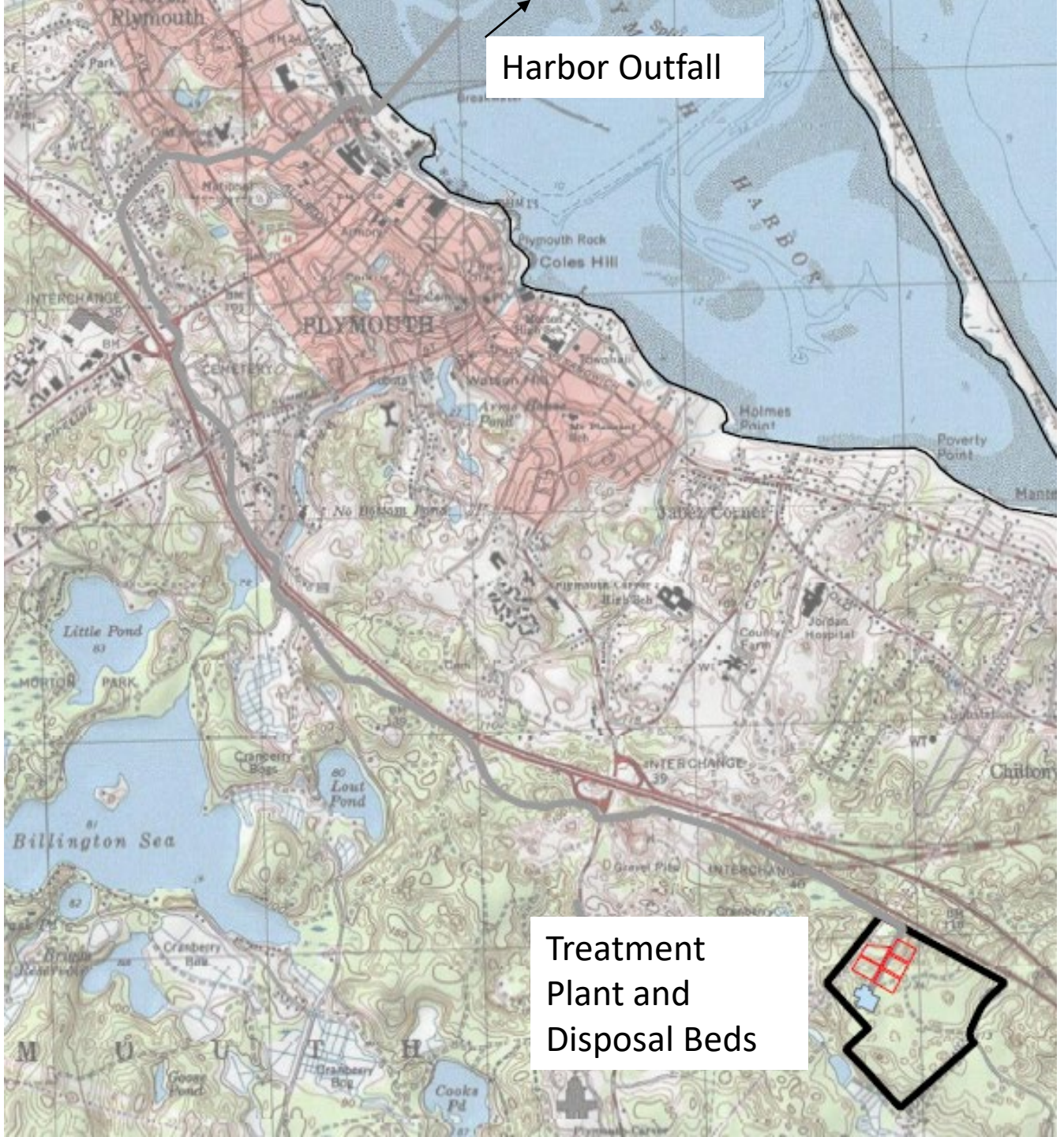
Plymouth WWTF Effluent Discharge Reprioritization -

EIR Status Update 4/28/25



Project Overview:

Reprioritization

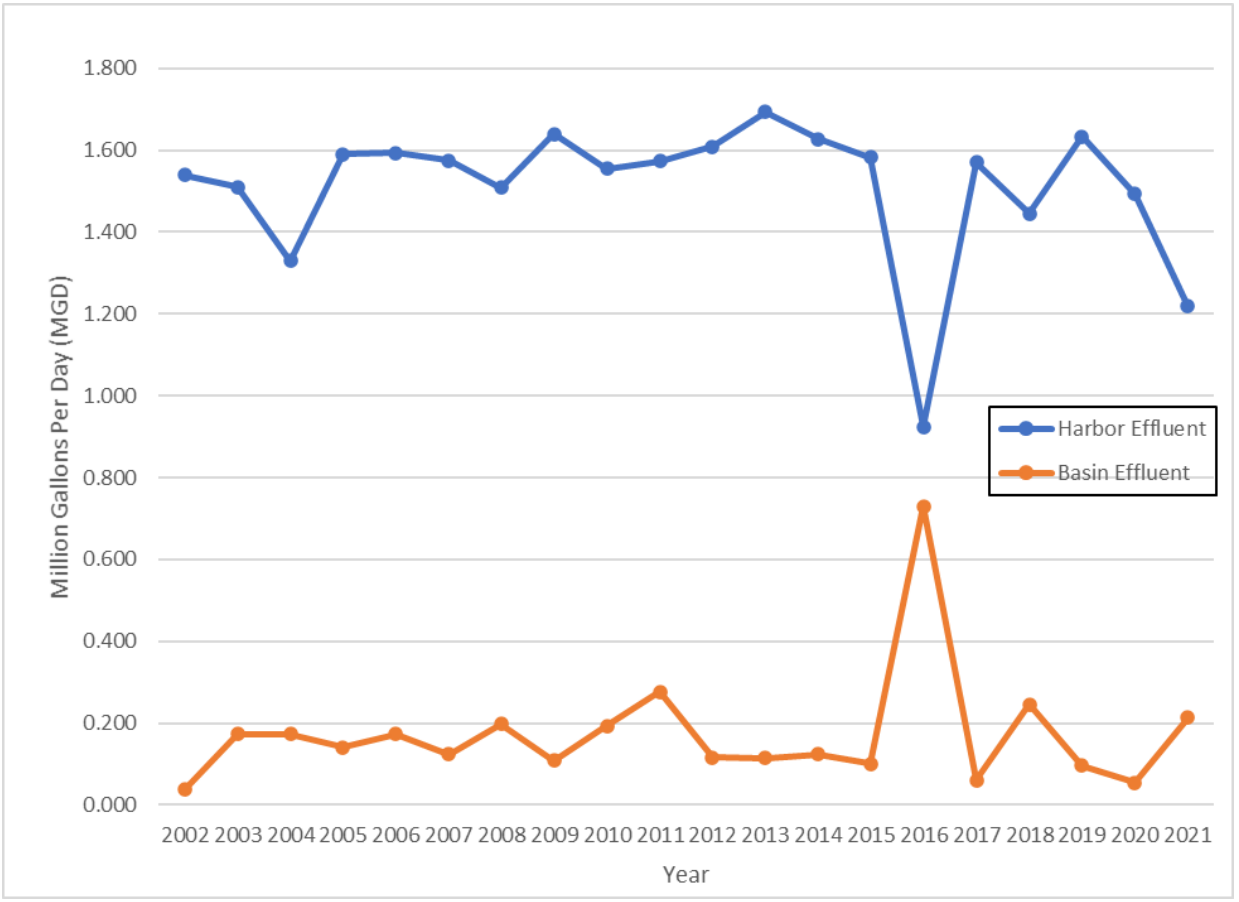
	Existing Conditions	Proposed Conditions
Harbor Outfall	**Primary discharge location** Permitted up to 1.75 MGD discharge	Emergency/backup discharge location NPDES permit retained for emergency use
Groundwater Discharge Beds (Camelot Drive)	Secondary discharge location Permitted up to 0.75 MGD after initial 1.75 MGD discharged to Harbor	**Primary discharge location** Permitted 3.0 MGD discharge
Total Discharge	2.5 MGD total discharge permitted	3.0 MGD total discharge permitted

ENF Certificate Requirements for EIR

- Update Data for analyses to current time period.
- Expanded Alternatives Analysis
  - Site 101
  - Cold Springs School
- Environmental Justice Section
- Discuss greenhouse gas benefits of project
- Public Meeting
- Revise nitrogen attenuation section of Narrative based on errors in MEP draft TMDL Report
- Include simplified table of potential env. impacts
- Present updated monitoring plan to track nutrient migration
- Propose mitigation as necessary to mitigate nutrient impacts
- Discuss climate change impacts on WWTF, GW mounding, and nutrient migration
- Discuss construction period impacts

