

EPA's Continuous Water Quality Monitoring in the Merrimack, River



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Why Merrimack?

- EPA has a long history of working on the Merrimack River
- This project was developed as part of the community work we did through the Lawrence Make a Visible Difference campaign beginning in 2015
- Drinking water source for 600,000 people in NH and MA
 - Lawrence is the last of five Mass communities that get their drinking water from the Merrimack: the others are Methuen, Andover, Tewksbury, and Lowell; and Nashua, NH
 - Other communities are considering taking water from the Merrimack; Manchester & Haverhill
- Most impaired drinking water source in NE
 - Bacterial pollution
 - Illicit discharges
 - CSOs – 5 sanitary sewer systems discharge into the Merrimack
 - Nutrients, Stormwater

Why Real Time Monitoring in Merrimack

- As part of Lawrence Making a Visible Difference process – consulted with community and water quality and drinking water plant resiliency rose as top concerns
- Brought in partners from EPA's Office of Research and Development (ORD)
- ORD proposed conducting real time monitoring to use for two modeling exercises to:
 - Predict bacterial levels in the river – for recreational use
 - Increase energy efficiency and optimize water treatment for the plant. Using the monitoring data to optimize the granulated activated carbon system
- And to see if “now casting” model – which would provide information to down-stream systems – is feasible for the Merrimack

Nowcasting Modeling

- Generate source water quality projection for the Lawrence plant operation.
- Bacteria forecasting in the river. This can help project bacterial levels in the boating area directly downstream from the monitoring point.



Blue Flags:

Indicate suitable boating conditions



Yellow Flags:

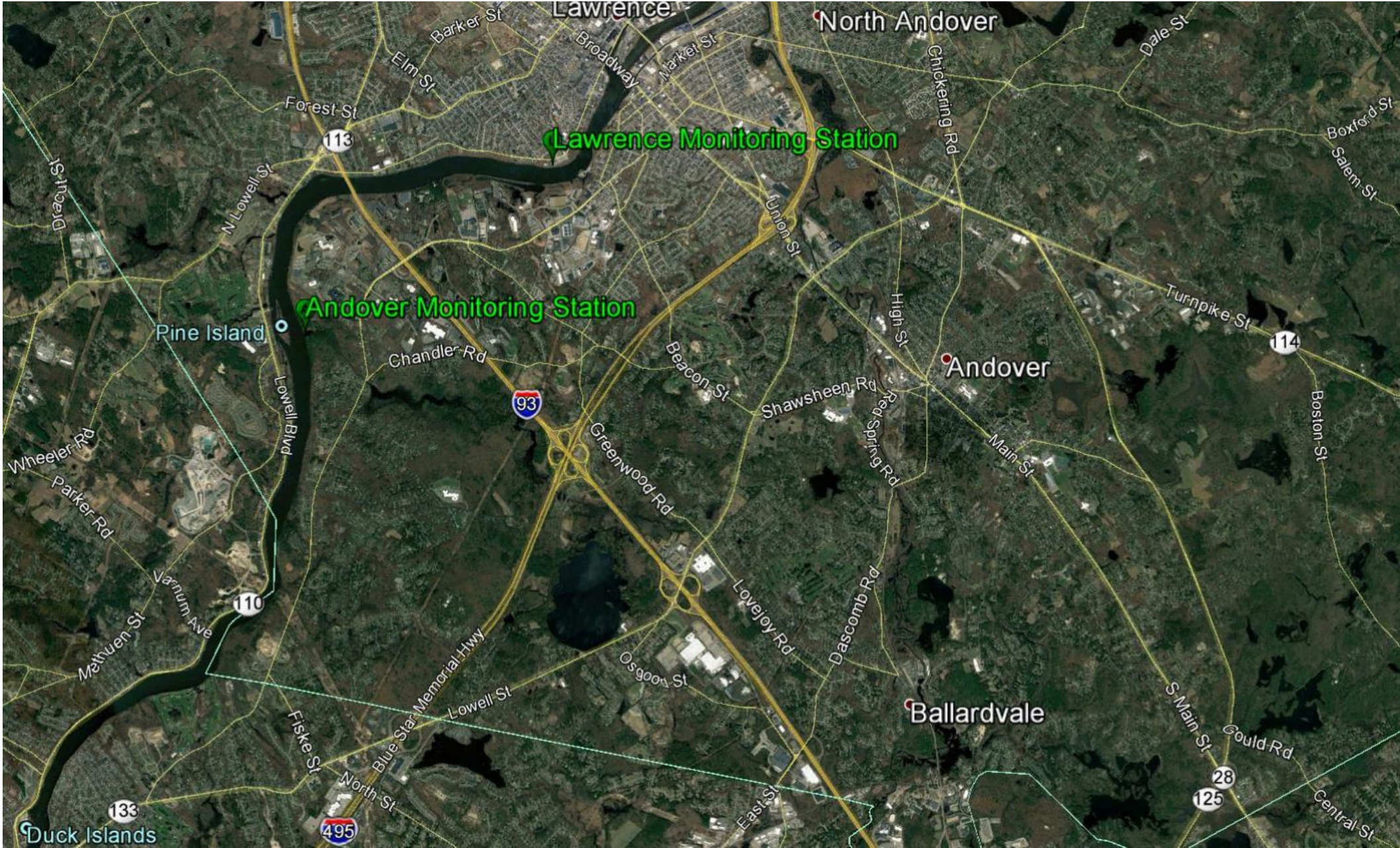
Indicate inconclusive data to preclude a possible health risks



