

Silver Lake Water Quality Monitoring

Draft Sampling and Analysis Plan



ESS Group, Inc.

Prepared for the Central Plymouth County Water District Commission



August 9, 2021



A Quick Overview

Outline for Tonight's Presentation

- Introduce the concept of the Sampling and Analysis Plan (SAP)
- Describe the objectives of the Silver Lake Water Quality Monitoring Project's Draft SAP
- Present the elements of the Silver Lake Water Quality Monitoring Project's Draft SAP
- Receive verbal input or questions on the Draft SAP



What Is a Sampling and Analysis Plan?

Sampling and Analysis Plan (SAP)

- Composed of the following elements associated with planning and execution of a field sampling program
- Project Description: Identifies the goals of the field sampling program, including problems or data gaps to be addressed
- Project Domain: Defines the geographic location of the project and associated sampling stations
- Project Design: Describes the data collection methods and approaches
- Project Schedule: Provides a timeline for implementation of the field sampling



Silver Lake Project Description

Objectives/Goals

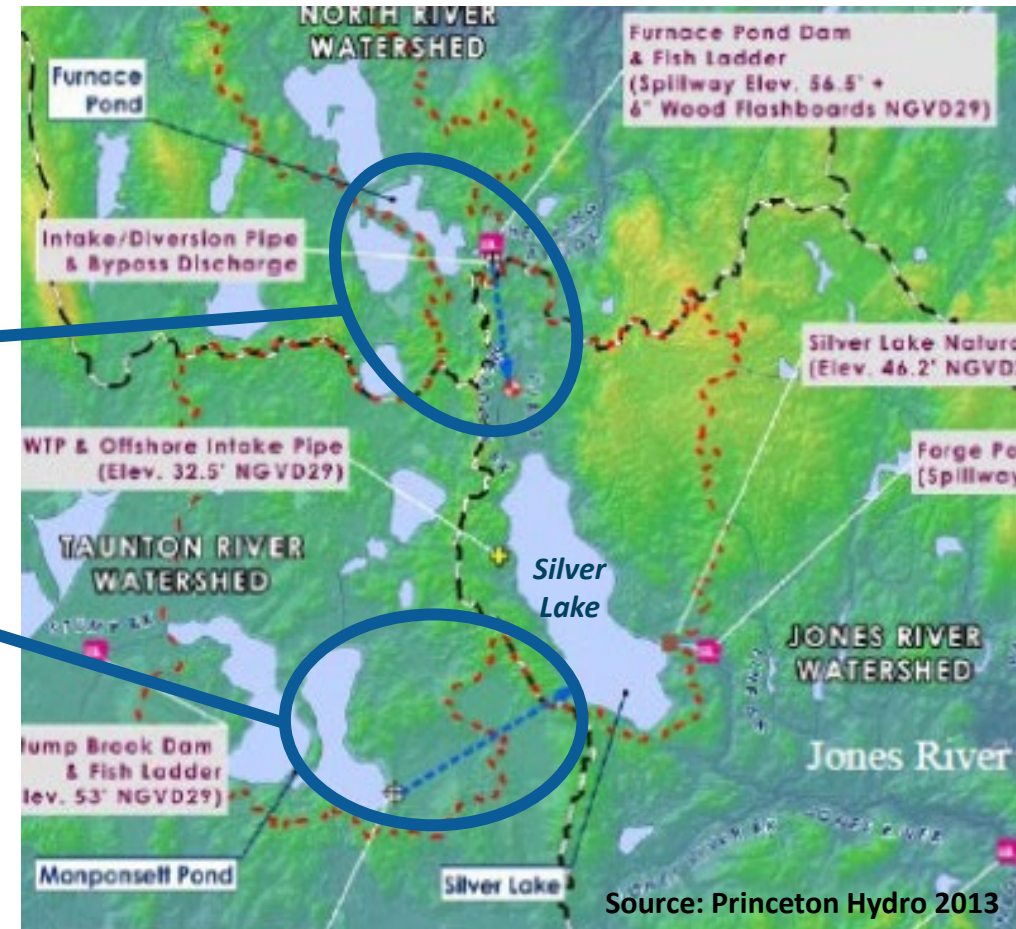
- Collect water quality data to help inform community management decisions to address water quality and quantity issues in Silver Lake and connected water bodies
- Develop a baseline understanding of current water quality and continue to develop solutions-oriented relationships with the City of Brockton's Water Division and the public



