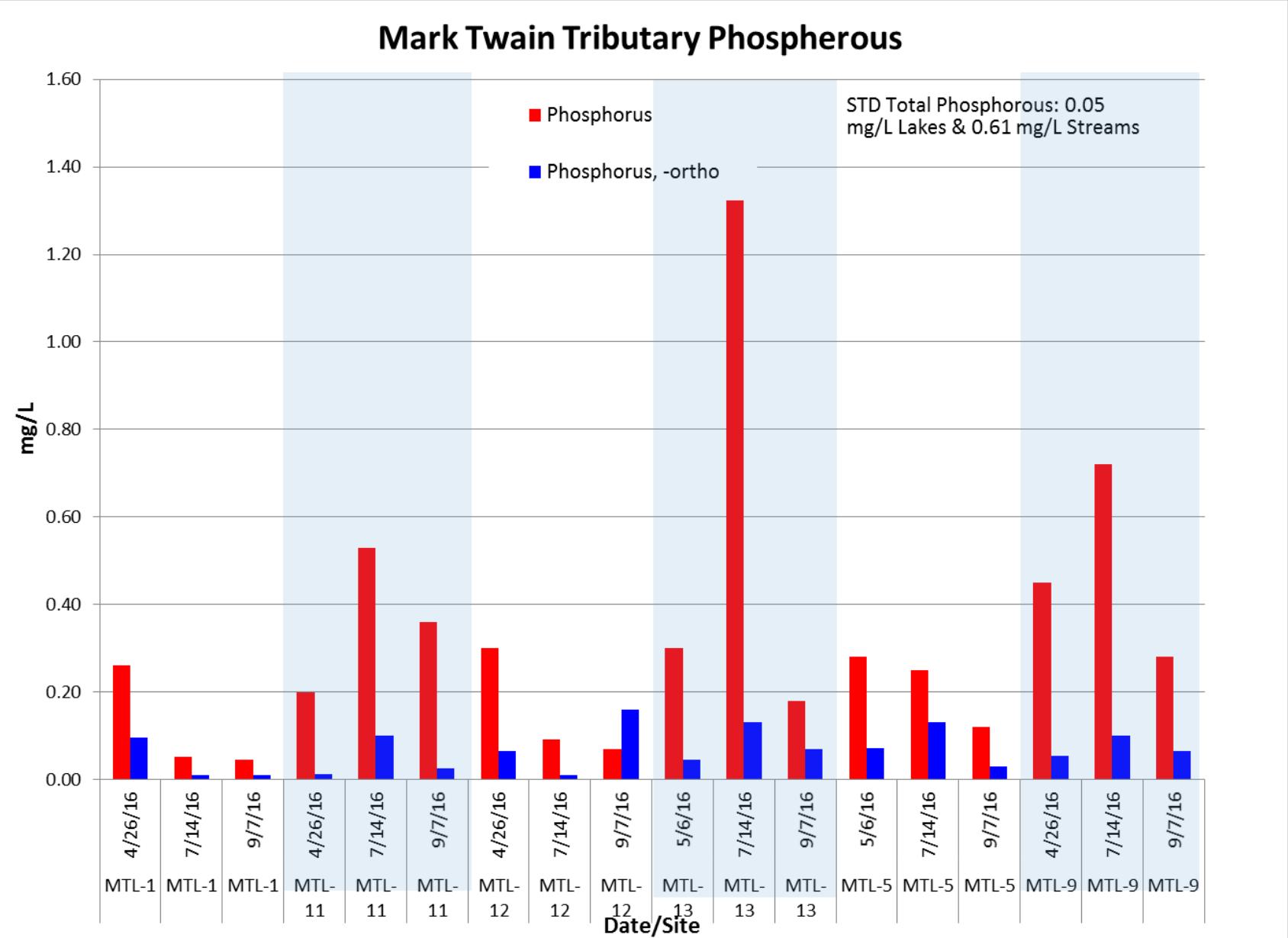


Mark Twain Tributary Ammonia Nitrogen & Nitrate Nitrogen

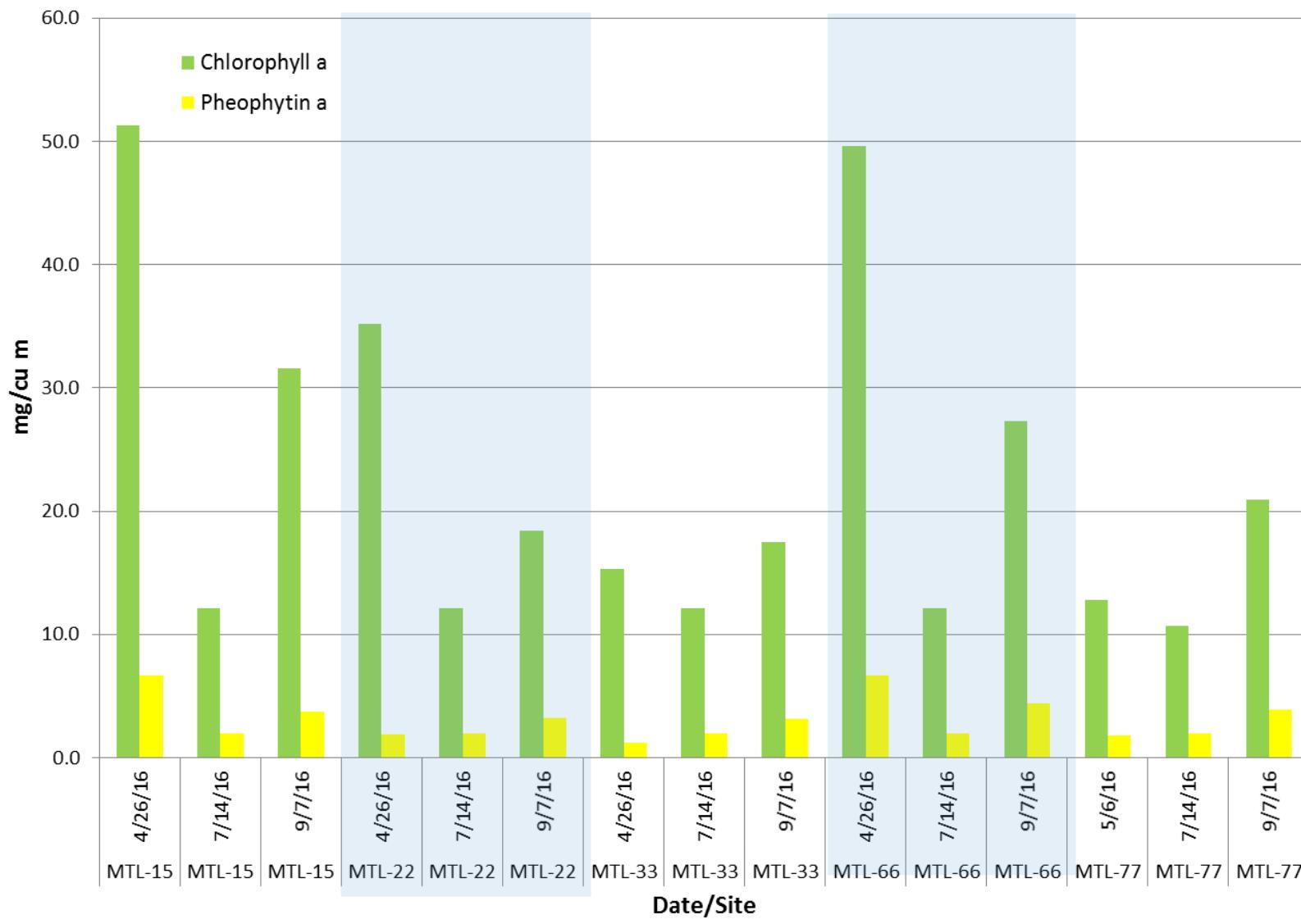


Mark Twain Lake Phosphorous

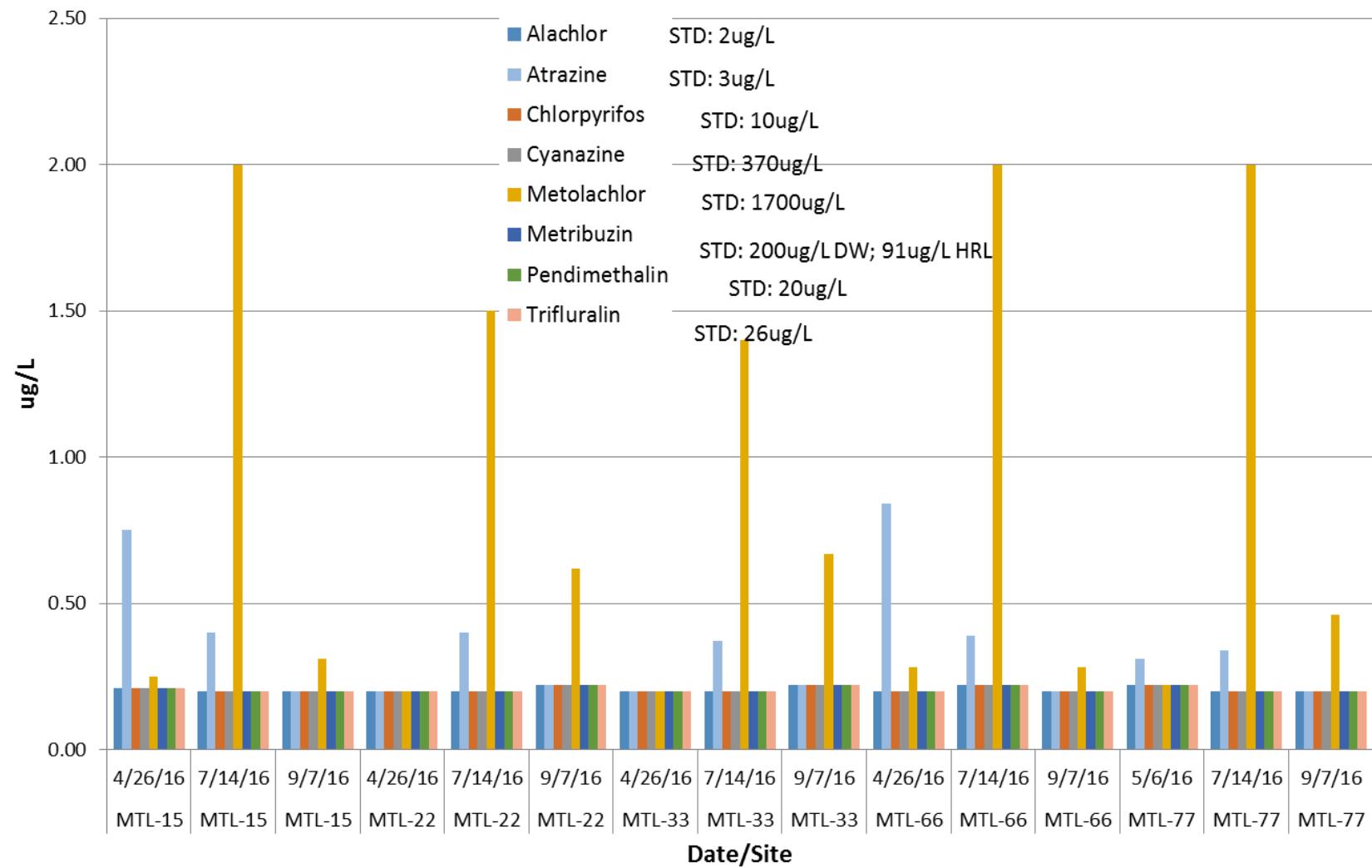


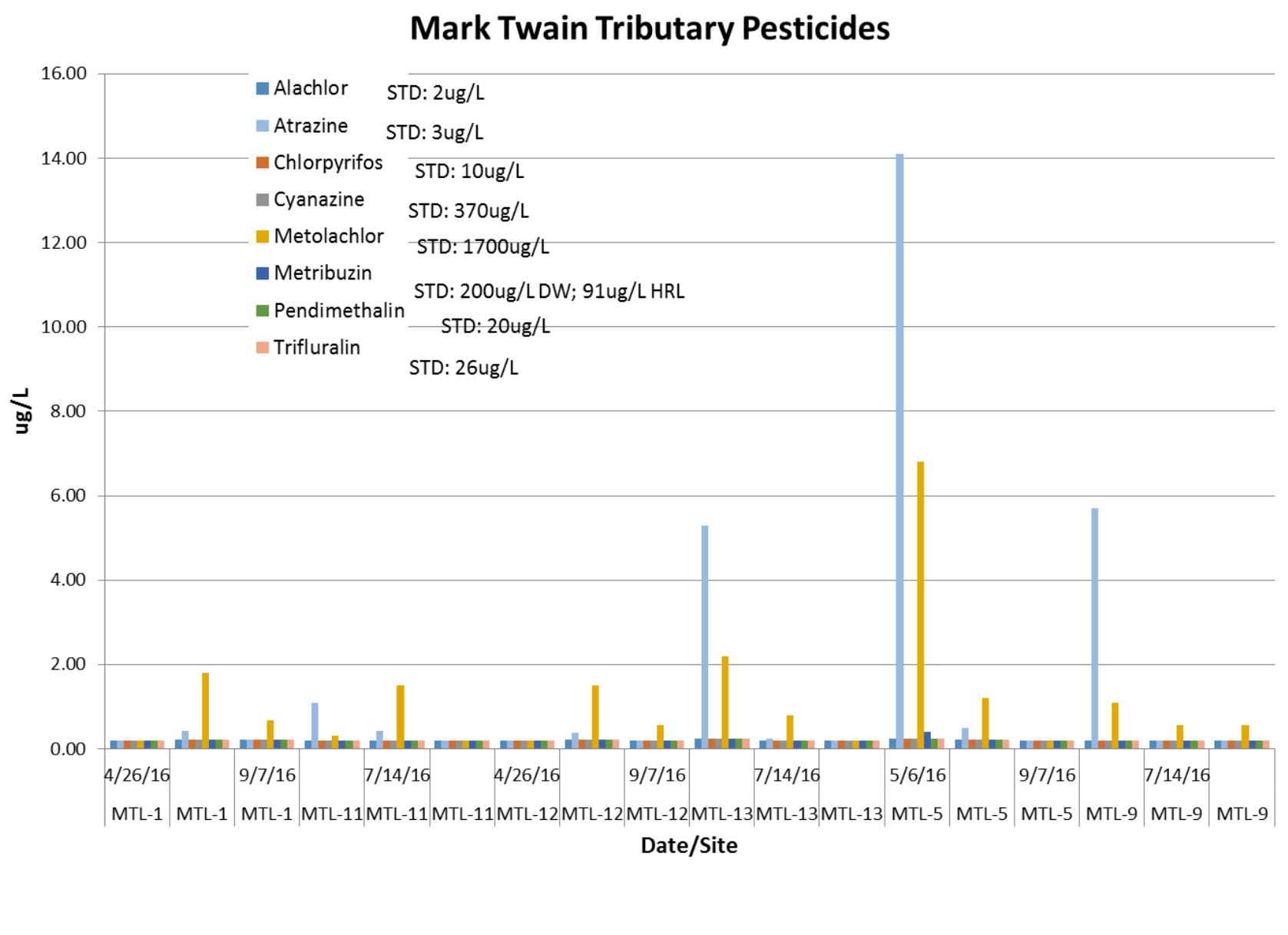


Mark Twain Lake Chlorophyll & Pheophytin

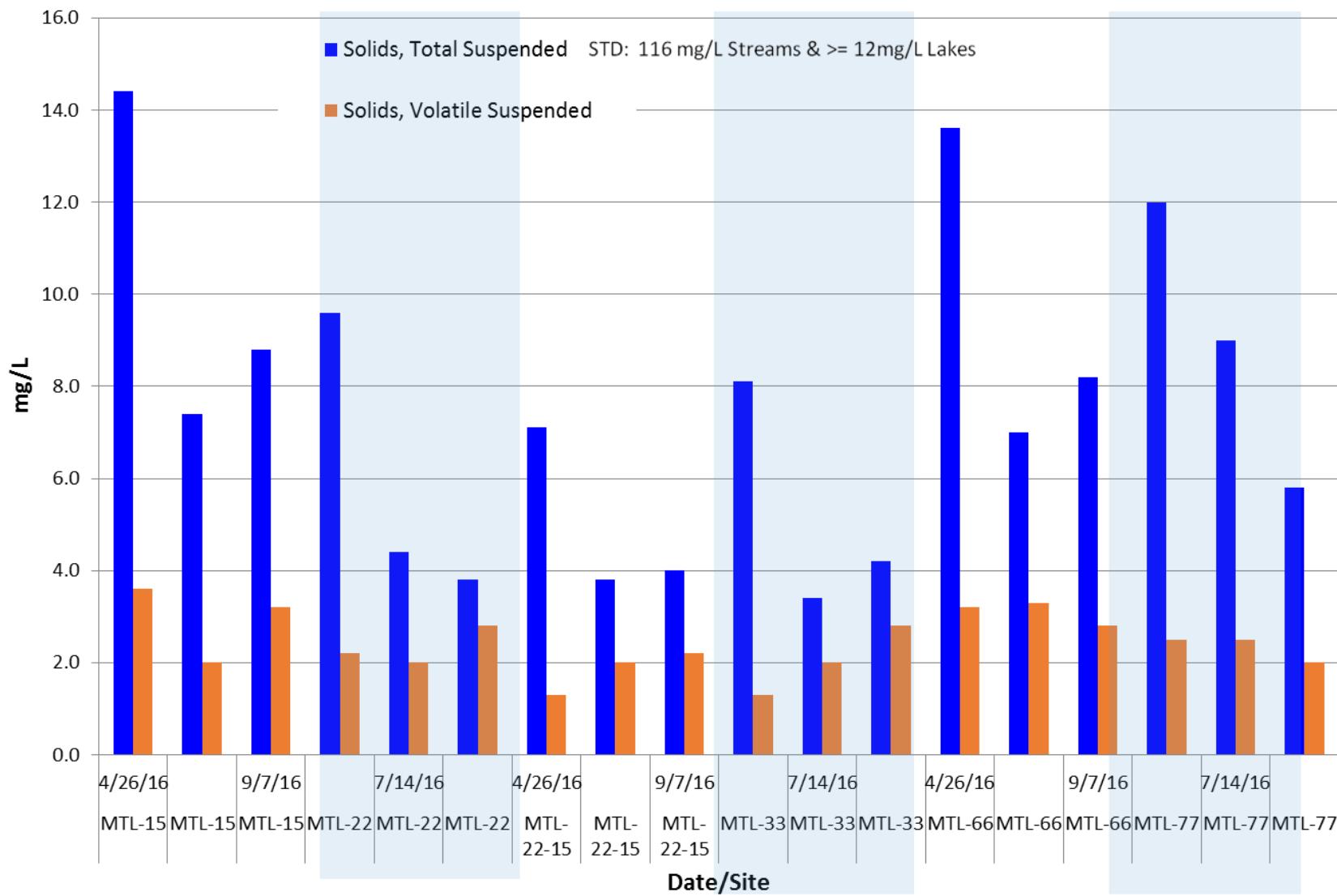


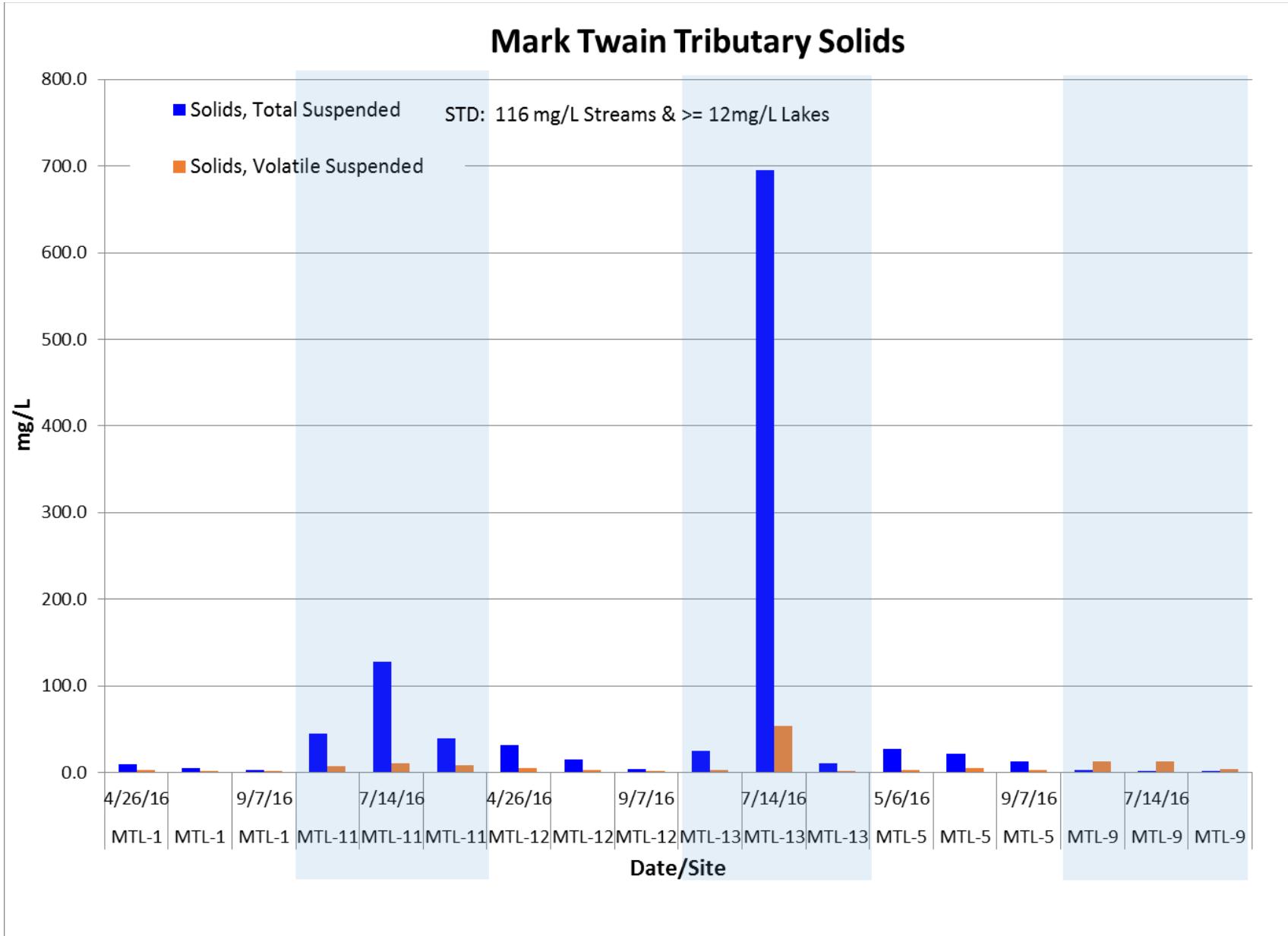