Red Flags:

Indicate potential health risks

Site Locations



Sites

Lawrence Station



Andover Station



Real-time Continuous Monitoring

- Sonde Parameters
 - Temperature
 - Conductivity
 - pH
 - Dissolved Oxygen
 - Turbidity
 - Chlorophyll (Algae)
 - Phycocyanin (Cyanobacteria)
- Total Organic Carbon
- Phosphate
- Nitrate (Lawrence only)



Merrimack River – Lawrence Data:

<https://www.epa.gov/lowermerrimackriver/live-water-quality-data-lower-merrimack-river>

Grab Sample Collection



Purpose:

- For Nowcasting modeling
- For checking continuous monitoring instruments and WQ assessments

How:

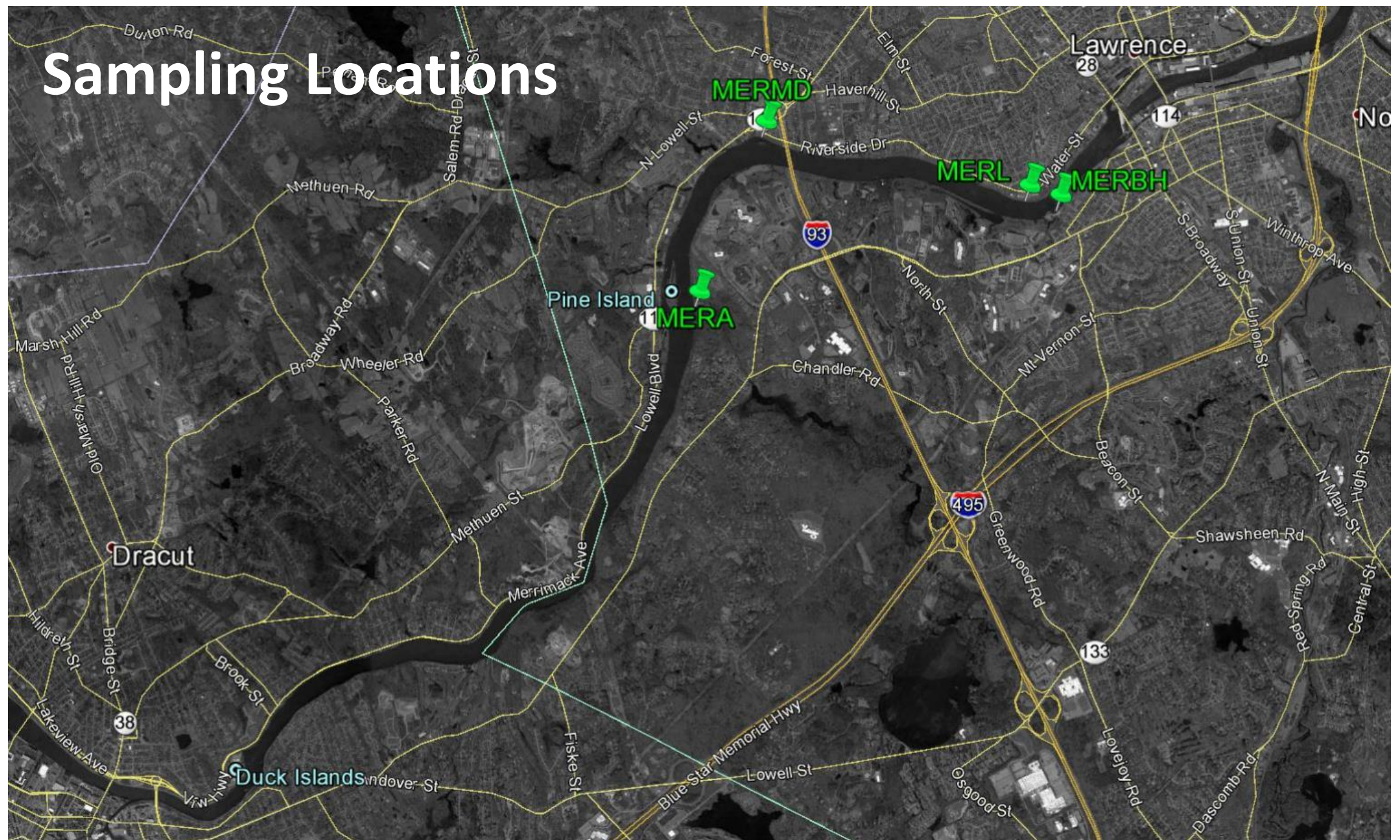
- Collect samples at different conditions in the River (elevated bacteria concentrations)
- Targeted wet weather sampling

