

Silver Lake Water Quality Monitoring Program

Project Update

Central Plymouth County Water District Commission

March 28, 2023

SUPPORTING

[DOING]

LEADING

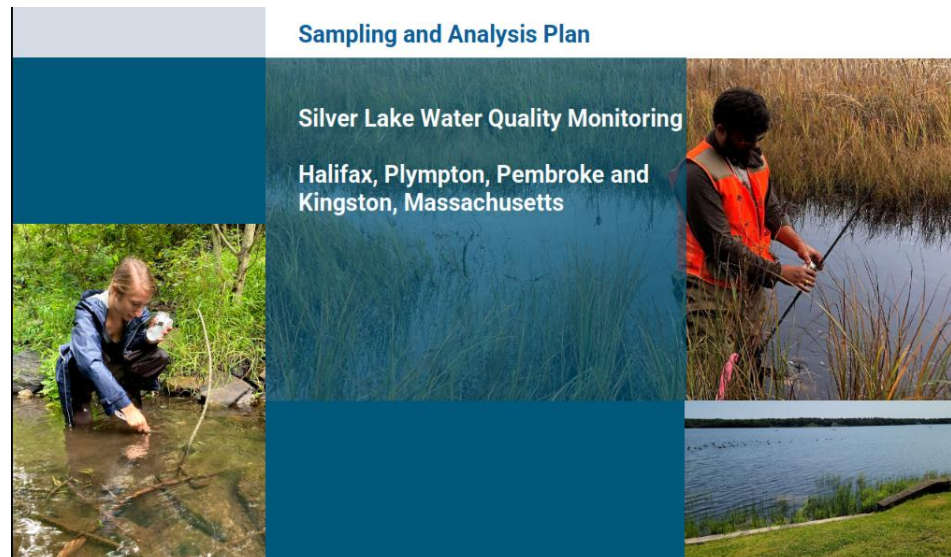
Project Background – Objectives/Goals

- 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



Project Background – Quality

- Sampling and Analysis Plan (SAP) - description of project domain, design, and schedule
 - Draft SAP presented to the public in August 2021
 - Public input received and incorporated into revised SAP – finalized January 2022
- Quality Assurance Project Plan (QAPP) – description of quality assurance/quality control
 - Draft QAPP submitted to US EPA Region 1 and MassDEP in January 2022
 - Agency comments received and incorporated into revised QAPP – finalized April 2022