Mark Twain Tributary Pesticides



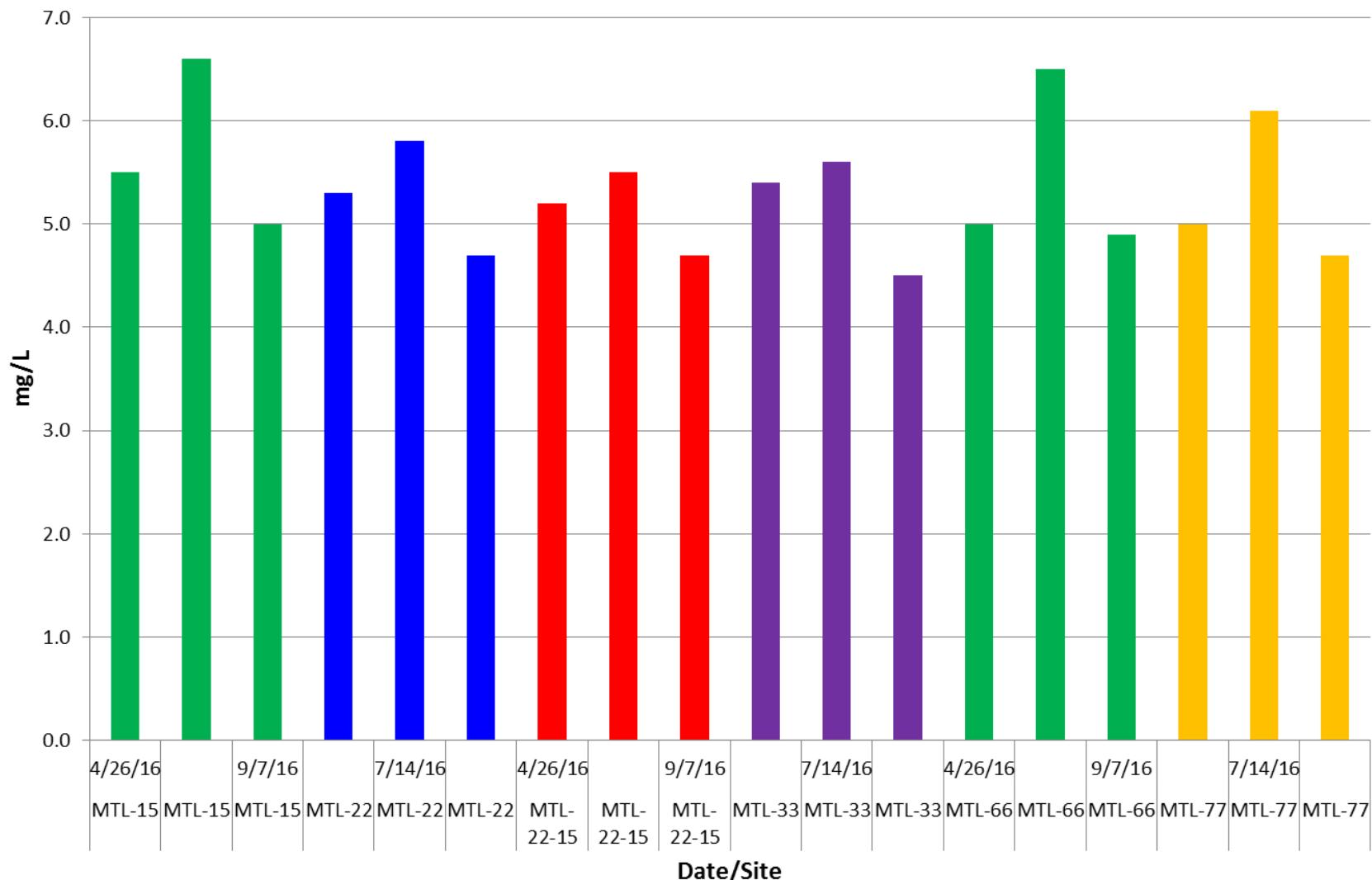


Mark Twain Lake Solids

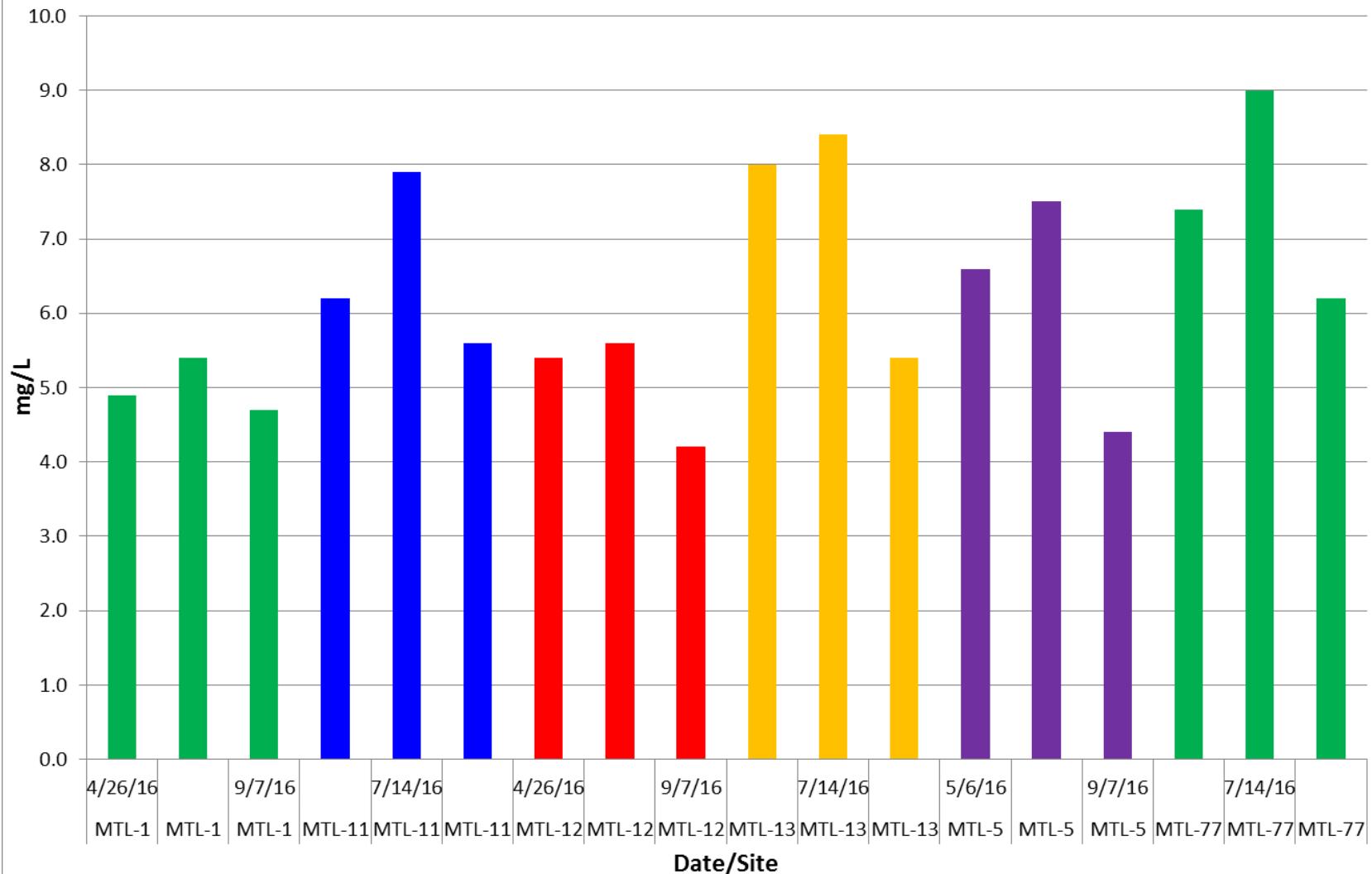




Mark Twain Lake Total Organic Carbon

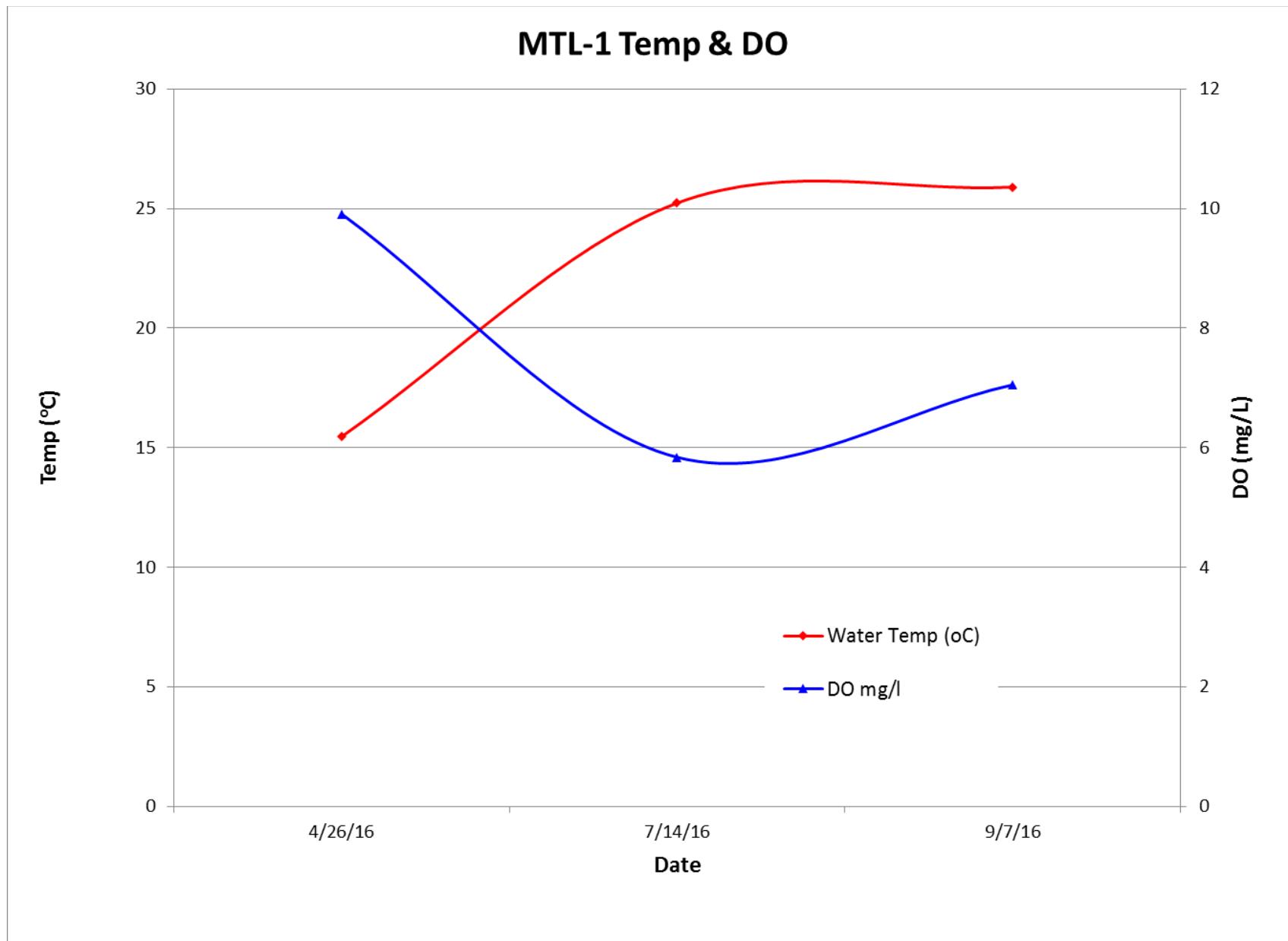


Mark Twain Tributary Total Organic Carbon

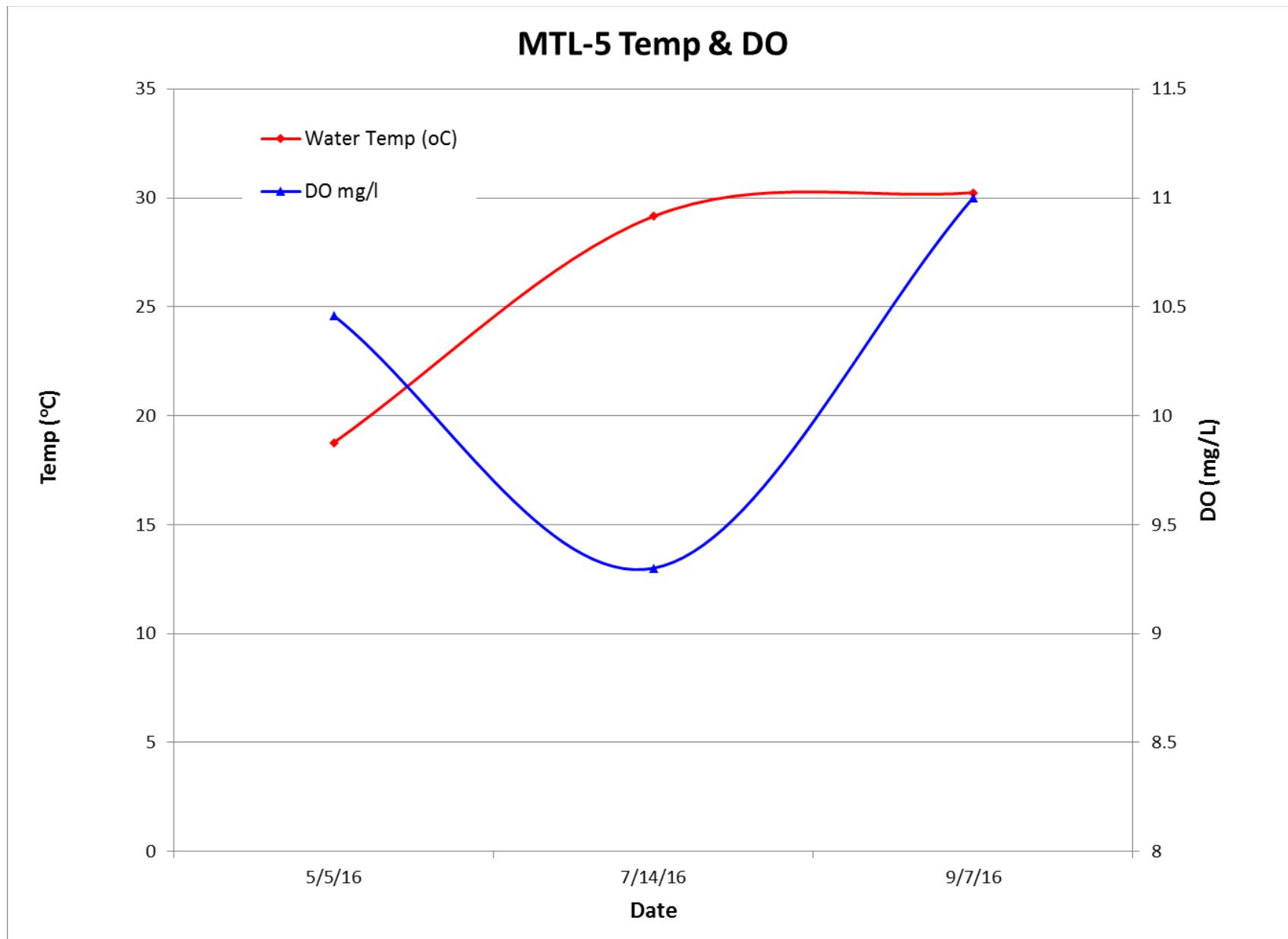


APPENDIX C

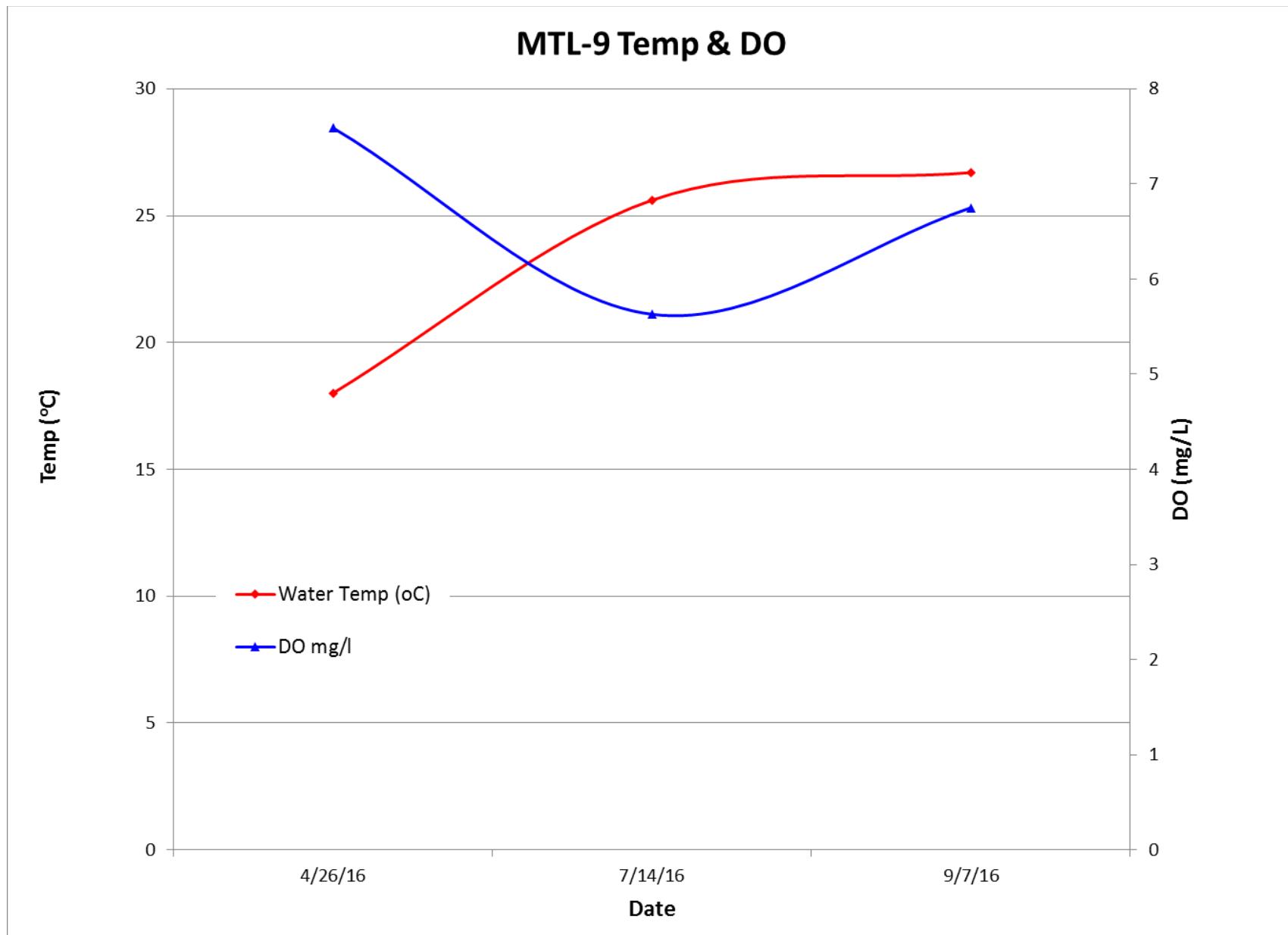