Nutrient Data Update

2002-2021



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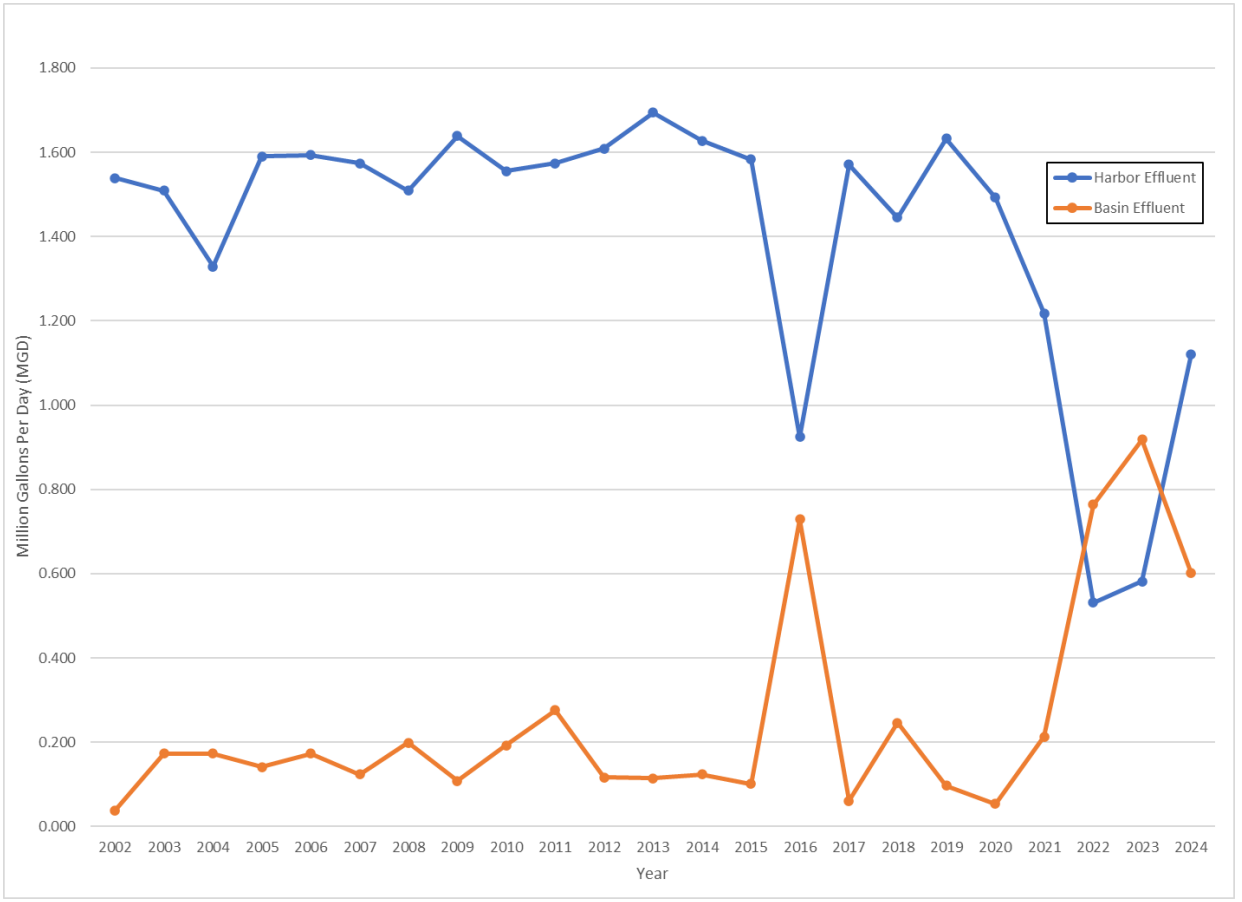
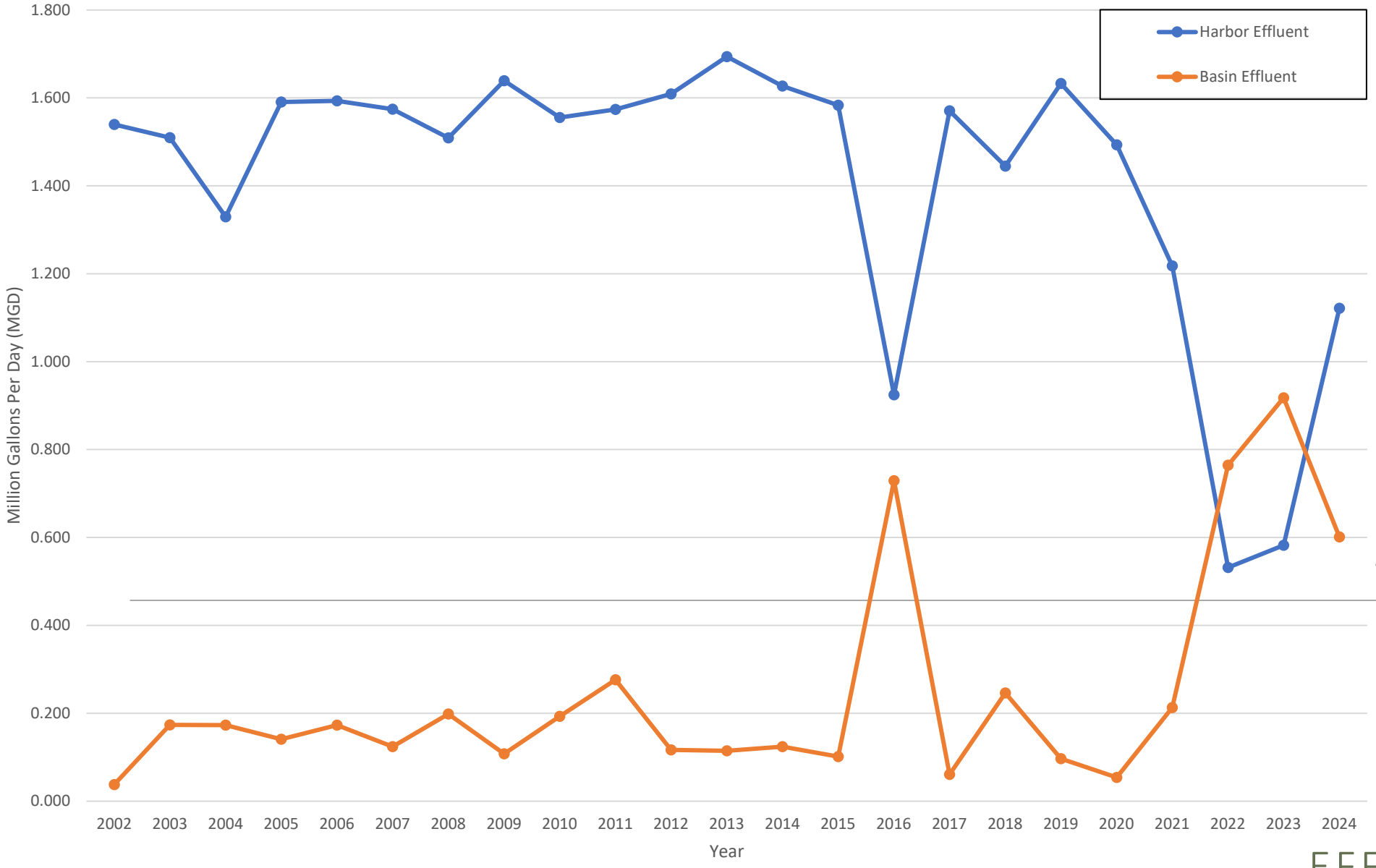


Flow Data Comparison 2021 to 2024

Disposal beds and harbor outfall



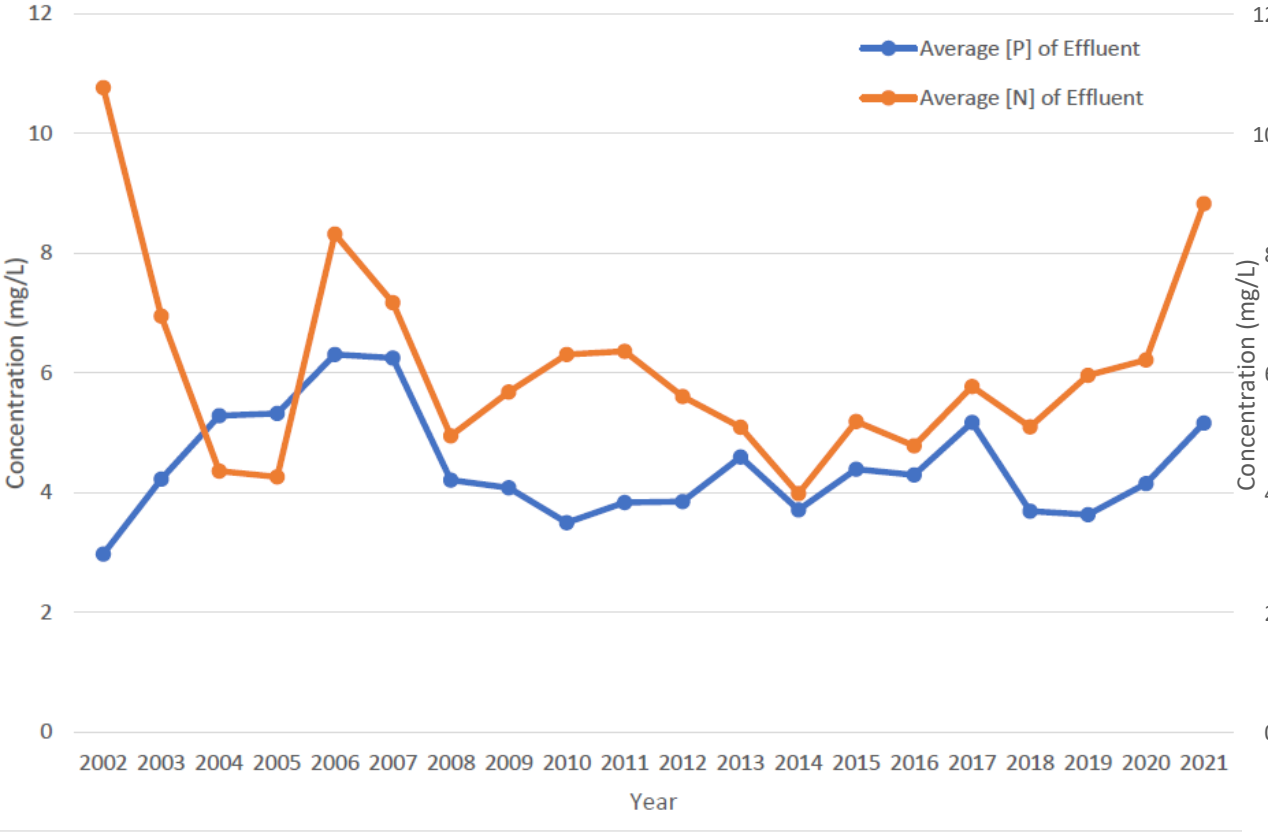
Due to sewer main repairs, all effluent was discharged to disposal beds between June 2016 and January 2017.

Flows were diverted again during the 2018 hydraulic loading test.