Grab Sample Collection

Sample Analyses at laboratory:

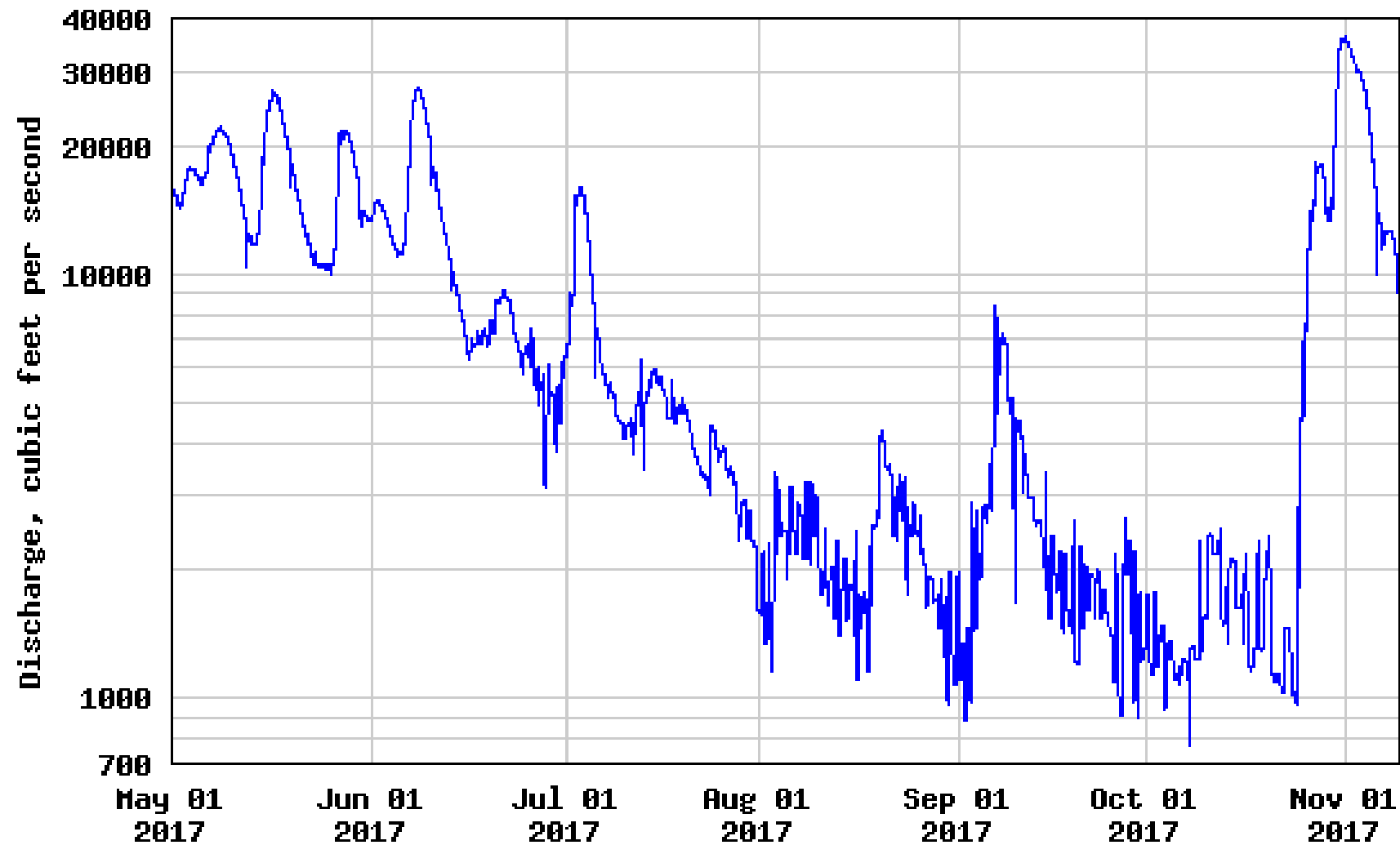
- E.coli
- Total Phosphorous
- Ortho Phosphate
- Chlorophyll
- Nitrate