FIELD DATA GRAPHS



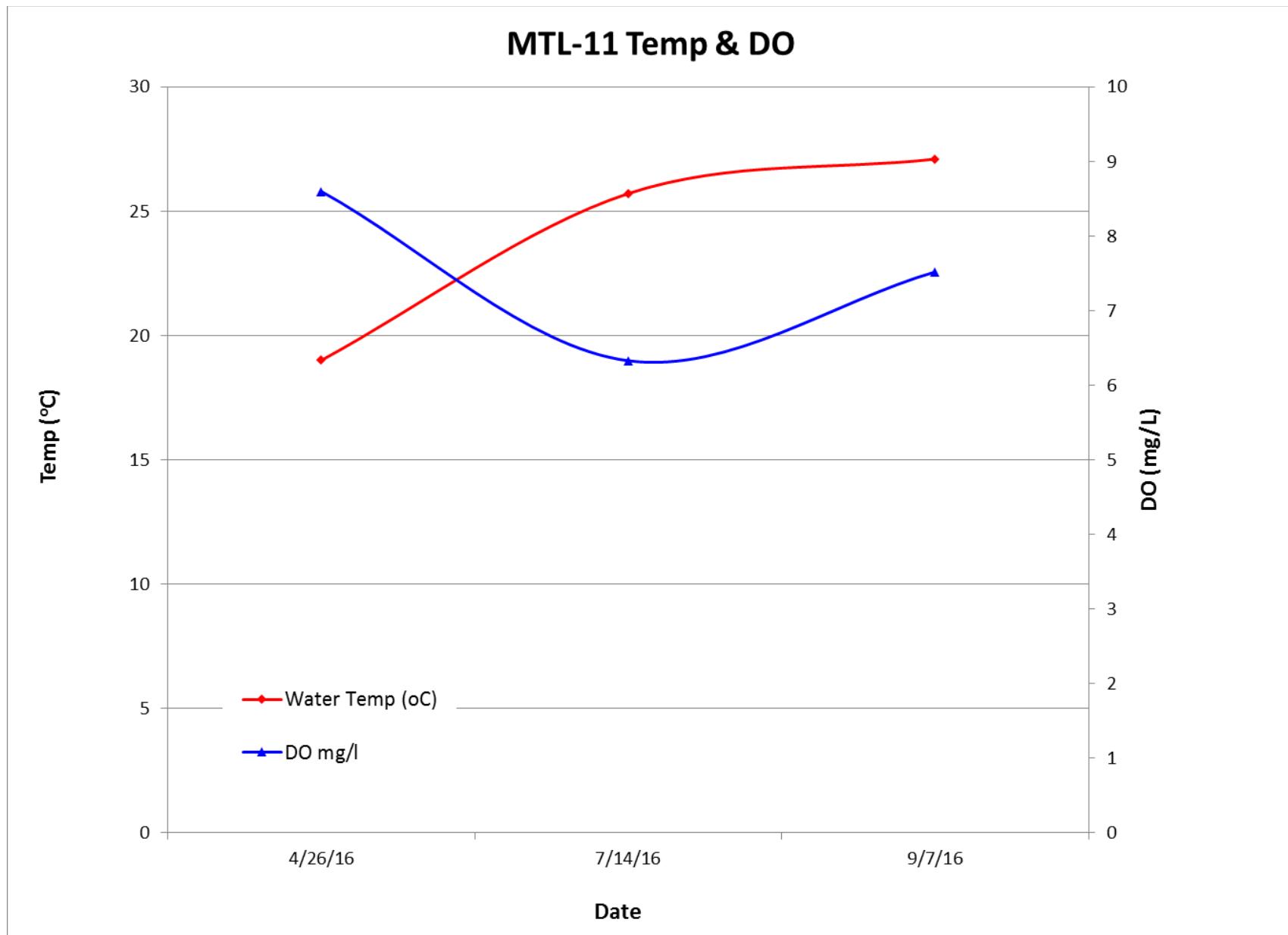
C1

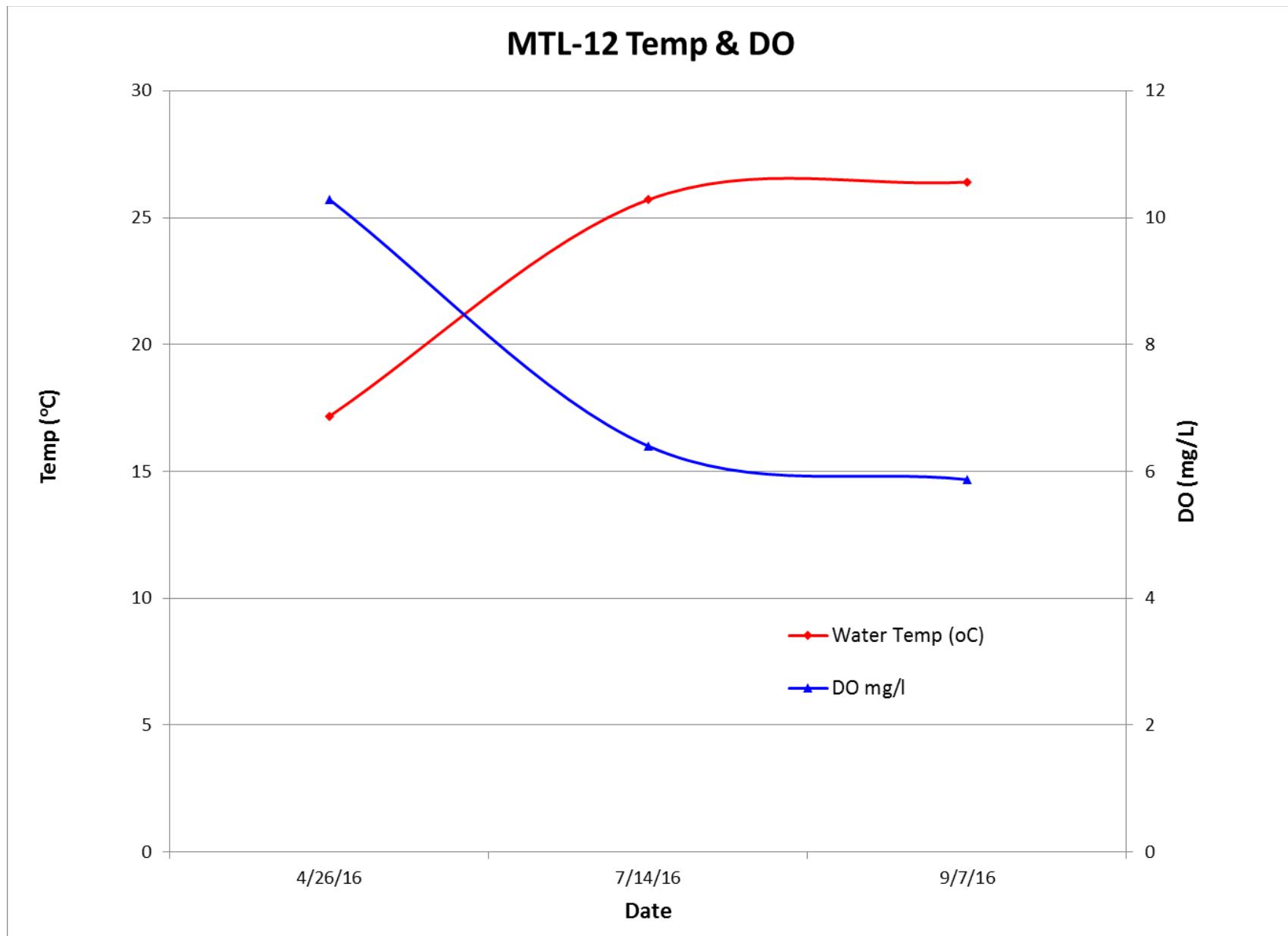


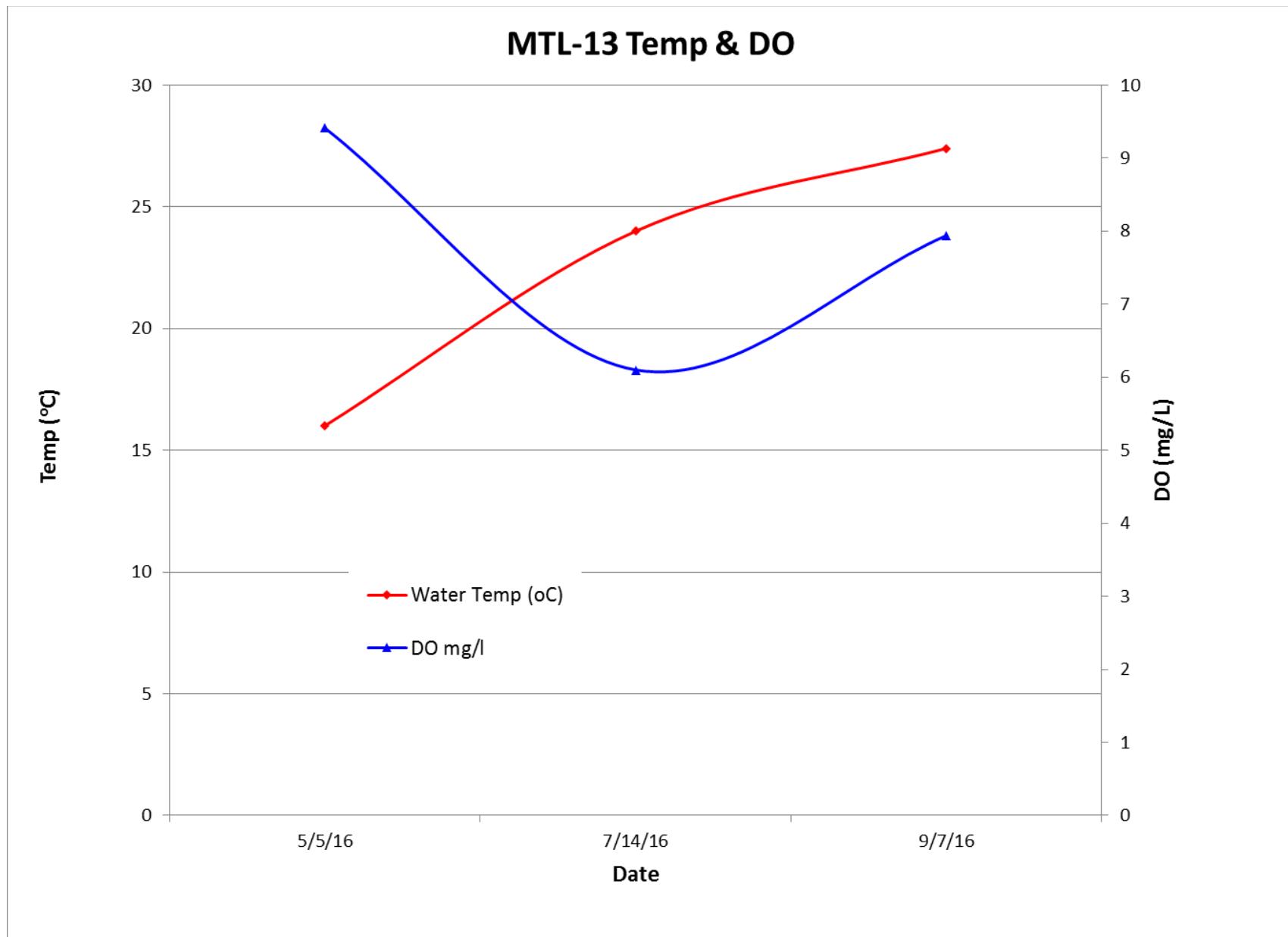
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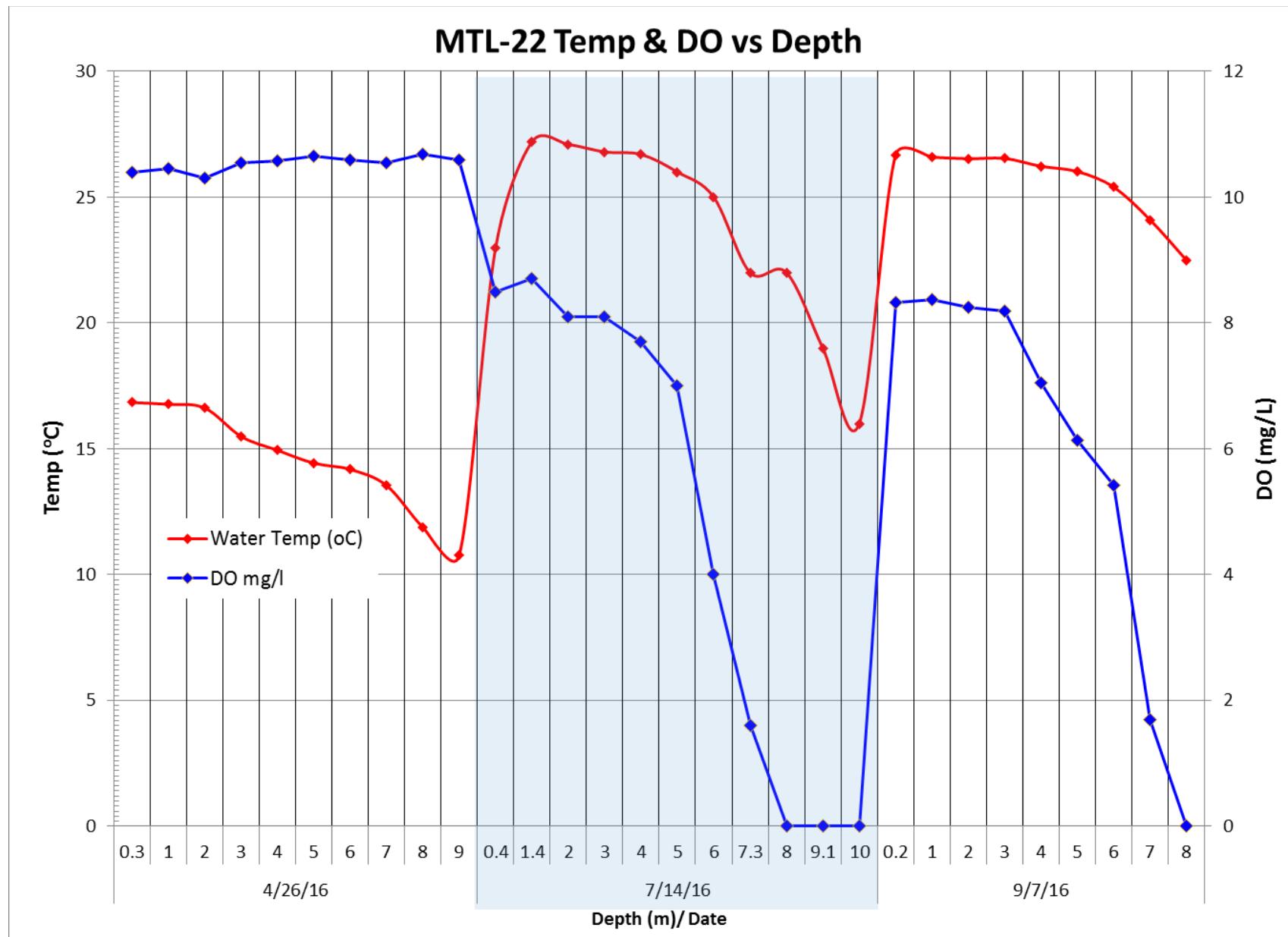


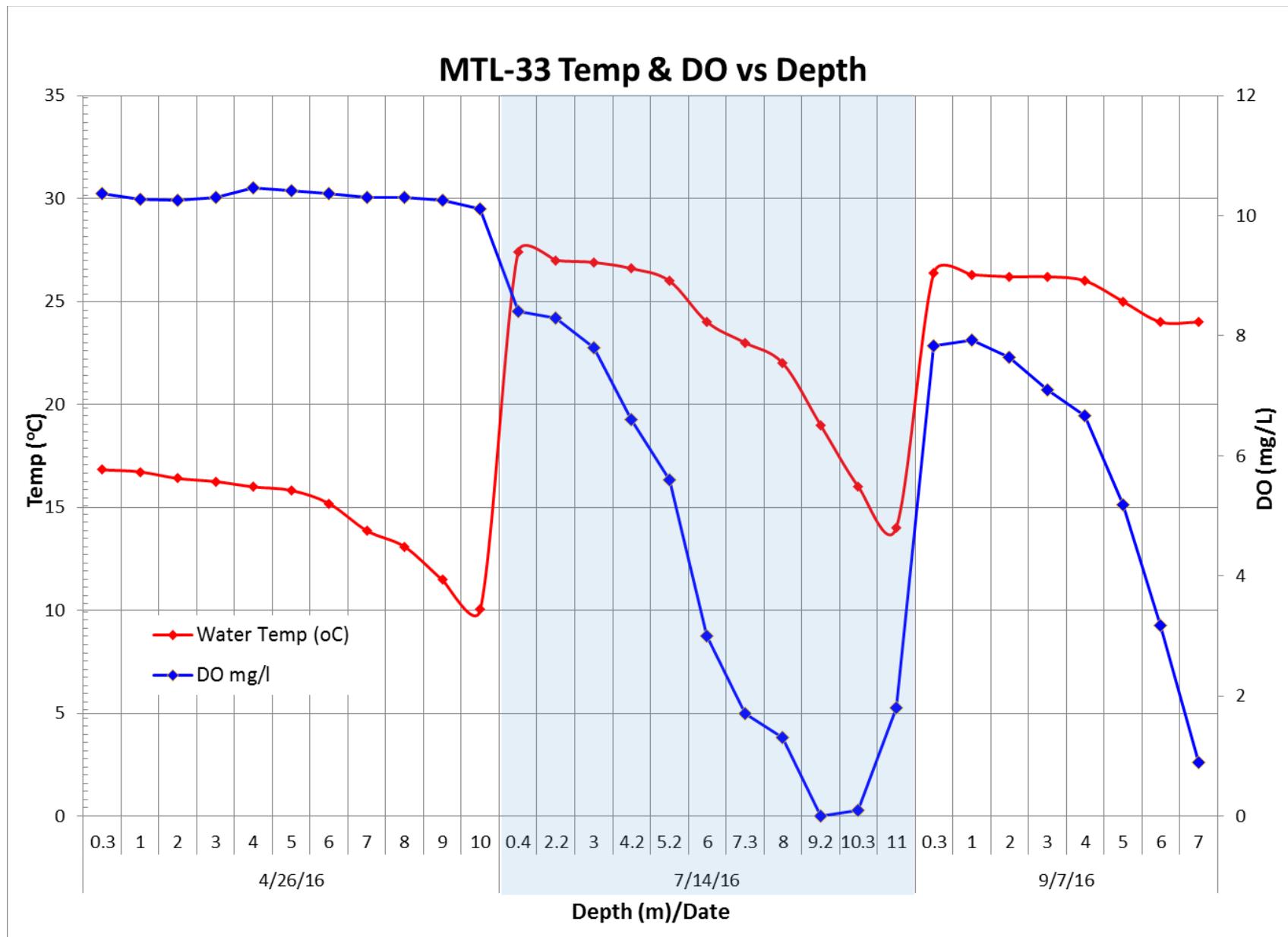
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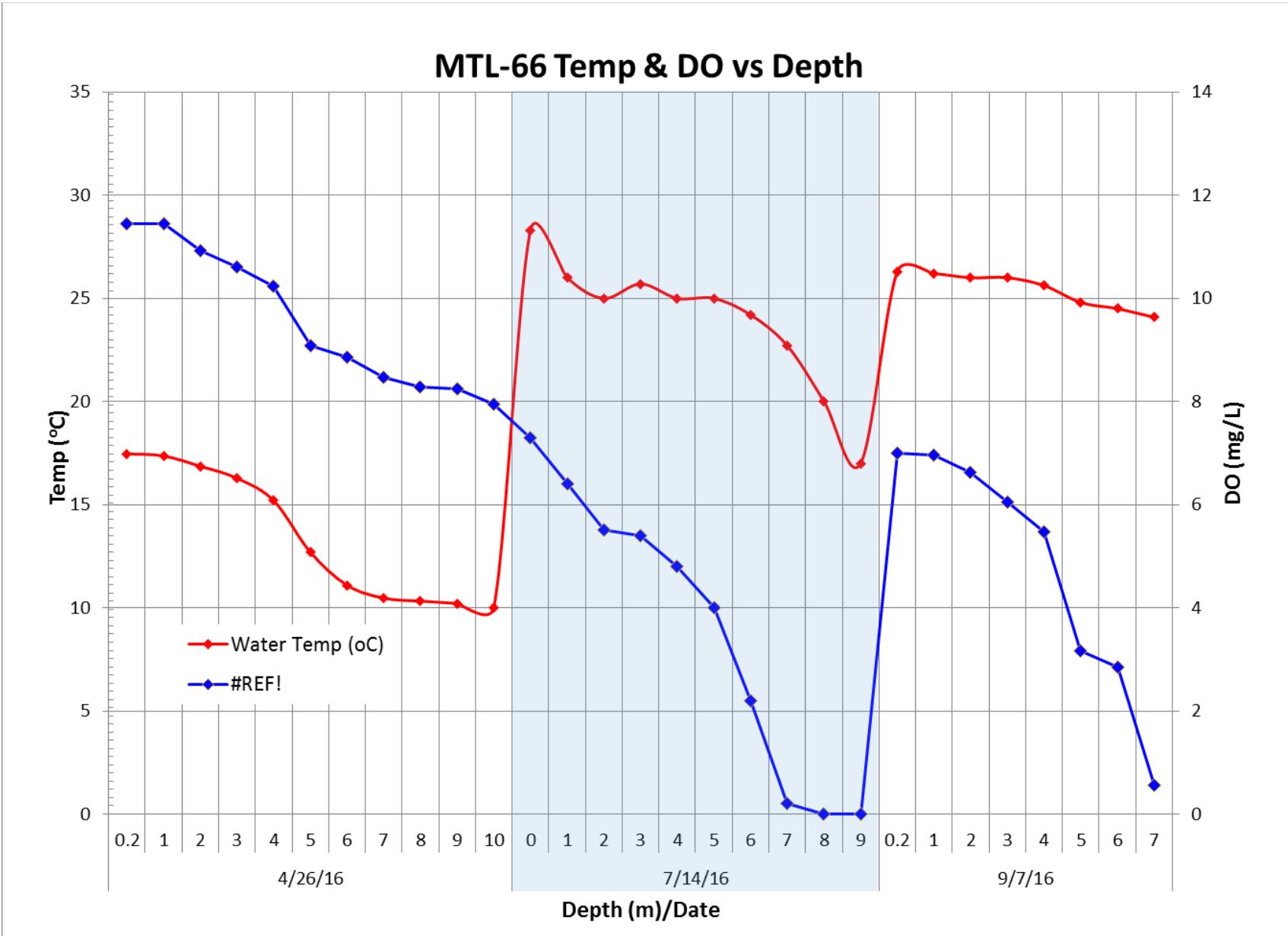