EFFLUENT FLOW DATA

WWTF Effluent Nutrient Data Comparison

2002-2021



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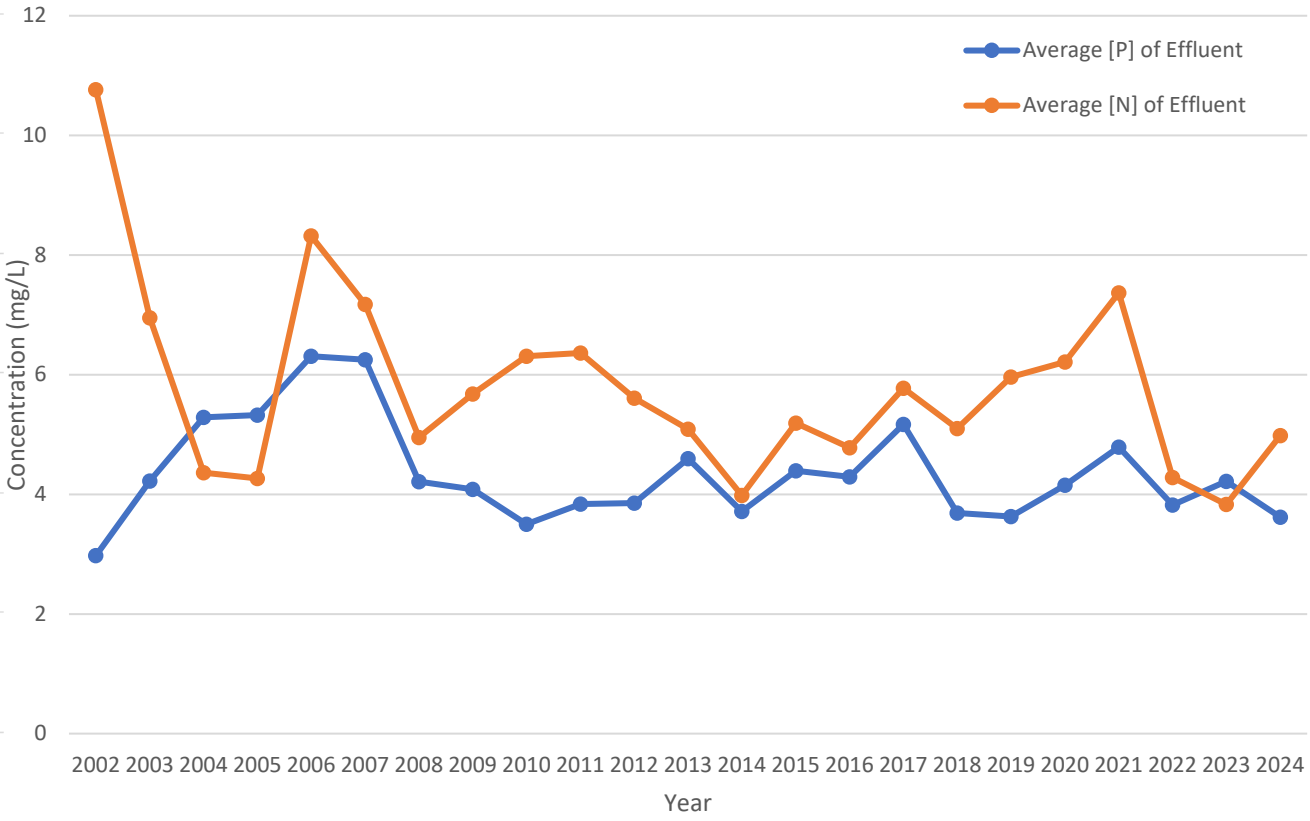
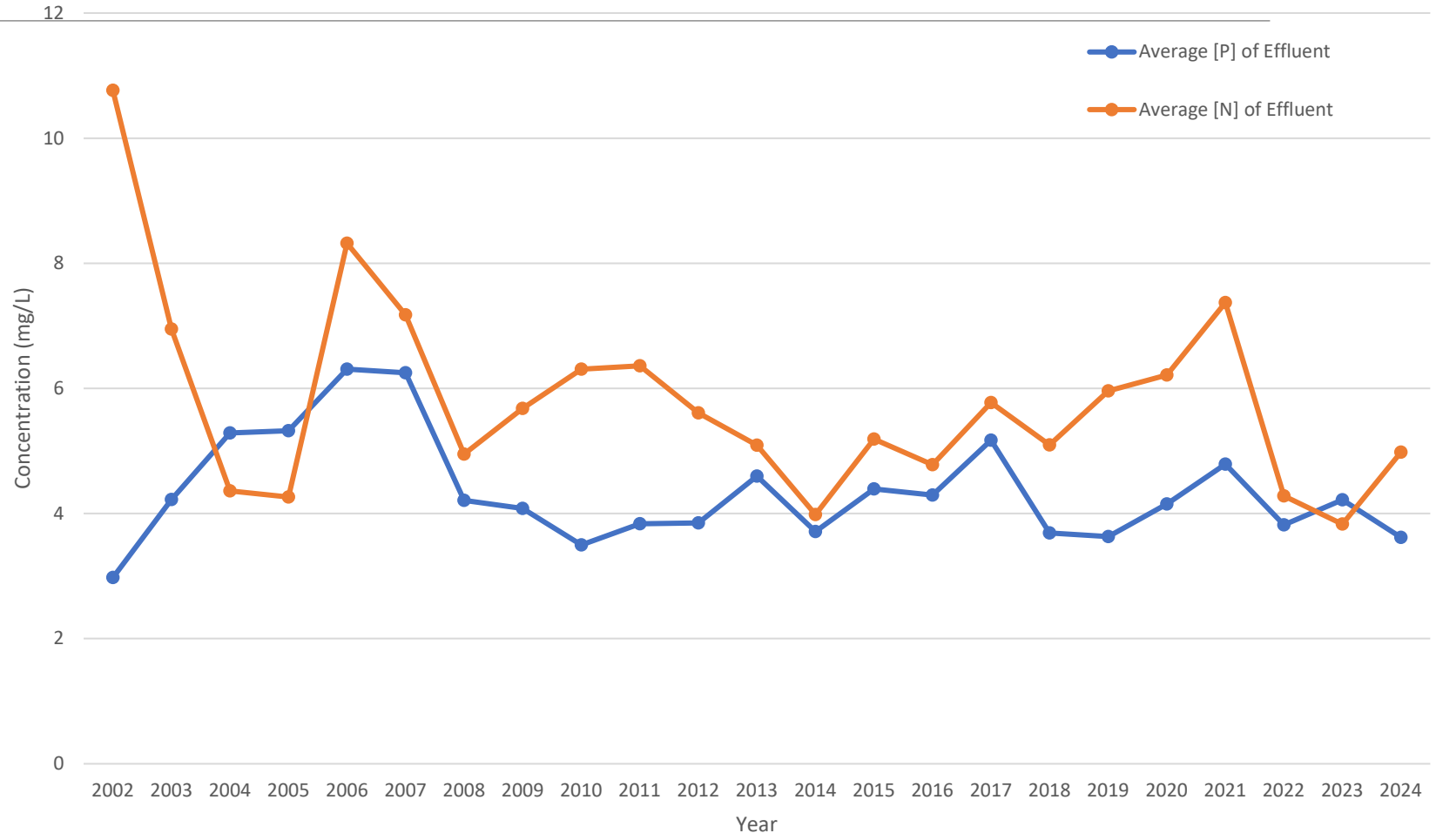
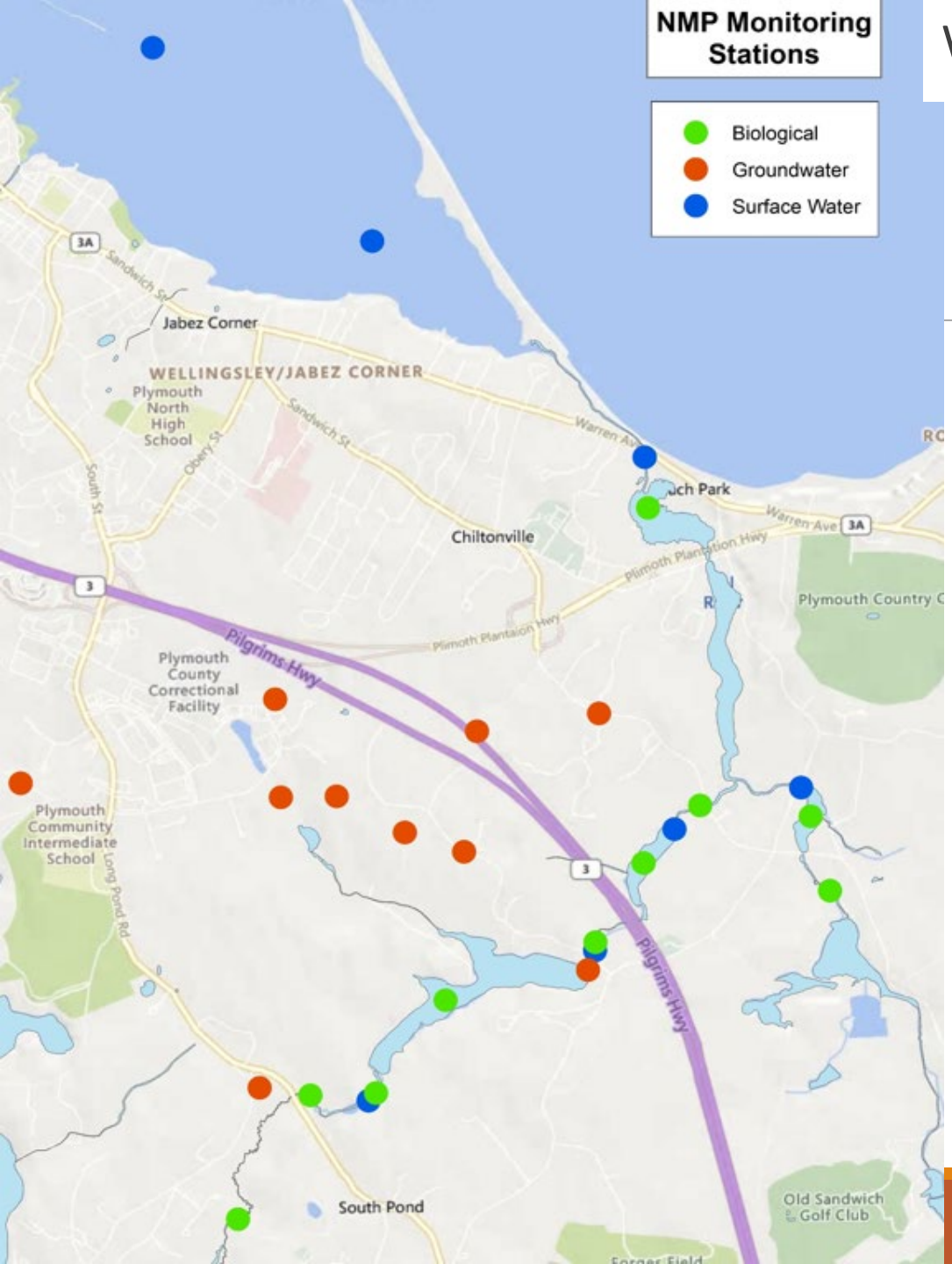


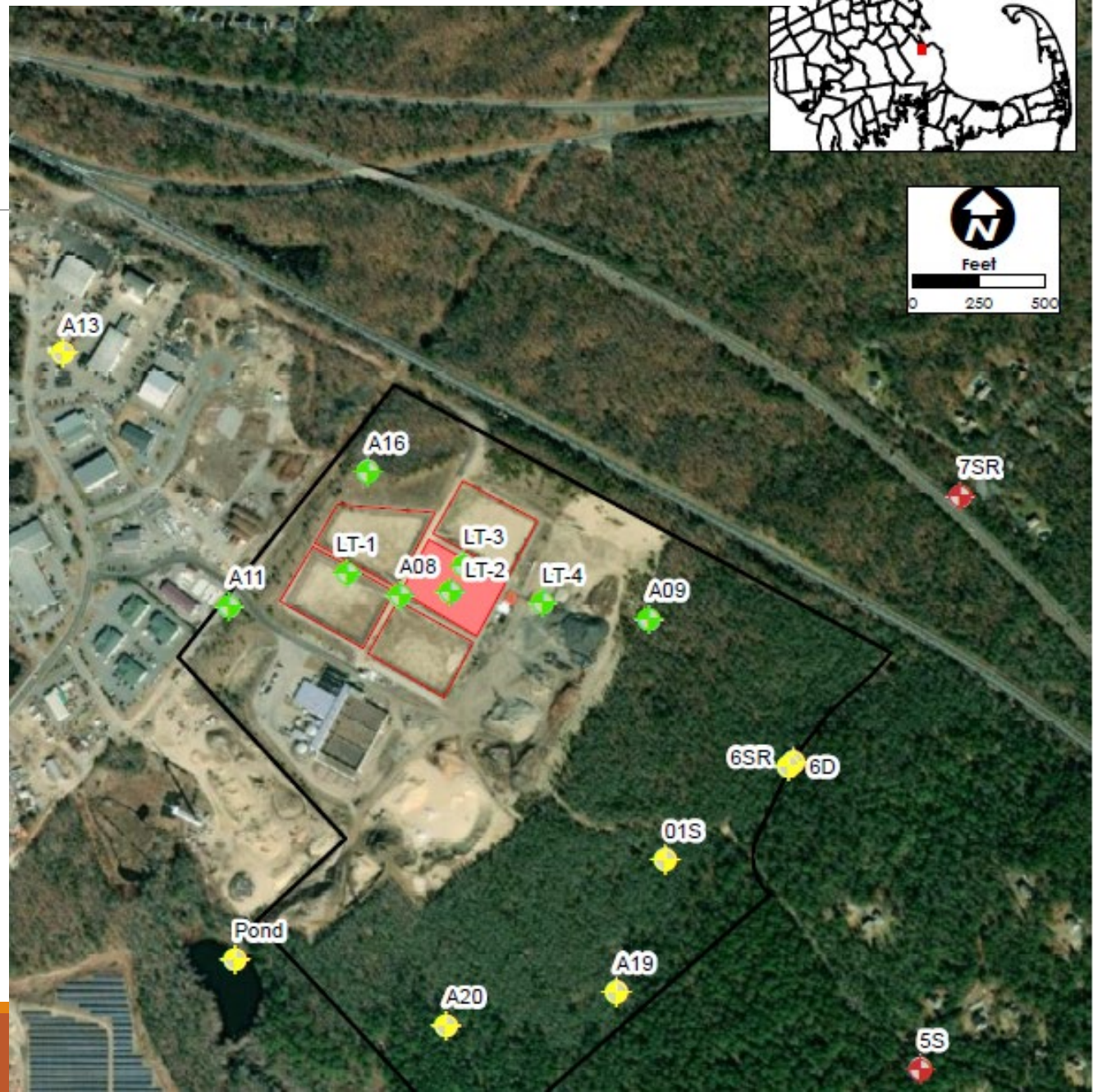
WWTF Effluent Nutrient Data

- Maximum allowable nitrogen concentration = 10mg/L
- No guidance on maximum phosphorus concentration
- Average P of Effluent ~ 4.3 mg/L
- Average N of Effluent ~ 5.8 mg/L