Sampling Locations





USGS 01100000 MERRIMACK RIVER BL CONCORD RIVER AT LOWELL, MA



----- Provisional Data Subject to Revision -----

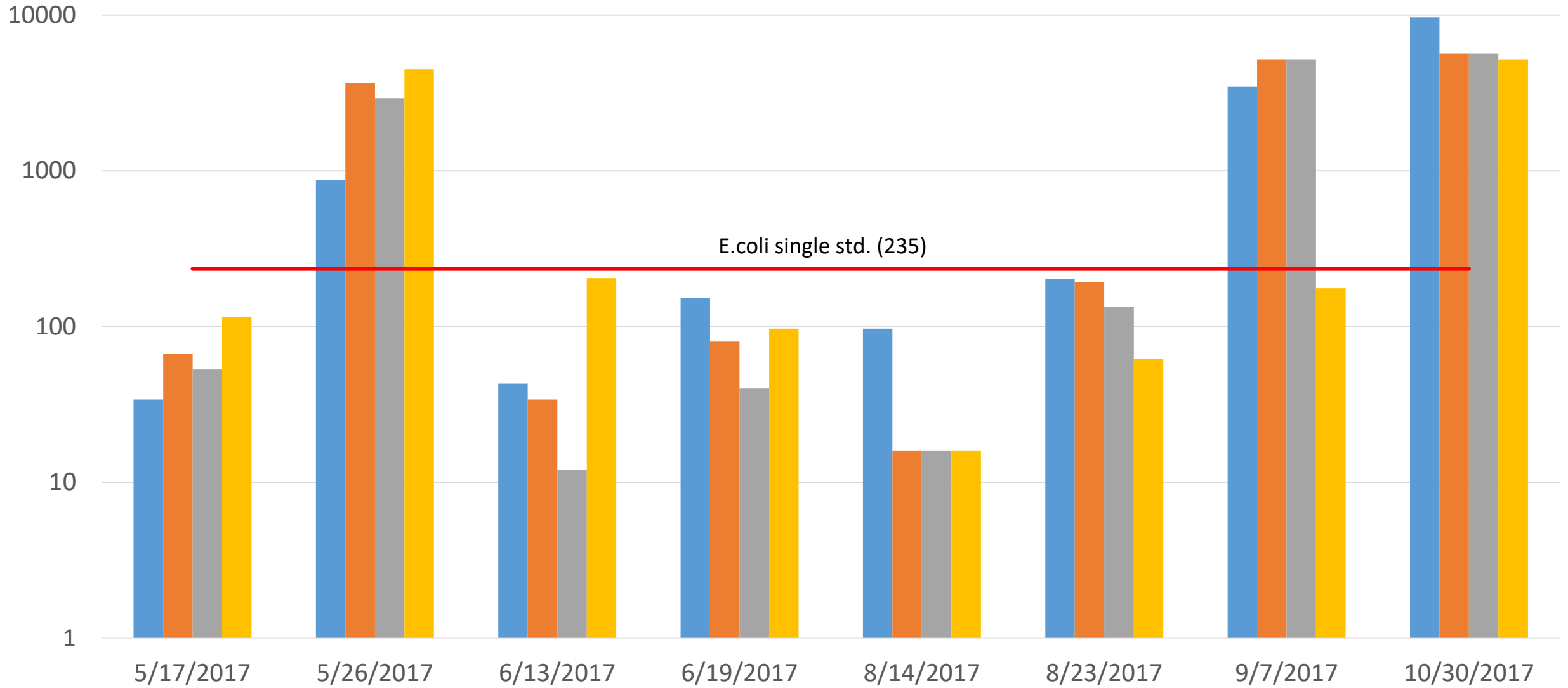
E.coli (MPN/100ml)