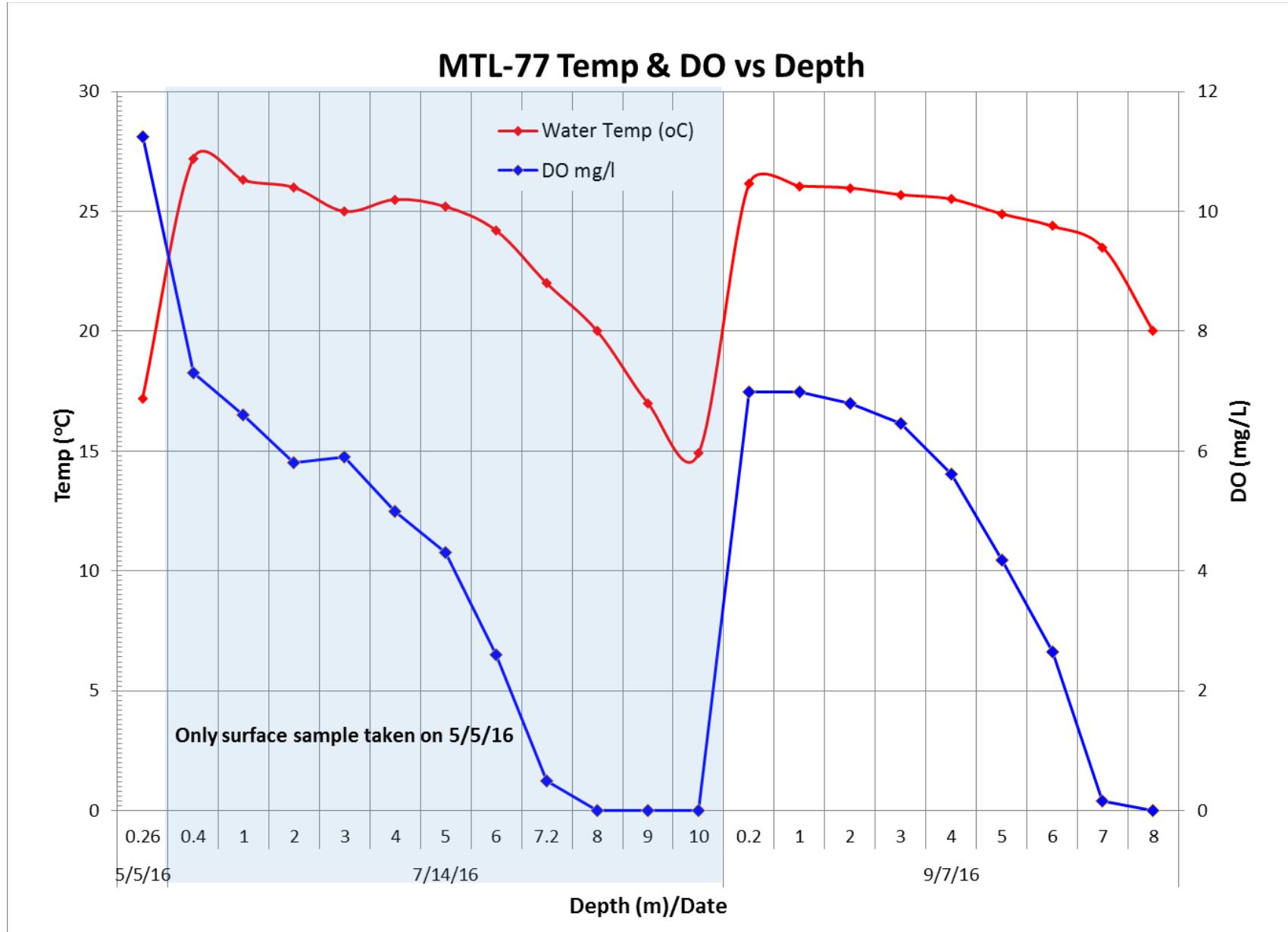


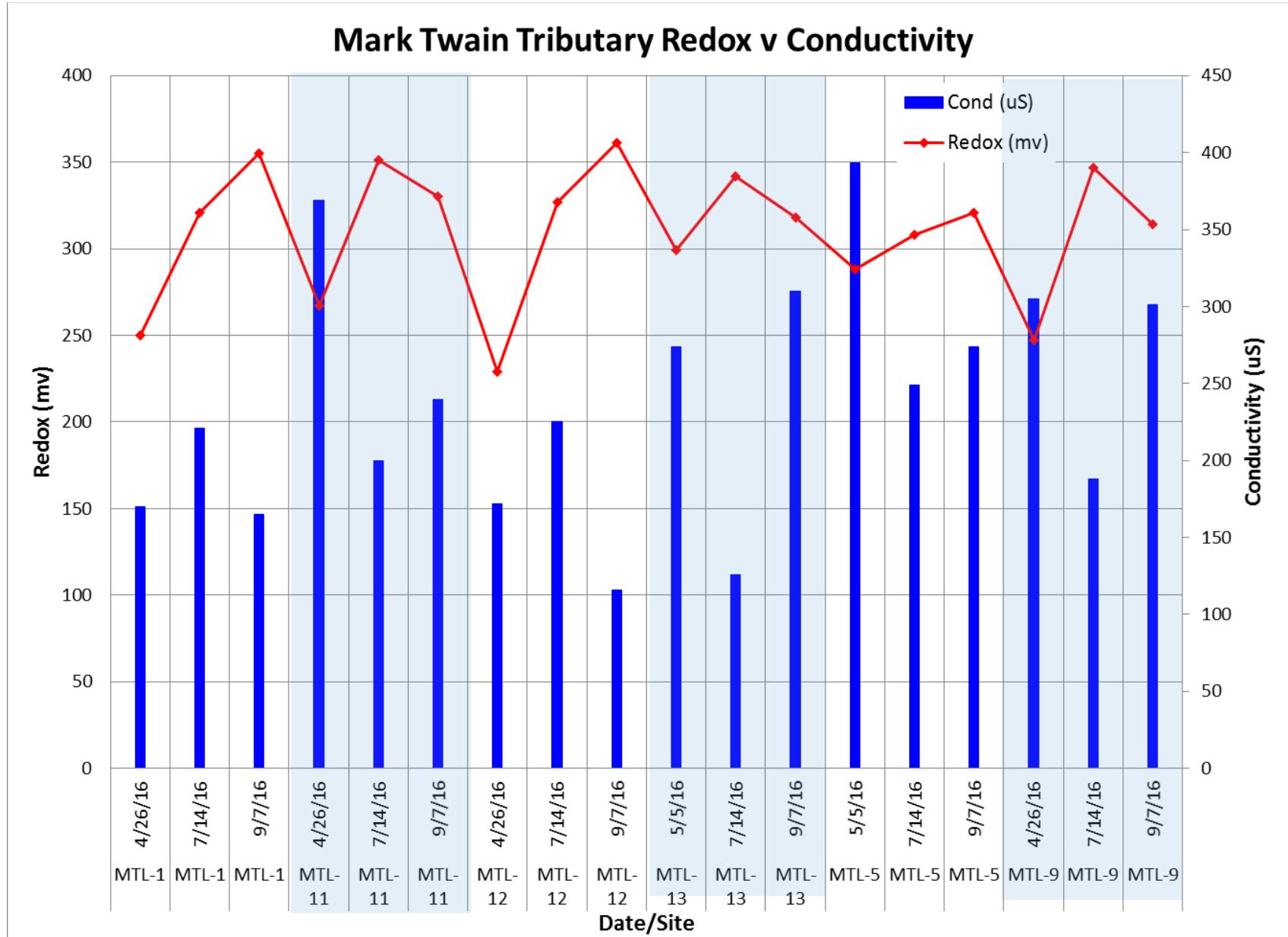


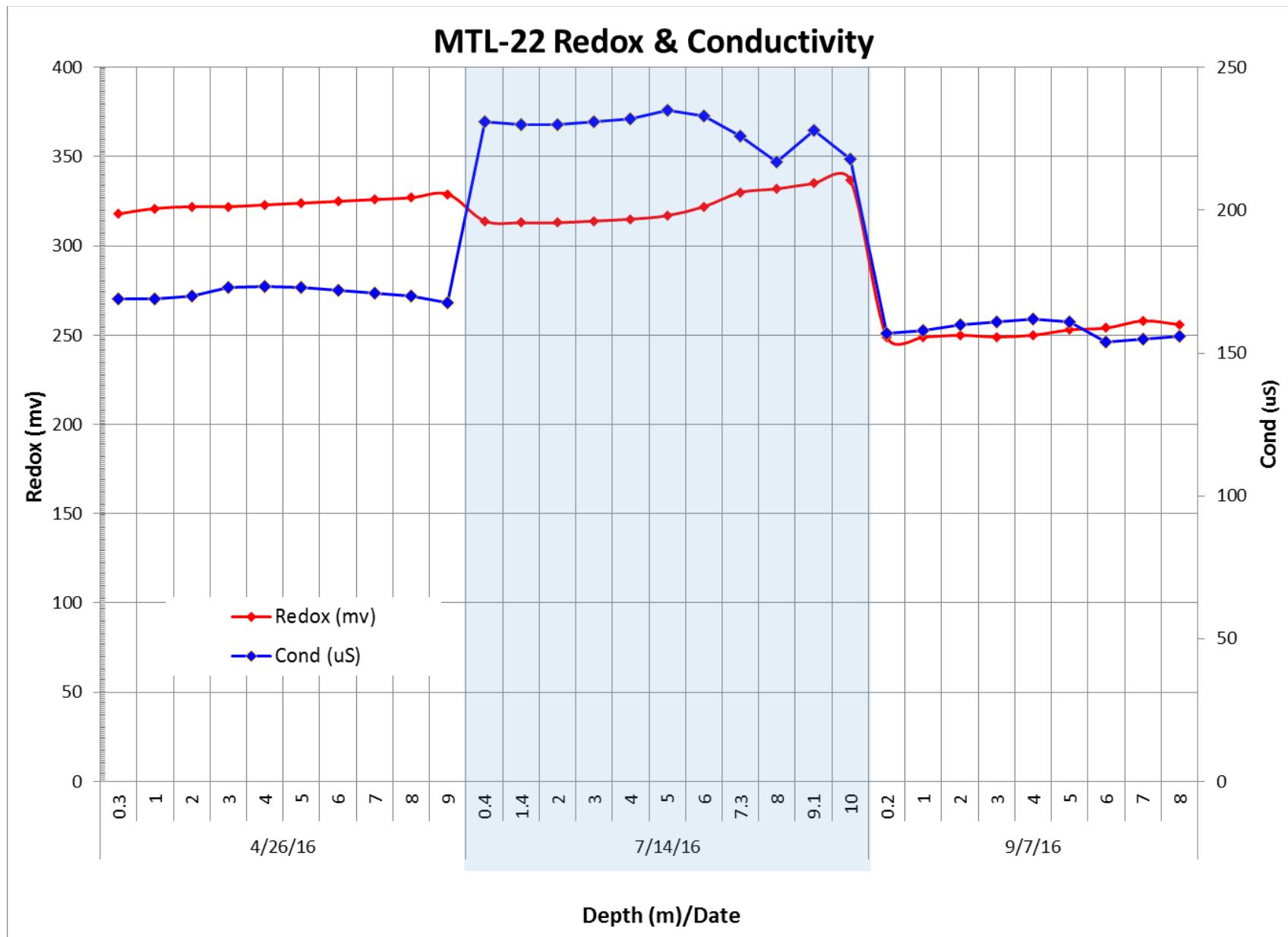






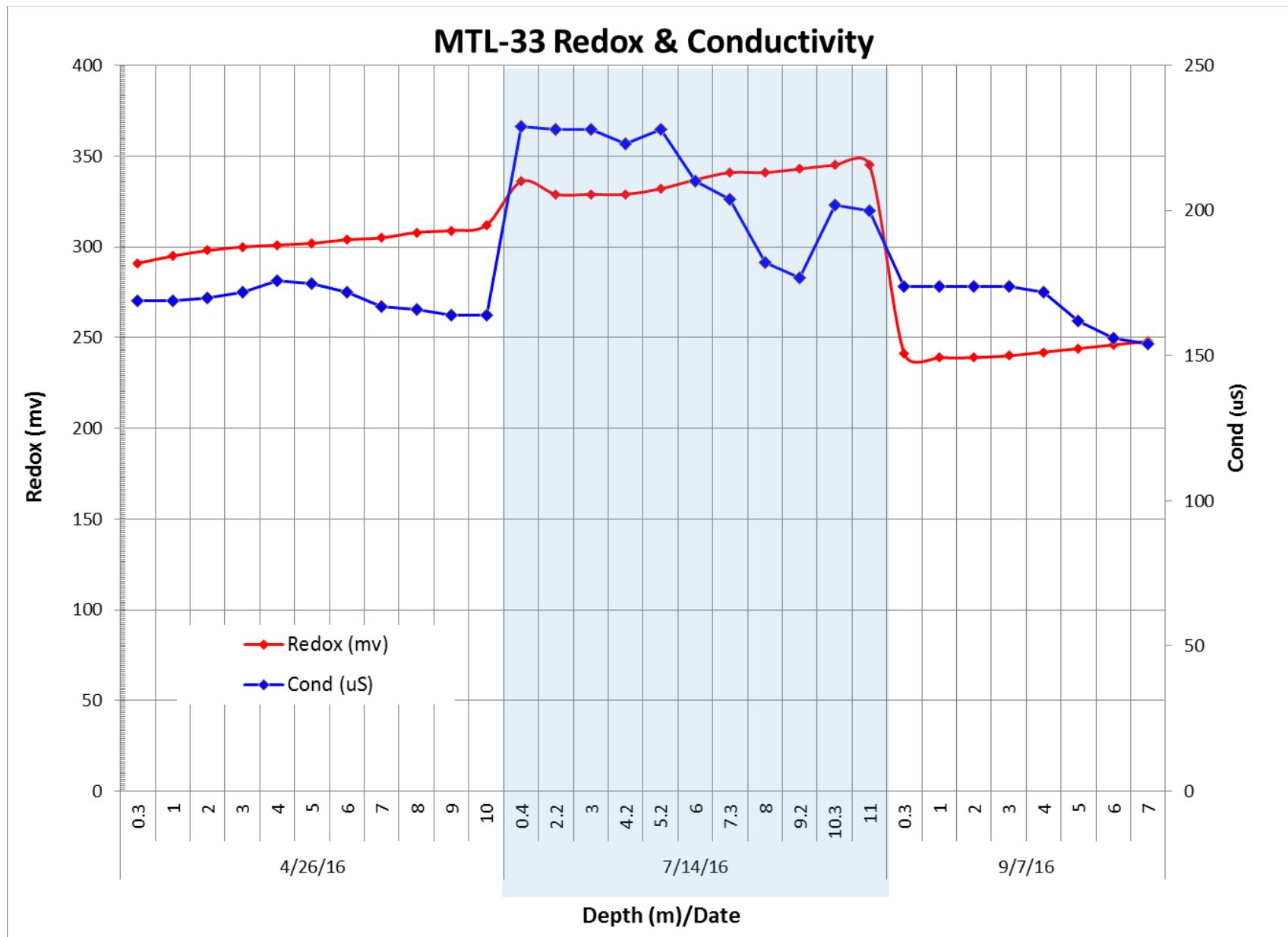


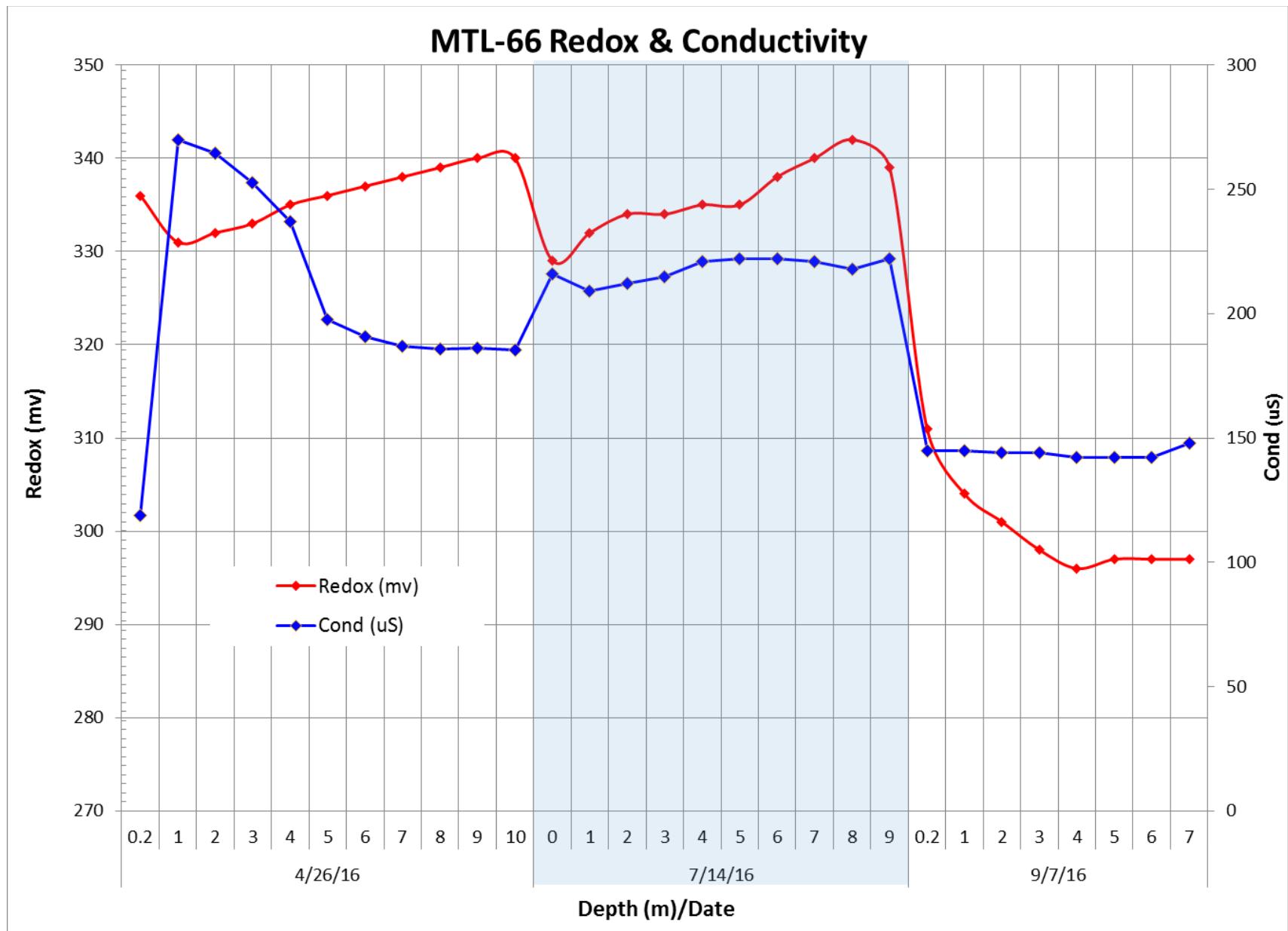


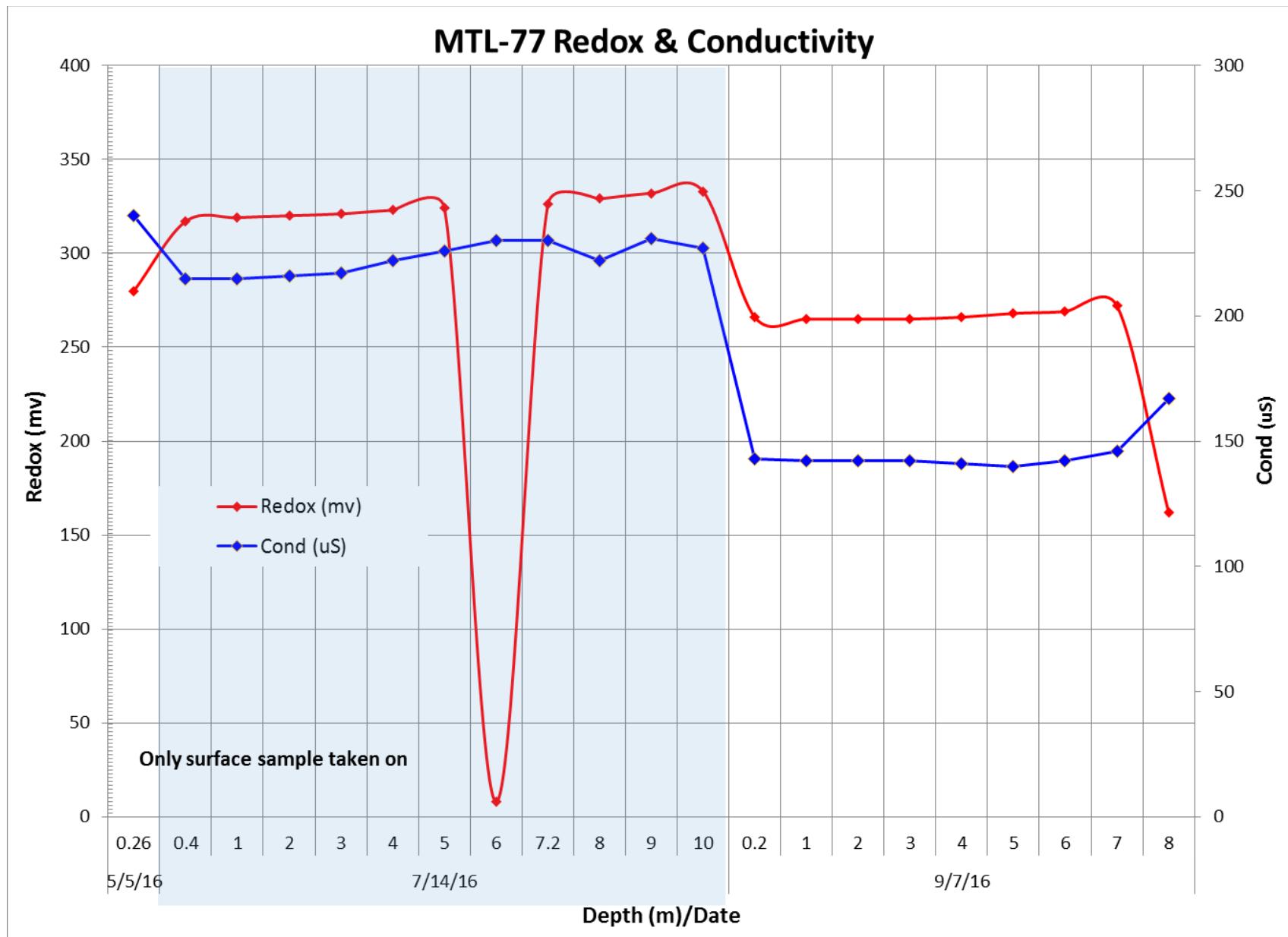


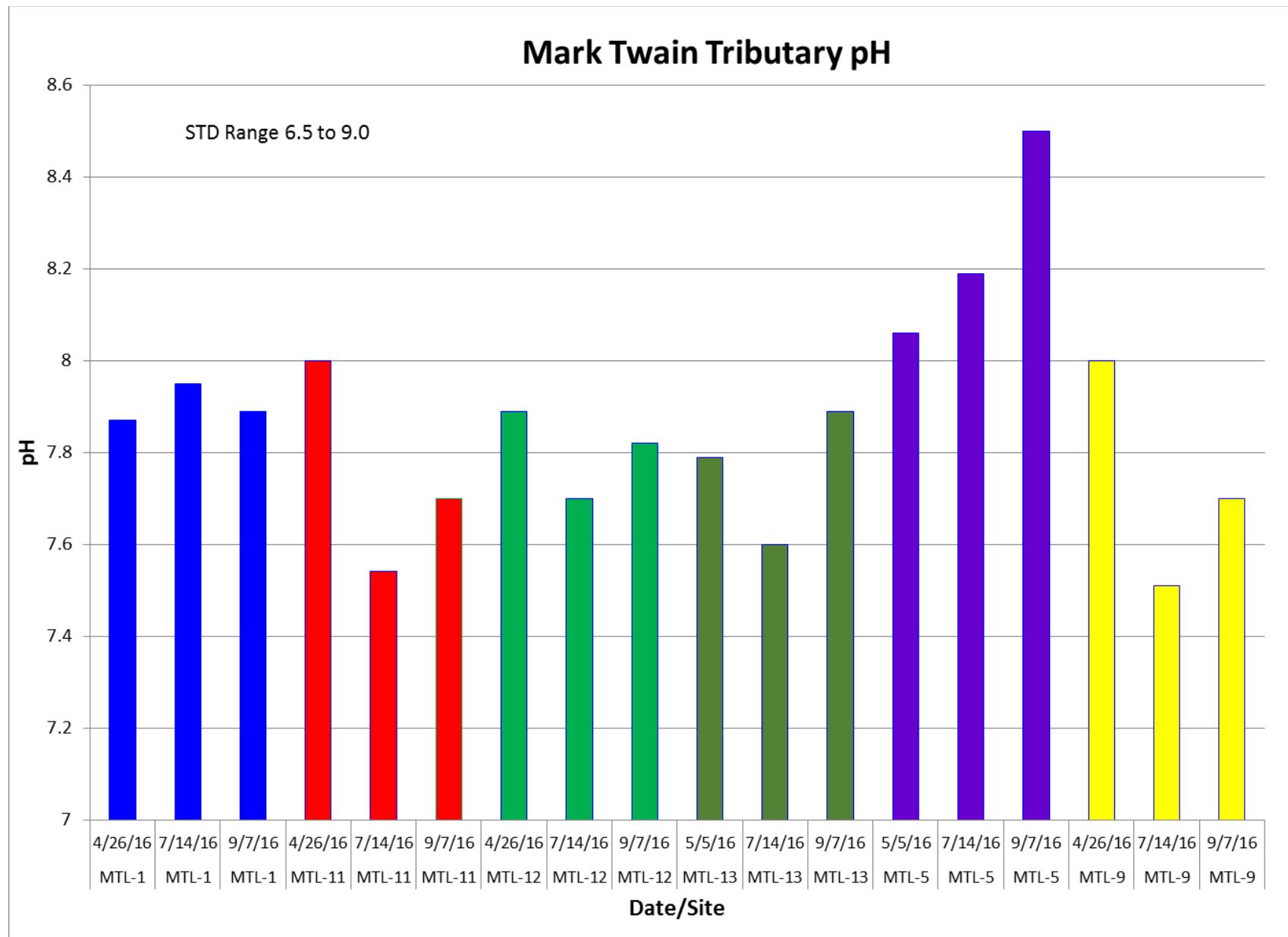
Depth (m)/Date

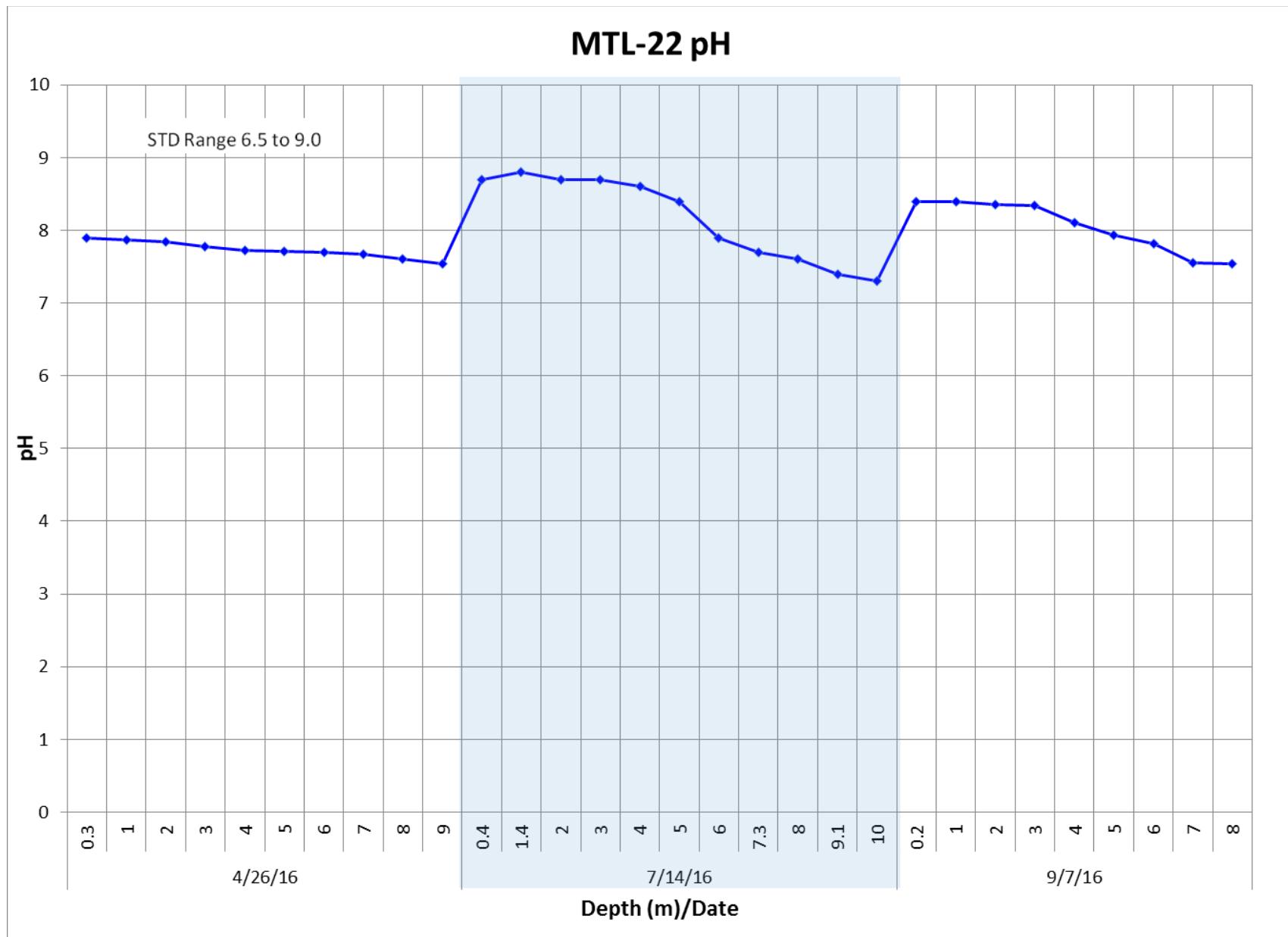
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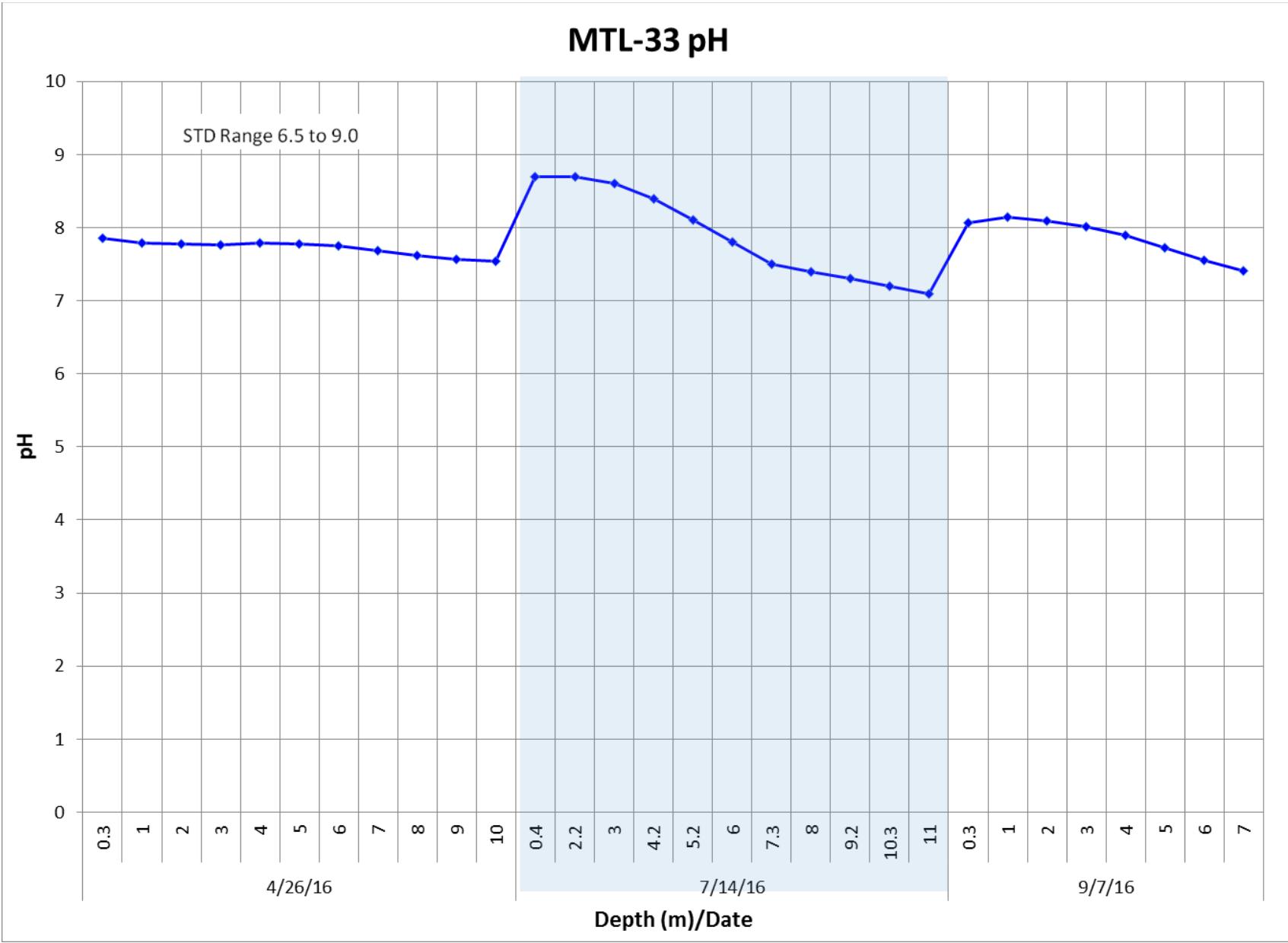