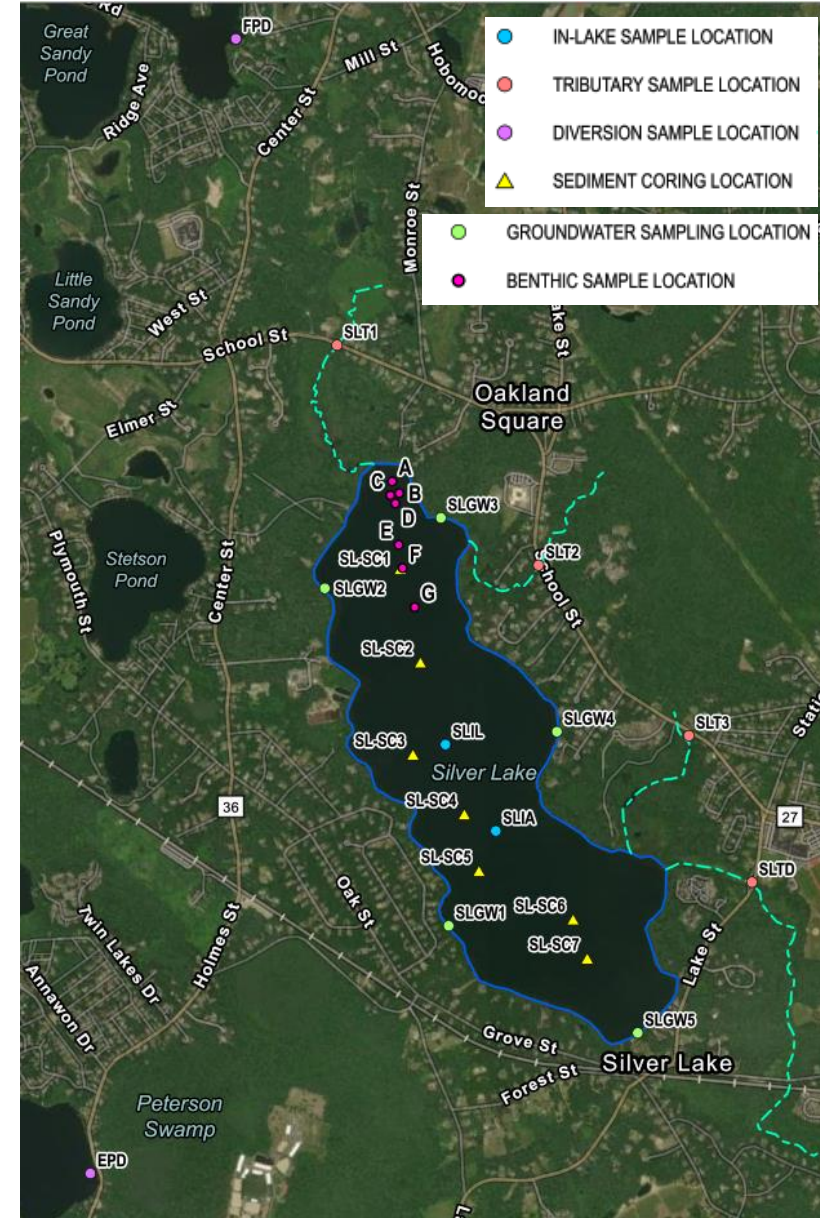
Monitoring Program - Timeline

- More than one year of monitoring data collected – September 2021 to October 2022
- Variety of physical, biological, and chemical data collected
- Field visits on an at least monthly basis
- Continuous data loggers in streams and deepest point in lake

Task	2021																2022											
	September		October		November		December		January		February		March		April		May		June		July		August		September		October	
	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	Late	Early	Late
Bathymetric, Aquatic Plant, and Benthic Surveys	█																											
In-Lake Water Column & Quality Sampling	█			█		█		█						█		█		█		█				█		█		█
In-Lake Bacteria Testing	█			█		█		█						█		█		█		█				█		█		█
In-Lake Cyanotoxin Testing							█																					
Upstream and Downstream Monitoring - Streams				█		█		█		█			█															
Upstream and Downstream Monitoring - Diversions																												
Groundwater Assessment																		█										
Sediment Coring and Phosphorus Fractionation																												