Silver Lake Project Domain

Geographic Scope

- Field sampling program is focused on Silver Lake.
- Also extends to the following:
 - Three Tributaries
 - Furnace Pond/Diversion
 - Monponsett Ponds/Diversion
 - Outlet



Silver Lake Project Domain



Water Body	Site ID	Description	Type
Silver Lake	SLIL	Deep hole	In-lake
Silver Lake	SLGW1	Southwestern shoreline	Groundwater
Silver Lake	SLGW2	Northwestern shoreline	Groundwater
Silver Lake	SLGW3	Northeastern shoreline	Groundwater
Silver Lake	SLGW4	Eastern shoreline	Groundwater
Tubbs Meadow Brook	SLT1	Tubbs Meadow Brook between Route 27 and Silver Lake	Tributary
Little Brook	SLT2	Little Brook between Route 27 and Silver Lake	Tributary
Mirage Brook	SLT3	Mirage Brook between Route 27 and Silver Lake	Tributary
Jones River	SLTD	Outlet from Silver Lake	Outlet
Furnace Pond/Diversion	FPD	Furnace Pond diversion to Tubbs Meadow Brook	In-lake/Diversion
East Monponsett Pond/Diversion	MPD	East Monponsett Pond diversion to Silver Lake	In-lake/Diversion

Silver Lake Project Design

Silver Lake Mapping

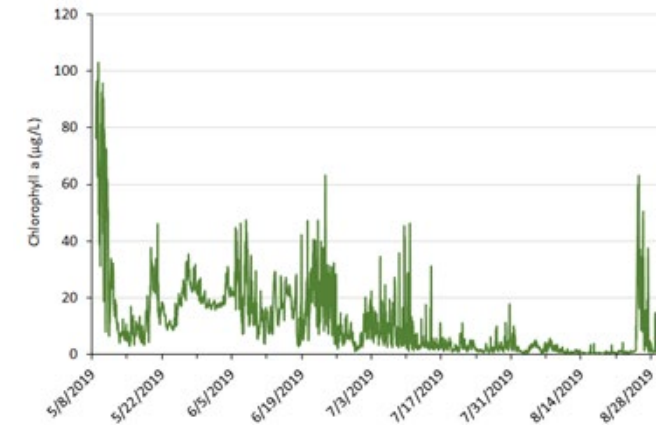
- Bathymetry
 - Update the bathymetric map of Silver Lake
 - Use echosounder and/or sounding line in ~360 grid cells
- Aquatic plants
 - Map the density, biovolume, and community
 - Identify the extent of any aquatic invasive species
 - Use plant sampling rakes, surface observations, and underwater camera in shallow grid cells
- Macroinvertebrates
 - Collect aquatic invertebrates from sediment to map extent of seasonal anoxia (low dissolved oxygen)
 - Seven grabs from varying water depths



Silver Lake Project Design

Silver Lake Water Quality

- Install continuous data logger arrays in deepest part of Silver Lake
- Program loggers to collect readings on an hourly basis
- Install one near surface and one near bottom
 - Water depth – surface and deep
 - Water temperature – surface and deep
 - Chlorophyll a (algae) – surface only



Silver Lake Project Design

Silver Lake Water Quality

- Discrete water quality sampling at deepest spot

Analyte/Parameter	Sampling Position(s) at SLIL	Number of Visits	Number of Samples per Visit	Total Number of Samples
Total Phosphorus	Surface, Mid-depth, Bottom	6	3	18
Soluble Phosphorus	Surface, Mid-depth, Bottom	6	3	18
Total Nitrogen	Surface, Mid-depth, Bottom	6	3	18
Alkalinity	Surface, Mid-depth, Bottom	6	3	18
Chlorophyll a	Surface	6	1	6
Algal ID and Enumeration	Surface	6	1	6
<i>E. coli</i>	Surface	4	1	4
Cyanotoxins	Surface	2	1	2
pH	Surface, Mid-depth, Bottom	6	3	18
Secchi Disk Transparency	Surface	6	1	6
Apparent Color	Surface, Mid-depth, Bottom	6	3	18
Turbidity	Surface, Mid-depth, Bottom	6	3	18
Water Temperature*	Every meter	6	22	132
Specific Conductance*	Every meter	6	22	132
Dissolved Oxygen*	Every meter	6	22	132

*Number of samples is estimated. Actual number will be determined by field conditions (i.e., water depth).