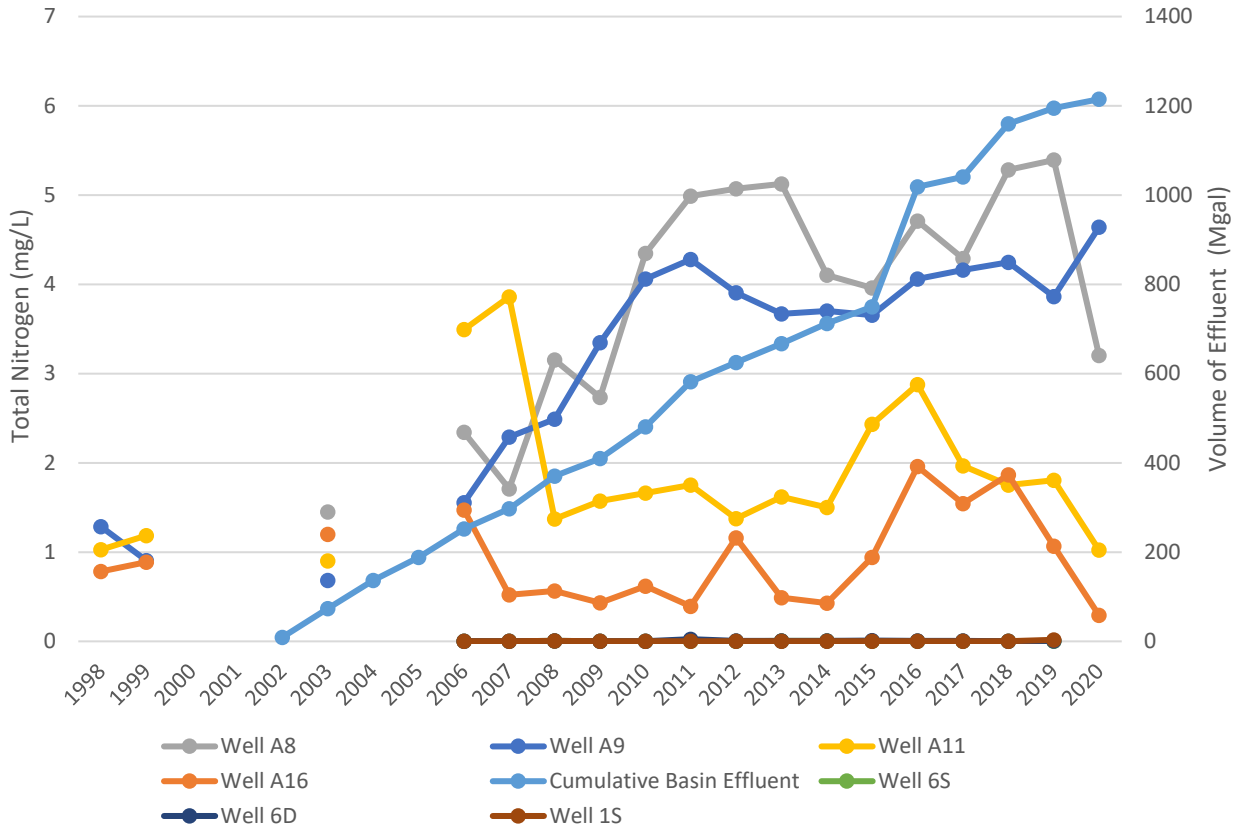


Water Quality Sampling Locations

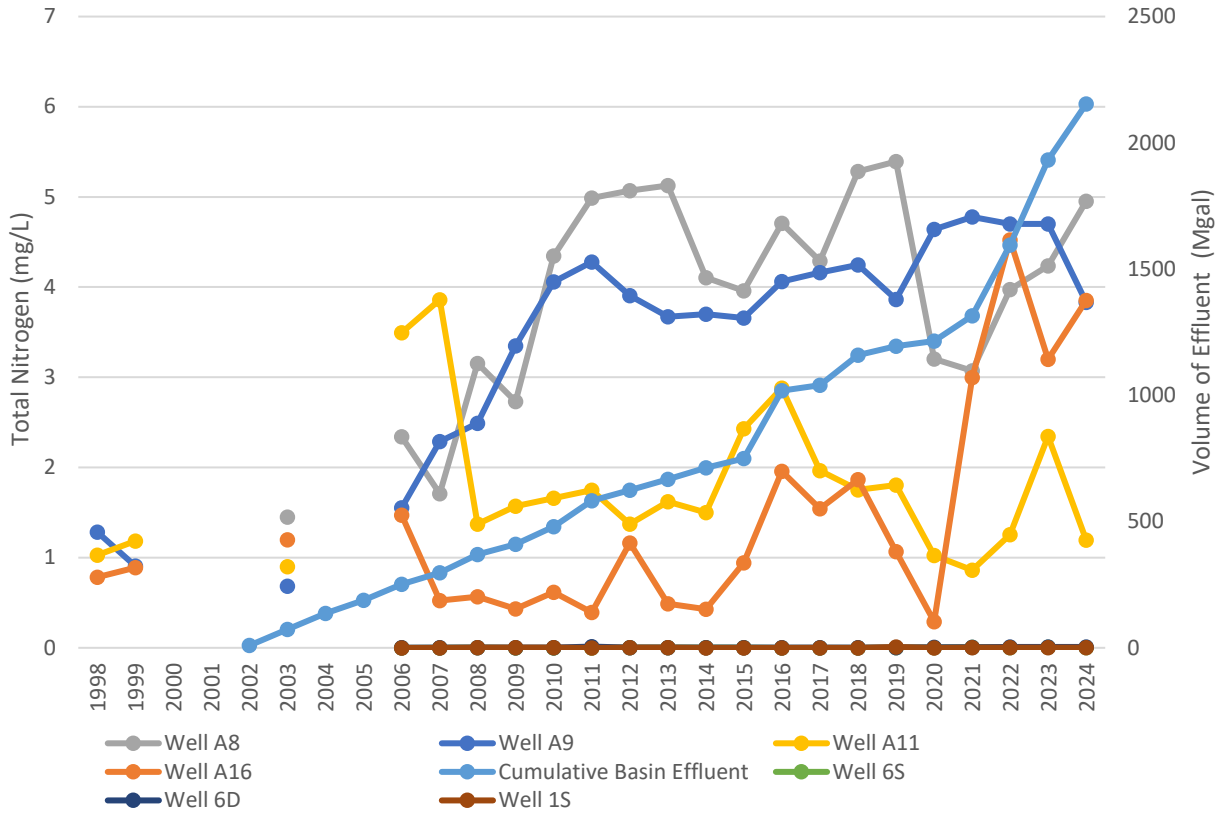




1998-2021



1998-2024



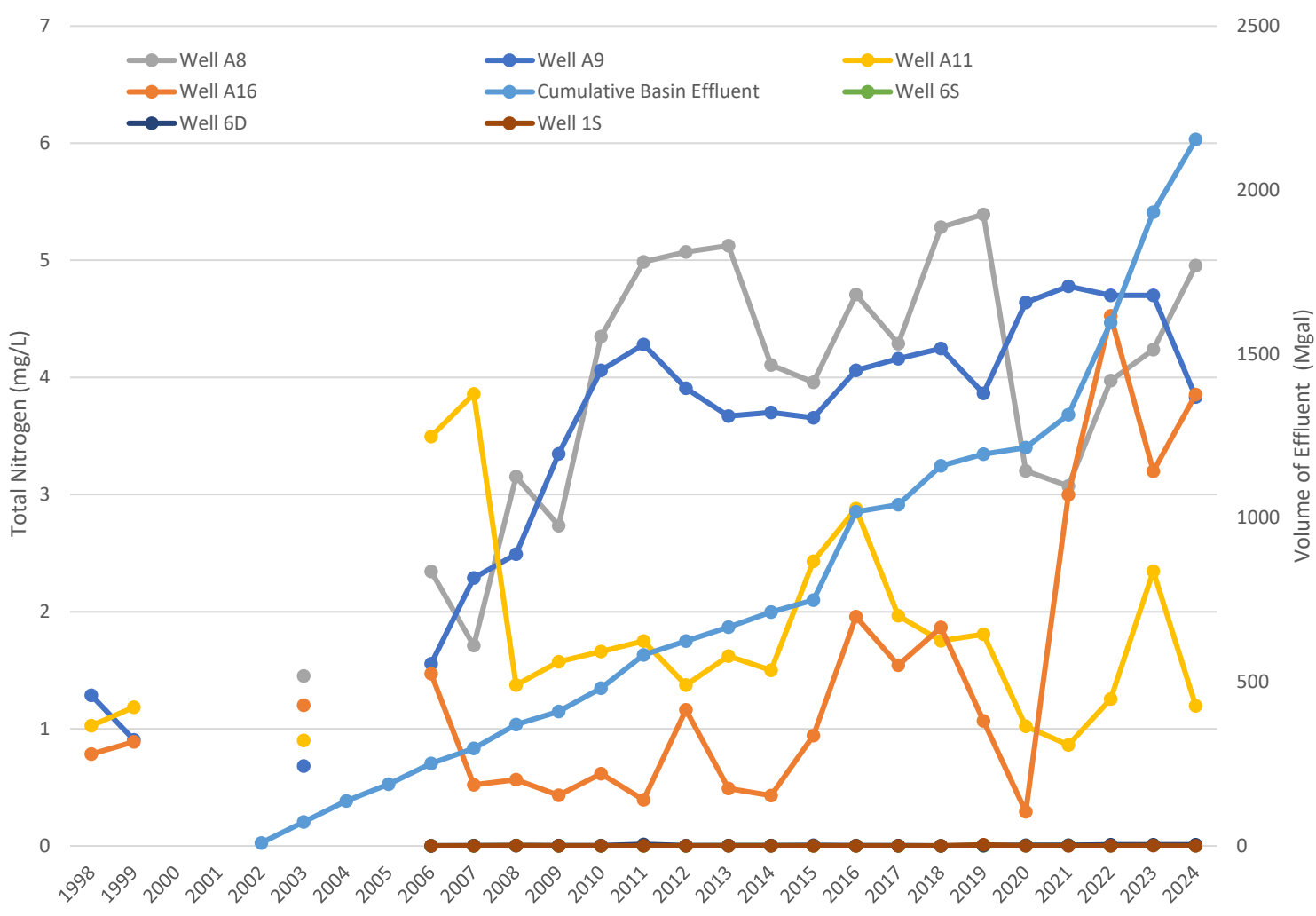
Groundwater Sampling Nitrogen Data Analysis Comparison 2021 to 2024

Nitrogen concentrations

Groundwater Nitrogen Data

Elevated nitrogen concentrations at wells close to the sand beds (Well A8, Well A9, Well 11, Well 16).

Minimal correlation between nitrogen concentrations observed in the groundwater wells and the cumulative volume of effluent infiltrated on site.



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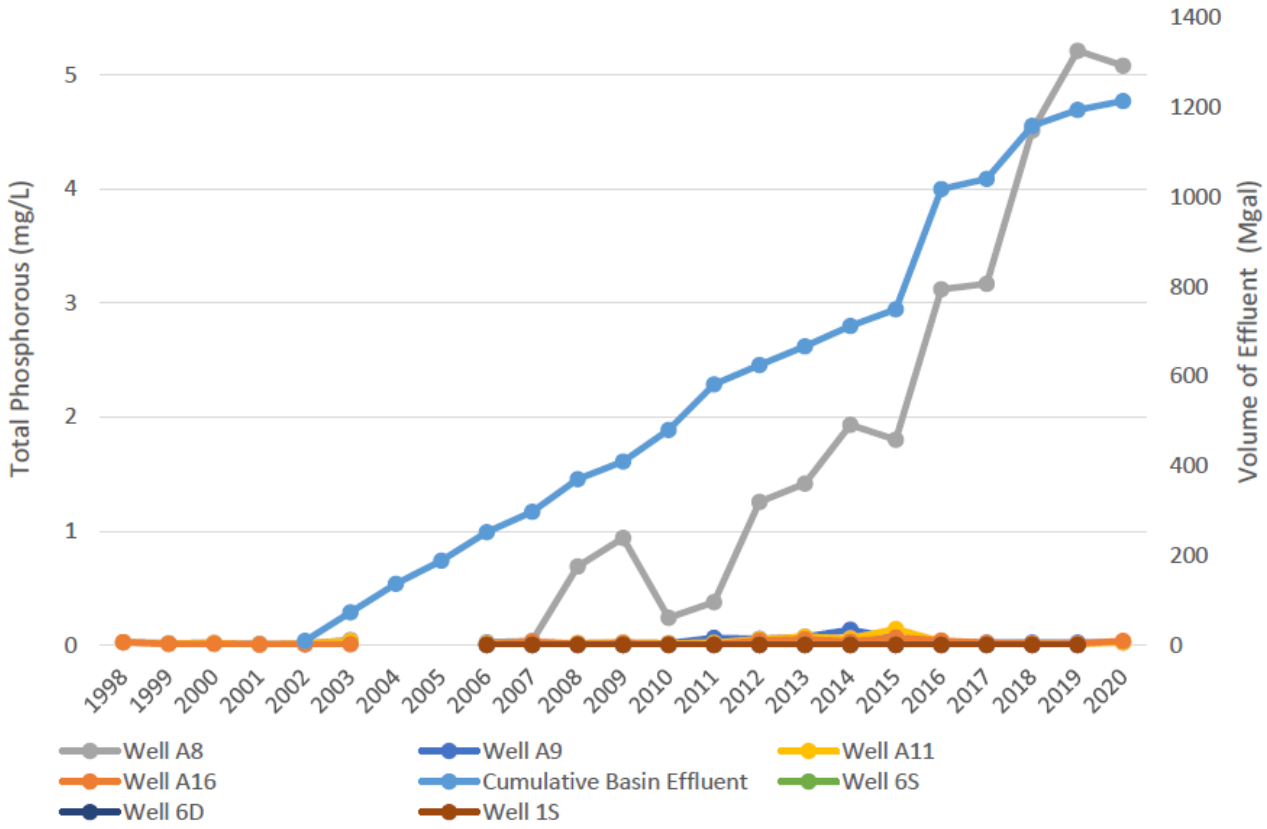