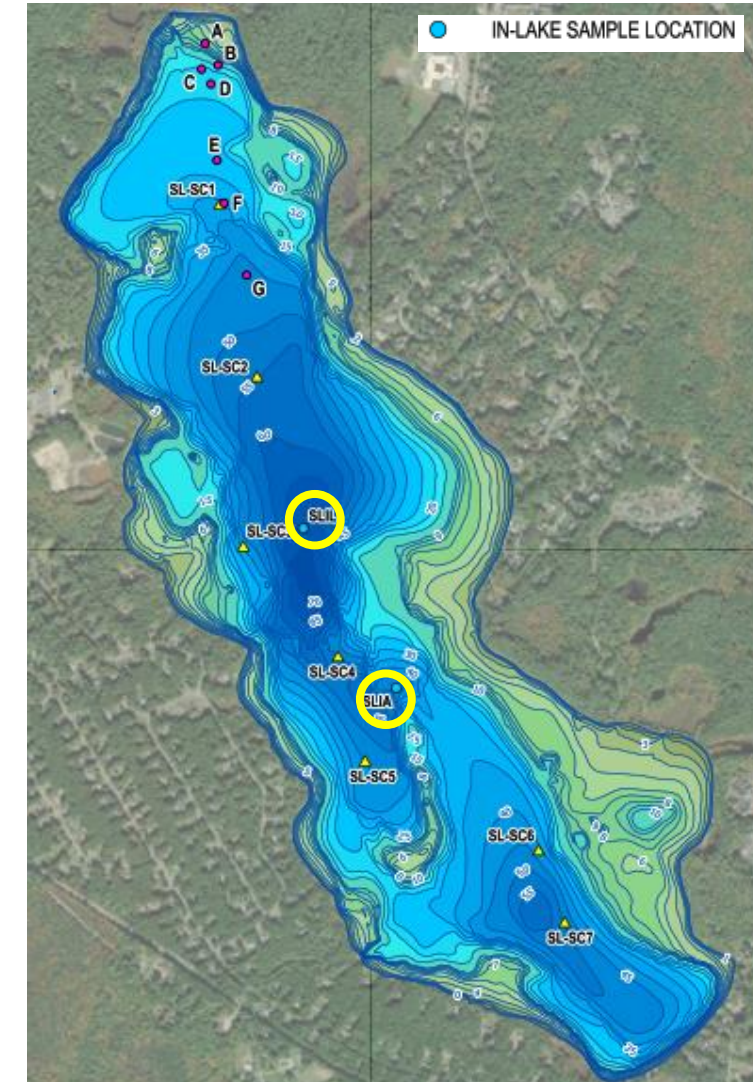
Monitoring Program - Locations

- 29 total sampling locations
- 4 in-lake surface water locations
- 4 tributary and outlet surface water locations
- 2 diversion source surface water locations
- 7 sediment coring locations
- 5 shoreline groundwater locations
- 7 benthic macroinvertebrate locations
- Additional in-lake water depth and aquatic plant mapping locations



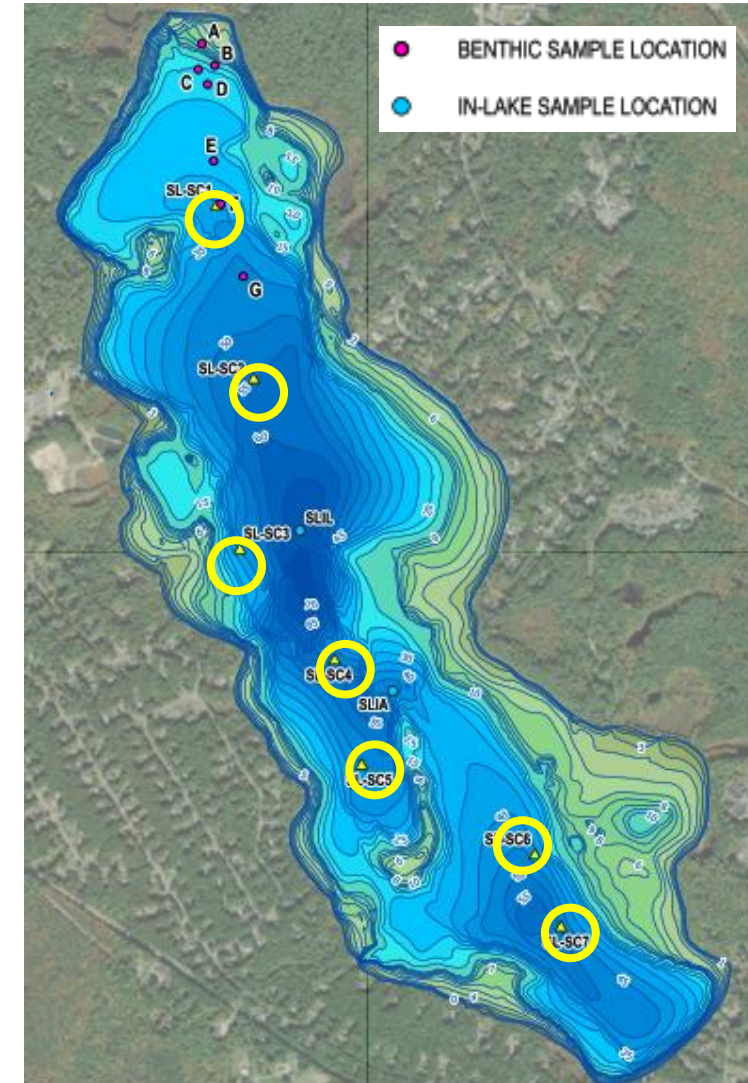
Monitoring Program – In-Lake Water Quality Sampling

- In-lake sampling focused at SLIL (deep location)
 - Continuous loggers for temperature and water depth at surface and bottom
 - Continuous logger for chlorophyll a at surface
 - Monthly water quality samples at surface, mid-, and bottom depths
 - Monthly vertical profiles of temperature, dissolved oxygen, and specific conductance
- Additional vertical profiles at SLIA
 - Additional in-lake location with occasional measurements