■ Andover (MERA)

■ Methuen (MERMD)

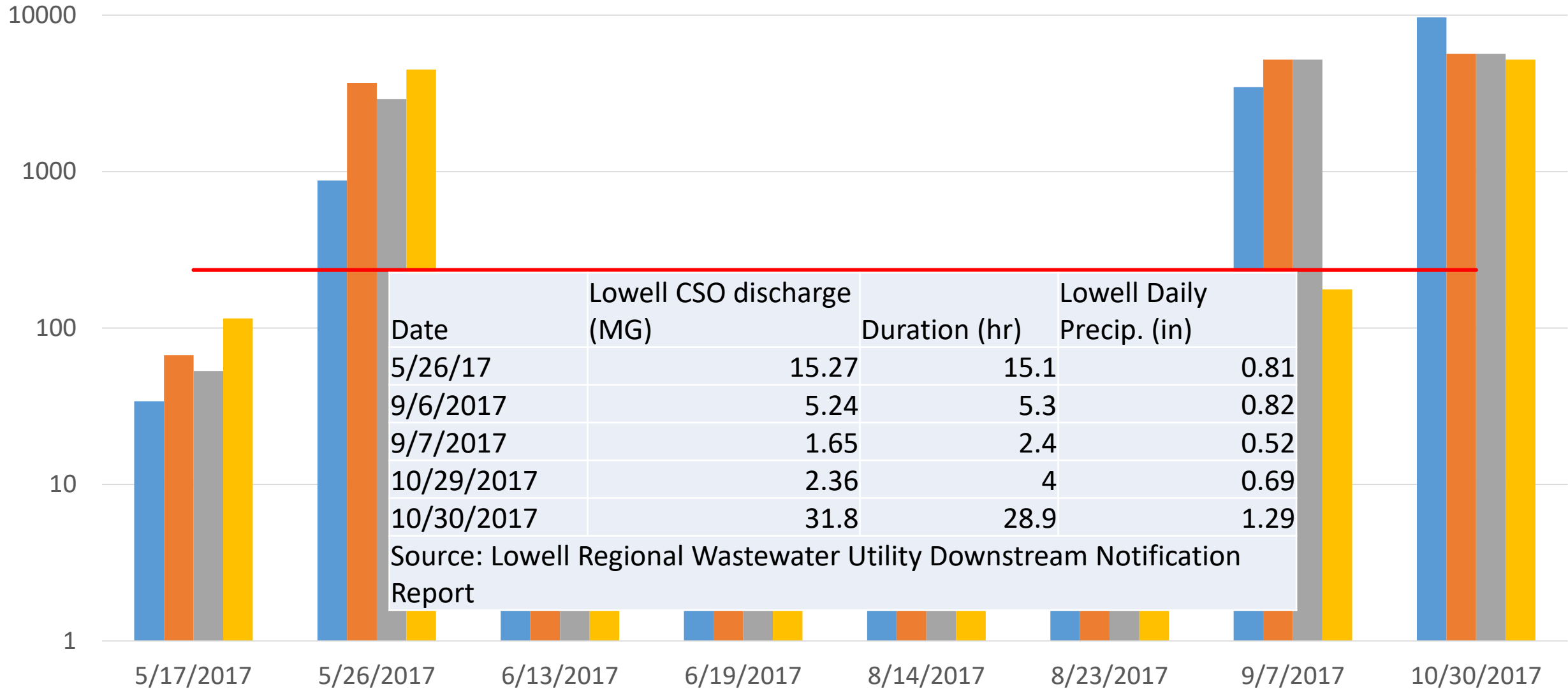
■ Lawrence (MERL)