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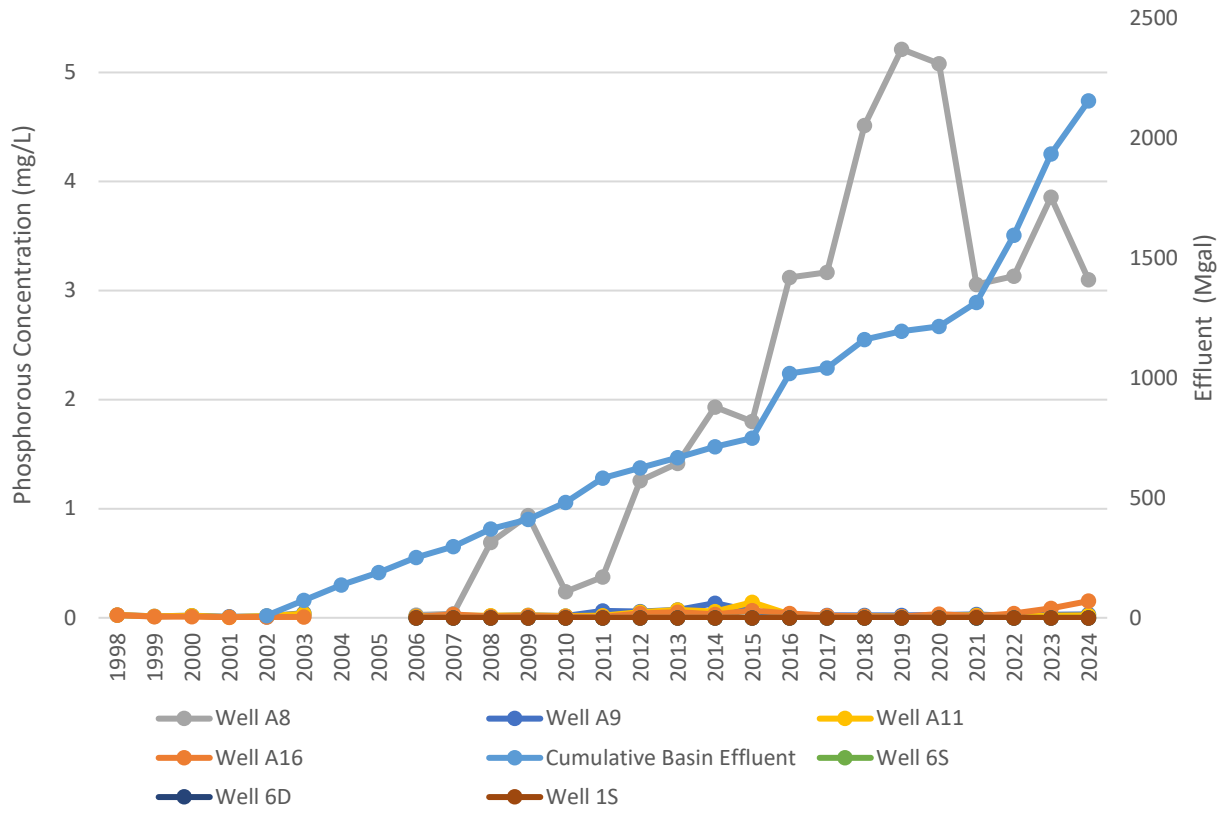
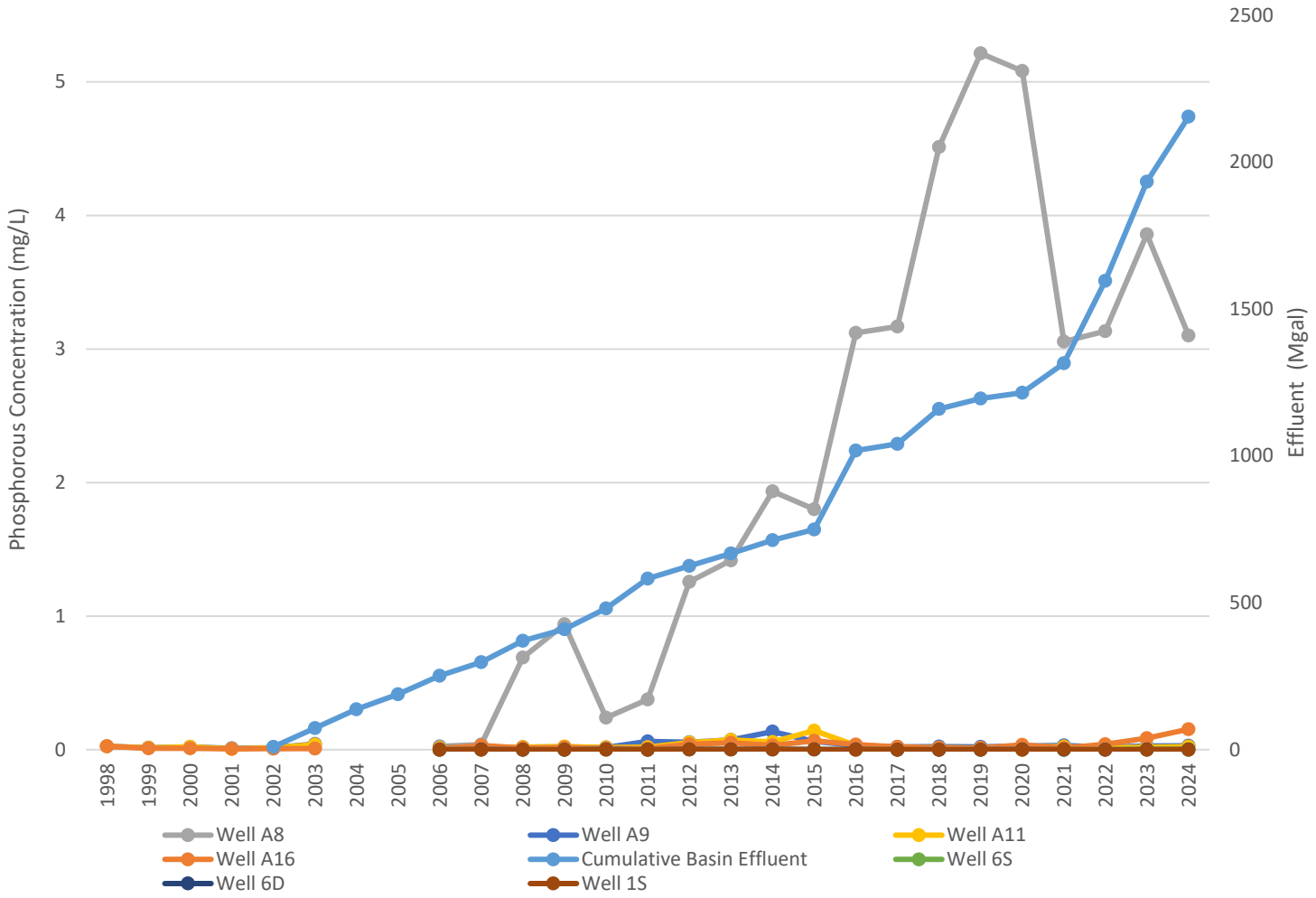


Groundwater Sampling Phosphorus Data Analysis Comparison 2021 to 2024

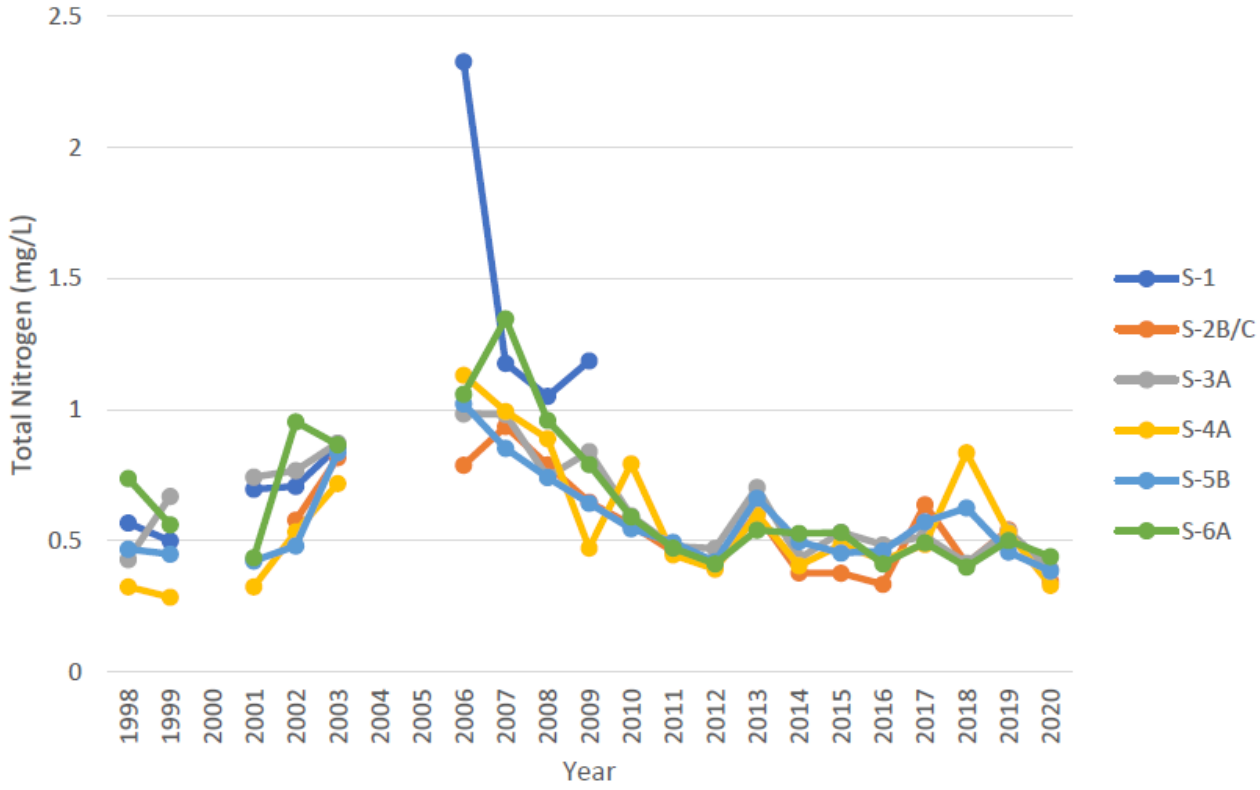
Phosphorus concentrations

- Correlation between phosphorus concentrations at Well A8 (directly below beds) and the cumulative volume of effluent infiltrated on site.
- Phosphorus at Well A8 increased significantly roughly around 2011, when approximately 600 MG had been discharged to sand beds since operation began in 2002.