Silver Lake Project Design

Diversion Water Quality

- Discrete water quality sampling for Monponsett and Furnace

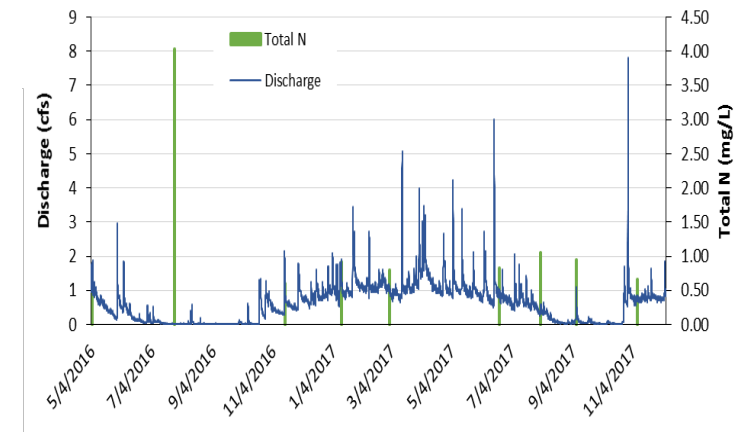
Analyte/Parameter	Number of Visits	Number of Samples per Visit	Total Number of Samples
Total Phosphorus	3	2	6
Soluble Phosphorus	3	2	6
Total Nitrogen	3	2	6
Alkalinity	3	2	6
Chlorophyll a	3	2	6
Algal ID and Enumeration	3	2	6
<i>E. coli</i>	3	2	6
Cyanotoxins	2	2	4
pH	3	2	6
Secchi Disk Transparency	3	2	6
Apparent Color	3	2	6
Turbidity	3	2	6
Water Temperature	3	2	6
Specific Conductance	3	2	6
Dissolved Oxygen	3	2	6



Silver Lake Project Design

Upstream & Downstream Water Quality

- Install continuous dataloggers in three tributaries and the outlet
 - Program loggers to collect readings on an hourly basis
 - Water depth
 - Water temperature
 - Install one barometric logger to correct for atmospheric pressure
- Measure stream discharge
 - Use results to convert continuous water level to discharge
- Collect discrete water quality samples
 - Lab: Total & dissolved phosphorus, total nitrogen
 - Field: Color, turbidity, specific conductance, temperature, dissolved oxygen, pH



Silver Lake Project Design

Silver Lake Groundwater Assessment

- Measure both groundwater inflow rate and quality along four shoreline segments
 - Two segments at upper end and two closer to the dam/outlet
- Use littoral interstitial porewater (LIP) mini-well to extract groundwater for water quality testing
 - Dissolved phosphorus, ammonia, nitrate
- Install seepage meters to measure inflow rate



Silver Lake Schedule for SAP Implementation

Task	2021												2022															
	June		July		August		September		October		November		December		January		February		March		April		May		June			
	Late	Early	Late	Early	Late	Early	Late	Early	Late	Early	Late	Early	Late	Early	Late	Early	Late	Early	Late	Early	Late	Early	Late	Early	Late	Early		
4. SAP Implementation																												
Bathymetric, Aquatic Plant, and Benthic Surveys					■																							
In-Lake Water Column & Quality Sampling							■		■		■		■						■		■							
Upstream and Downstream Monitoring							■		■		■		■		■		■		■		■							
Groundwater Assessment																					■							
Draft Technical Memorandum																									■			
Revised Final Technical Memorandum																											■	

Thank You!

Questions or Input?



Central Plymouth County
Water District Commission

Written comments may be submitted to:

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