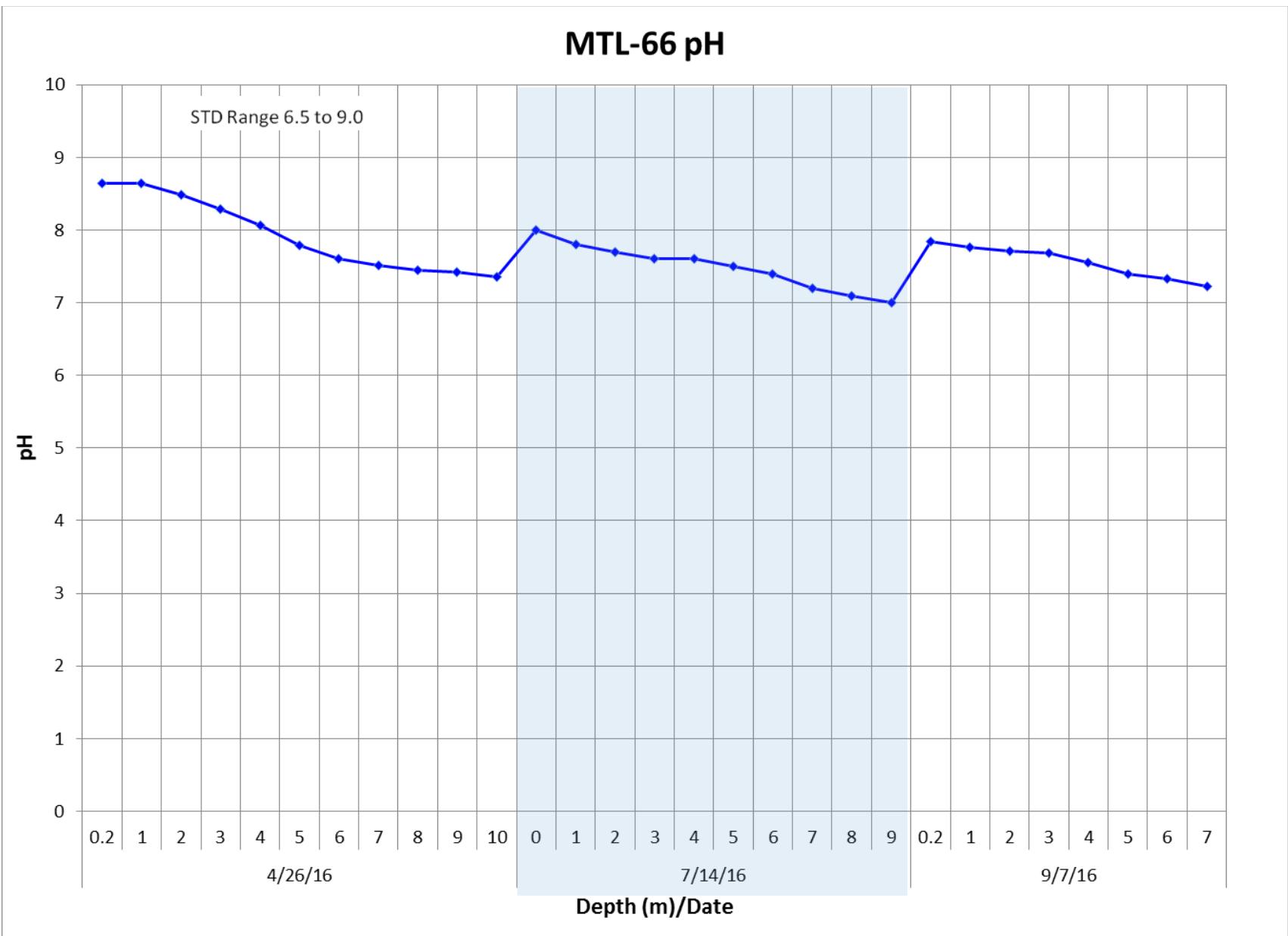


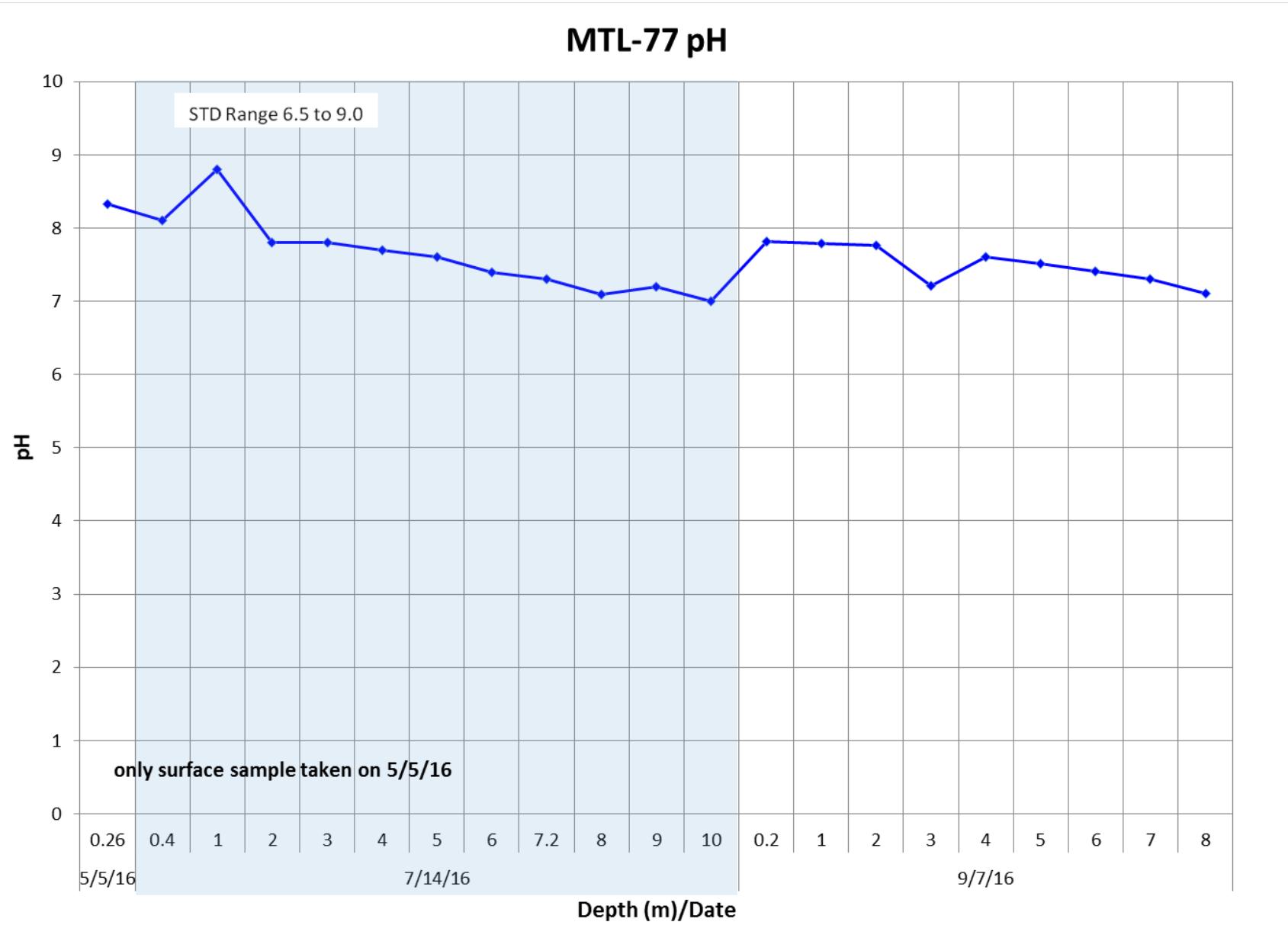




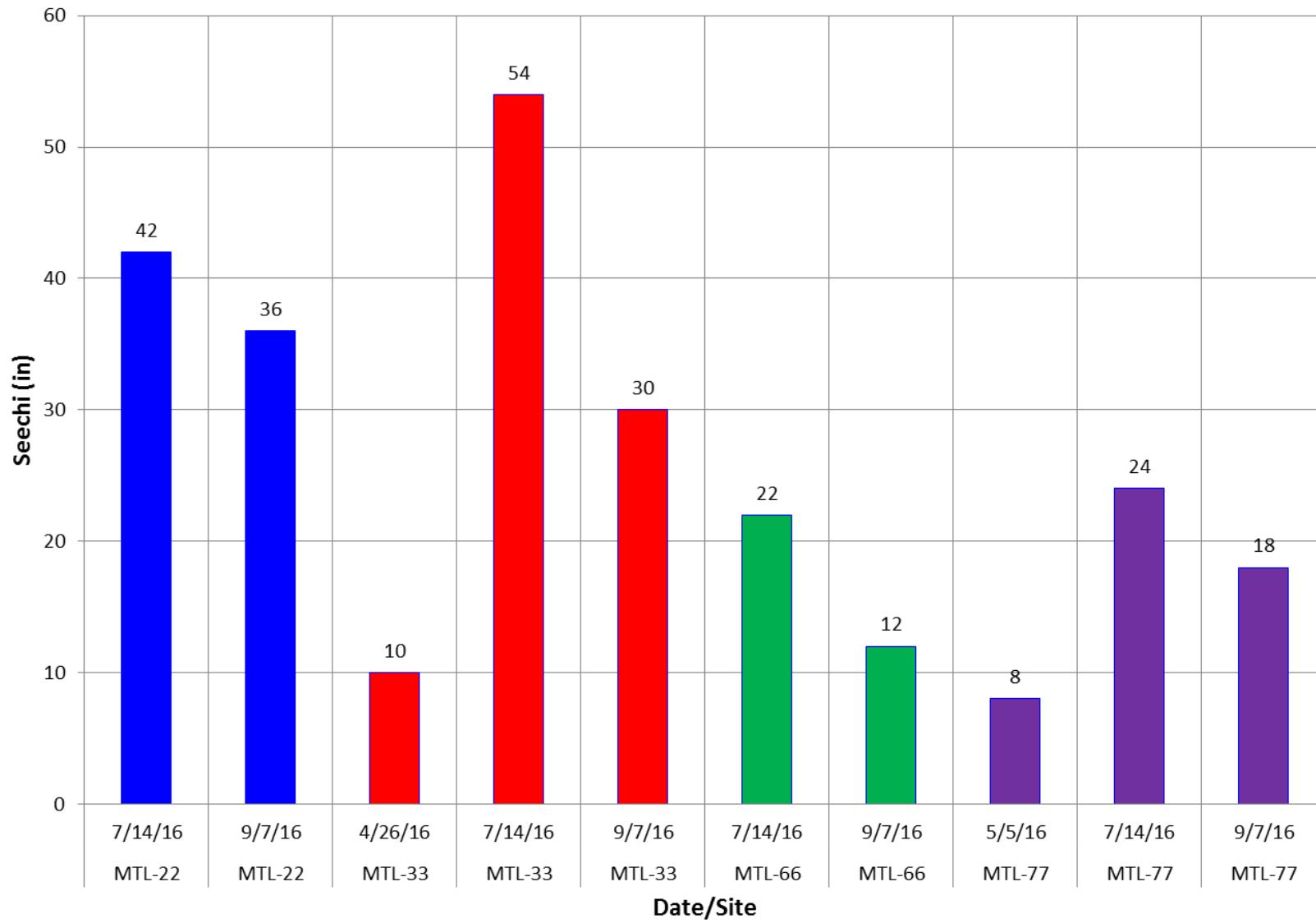


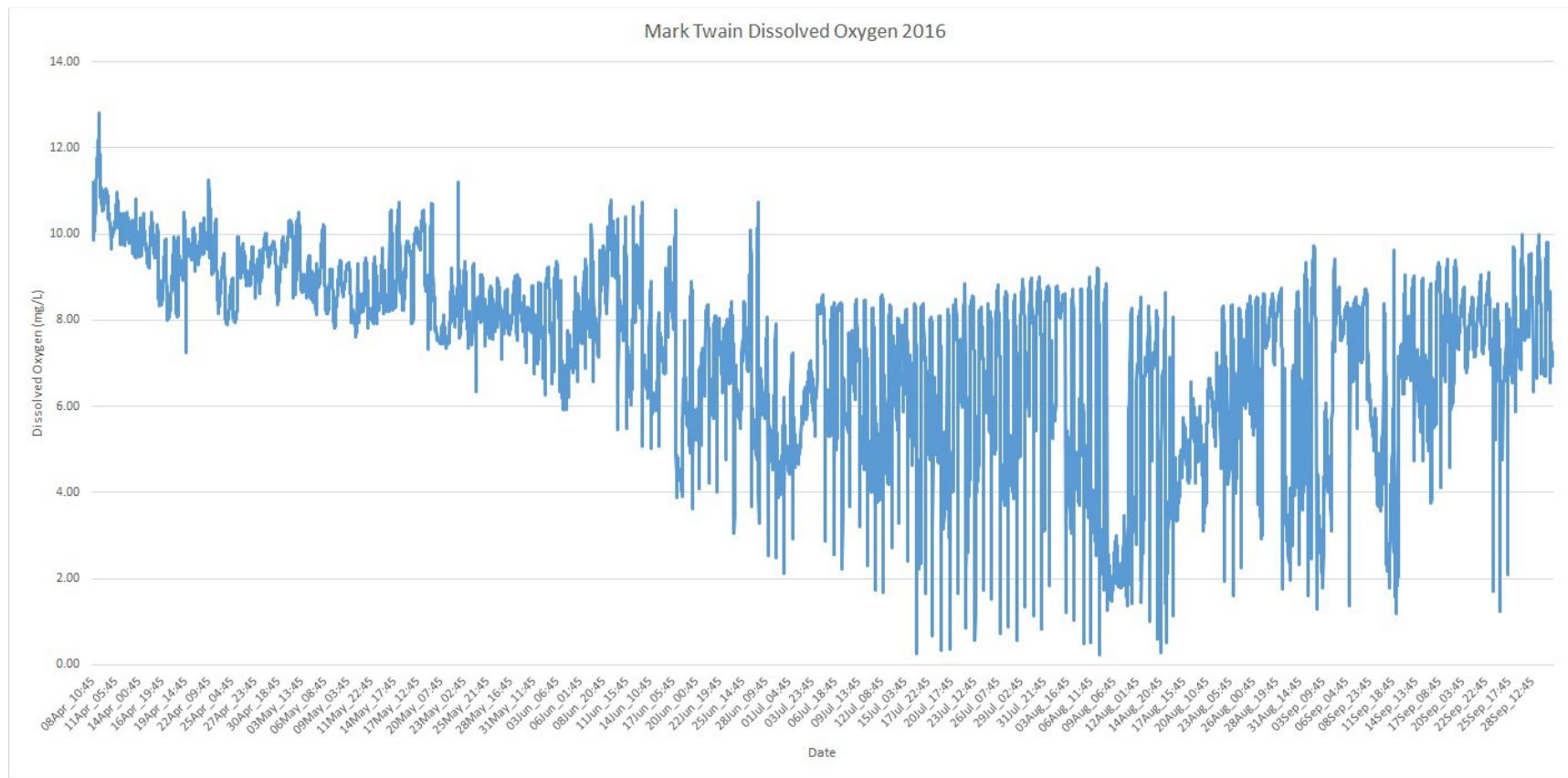




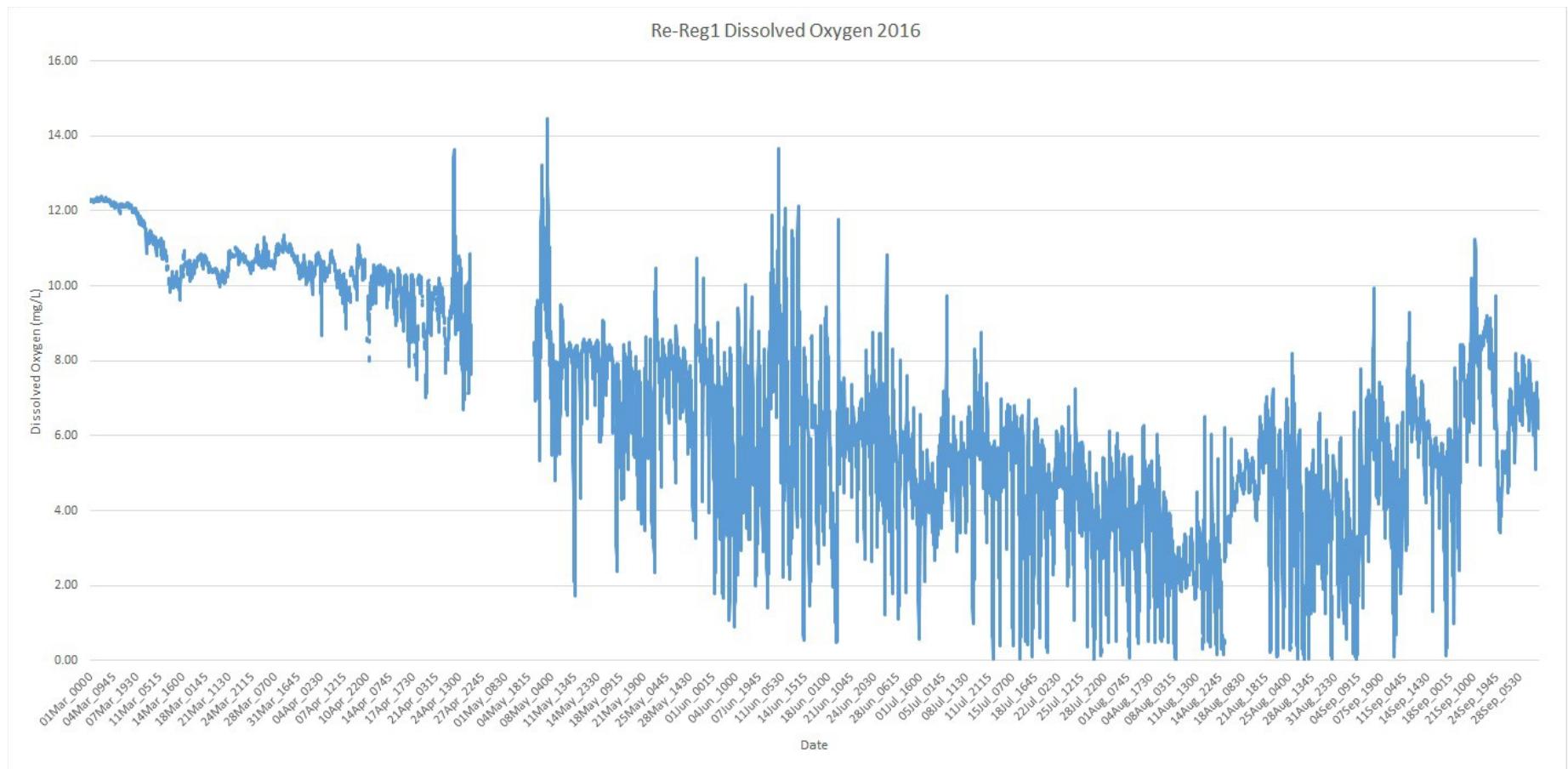


Mark Twain Lake Secchi

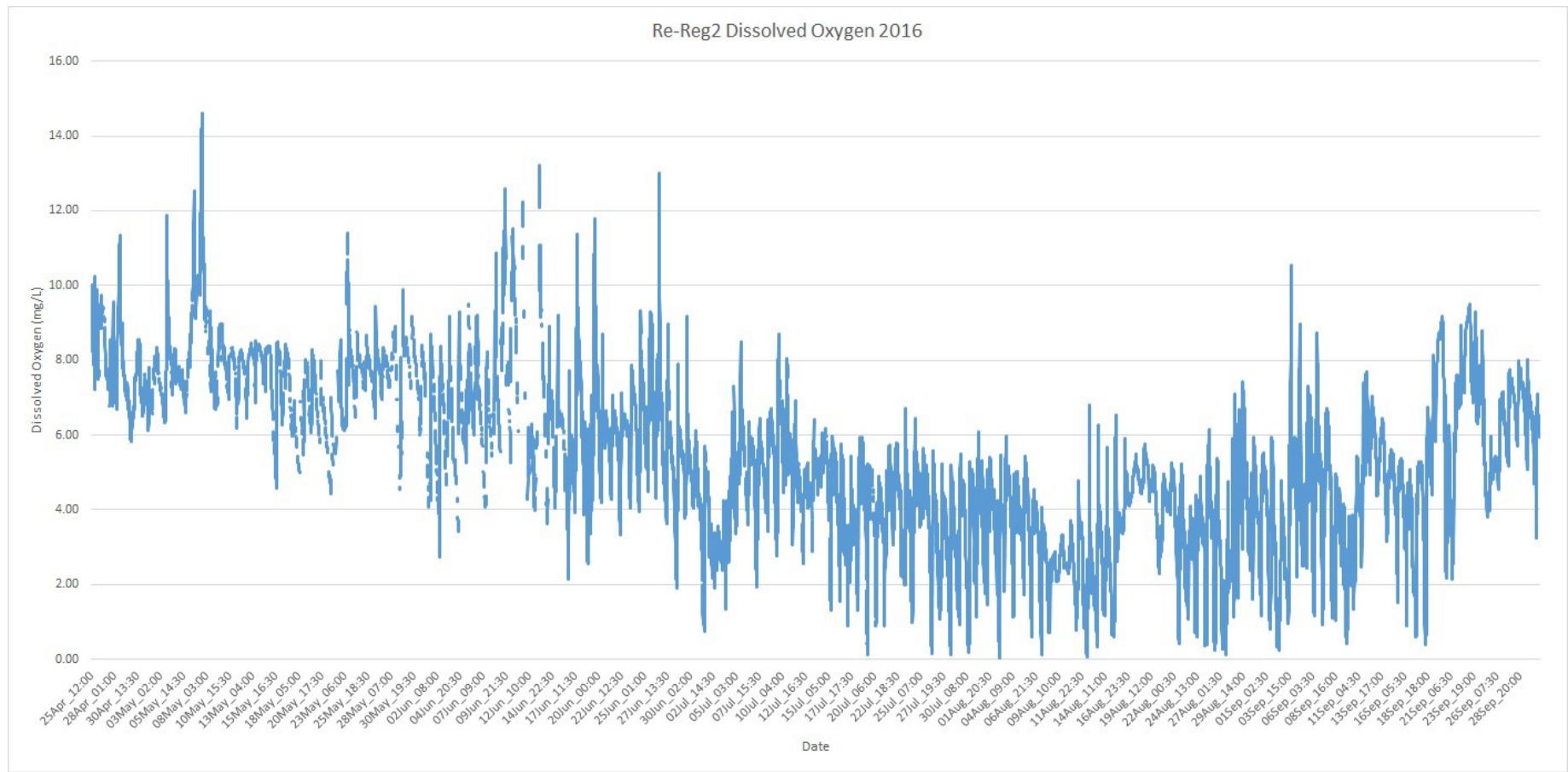




Main Dam Spillway D.O.



Re-reg 1 Sonde Dissolved Oxygen



Re-reg 2 Sonde Dissolved Oxygen

APPENDIX D

Lakes of Missouri Volunteer Program (LMVP) Data

2016 Lakes of Missouri Volunteer Program (LMVP) Data

Site	Date	Temp	Secchi	TP	TN	TCHLa	CHLa	PHEO	ISS	OSS	TSS	Comments	Latitude	Longitude	
		F	INCHES	ug/L	ug/L	ug/L	ug/L	ug/L	mg/L	mg/L	mg/L				
1	4/30/2016	58	16	125	1830	4	3.5	1.3	7	1.6	8.6	58	39.524	-91.6478	
1	5/21/2016	66	20	127	1800	3.2	3	0.5	5.3	1.5	6.8	75	Sunny, pt cloudy. Light winds. We sampled sites in a diff. order than usual.	39.524	-91.6478
1	6/11/2016	81	41	42	1580	13.6	11.1	7.2	5.2	4	9.2	68		39.524	-91.6478
1	7/4/2016	73	36	36	1500	21.6	19.4	6.2	3.4	3.6	7	66	Cloudy, Air 73F. Light misty rain Pt cloudy, light winds	39.524	-91.6478
1	7/23/2016	83	48	27	1400	17.3	14.8	6.9	1.6	4	5.6	60		39.524	-91.6478
1	8/13/2016	84	50	36	860	40.8	35.6	15.1	1.6	6.4	8	83	Pt cloudy, mostly sunny. WInds from W/NW at 10mph.	39.524	-91.6478
1	9/2/2016	75	46	36	650	21.8	18.7	9.2	1	3.4	4.4	69	Sunny, 77F, W wind at 8mph	39.524	-91.6478
1	9/24/2016	80	51	27	660	21.5	18.7	7.9	0.6	4	4.6	83	86F air, Sunny, pt cloudy. Light winds S-SW 4-8mph	39.524	-91.6478
2	4/30/2016	58	14	159	1840	7.3	6.3	2.8	8.5	1.8	10.3	39		39.5395	-91.6972
2	5/21/2016	69	18	126	1820	4.7	4.4	0.7	4.1	1.4	5.5	61	Overcast	39.5395	-91.6972
2	6/11/2016	80	36	29	1430	13.4	11.5	5.5	5.7	2.9	8.6	74		39.5395	-91.6972
2	7/4/2016	73	40	27	1330	22.4	19.7	7.7	3.2	3.3	6.5	65		39.5395	-91.6972
2	7/23/2016	84	49	23	1090	16.9	14.7	6.4	2.3	3.7	6	64		39.5395	-91.6972
2	8/13/2016	85	46	23	770	32.5	28.5	11.8	1.4	5.9	7.3	65		39.5395	-91.6972
2	9/2/2016	76	39	33	670	25.1	21.2	11.3	2.2	4.3	6.5	48	"Silo"	39.5395	-91.6972
2	9/24/2016	80	47	19	620	16	14	5.7	1.1	3.5	4.6	62		39.5395	-91.6972
5	4/30/2016	58	16	148	1830	4.7	4	1.8	7.2	2.3	9.5	27	Light rain, overcast day	39.5066	-91.7679
5	5/21/2016	67	20	125	1790	6.2	5.6	1.7 D1	4.5	2.2	6.7	30	Overcast	39.5066	-91.7679

Site	Date	Temp F	Secchi INCHES	TP ug/L	TN ug/L	TCHLa ug/L	CHLa ug/L	PHEO ug/L	ISS mg/L	OSS mg/L	TSS mg/L	Depth	Comments	Latitude	Longitude
5	6/11/2016	79	31	38	1610	18.4	15.6	8.3	5.8	3.7	9.5	57		39.5066	-91.7679
5	7/4/2016	73	36	34	1510	14.2	13.8	1	3.5	3	6.5	45		39.5066	-91.7679
5	7/23/2016	85	45	30	1250	18.4	16.2	6.4	2	3.6	5.6	53		39.5066	-91.7679
5	8/13/2016	85	42	41	830	45	39.3	16.5	2	6.7	8.7	40		39.5066	-91.7679
5	9/2/2016	75	36	46	690	29.5	25.3	12.4	2.2	4.8	7	52	"Hurricane gulch"	39.5066	-91.7679
5	9/24/2016	81	53	26	550	17.5	15.3	6.2	0.3	4.2	4.5	36		39.5066	-91.7679

Site 1 - near dam

Site 2 - Indian Creek

Site 5 - Confluence of North Fork & South Fork

Parameter	Abreviation	Unit of Measure
Water Clarity (using Secchi disk)	Secchi	Inches (")
Total Phosphorus	TP	Micrograms per liter (ug/L) or parts per billion (ppb)
Total Nitrogen	TN	Micrograms per liter (ug/L) or parts per billion (ppb)
Chlorophyll A	TCHLA	Micrograms per liter (ug/L) or parts per billion (ppb) (uncorrected for pheophytin)
Chlorophyll A	CHLA	ug/L (pheophytin corrected)
Pheophytin	Pheo	ug/L
Inorganic Suspended Sediments	ISS	Milligrams per liter (mg/L), or parts per million (ppm)
Organic Suspended Solids	OSS	mg/L
Total Suspended Sediments	TSS	Milligrams per liter (mg/L), or parts per million (ppm)

Full report for all lakes in the LMVP can be found at <http://www.lmvp.org/lakes.htm>.

APPENDIX E

**United Water Services
Clarence Cannon WTP Data**

HIGH SERVICE+A1:P30

January 2016

	PLANT EFFLUENT														
	Flow (mgd)	pH	Alkalinity (mg/l)	Turbidity (NTU)	Free Cl2 (mg/l)	Total Cl2 (mg/l)	Hardness (mg/l)	Iron (mg/l)	Mn (mg/l)	NH3 (mg/l)	NO2 (mg/l)	TDS (mg/l)	Color (u)	Temp (°C)	Total Coliforms
DATE															
1	3.54	7.77	91	0.06	0.09	3.80	159	0.029		0.08		236	0.0	9	A
2	4.04	7.74	91	0.05	0.10	3.85	159	0.007		0.04		236	0.0	9	
3	3.91	7.74	89	0.05	0.07	3.75	159	0.008		0.07		230	0.0	9	
4	3.82	7.78	86	0.05	0.07	3.73	150	0.065		0.04		230	0.0	8	A
5	4.13	7.77	84	0.06	0.07	3.71	151	0.034		0.08		232	0.0	9	
6	3.56	7.79	87	0.05	0.10	3.78	156	0.003	0.023	0.09	0.005	225	0.0	9	A
7	3.82	7.85	88	0.04	0.09	3.78	158	0.005		0.15		226	0.0	9	
8	3.99	7.75	86	0.06	0.10	3.73	159	0.008		0.05		224	0.0	10	A
9	3.64	7.84	82	0.07	0.08	3.69	153	0.007		0.07		230	0.0	9	
10	3.98	7.83	85	0.07	0.08	3.84	150	0.007		0.06		230	0.0	8	
11	4.48	7.81	87	0.06	0.10	3.83	157	0.003		0.08		226	0.0	7	A
12	3.99	7.76	84	0.05	0.07	3.53	156	0.009		0.05		229	0.0	11	
13	4.30	7.70	87	0.07	0.09	3.69	158	0.006	0.012	0.14	0.004	233	0.0	7	A
14	4.11	7.80	89	0.08	0.10	3.68	155	0.006		0.08		230	0.0	8	
15	4.04	7.73	91	0.07	0.08	3.53	150	0.010		0.08		231	0.0	8	A
16	4.31	7.75	90	0.06	0.07	3.55	150	0.014		0.05		227	0.0	7	
17	3.97	7.94	93	0.06	0.08	3.56	151	0.014		0.05		229	0.0	7	
18	4.52	7.82	92	0.07	0.05	3.46	150	0.014		0.08		230	0.0	7	A
19	4.21	7.79	92	0.07	0.06	3.40	154	0.015		0.06		227	0.0	7	
20	3.87	7.74	91	0.06	0.07	3.48	152	0.009	0.008	0.18	0.004	229	0.0	7	A
21	4.05	7.67	92	0.06	0.06	3.52	153	0.018		0.10		231	0.0	7	
22	4.10	7.65	91	0.06	0.08	3.55	152	0.006		0.01		232	0.0	7	A
23	4.02	7.77	94	0.08	0.09	3.76	152	0.004		0.00		0	0.0	7	
24	3.94	7.82	96	0.07	0.10	3.62	158	0.006		0.06		230	0.0	7	
25	4.70	7.87	93	0.06	0.08	3.54	153	0.016		0.08		232	0.0	7	A
26	3.79	7.81	92	0.06	0.06	3.40	150	0.006		0.07		230	0.0	10	
27	3.99	7.73	90	0.06	0.08	3.47	149	0.009	0.016	0.13	0.006	0	8.0	8	A
28	4.18	7.74	87	0.07	0.06	3.51	147	0.065		0.11		228	0.0	8	
29	3.91	7.75	75	0.08	0.08	3.59	139	0.015		0.16		208	5.0	8	A
30	4.11	7.79	79	0.06	0.08	3.35	144	0.002		0.09		216	0.0	9	
31	4.10	7.74	85	0.07	0.07	3.41	151	0.012		0.08		222	0.0	9	
AVG	4.04	7.77	88	0.06	0.08	3.61	153	0.014	0.015	0.08	0.005	213	0.4	8	
TOTAL	125.12														

HIGH SERVICE
February 2016

	PLANT EFFLUENT														
	Flow	pH	Alkalinity	Turbidity	Free Cl2	Total Cl2	Hardness	Iron	Mn	NH3	NO2	TDS	Color	Temp	Total
DATE	(mgd)	-	(mg/l)	(NTU)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(u)	(°C)	Coliforms
1	3.61	7.75	90	0.08	0.06	3.37	153	0.015		0.12		228	0.0	7	A
2	4.11	7.69	92	0.08	0.09	3.51	150	0.019		0.14		222	0.0	8	