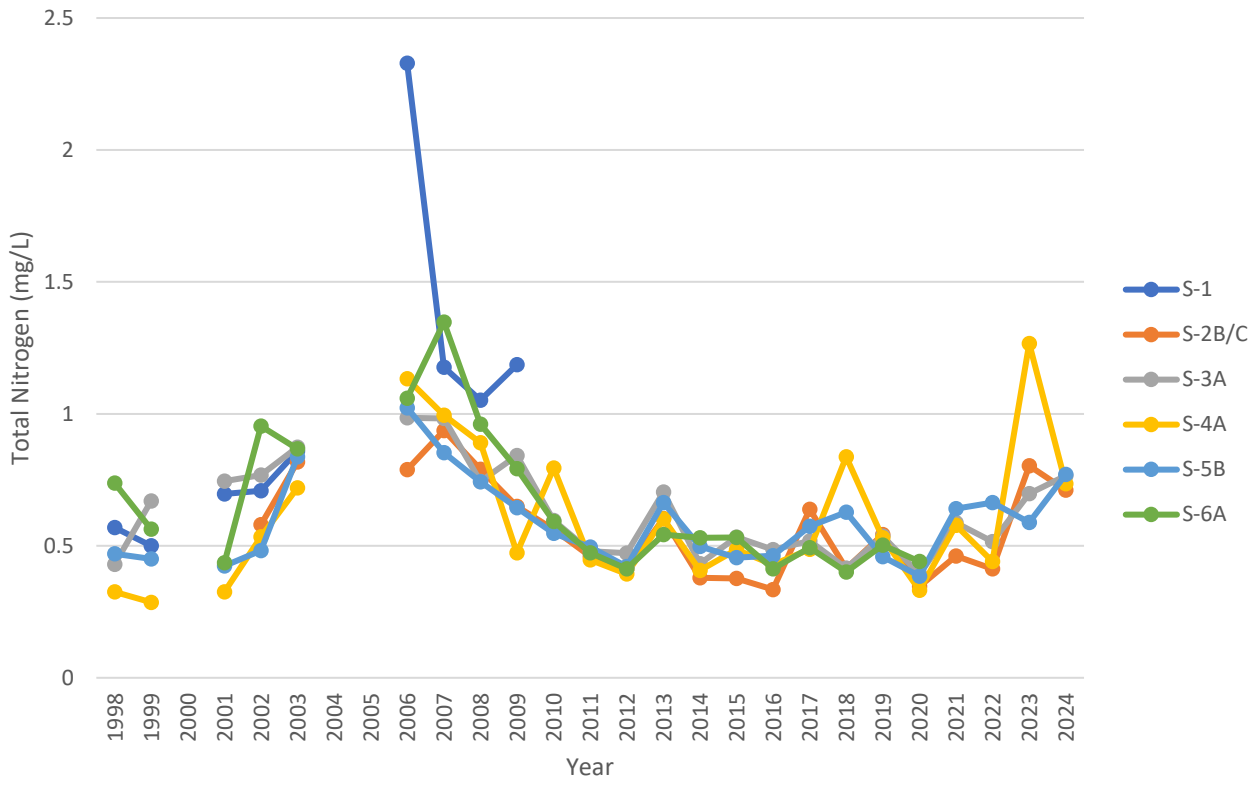


Groundwater Phosphorus Data

1998-2021



1998-2024

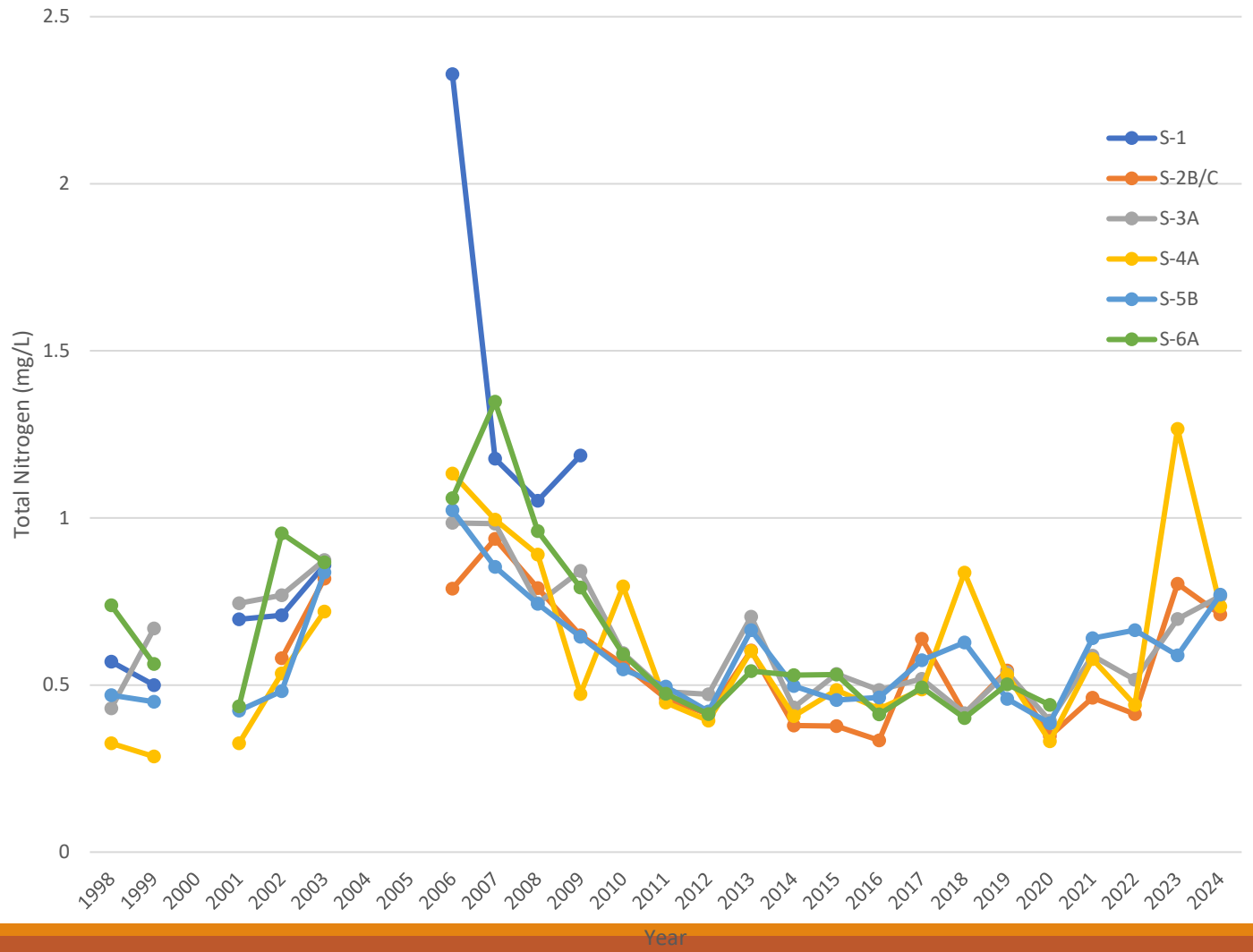


Surface Water Sampling Nitrogen Data Analysis Comparison 2021 to 2024

Nitrogen concentrations

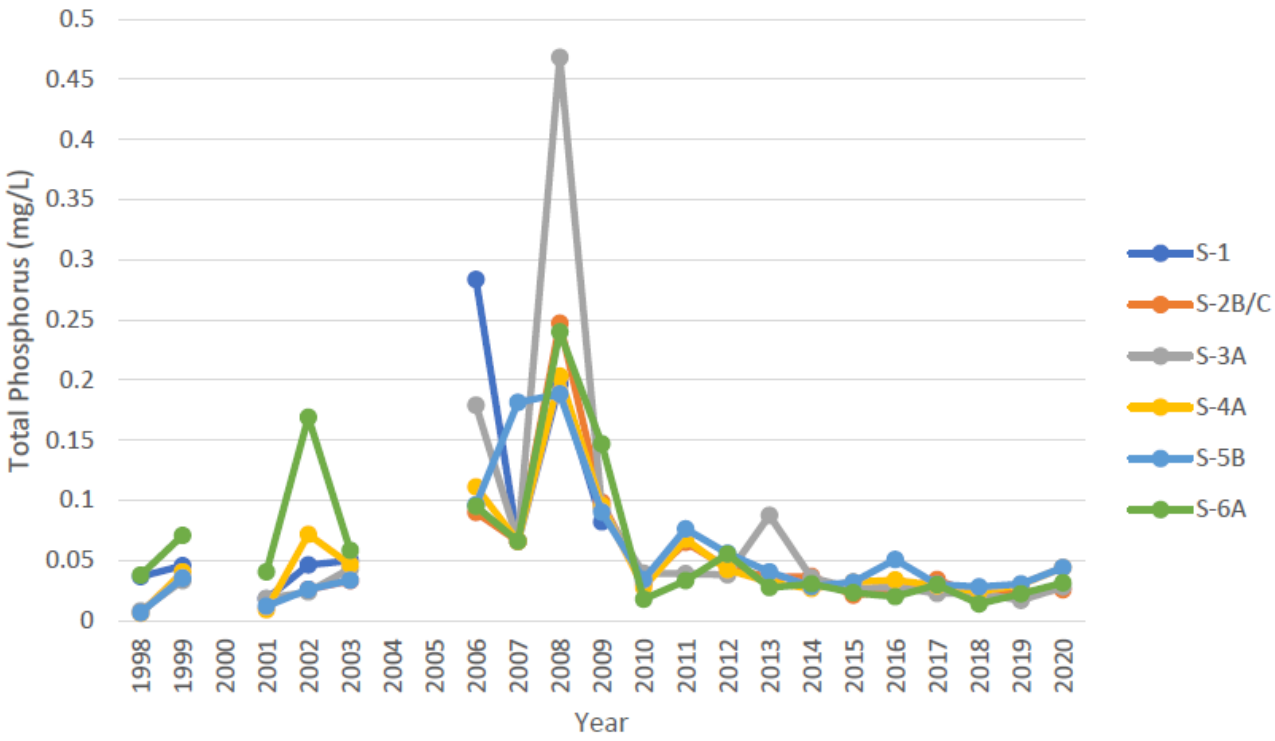
The spike in 2006 is thought to have been caused by wetland clearing along Warren Wells Brook in 2006.

Nitrogen concentrations remained somewhat consistent, around 0.05mg/L from 2012-2020 and have increased to about 0.07 mg/L in 2024.



Surface Water Nitrogen Data

1998-2021



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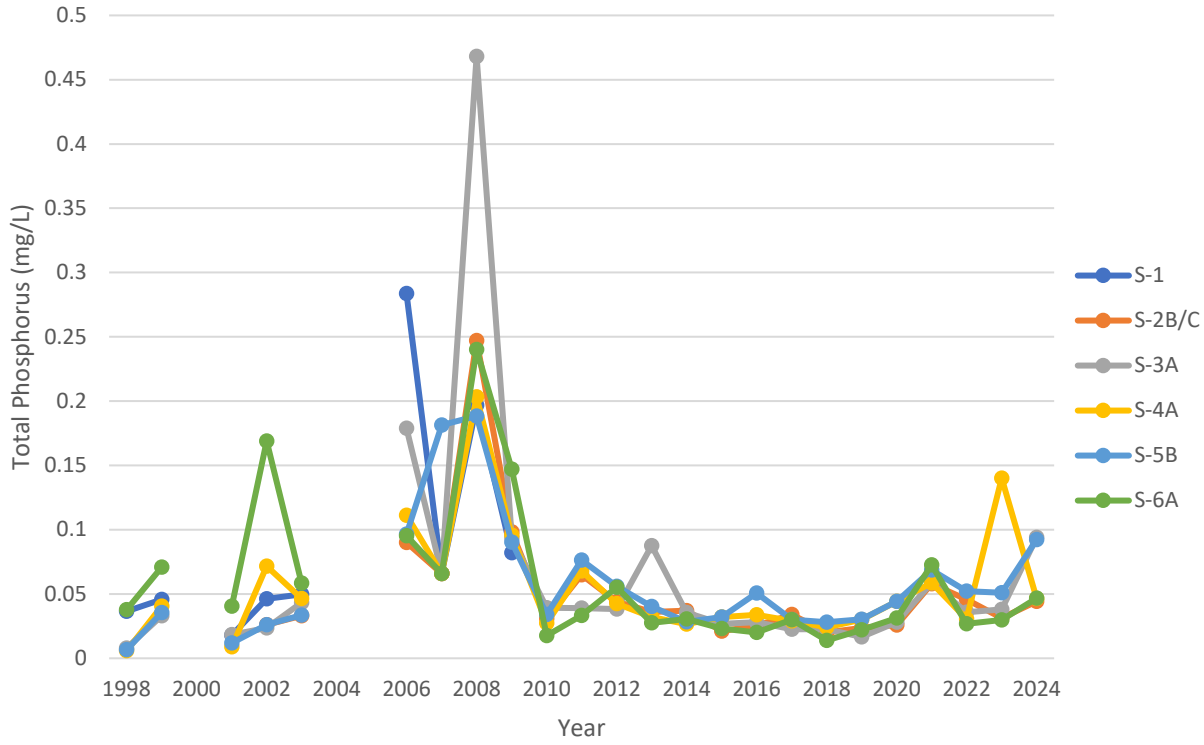