■ Abe Bashara (MERBH)



E.coli (MPN/100ml)

■ Andover (MERA)
 ■ Methuen (MERMD)
 ■ Lawrence (MERL)
 ■ Abe Bashara (MERBH)



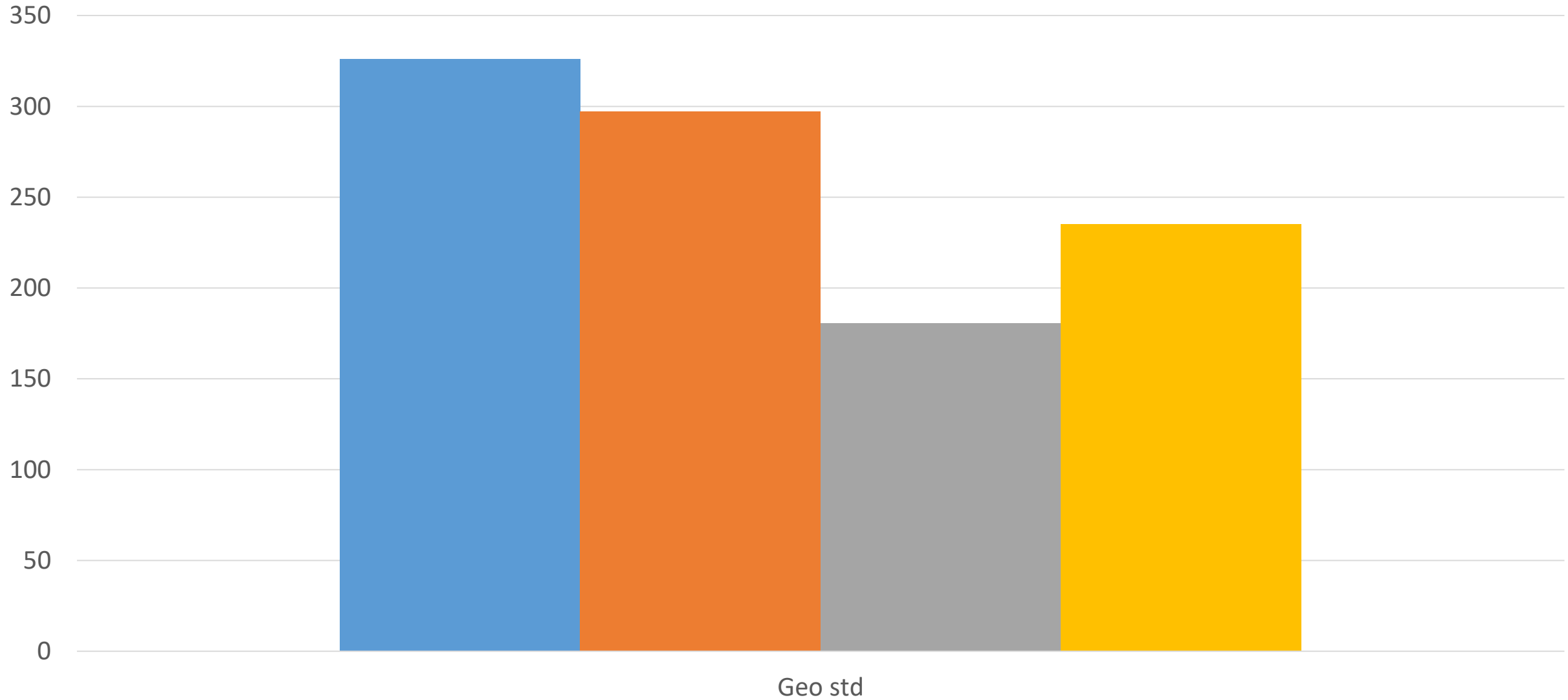
E.coli Geometric Mean (MPN/100ml)

■ Andover (MERA)

■ Methuen (MERMD)

■ Lawrence (MERL)

■ Abe Bashara (MERBH)



Other Recent Monitoring and EPA projects

- Lawrence Flooding analyses project
- 2016 nutrient sampling Nashua to Lawrence
- 2017 Lower Merrimack nutrient sampling