3	3.72	7.77	92	0.06	0.06	3.29	148	0.008	0.011	0.10	0.005	234	0.0	6	A
4	3.86	7.79	93	0.06	0.07	3.42	149	0.011		0.10		228	0.0	9	
5	3.62	7.77	93	0.06	0.08	3.56	155	0.006		0.02		232	0.0	11	A
6	3.94	7.75	94	0.07	0.07	3.63	157	0.007		0.05		231	0.0	9	
7	4.26	7.72	98	0.07	0.08	3.66	156	0.006		0.07		232	0.0	10	
8	3.88	7.74	99	0.06	0.07	3.56	162	0.018		0.04		236	0.0	9	A
9	3.77	7.77	97	0.07	0.07	3.48	160	0.005		0.04		226	0.0	10	
10	3.84	7.74	95	0.06	0.06	3.53	157	0.008	0.010	0.05	0.000	228	0.0	6	A
11	4.02	7.74	96	0.07	0.06	3.47	159	0.006		0.06		225	0.0	9	
12	4.15	7.76	105	0.07	0.11	3.60	162	0.013		0.11		231	0.0	8	A
13	4.10	7.74	102	0.06	0.07	3.53	162	0.011		0.08		229	0.0	9	
14	3.80	7.73	100	0.07	0.07	3.49	161	0.015		0.06		230	0.0	9	
15	4.30	7.72	102	0.08	0.06	3.55	170	0.009		0.04		232	0.0	7	A
16	4.01	7.84	102	0.07	0.08	3.54	160	0.013		0.11		230	0.0	7	
17	3.92	7.86	100	0.05	0.08	3.46	158	0.004	0.008	0.01	0.005	229	0.0	9	A
18	4.08	7.74	98	0.07	0.17	3.60	158	0.015		0.05		229	0.0	9	
19	3.82	7.70	95	0.07	0.08	3.73	161	0.006		0.08		228	0.0	12	A
20	4.04	7.76	96	0.07	0.07	3.78	164	0.007		0.08		230	0.0	12	
21	4.31	7.78	97	0.07	0.07	3.48	171	0.007		0.08		228	0.0	9	
22	4.16	7.80	99	0.07	0.08	3.54	160	0.015		0.04		231	1.0	9	A
23	3.93	7.89	99	0.06	0.07	3.62	170	0.005		0.07		233	0.0	11	
24	3.47	7.93	100	0.06	0.07	3.57	152	0.007	0.012	0.10	0.011	229	0.0	9	A
25	4.29	7.89	100	0.06	0.07	3.51	158	0.007		0.09		230	0.0	8	
26	3.97	7.78	101	0.07	0.06	3.47	167	0.010		0.10		230	0.0	8	A
27	4.16	7.75	99	0.05	0.07	3.48	165	0.014		0.03		233	0.0	10	
28	4.12	7.74	99	0.06	0.07	3.43	167	0.016		0.05		234	0.0	12	
29	4.29	7.76	96	0.05	0.08	3.52	169	0.007		0.10		230	0.0	8	A
AVG	3.98	7.77	97	0.06	0.08	3.53	160	0.010	0.010	0.07	0.005	230	0.0	9	
TOTAL	115.55														

HIGH SERVICE

March 2016

	PLANT EFFLUENT														
	Flow	pH	Alkalinity	Turbidity	Free Cl2	Total Cl2	Hardness	Iron	Mn	NH3	NO2	TDS	Color	Temp	Total
DATE	(mgd)	-	(mg/l)	(NTU)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(u)	(°C)	Coliforms
1	3.97	7.74	97	0.06	0.07	3.53	165	0.023		0.05		232	0.0	9	
2	3.83	7.75	99	0.05	0.07	3.47	159	0.006	0.009	0.05	0.003	228	0.0	10	A
3	4.22	7.78	98	0.06	0.06	3.52	164	0.012		0.01		247	0.0	11	
4	3.47	7.77	99	0.07	0.06	3.59	165	0.007		0.07		250	0.0	13	A
5	4.11	7.76	99	0.07	0.08	3.58	161	0.007		0.10		236	0.0	12	
6	3.95	7.76	100	0.07	0.07	3.56	161	0.007		0.10		228	0.0	8	
7	4.24	7.77	101	0.06	0.07	3.62	164	0.003		0.05		248	0.0	12	A
8	3.98	7.77	101	0.06	0.06	3.56	163	0.005		0.05		250	0.0	14	
9	3.57	7.74	101	0.07	0.07	3.61	168	0.006	0.011	0.11	0.001	236	0.0	10	A
10	4.32	7.78	100	0.07	0.05	3.53	169	0.007		0.10		244	2.0	12	
11	3.61	7.87	100	0.06	0.06	3.62	169	0.015		0.11		248	1.0	12	A
12	4.36	7.81	100	0.06	0.06	3.45	167	0.003		0.19		248	0.0	15	
13	3.58	7.70	98	0.05	0.06	3.48	166	0.003		0.07		248	0.0	15	
14	4.21	7.76	99	0.06	0.05	3.39	169	0.005		0.08		246	2.0	13	A
15	4.14	7.84	102	0.06	0.06	3.50	170	0.010		0.06		248	1.0	13	
16	3.88	7.87	102	0.06	0.07	3.44	158	0.005	0.008	0.07	0.003	243	0.0	14	A
17	3.87	7.87	102	0.06	0.06	3.38	164	0.011		0.13		248	0.0	15	
18	3.84	7.78	104	0.06	0.07	3.46	167	0.009		0.03		253	0.0	16	A
19	3.86	7.74	104	0.07	0.06	3.36	171	0.059		0.08		250	0.0	14	
20	4.23	7.68	105	0.07	0.05	3.39	175	0.006		0.09		253	2.0	12	
21	3.97	7.66	108	0.07	0.05	3.39	175	0.014		0.09		258	0.0	13	A
22	4.12	7.68	105	0.06	0.05	3.34	174	0.006		0.10		256	0.0	12	
23	3.87	7.74	101	0.06	0.06	3.44	163	0.005	0.008	0.08	0.000	249	0.0	13	A
24	3.70	7.80	101	0.08	0.06	3.34	166	0.007		0.08		250	0.0	13	
25	4.40	7.82	102	0.07	0.05	3.35	168	0.014		0.06		249	1.0	13	A
26	3.99	7.87	107	0.05	0.06	3.34	168	0.004		0.11		252	0.0	15	
27	3.76	7.88	106	0.05	0.05	3.32	171	0.009		0.10		255	0.0	14	
28	4.25	7.87	104	0.06	0.05	3.37	165	0.007		0.06		253	0.0	13	A
29	3.99	7.84	101	0.06	0.07	3.38	167	0.015		0.09		246	0.0	13	
30	3.79	7.75	104	0.05	0.07	3.45	169	0.003	0.023	0.06	0.005	254	0.0	16	A
31	4.20	7.72	104	0.05	0.07	3.42	174	0.005		0.11		256	0.0	15	
AVG	3.98	7.78	102	0.06	0.06	3.46	167	0.009	0.012	0.08	0.002	247	0.3	13	
TOTAL	123.28														

HIGH SERVI+A1:P33CE

April 2016

	PLANT EFFLUENT														
	Flow	pH	Alkalinity	Turbidity	Free Cl2	Total Cl2	Hardness	Iron	Mn	NH3	NO2	TDS	Color	Temp	Total
DATE	(mgd)	-	(mg/l)	(NTU)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(u)	(°C)	Coliforms
1	3.48	7.88	104	0.05	0.06	3.41	177	0.007		0.11		255	0.0	12	A
2	4.25	7.98	105	0.06	0.06	3.48	171	0.009		0.16		252	0.0	12	
3	4.44	7.92	105	0.07	0.05	3.41	170	0.007		0.12		254	0.0	12	
4	4.11	7.82	103	0.05	0.06	3.30	172	0.005		0.08		253	0.0	14	A
5	4.03	7.75	101	0.05	0.07	3.37	173	0.005		0.08		243	0.0	15	
6	3.84	7.77	100	0.06	0.07	3.51	167	0.006	0.002	0.11		246	0.0	14	A
7	3.99	7.78	102	0.07	0.07	3.42	170	0.006		0.10		246	0.0	15	
8	4.25	7.80	104	0.06	0.05	3.35	167	0.003		0.07		244	0.0	15	A
9	3.78	7.92	108	0.06	0.05	3.31	173	0.007		0.09		247	0.0	14	
10	4.07	7.89	107	0.05	0.05	3.26	172	0.007		0.06		247	0.0	15	
11	3.87	7.81	104	0.05	0.05	3.29	170	0.007		0.08		242	0.0	14	A
12	3.69	7.78	106	0.07	0.05	3.35	175	0.050		0.12		247	0.0	14	
13	4.06	7.76	105	0.05	0.06	3.48	177	0.004	0.018	0.01	0.005	249	0.0	16	A
14	4.19	7.77	108	0.05	0.06	3.39	176	0.008		0.07		251	0.0	15	
15	4.38	7.76	105	0.06	0.07	3.49	173	0.005		0.08		248	0.0	17	A
16	4.28	7.76	99	0.06	0.06	3.49	171	0.006		0.12		245	0.0	18	
17	4.56	7.79	100	0.06	0.07	3.57	177	0.005		0.05		246	0.0	19	
18	4.85	7.76	104	0.05	0.05	3.44	166	0.011		0.06		236	0.0	18	A
19	4.29	7.80	101	0.05	0.06	3.38	166	0.006		0.05		235	0.0	18	
20	4.01	7.91	99	0.06	0.06	3.44	160	0.006	0.009	0.06	0.004	235	0.0	19	A
21	3.97	7.98	99	0.07	0.05	3.37	170	0.007		0.08		238	0.0	18	
22	3.96	7.91	99	0.06	0.04	3.31	163	0.009		0.11		233	0.5	19	A
23	4.41	7.85	104	0.05	0.05	3.29	170	0.005		0.11		243	0.0	20	
24	4.37	7.79	106	0.06	0.05	3.26	171	0.005		0.12		244	0.0	20	
25	4.79	7.80	103	0.07	0.04	3.21	158	0.006		0.11		240	0.0	19	A
26	4.55	7.83	101	0.07	0.05	3.13	164	0.009		0.19		242	0.0	20	
27	3.76	7.84	103	0.07	0.04	3.25	168	0.006	0.009	0.10	0.004	243	0.0	22	A
28	3.90	7.83	104	0.05	0.04	3.41	166	0.005		0.09		244	0.0	20	
29	4.34	7.83	101	0.05	0.04	3.37	170	0.002		0.10		245	0.0	20	A
30	4.05	7.89	101	0.06	0.04	3.27	165	0.005		0.07		244	0.0	20	
AVG	4.15	7.83	103	0.06	0.05	3.37	170	0.007	0.010	0.09	0.004	244	0.0	17	
TOTAL	124.52														