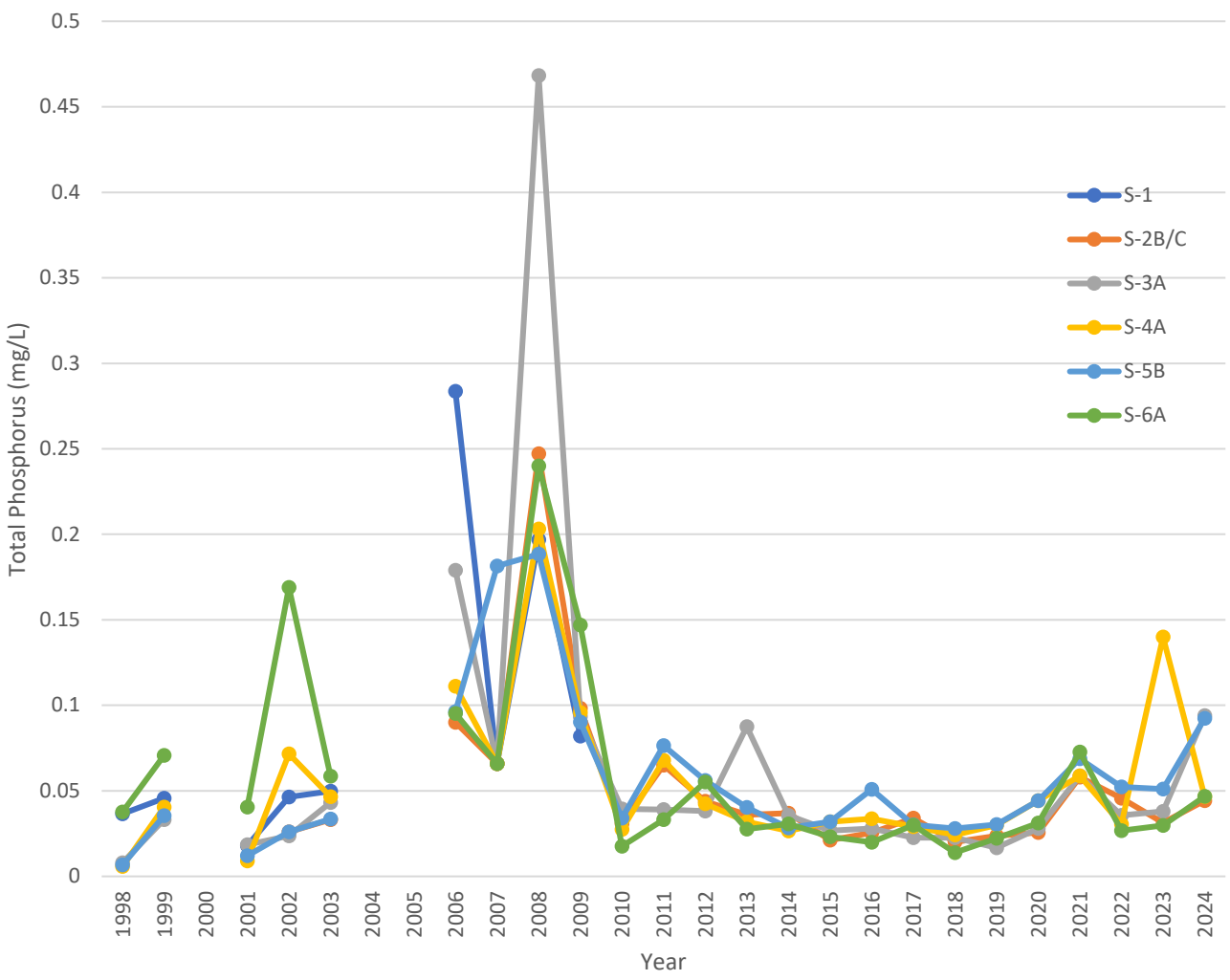
Surface Water Sampling Phosphorus Data Analysis Comparison 2021 to 2024

Phosphorus concentrations

The spike in 2006 is thought to have been caused by wetland clearing along Warren Wells Brook in 2006.

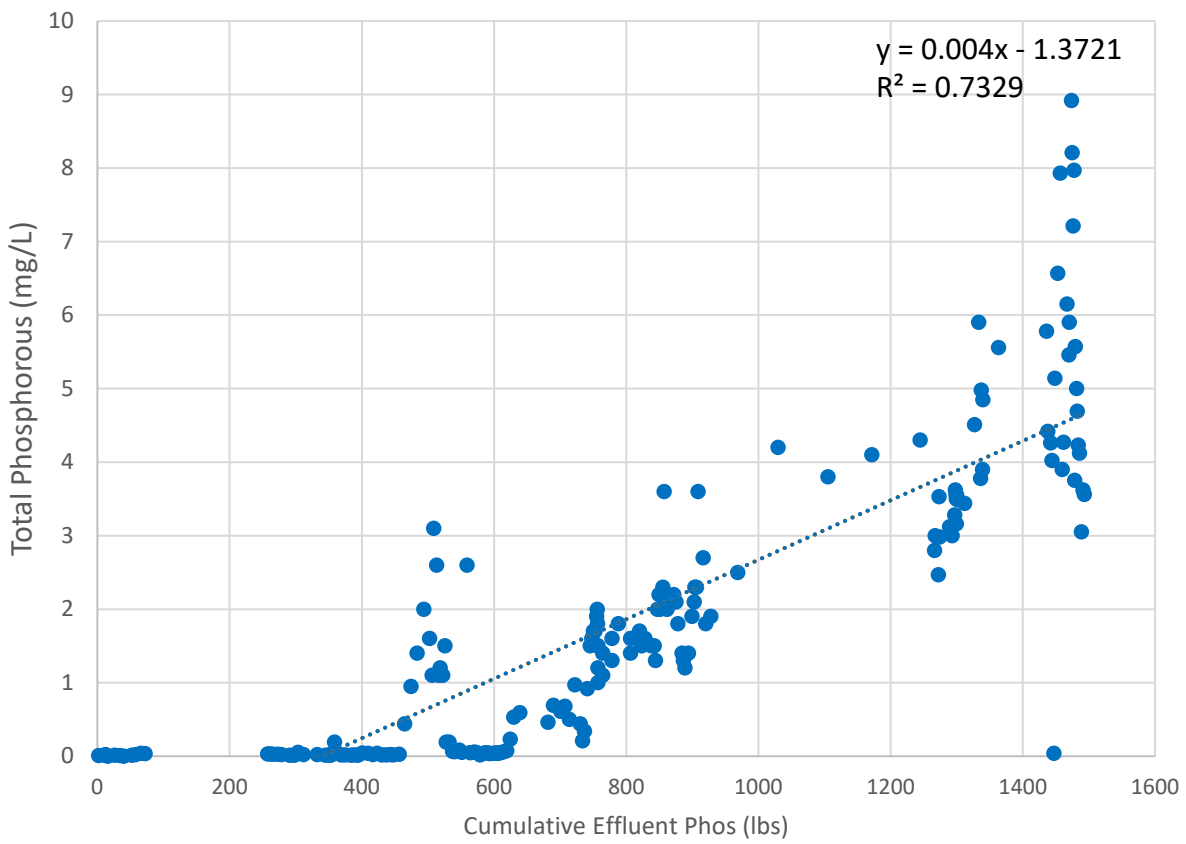
The spike in 2008 is thought to be caused by algal blooms that were present when testing.

Since 2010 phosphorus concentrations have remained around 0.04-0.09mg/L.



Surface Water Phosphorus Data

2002-2021



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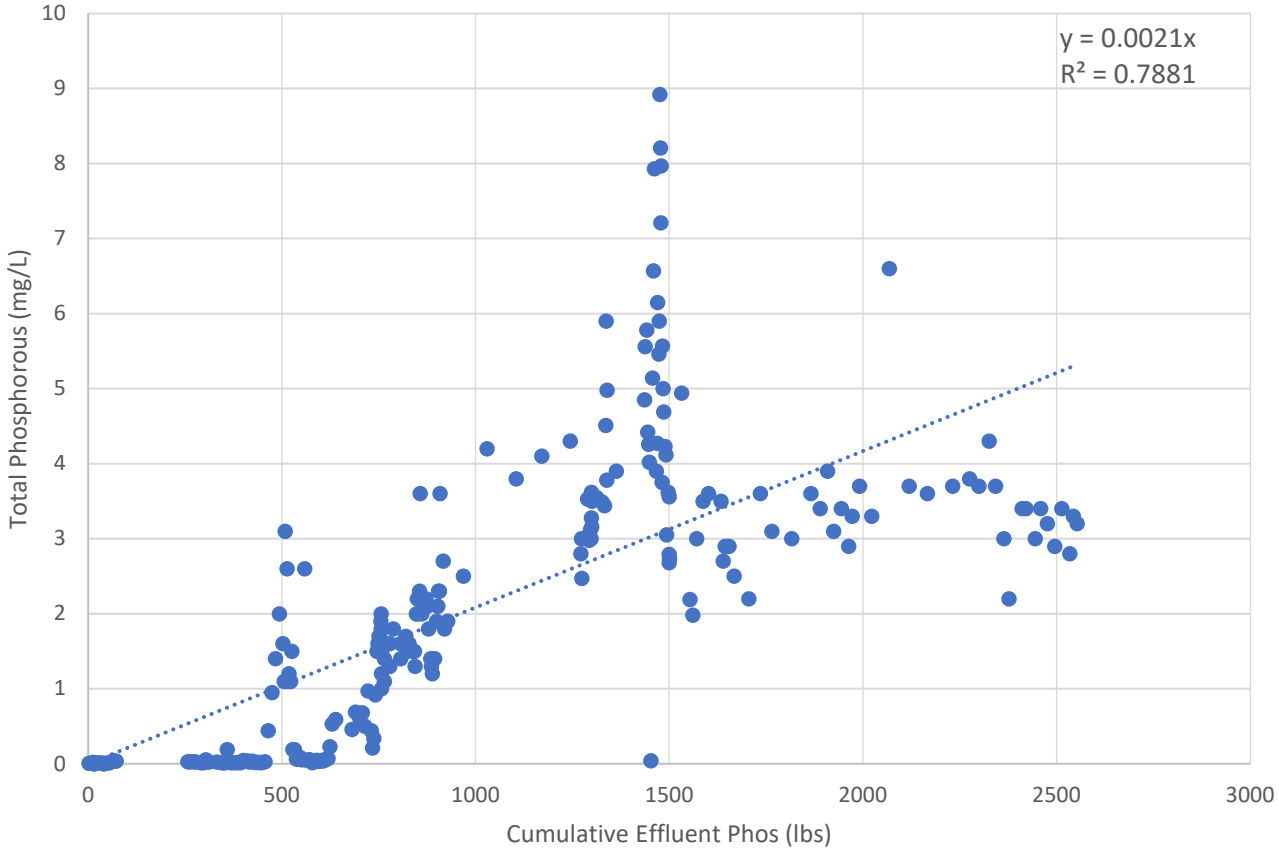