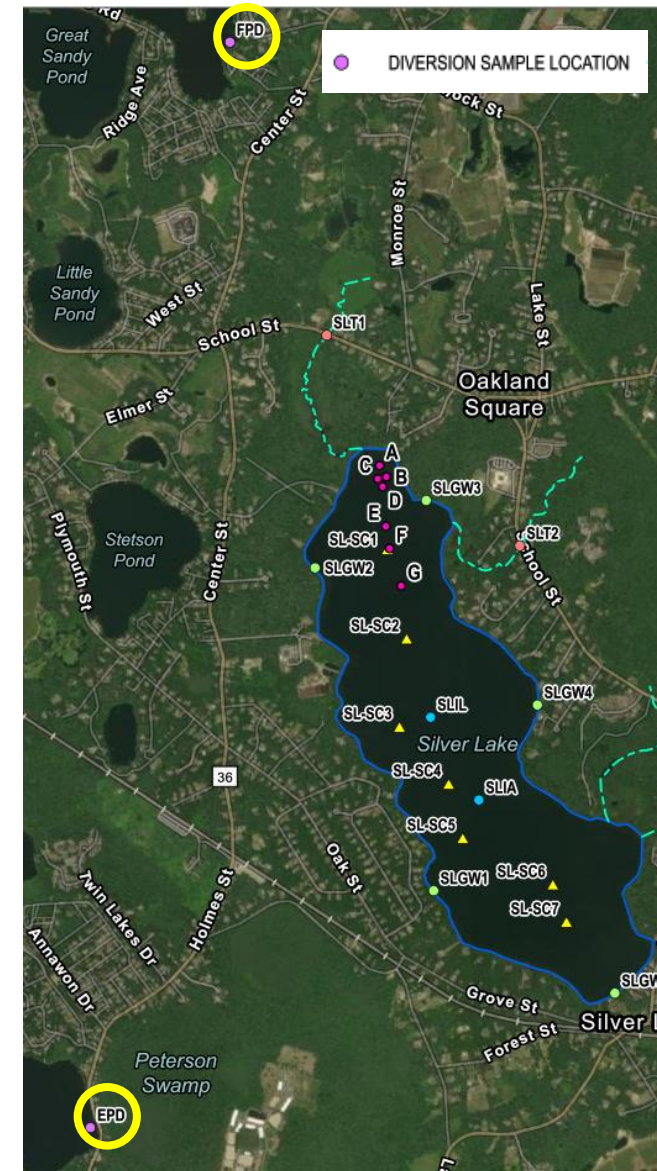
Monitoring Program – In-Lake Sediment Sampling

- Macroinvertebrate grab sampling at seven locations of varying depth
 - Conducted September 2021
- Sediment core sampling at seven locations
 - Conducted May 2022
 - Analyzed vertical profiles using a phosphorus fractionation approach