HIGH SERVICE

May 2016

	PLANT EFFLUENT														
	Flow (mgd)	pH	Alkalinity (mg/l)	Turbidity (NTU)	Free Cl2 (mg/l)	Total Cl2 (mg/l)	Hardness (mg/l)	Iron (mg/l)	Mn (mg/l)	NH3 (mg/l)	NO2 (mg/l)	TDS (mg/l)	Color (u)	Temp (°C)	Total Coliforms
DATE															
1	4.08	7.86	103	0.06	0.03	3.31	164	0.007		0.08		246	0.0	19	
2	3.85	7.83	107	0.04	0.04	3.29	169	0.005		0.18		248	0.0	20	A
3	4.03	7.84	109	0.05	0.04	3.22	169	0.006		0.10		254	0.0	19	
4	4.18	7.79	108	0.05	0.05	3.39	171	0.007	0.019	0.05		253	0.0	20	A
5	3.77	7.78	106	0.06	0.05	3.53	152	0.007		0.07		254	0.0	20	
6	4.95	7.77	107	0.06	0.05	3.28	174	0.011		0.06		250	0.0	20	A
7	4.59	7.82	109	0.05	0.06	3.33	174	0.006		0.08		248	0.0	21	
8	4.41	7.76	109	0.05	0.04	3.29	173	0.011		0.15		250	0.0	21	
9	3.88	7.73	105	0.06	0.06	3.26	169	0.008		0.11		250	0.0	22	A
10	4.40	7.78	106	0.06	0.04	3.24	169	0.013		0.10		248	0.5	20	
11	3.82	7.81	108	0.05	0.05	3.27	175	0.007	0.002	0.11	0.006	137	0.0	22	A
12	4.05	7.76	109	0.04	0.04	3.08	175	0.011		0.16		251	0.0	21	
13	4.14	7.73	107	0.05	0.04	3.13	178	0.005		0.11		254	0.0	21	A
14	4.05	7.75	101	0.06	0.05	3.38	167	0.005		0.04		250	0.0	21	
15	4.56	7.75	99	0.05	0.06	3.35	160	0.004		0.10		238	0.0	21	
16	3.86	7.71	103	0.05	0.04	3.31	166	0.006		0.12		245	0.0	20	A
17	3.86	7.77	103	0.04	0.04	3.31	171	0.005		0.10		245	0.0	20	
18	4.03	7.88	100	0.06	0.04	3.41	168	0.005	0.009	0.01	0.004	245	0.0	20	A
19	4.08	7.92	100	0.06	0.05	3.65	172	0.004		0.09		245	0.0	20	
20	4.26	7.83	100	0.06	0.06	3.48	163	0.009		0.08		244	0.0	20	A
21	4.47	7.78	103	0.05	0.05	3.44	169	0.006		0.07		242	0.0	21	
22	4.42	7.73	101	0.05	0.06	3.59	170	0.005		0.12		238	0.0	22	
23	4.74	7.72	100	0.07	0.06	3.44	162	0.006		0.11		230	0.0	21	A
24	4.63	7.75	99	0.06	0.05	3.39	165	0.012		0.07		234	0.0	21	
25	4.88	7.79	97	0.06	0.06	3.24	160	0.005	0.008	0.02	0.003	231	0.0	22	A
26	4.05	7.80	99	0.05	0.06	3.33	165	0.005		0.09		239	0.0	22	
27	4.95	7.84	98	0.06	0.07	3.31	165	0.005		0.07		239	0.0	23	A
28	4.71	7.90	100	0.07	0.06	3.42	167	0.005		0.11		238	0.0	22	
29	4.44	7.94	101	0.06	0.05	3.45	167	0.006		0.10		238	0.0	22	
30	4.70	7.90	103	0.05	0.05	3.39	167	0.004		0.14		240	0.0	23	A
31	4.97	7.79	102	0.05	0.05	3.19	170	0.006		0.10		237	0.0	24	
AVG	4.32	7.80	103	0.05	0.05	3.34	168	0.006	0.010	0.09	0.004	241	0.0	21	
TOTAL	133.81														

HIGH SERVICE
June 2016

	PLANT EFFLUENT														
	Flow	pH	Alkalinity	Turbidity	Free Cl2	Total Cl2	Hardness	Iron	Mn	NH3	NO2	TDS	Color	Temp	Total
DATE	(mgd)	-	(mg/l)	(NTU)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(u)	(°C)	Coliforms
1	4.53	7.74	104	0.07	0.06	3.23	172	0.006	0.003	0.10	0.004	237	0.0	24	A
2	4.78	7.84	104	0.07	0.06	3.48	169	0.006		0.09		243	0.0	24	
3	4.84	7.75	103	0.06	0.07	3.39	169	0.003		0.09		242	0.0	25	A
4	4.69	7.79	106	0.05	0.05	3.20	169	0.003		0.14		239	0.0	25	
5	4.51	7.90	106	0.05	0.04	3.19	172	0.006		0.06		233	0.0	24	
6	5.23	7.87	103	0.07	0.05	3.34	166	0.010		0.08		236	0.0	23	A
7	4.41	7.79	102	0.06	0.06	3.39	165	0.004		0.08		226	0.0	23	
8	5.03	7.77	102	0.05	0.05	3.39	170	0.004	0.014	0.08	0.060	234	0.0	25	A
9	5.05	7.76	102	0.04	0.04	3.30	167	0.006		0.12		232	0.0	25	
10	4.53	7.80	103	0.04	0.06	3.31	167	0.010		0.09		231	0.0	26	A
11	5.51	7.82	99	0.07	0.06	3.38	166	0.065		0.09		234	0.0	25	
12	4.77	7.88	100	0.06	0.05	3.41	165	0.007		0.08		236	0.0	25	
13	5.82	7.92	103	0.05	0.05	3.41	170	0.004		0.12		232	0.0	27	A
14	5.39	7.92	100	0.04	0.05	3.33	165	0.005		0.17		236	0.0	27	
15	5.49	7.82	95	0.05	0.06	3.37	159	0.005	0.002	0.13	0.004	232	0.0	27	A
16	5.30	7.81	96	0.07	0.06	3.39	161	0.007		0.09		233	0.0	27	
17	5.55	7.78	99	0.06	0.05	3.31	157	0.003		0.14		231	0.0	27	A
18	4.90	7.86	101	0.05	0.04	3.20	164	0.007		0.15		232	0.0	28	
19	5.63	7.95	100	0.04	0.04	3.28	162	0.006		0.14		234	0.0	28	
20	5.46	7.75	97	0.05	0.05	3.46	163	0.009		0.11		234	0.0	29	A
21	4.35	7.68	96	0.06	0.05	3.37	159	0.007		0.12		232	0.0	29	
22	4.35	7.74	98	0.05	0.05	3.29	164	0.005	0.012	0.15	0.004	234	0.0	28	A
23	5.27	7.85	101	0.04	0.05	3.19	166	0.005		0.19		237	0.0	29	
24	4.34	7.88	100	0.04	0.05	3.28	168	0.005		0.09		228	0.0	28	A
25	5.78	7.85	97	0.06	0.06	3.32	162	0.005		0.11		229	0.0	27	
26	5.11	7.93	97	0.07	0.05	3.31	160	0.008		0.10		233	0.0	28	
27	5.14	7.92	102	0.05	0.05	3.25	160	0.007		0.15		231	0.0	28	A
28	5.20	7.78	97	0.05	0.05	3.22	160	0.006		0.09		231	0.0	27	
29	4.59	7.85	95	0.07	0.04	3.30	158	0.007	0.004	0.12	0.006	232	2.0	28	A
30	5.42	7.86	99	0.08	0.05	3.34	157	0.006		0.09		233	4.0	29	
AVG	5.03	7.83	100	0.06	0.05	3.32	164	0.008	0.007	0.11	0.016	233	0.2	26	
TOTAL	150.97														

HIGH SERVICE

July 2016

	PLANT EFFLUENT														
	Flow (mgd)	pH	Alkalinity (mg/l)	Turbidity (NTU)	Free Cl2 (mg/l)	Total Cl2 (mg/l)	Hardness (mg/l)	Iron (mg/l)	Mn (mg/l)	NH3 (mg/l)	NO2 (mg/l)	TDS (mg/l)	Color (u)	Temp (°C)	Total Coliforms
DATE															
1	4.74	7.86	98	0.06	0.05	3.37	161	0.014		0.14		231	0.5	27	A
2	4.71	7.84	102	0.05	0.04	3.23	162	0.013		0.10		229	0.0	26	
3	4.15	7.85	100	0.05	0.04	3.25	163	0.009		0.11		231	0.0	26	
4	4.49	7.81	97	0.07	0.04	3.37	163	0.085		0.11		234	0.0	26	A
5	5.35	7.86	97	0.06	0.04	3.35	163	0.010		0.08		233	0.0	25	
6	4.05	7.87	102	0.04	0.05	3.30	166	0.004	0.008	0.08	0.003	233	0.0	26	A
7	4.56	7.83	101	0.04	0.04	3.31	164	0.002		0.10		228	0.0	26	
8	3.95	7.78	102	0.04	0.05	3.38	165	0.004		0.11		281	1.0	27	A
9	5.25	7.70	98	0.06	0.07	3.32	160	0.004		0.07		270	0.0	26	
10	4.84	7.61	95	0.05	0.06	3.34	153	0.007		0.16		264	0.0	27	
11	4.49	7.74	98	0.04	0.05	3.30	155	0.009		0.18		258	0.0	26	A
12	4.65	7.95	99	0.05	0.05	3.31	155	0.007		0.14		256	1.0	25	
13	3.98	8.06	94	0.06	0.05	3.38	157	0.005		0.12		265	1.0	26	A
14	4.64	7.99	95	0.07	0.05	3.37	156	0.005	0.002	0.13	0.004	264	2.0	26	
15	4.35	7.94	93	0.05	0.06	3.31	150	0.010		0.06		253	0.0	27	A
16	5.15	7.88	95	0.04	0.04	3.25	151	0.003		0.10		255	0.0	27	
17	4.94	7.76	93	0.04	0.04	3.10	151	0.003		0.11		252	0.0	28	
18	4.75	7.83	90	0.06	0.04	6.95	147	0.006		0.11		250	0.0	28	A
19	4.80	7.77	90	0.06	0.05	3.42	150	0.005		0.11		245	0.0	28	
20	4.68	7.75	91	0.04	0.05	3.36	153	0.004	0.014	0.11	0.005	250	0.0	28	A
21	4.76	7.81	92	0.04	0.06	3.32	150	0.004		0.14		252	0.0	29	
22	5.01	7.83	93	0.04	0.05	3.35	151	0.004		0.16		251	0.0	28	A
23	4.32	7.83	89	0.06	0.05	3.30	144	0.006		0.14		251	0.0	29	
24	4.57	7.76	88	0.06	0.06	3.36	146	0.008		0.15		251	0.0	29	
25	4.94	7.79	93	0.05	0.04	3.18	147	0.005		0.16		248	0.0	28	A
26	5.06	7.95	94	0.04	0.04	3.16	153	0.006		0.14		243	0.0	28	
27	4.56	7.98	91	0.06	0.04	3.30	146	0.005	0.004	0.12	0.003	266	3.0	29	A
28	5.30	7.83	91	0.07	0.05	3.47	147	0.006		0.11		260	1.0	29	
29	4.28	7.81	91	0.06	0.05	3.31	147	0.004		0.14		247	0.0	29	A
30	4.46	7.74	91	0.05	0.04	3.21	147	0.005		0.13		242	0.0	29	
31	4.09	7.67	92	0.05	0.04	3.21	143	0.006		0.15		243	0.0	29	
AVG	4.64	7.83	95	0.05	0.05	3.42	154	0.008	0.007	0.12	0.004	249	0.3	27	
TOTAL	143.87														

HIGH SERVICE

August 2016

	PLANT EFFLUENT														
	Flow (mgd)	pH	Alkalinity (mg/l)	Turbidity (NTU)	Free Cl2 (mg/l)	Total Cl2 (mg/l)	Hardness (mg/l)	Iron (mg/l)	Mn (mg/l)	NH3 (mg/l)	NO2 (mg/l)	TDS (mg/l)	Color (u)	Temp (°C)	Total Coliforms
DATE															
1	4.78	7.74	91	0.07	0.05	3.26	142	0.007		0.22		245	0.0	28	A
2	3.76	7.91	92	0.07	0.05	3.28	143	0.008		0.16		244	0.0	28	
3	4.25	7.80	91	0.06	0.05	3.15	140	0.006	0.004	0.15	0.003	243	0.5	28	A
4	4.31	7.67	89	0.05	0.05	3.14	138	0.005		0.18		238	0.0	28	
5	4.54	7.70	86	0.06	0.06	3.08	138	0.006		0.11		220	0.0	27	A
6	4.10	8.01	86	0.06	0.05	3.44	132	0.008		0.12		226	0.0	27	
7	4.58	8.02	88	0.07	0.05	3.38	135	0.007		0.12		219	0.0	28	
8	4.01	7.86	90	0.05	0.05	3.38	140	0.004		0.10		214	0.0	27	A
9	4.79	7.95	90	0.05	0.06	3.34	142	0.004		0.13		212	0.0	27	
10	4.16	7.93	89	0.06	0.05	3.41	139	0.005	0.004	0.12	0.003	219	0.0	28	A
11	5.35	7.80	91	0.06	0.04	3.27	134	0.006		0.11		225	0.0	28	
12	4.39	7.85	93	0.06	0.05	3.15	139	0.004		0.13		224	0.0	28	A
13	4.70	7.87	92	0.06	0.05	3.09	142	0.006		0.19		219	0.0	28	
14	4.25	7.81	93	0.06	0.04	3.02	139	0.008		0.19		212	0.0	27	
15	4.28	7.83	89	0.07	0.05	3.29	135	0.049		0.15		220	0.0	27	A
16	4.67	7.97	89	0.06	0.04	3.48	138	0.007		0.10		222	0.0	27	
17	4.19	7.67	90	0.06	0.05	3.47	139	0.004	0.015	0.05	0.006	212	0.0	28	A
18	4.37	7.62	91	0.06	0.05	3.28	142	0.004		0.14		213	0.0	28	
19	4.23	7.72	92	0.06	0.05	3.37	149	0.005		0.15		212	0.0	27	A
20	4.72	7.80	90	0.07	0.06	3.53	137	0.006		0.15		218	0.0	27	
21	4.01	7.87	91	0.07	0.05	3.61	137	0.007		0.14		216	0.0	27	
22	5.05	7.76	92	0.07	0.05	3.47	138	0.005		0.12		214	0.0	27	A
23	3.70	7.71	90	0.05	0.04	3.33	143	0.006		0.16		213	0.0	26	
24	4.08	7.80	90	0.06	0.05	3.42	135	0.005	0.010	0.12		216	0.0	27	A
25	4.33	7.84	92	0.06	0.05	3.60	136	0.005		0.13		220	0.0	27	
26	4.47	7.93	93	0.06	0.05	3.43	138	0.009		0.10		212	0.0	27	A
27	4.36	7.94	96	0.05	0.04	3.19	144	0.006		0.09		219	0.0	27	
28	4.44	7.79	94	0.04	0.04	3.30	144	0.005		0.12		215	0.0	27	
29	3.98	7.73	91	0.06	0.05	3.27	141	0.007		0.09		216	2.0	26	A
30	4.79	7.75	93	0.07	0.06	3.24	141	0.006		0.14		219	0.0	27	
31	3.78	7.88	93	0.05	0.04	3.24	143	0.004		0.10		217	0.0	27	A
AVG	4.37	7.82	91	0.06	0.05	3.32	139	0.007	0.008	0.13	0.004	220	0.1	27	
TOTAL	135.42														

HIGH SERVICE
September 2016

	PLANT EFFLUENT														
	Flow	pH	Alkalinity	Turbidity	Free Cl2	Total Cl2	Hardness	Iron	Mn	NH3	NO2	TDS	Color	Temp	Total
DATE	(mgd)	-	(mg/l)	(NTU)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(u)	(°C)	Coliforms
1	4.33	7.94	94	0.05	0.07	3.14	139	0.007		0.18		211	0.0	27	
2	4.46	7.88	91	0.04	0.04	3.30	140	0.006		0.14		209	0.0	25	A
3	4.21	7.88	89	0.07	0.05	3.35	138	0.006		0.12		210	0.0	25	
4	4.38	7.85	93	0.07	0.06	3.35	137	0.038		0.11		212	0.0	25	
5	4.95	7.73	96	0.04	0.04	3.11	146	0.008		0.23		216	0.0	27	A
6	4.44	7.63	93	0.07	2.05	3.20	141	0.006		0.04		216	0.0	27	
7	4.04	7.63	88	0.08	3.38	4.03	134	0.008	0.004	0.09	0.002	216	0.5	28	A
8	3.54	7.65	92	0.07	3.27	3.98	139	0.007		0.09		240	0.0	27	
9	4.15	7.68	91	0.07	3.00	3.66	142	0.007		0.08		210	0.0	27	A
10	5.04	7.71	92	0.06	2.70	3.53	142	0.007		0.00		244	0.0	27	
11	4.61	7.80	93	0.05	2.85	3.89	144	0.005		0.00		248	0.0	26	
12	4.14	7.75	93	0.07	2.75	3.20	143	0.008		0.00		246	0.0	26	A
13	4.69	7.72	93	0.07	2.68	3.23	141	0.007		0.00		245	0.0	26	
14	4.09	7.77	95	0.05	2.71	3.26	146	0.004	0.002	0.00	0.004	247	0.0	26	A
15	4.38	7.81	94	0.05	2.63	3.31	145	0.006		0.00		249	0.0	26	
16	3.91	7.79	95	0.04	2.61	3.29	147	0.006		0.00		246	0.0	26	A
17	4.80	7.82	94	0.06	2.98	3.55	144	0.005		0.00		247	0.0	26	
18	4.01	7.84	94	0.06	3.04	3.55	141	0.006		0.00		245	0.0	26	
19	4.86	7.74	93	0.05	2.91	3.44	142	0.003		0.00		251	0.0	26	A
20	4.34	7.76	97	0.04	2.68	3.35	145	0.005		0.00		249	0.0	26	
21	4.67	7.88	97	0.06	2.97	3.57	148	0.005	0.004	0.00	0.003	250	0.0	26	A
22	5.03	7.90	97	0.06	3.09	3.69	147	0.004		0.00		240	0.0	26	
23	4.39	7.91	96	0.06	3.12	3.65	147	0.004		0.00		244	0.0	27	A
24	4.69	7.83	98	0.05	2.71	3.35	149	0.007		0.00		249	0.0	27	
25	4.08	7.77	95	0.04	2.59	3.25	146	0.007		0.00		247	0.0	27	
26	4.64	7.85	90	0.06	2.74	3.35	144	0.006		0.00		250	0.0	27	A
27	4.38	7.71	90	0.07	2.80	3.40	136	0.008		0.00		241	0.0	26	
28	4.48	7.83	95	0.04	2.78	3.37	147	0.006	0.013	0.00		237	0.0	25	A
29	4.01	7.84	94	0.05	2.70	3.19	149	0.007		0.00		244	0.0	24	
30	4.11	7.81	98	0.04	2.69	3.34	153	0.004		0.00		244	0.0	23	A
AVG	4.40	7.79	94	0.05	2.36	3.43	143	0.007	0.006	0.04	0.003	237	0.0	26	
TOTAL	131.85														

HIGH SERVICE

October 2016

	PLANT EFFLUENT														
	Flow (mgd)	pH	Alkalinity (mg/l)	Turbidity (NTU)	Free Cl2 (mg/l)	Total Cl2 (mg/l)	Hardness (mg/l)	Iron (mg/l)	Mn (mg/l)	NH3 (mg/l)	NO2 (mg/l)	TDS (mg/l)	Color (u)	Temp (°C)	Total Coliforms
DATE															
1	4.20	7.77	96	0.06	2.68	3.23	145	0.006		0.00		247	0.0	23	
2	4.36	7.60	92	0.06	2.90	3.48	145	0.006		0.00		244	0.0	23	
3	4.19	7.75	97	0.05	2.63	3.36	153	0.004		0.00		251	0.0	23	A
4	4.13	7.76	98	0.04	2.72	3.43	153	0.006		0.00		256	0.0	22	
5	3.69	7.70	98	0.06	2.81	3.34	155	0.005	0.012	0.00	0.004	253	0.0	23	
6	4.55	7.74	100	0.07	2.83	3.36	149	0.006		0.00		252	0.0	23	
7	3.81	7.84	102	0.06	2.94	3.56	148	0.006		0.00		251	0.0	22	A
8	4.04	7.90	101	0.05	2.76	3.50	153	0.006		0.00		252	0.0	23	
9	3.97	7.78	96	0.04	2.80	3.52	149	0.005		0.00		247	0.0	22	
10	4.03	7.69	95	0.06	2.75	3.38	148	0.006		0.00		246	0.0	23	
11	4.21	7.88	100	0.07	1.26	2.87	145	0.010		0.09		246	0.0	22	
12	3.62	8.02	102	0.05	0.06	3.18	149	0.005	0.003	0.18	0.004	247	0.0	23	A
13	3.89	7.95	101	0.04	0.05	3.36	148	0.005		0.18		247	0.0	22	
14	4.39	7.83	99	0.04	0.04	3.29	149	0.004		0.20		242	0.0	22	A
15	3.68	7.75	100	0.07	0.04	3.42	150	0.006		0.21		242	0.0	22	
16	4.00	7.79	103	0.07	0.05	3.46	150	0.006		0.22		246	0.0	22	
17	4.87	7.99	100	0.05	0.06	3.40	147	0.006		0.17		247	0.0	23	A
18	4.11	7.98	100	0.05	0.07	3.45	147	0.005		0.17		240	0.0	24	
19	3.44	7.96	99	0.05	0.51	3.69	147	0.008	0.005	0.16	0.004	244	0.0	22	
20	4.67	7.90	100	0.07	0.04	3.57	147	0.007		0.16		246	0.0	22	
21	3.52	7.84	98	0.06	0.05	3.64	144	0.004		0.14		248	0.0	21	
22	4.21	7.80	101	0.04	0.04	3.50	154	0.003		0.11		246	0.0	21	
23	3.80	7.74	102	0.04	0.05	3.44	150	0.003		0.11		245	0.0	21	
24	4.01	7.76	99	0.06	0.05	3.42	147	0.006		0.12		244	0.0	21	A
25	4.06	7.79	99	0.06	0.04	3.40	147	0.005		0.10		246	0.0	20	
26	3.77	7.80	99	0.04	0.05	3.32	146	0.004	0.003	0.09	0.003	228	0.0	21	A
27	3.60	7.81	102	0.05	0.05	3.66	154	0.004		0.08		250	0.0	20	
28	4.73	7.87	102	0.04	0.05	3.61	155	0.010		0.08		249	0.0	21	A
29	3.95	7.91	100	0.06	0.04	3.47	154	0.006		0.08		250	0.0	20	
30	3.97	7.92	100	0.06	0.05	3.49	155	0.006		0.08		248	0.0	20	
31	4.43	7.87	103	0.05	0.06	3.53	153	0.006		0.01		247	0.0	20	A
AVG	4.06	7.83	99	0.05	0.98	3.43	149	0.005	0.006	0.09	0.004	247	0.0	22	
TOTAL	125.90														

HIGH SERVICE
November 2016

	PLANT EFFLUENT														
	Flow	pH	Alkalinity	Turbidity	Free Cl2	Total Cl2	Hardness	Iron	Mn	NH3	NO2	TDS	Color	Temp	Total
DATE	(mgd)	-	(mg/l)	(NTU)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(u)	(°C)	Coliforms
1	3.59	7.85	101	0.04	0.05	3.28	156	0.005		0.03		240	0.0	21	
2	4.26	7.81	100	0.05	0.05	3.43	148	0.006	0.024	0.02	0.004	244	0.0	21	A
3	3.71	7.73	100	0.07	0.05	3.38	150	0.005		0.06		240	0.0	20	
4	3.99	7.83	101	0.06	0.04	3.37	144	0.005		0.05		229	0.0	11	A
5	3.86	7.86	101	0.04	0.04	3.40	149	0.007		0.04		235	0.0	20	
6	4.10	7.85	101	0.04	0.04	3.41	152	0.012		0.06		236	0.0	20	
7	4.05	7.84	101	0.05	0.05	3.38	149	0.006		0.04		236	0.0	20	A
8	4.01	7.78	99	0.06	0.04	3.45	151	0.008		0.08		235	0.0	20	
9	3.92	7.83	101	0.04	0.04	3.53	155	0.004	0.013	0.05	0.005	236	0.0	19	A
10	3.97	7.86	102	0.04	0.05	3.49	152	0.004		0.07		249	0.0	19	
11	3.52	7.88	100	0.04	0.06	3.55	157	0.005		0.06		258	0.0	19	A
12	4.21	7.90	96	0.04	0.06	3.39	148	0.004		0.11		224	0.0	18	
13	4.12	7.92	98	0.06	0.04	3.38	149	0.005		0.10		230	0.0	18	
14	3.65	7.98	101	0.05	0.05	3.51	152	0.009		0.06		242	0.0	18	A
15	3.99	7.91	100	0.04	0.05	3.65	156	0.005		0.07		236	0.0	18	
16	4.27	7.85	92	0.06	0.05	3.67	154	0.005	0.006	0.09	0.005	243	0.0	18	A
17	3.97	7.80	96	0.06	0.05	3.55	150	0.007		0.09		244	0.0	18	
18	3.77	7.78	101	0.06	0.04	3.38	149	0.013		0.08		247	0.0	18	A
19	4.19	7.82	102	0.04	0.04	3.36	150	0.012		0.06		256	0.0	17	
20	3.91	7.77	100	0.04	0.04	3.36	152	0.006		0.09		254	0.0	16	
21	4.22	7.74	97	0.06	0.04	3.43	149	0.006		0.05		255	0.0	16	A
22	4.12	7.83	97	0.04	0.05	3.42	146	0.005		0.05		250	0.0	16	
23	4.12	7.92	100	0.04	0.06	3.50	156	0.004	0.019	0.10	0.000	257	0.0	16	A
24	3.75	7.83	101	0.04	0.04	3.47	151	0.004		0.16		257	0.0	14	
25	3.66	7.76	100	0.04	0.09	3.42	156	0.001		0.09		257	0.0	15	A
26	4.25	7.75	97	0.07	0.06	3.52	155	0.005		0.10		254	0.0	15	
27	3.97	7.82	96	0.06	0.05	3.52	147	0.006		0.10		252	0.0	15	
28	3.93	7.87	97	0.04	0.05	3.46	150	0.006		0.14		252	0.0	15	A
29	4.04	7.89	98	0.04	0.05	3.48	152	0.003		0.08		260	0.0	14	
30	3.64	7.89	100	0.06	0.06	3.48	151	0.005	0.005	0.07	0.004	259	0.0	14	A
AVG	3.96	7.84	99	0.05	0.05	3.45	151	0.006	0.013	0.07	0.004	245	0.0	17	
TOTAL	118.76														

HIGH SERVICE

December 2016

PLANT EFFLUENT

	PLANT EFFLUENT														
	Flow	pH	Alkalinity	Turbidity	Free Cl2	Total Cl2	Hardness	Iron	Mn	NH3	NO2	TDS	Color	Temp	Total
DATE	(mgd)	-	(mg/l)	(NTU)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(mg/l)	(u)	(°C)	Coliforms
1	3.64	7.86	99	0.06	0.04	3.51	140	0.007		0.06		254	0.0	14	A
2	3.61	7.86	99	0.05	0.05	3.58	148	0.008		0.08		258	0.0	14	
3	3.98	7.78	101	0.04	0.05	3.53	153	0.002		0.11		256	0.0	14	
4	3.81	7.75	99	0.04	0.05	3.34	154	0.005		0.06		257	0.0	12	
5	4.06	7.74	100	0.05	0.06	3.48	149	0.005		0.05		256	0.0	13	
6	3.81	7.73	99	0.05	0.05	3.50	151	0.005		0.11		251	0.0	13	A
7	3.50	7.74	101	0.03	0.07	3.58	155	0.003	0.014	0.17	0.003	259	0.0	14	
8	4.10	7.83	101	0.04	0.07	3.46	158	0.004		0.06		261	0.0	12	
9	3.97	7.84	100	0.04	0.06	3.51	160	0.004		0.05		260	0.0	12	A
10	3.74	7.88	97	0.05	0.07	3.49	147	0.004		0.11		205	0.0	12	
11	3.76	7.88	99	0.05	0.05	3.53	147	0.006		0.10		240	0.0	11	
12	4.17	7.89	101	0.04	0.06	3.41	156	0.006		0.00		252	0.0	12	A
13	4.33	7.84	100	0.04	0.06	3.57	156	0.004		0.01		262	0.0	10	
14	3.94	7.88	99	0.06	0.05	3.76	150	0.005	0.015	0.04	0.004	260	0.0	12	
15	4.02	7.85	99	0.05	0.05	3.75	149	0.004		0.02		262	0.0	10	
16	3.90	7.77	99	0.04	0.06	3.78	150	0.002		0.01		256	0.0	10	A
17	3.85	7.74	102	0.04	0.07	3.67	156	0.007		0.05		257	0.5	10	
18	4.17	7.75	103	0.04	0.07	3.67	152	0.003		0.01		259	0.0	8	
19	4.36	7.78	100	0.05	0.05	3.74	151	0.005		0.01		255	0.0	7	
20	4.21	7.80	98	0.04	0.05	3.94	151	0.007		0.11		261	0.0	6	
21	5.04	7.72	102	0.04	0.08	3.72	154	0.004	0.017	0.02	0.006	261	0.0	10	A
22	3.99	7.75	101	0.04	0.06	3.39	157	0.010		0.02		261	0.0	6	
23	4.51	7.74	101	0.04	0.07	3.45	160	0.007		0.01		263	0.0	5	A
24	4.21	7.74	99	0.06	0.07	3.94	153	0.006		0.02		260	0.0	6	
25	4.04	7.73	102	0.04	0.09	4.15	156	0.019		0.02		263	0.0	6	
26	4.36	7.76	101	0.04	0.08	3.51	160	0.003		0.06		260	0.0	6	A
27	4.18	7.75	99	0.05	0.08	3.65	147	0.006		0.03		254	0.0	9	
28	4.28	7.76	100	0.05	0.08	3.79	152	0.006	0.002	0.02	0.004	261	0.0	7	A
29	4.55	7.72	100	0.05	0.08	3.71	153	0.005		0.02		262	0.0	10	
30	4.05	7.68	101	0.05	0.06	3.65	151	0.010		0.07		260	0.0	11	A
31	4.13	7.71	102	0.04	0.06	3.65	155	0.002		0.05		265	0.0	8	
AVG	4.07	7.78	100	0.04	0.06	3.62	153	0.005	0.012	0.05	0.004	256	0.0	10	
TOTAL	126.27														

APPENDIX F

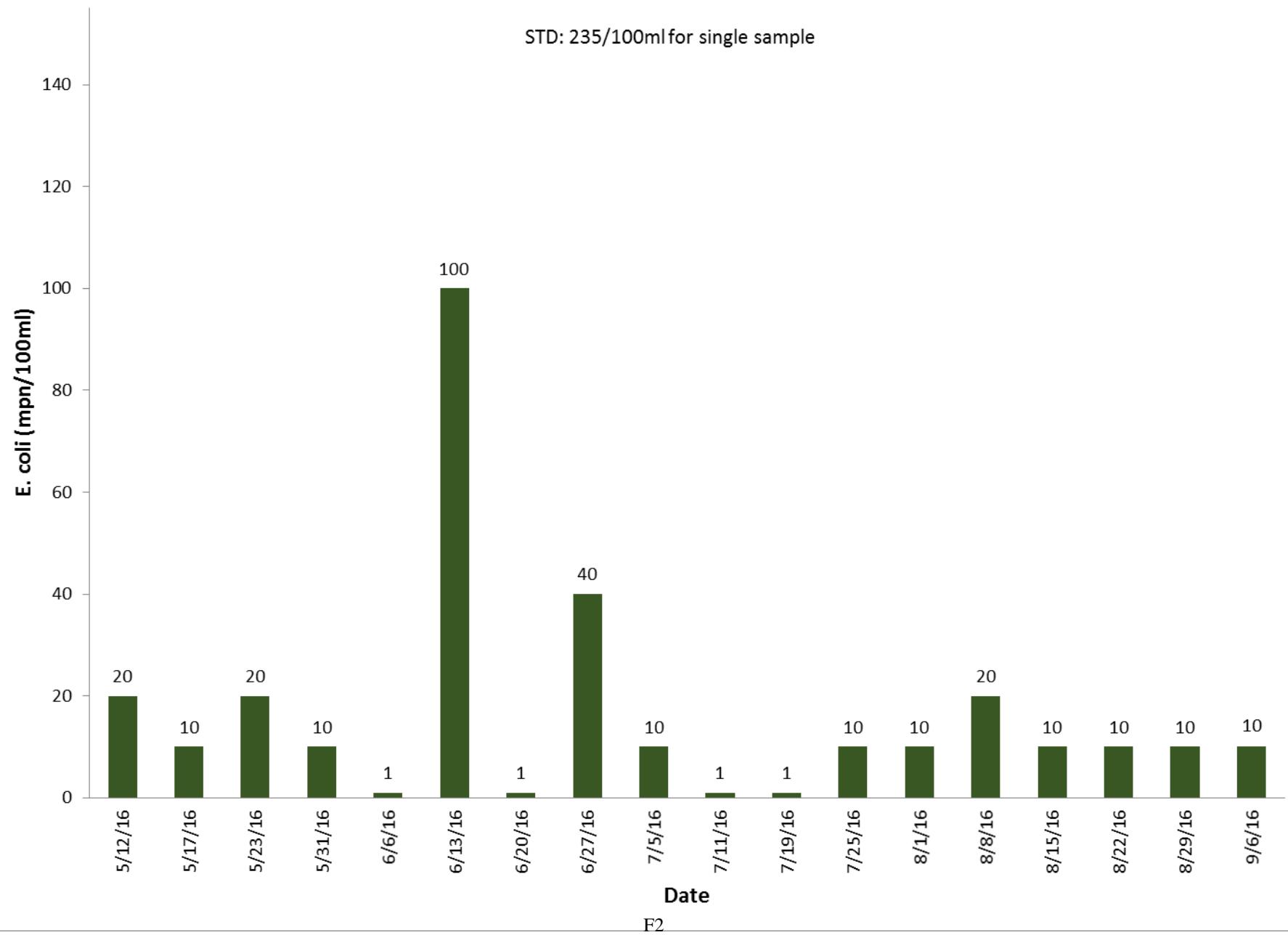
Beach Data & Graphs

2016 Beach Data

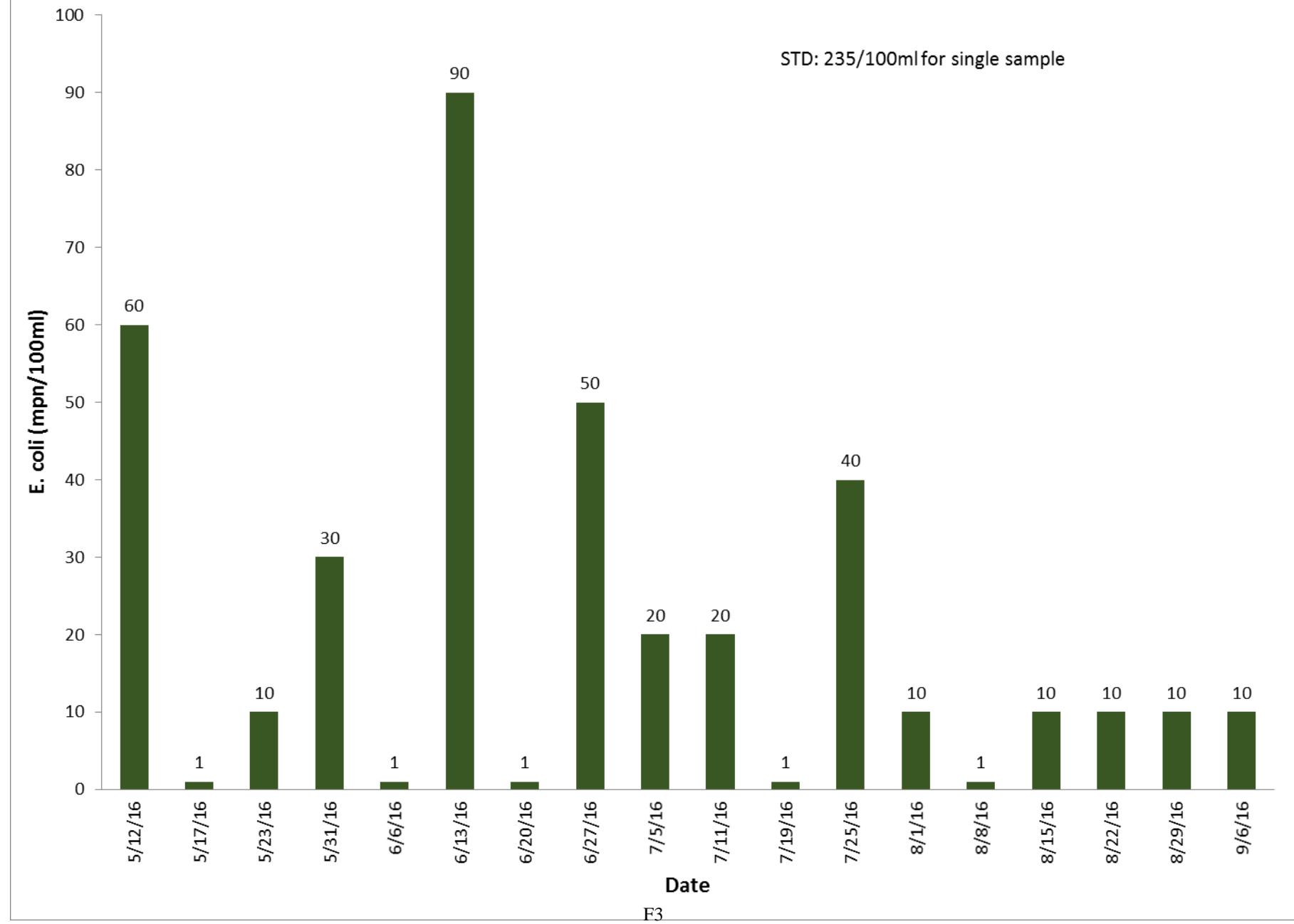
Date	Bottle Number	Spalding East (E. Coli / 100 ml)	Bottle Number	Spalding West (E. Coli / 100 ml)	Bottle Number	Indian Creek (E. Coli / 100 ml)
5/12/2016	3075	20	3252	60	3370	20
5/17/2016	4752	10	4762	1	4763	1
5/23/2016	7176	20	7205	10	7211	10
5/31/2016	7197	10	7207	30	7208	20
6/6/2016	7248	1	7257	1	7263	1
6/13/2016	7174	100	7255	90	7258	180
6/20/2016	7214	1	7264	1	7265	1
6/27/2016	7221	40	7222	50	7260	140
7/5/2016	7223	10	7228	20	7233	10
7/11/2016	7266	1	7313	20	7314	1
7/19/2016	7305	1	7306	1	7311	1
7/25/2016	7284	10	7278	40	7279	10
8/1/2016	7327	10	7335	10	7336	10
8/8/2016	7317	20	7334	1	7339	1
8/15/2016	7328	10	7333	10	7358	10
8/22/2016	7325	10	7343	10	7347	10
8/29/2016	7341	10	7359	10	7360	10
9/6/2016	7369	10	7370	10	7376	10

Spalding East

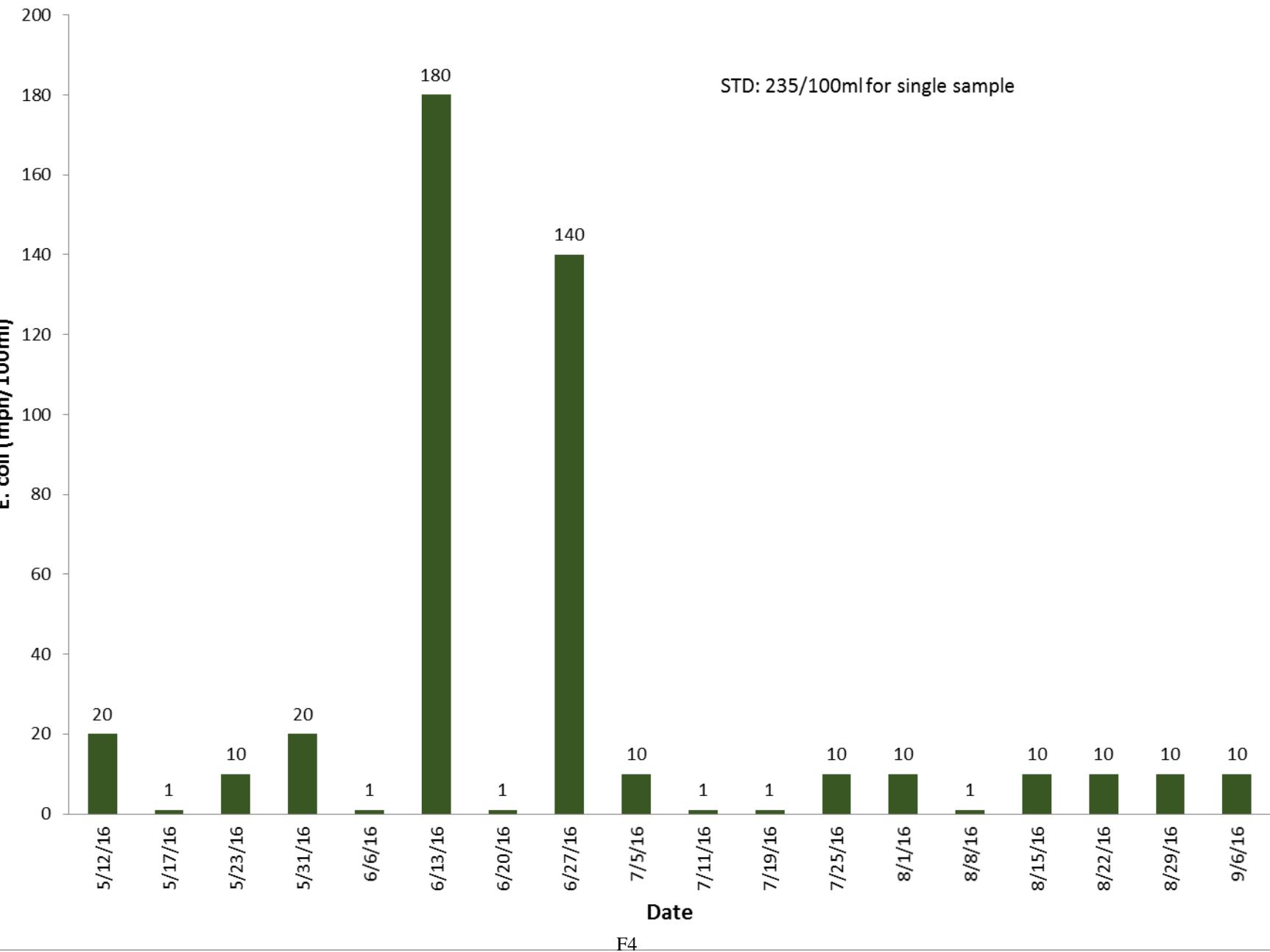
STD: 235/100ml for single sample



Spalding West



Indian Creek



2016 Mark Twain State Park Beach Data

Park	SampleNumber	CollectDate	Ecoli	ReportingUnits	Comment	Qualifier
Mark Twain SP	AC73357	23-May-16	12.2	mpn/100ml	very windy-murky blowing into beach water	27
Mark Twain SP	AC73358	23-May-16	12.0	mpn/100ml	very windy- murky blowing into beach water	27
Mark Twain SP	AC74648	31-May-16	10.9	mpn/100ml		27
Mark Twain SP	AC74649	31-May-16	547.5	mpn/100ml		27
Mark Twain SP	AC74650	31-May-16	14.8	mpn/100ml		27
Mark Twain SP	AC75694	06-Jun-16	5.2	mpn/100ml		
Mark Twain SP	AC75695	06-Jun-16	2.0	mpn/100ml		
Mark Twain SP	AC77483	13-Jun-16	41.1	mpn/100ml		
Mark Twain SP	AC77484	13-Jun-16	24.6	mpn/100ml		
Mark Twain SP	AC77619	20-Jun-16	5.2	mpn/100ml		
Mark Twain SP	AC77620	20-Jun-16	4.1	mpn/100ml		
Mark Twain SP	AC77749	27-Jun-16	12.1	mpn/100ml		27
Mark Twain SP	AC77750	27-Jun-16	2.0	mpn/100ml		27
Mark Twain SP	AC77751	27-Jun-16	<1	mpn/100ml		ND, 27
Mark Twain SP	AC79507	05-Jul-16	51.2	mpn/100ml		
Mark Twain SP	AC79508	05-Jul-16	82.3	mpn/100ml		
Mark Twain SP	AC81013	11-Jul-16	1553.1	mpn/100ml		27
Mark Twain SP	AC81014	11-Jul-16	980.4	mpn/100ml		27
Mark Twain SP	AC81114	19-Jul-16	2.0	mpn/100ml		
Mark Twain SP	AC81115	19-Jul-16	46.5	mpn/100ml		
Mark Twain SP	AC81301	26-Jul-16	19.7	mpn/100ml		27
Mark Twain SP	AC81303	26-Jul-16	>2419.6	mpn/100ml		27
Mark Twain SP	AC81432	02-Aug-16	96.0	mpn/100ml		
Mark Twain SP	AC81433	02-Aug-16	32.7	mpn/100ml		
Mark Twain SP	AC82922	08-Aug-16	248.9	mpn/100ml		
Mark Twain SP	AC82923	08-Aug-16	110.0	mpn/100ml		
Mark Twain SP	AC83082	15-Aug-16	185.0	mpn/100ml		
Mark Twain SP	AC83083	15-Aug-16	133.4	mpn/100ml		

Park	SampleNumber	CollectDate	Ecoli	ReportingUnits	Comment	Qualifier
Mark Twain SP	AC83084	15-Aug-16	378.4	mpn/100ml		
Mark Twain SP	AC83179	22-Aug-16	5.1	mpn/100ml		
Mark Twain SP	AC83180	22-Aug-16	8.6	mpn/100ml		
Mark Twain SP	AC83433	29-Aug-16	155.3	mpn/100ml		
Mark Twain SP	AC83434	29-Aug-16	50.4	mpn/100ml		

Qualifier 27 - sample received above 6 degrees C.

Mark Twain State Park Beach Missouri DNR Data

STD: 235/100ml for single sample