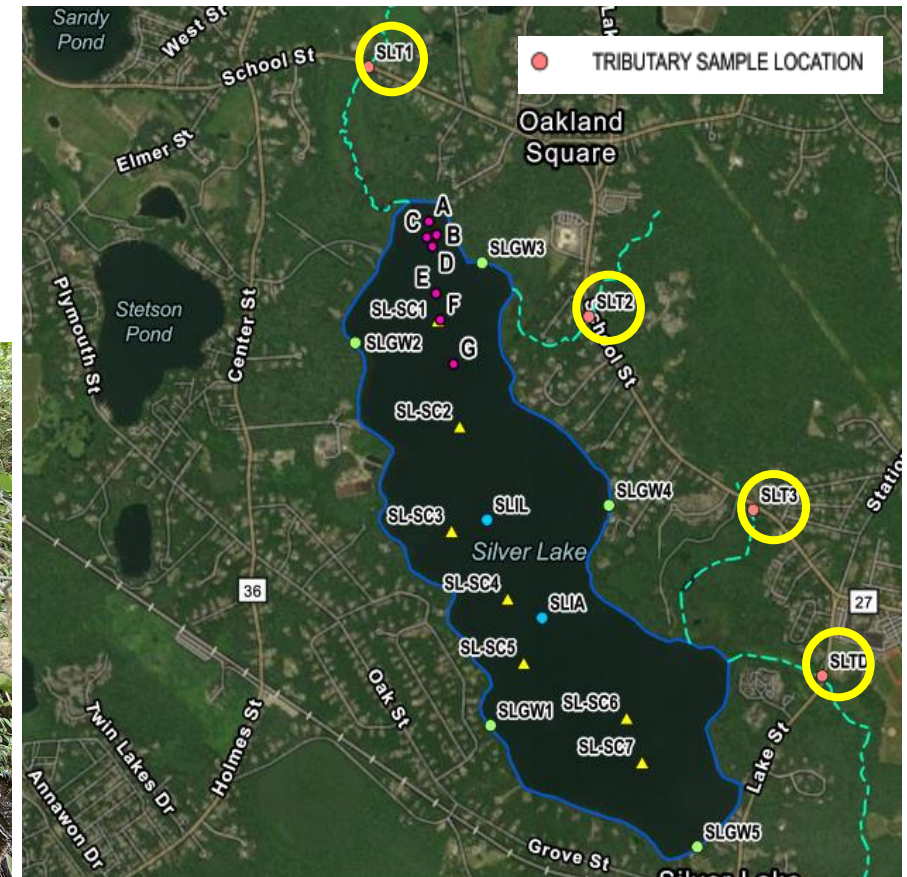
Monitoring Program – Diversion Water Quality Sampling

- Sampling in source ponds for two diversions to Silver Lake
 - Three visits to each source pond during active flow diversion in 2022 (East Monponsett was only diversion activated)
 - Collection of surface water quality samples
 - Vertical profiles of temperature, dissolved oxygen, and specific conductance



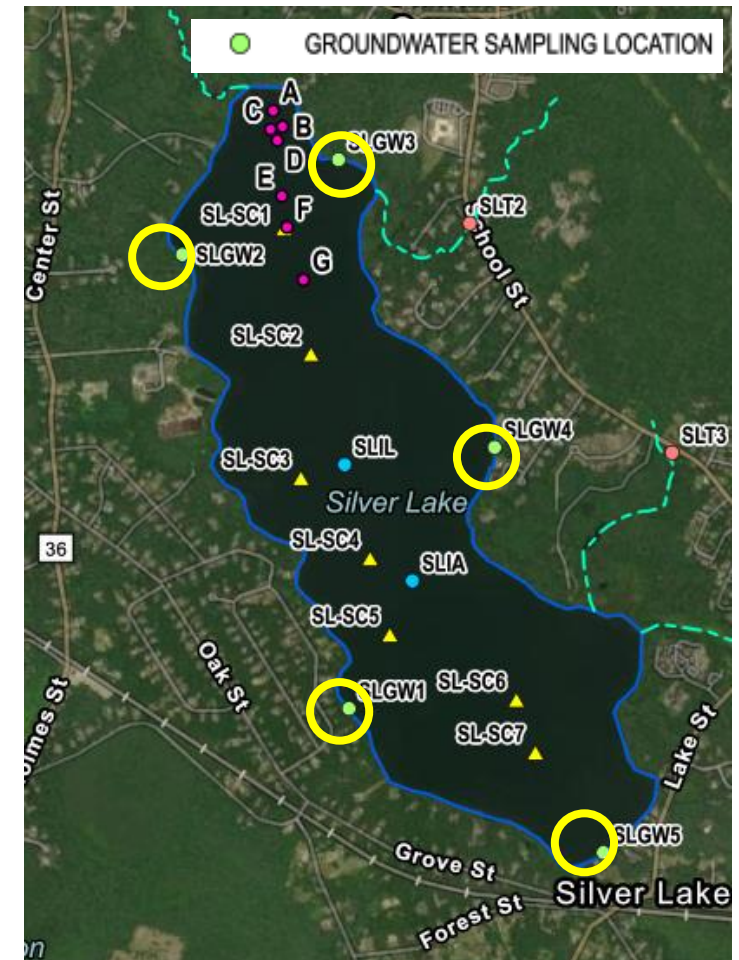
Monitoring Program – Stream Water Quality Sampling

- Sampling in three tributaries and outlet
 - Continuous dataloggers for temperature and water depth
 - Monthly collection of water quality samples
 - Monthly measurement of discharge



Monitoring Program – Groundwater Sampling

- Sampling along five shoreline segments
 - May and October 2022
 - Water quality samples from composite of three locations along each segment
 - Measurement of seepage rate at two locations along each segment



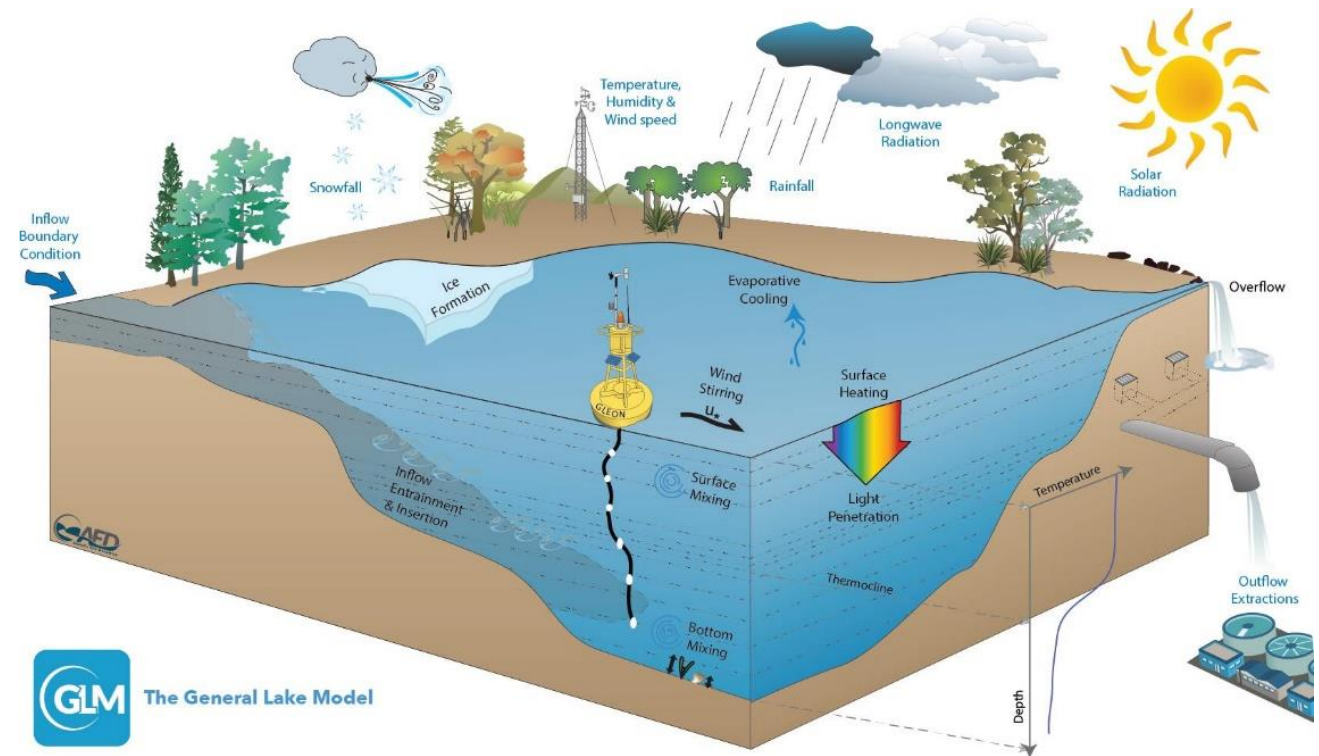
Monitoring Program – Mapping

- More than 300 locations mapped in September 2022
- Lake was full at time of mapping
- Bathymetry (water depth)
- Aquatic plants



Monitoring Program – Lake Modeling

- Developed lake model that included these components:
 - Water balance
 - External loads of N and P
 - Internal loads of N and P
 - Losses of N and P
 - N and P in-lake transformation
 - Lake temperature
- Model calibrated to observed conditions
- May be used to test management scenarios going forward



Monitoring Program - Results

- Results of the monitoring program and modeling undergoing review
- Preliminary draft report complete
- More updates to come soon



Thanks!

Questions?



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