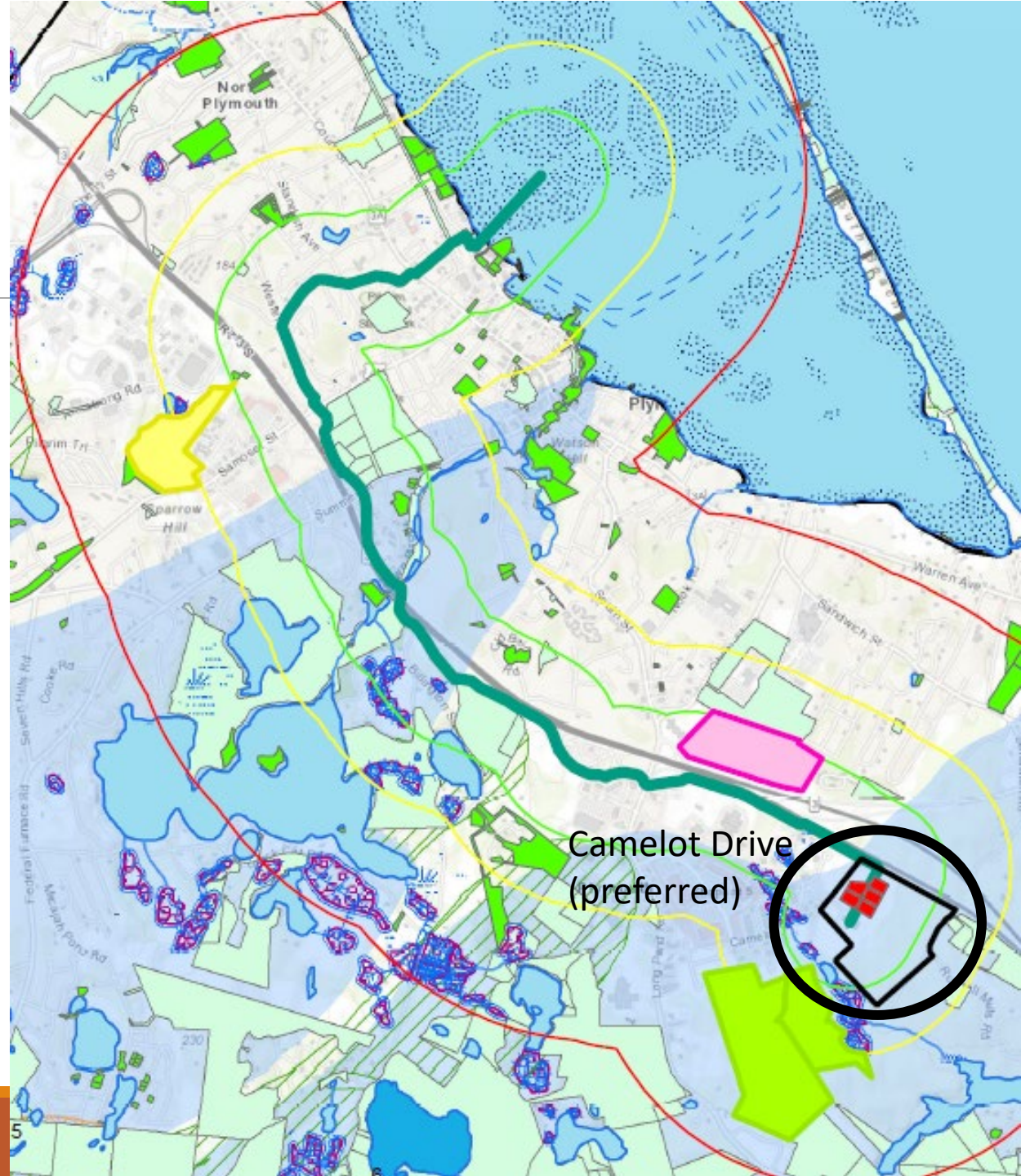
A8 Average Phosphorus Concentration vs Cumulative Basin Phosphorus Load Comparison 2021 to 2024

Phosphorus concentrations

Alternatives Update

Preferred Alternative

- Changing the prioritization of treated effluent discharge locations from the harbor outfall to on-site infiltration.
- Benefits:
  - No existing infrastructure to be impacted.
  - No significant impact to water supply.
  - No significant risk to existing dams/bridges along Eel River.
  - Anticipated minimal impact to Eel River water quality. Offset/mitigation analyses underway.
  - No pumping or new infrastructure required.



Alternatives for Further Consideration from ENF

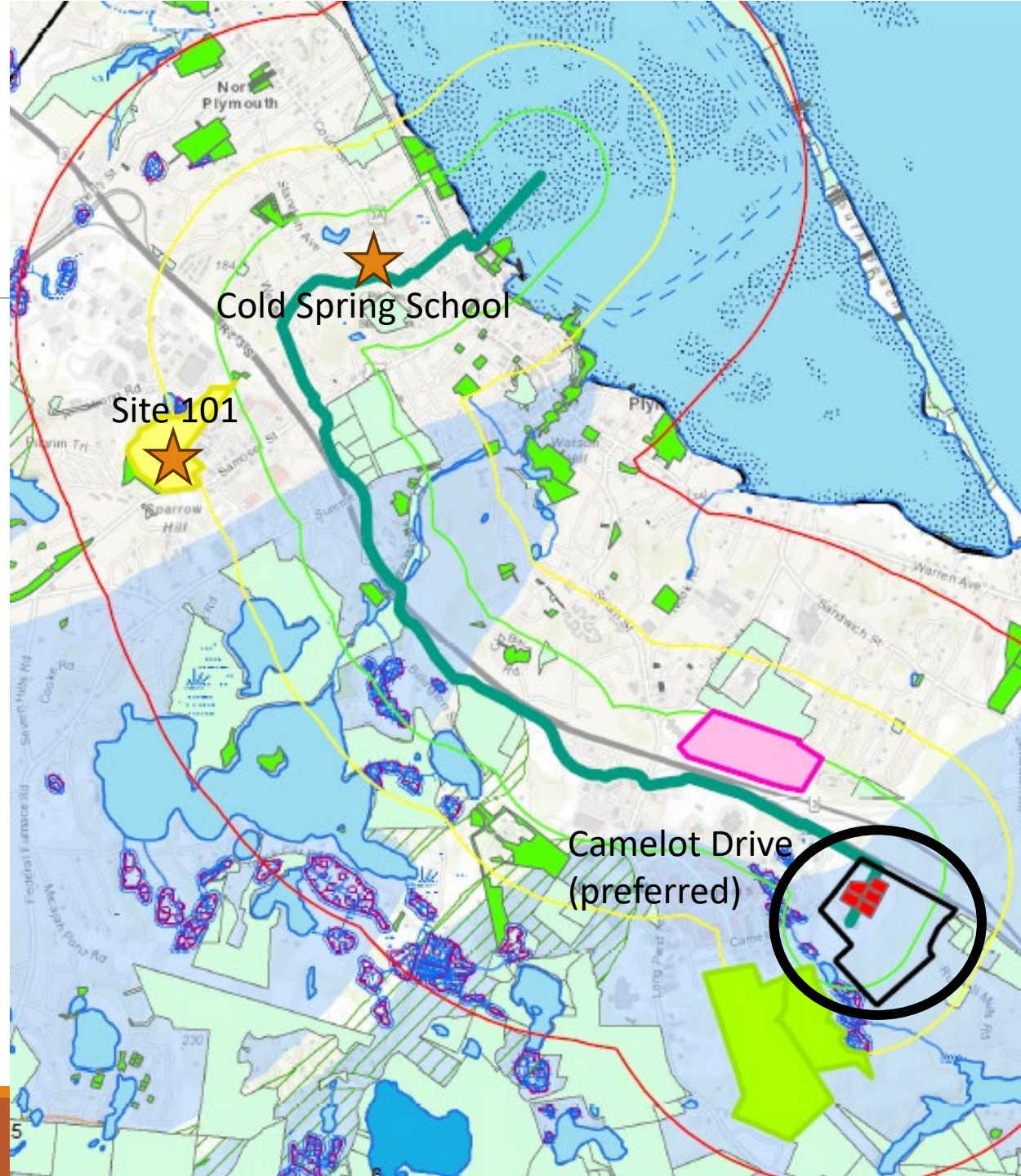
DEP recommended further consideration of two specific alternatives, as well as other alternatives outside of the Eel River watershed

"Site 101" – 183 Samoset Street – 43.5 Acres

- Evaluated by CDM in 1997 EIR
- Existing data suggests limited infiltration capacity

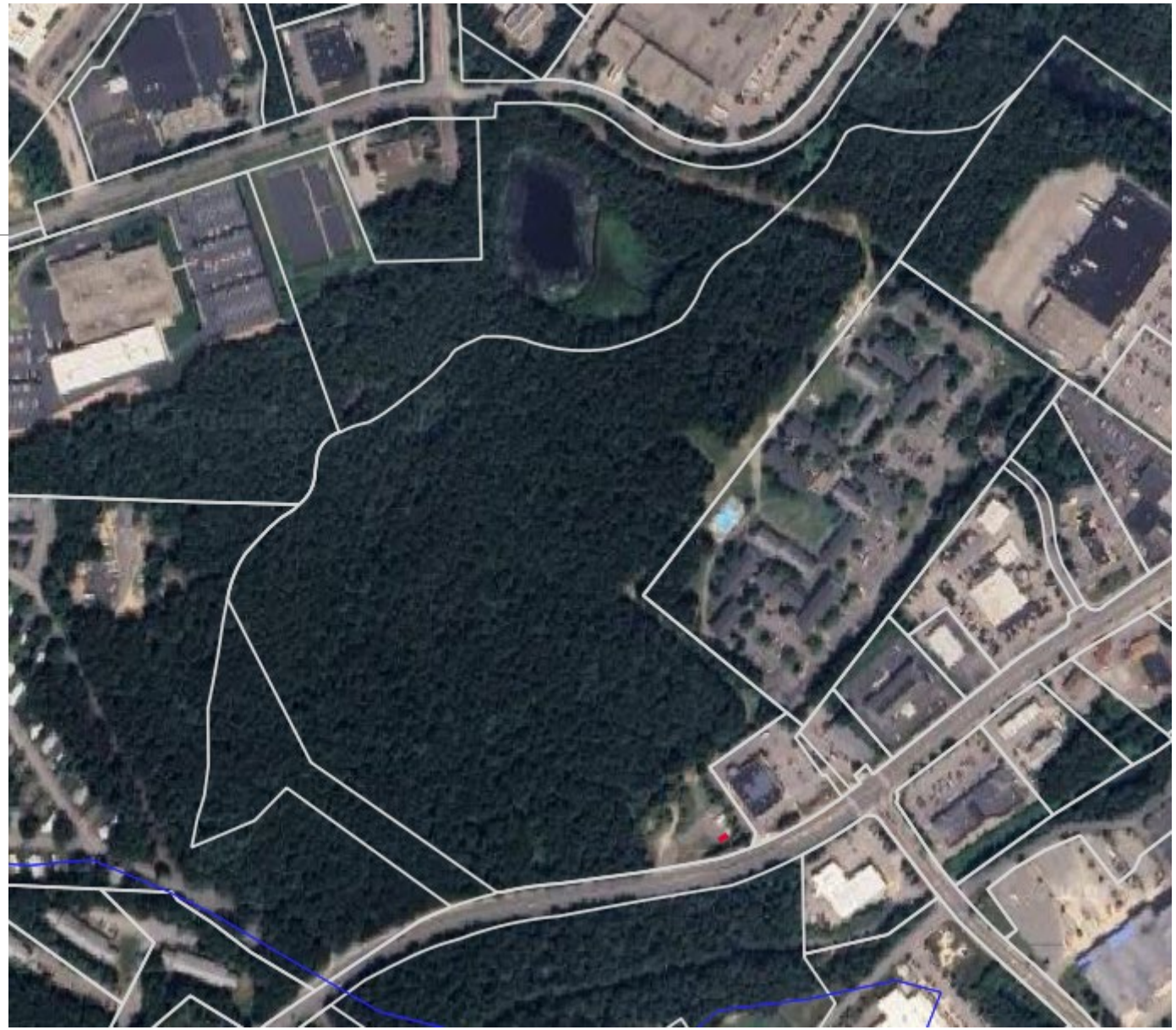
Cold Spring School – 25 Alden Street – 7.6 acres

- Previously unevaluated
- Small size and suspected poor infiltration



Site 101

- 1997 investigations by CDM suggested capacity to receive discharge is limited by mounding impacts. Discharge > 0.7 MGD modeled to impact Plymouth and Kington drinking water wells & raise water levels in Triangle and Leach Ponds by 1.5-3.5 ft
- The USGS regional groundwater model for the area indicates lower hydraulic conductivity (50 ft/day) than at Camelot Drive (180 ft/day).
- Preliminary modeling by HW further supports inability to receive 3 MGD discharge (mounding above land surface).



Cold Spring School

- Usable area within the parcel, due to the geometry of the lot, is too small to receive discharge (7.3 acres).
- Surficial geology and preliminary modeling using USGS regional model further supports the inability to receive required infiltration rates.
- Further field investigation would be required to refine infiltration capacity estimates.

Additional Alternatives Outside Eel River Watershed

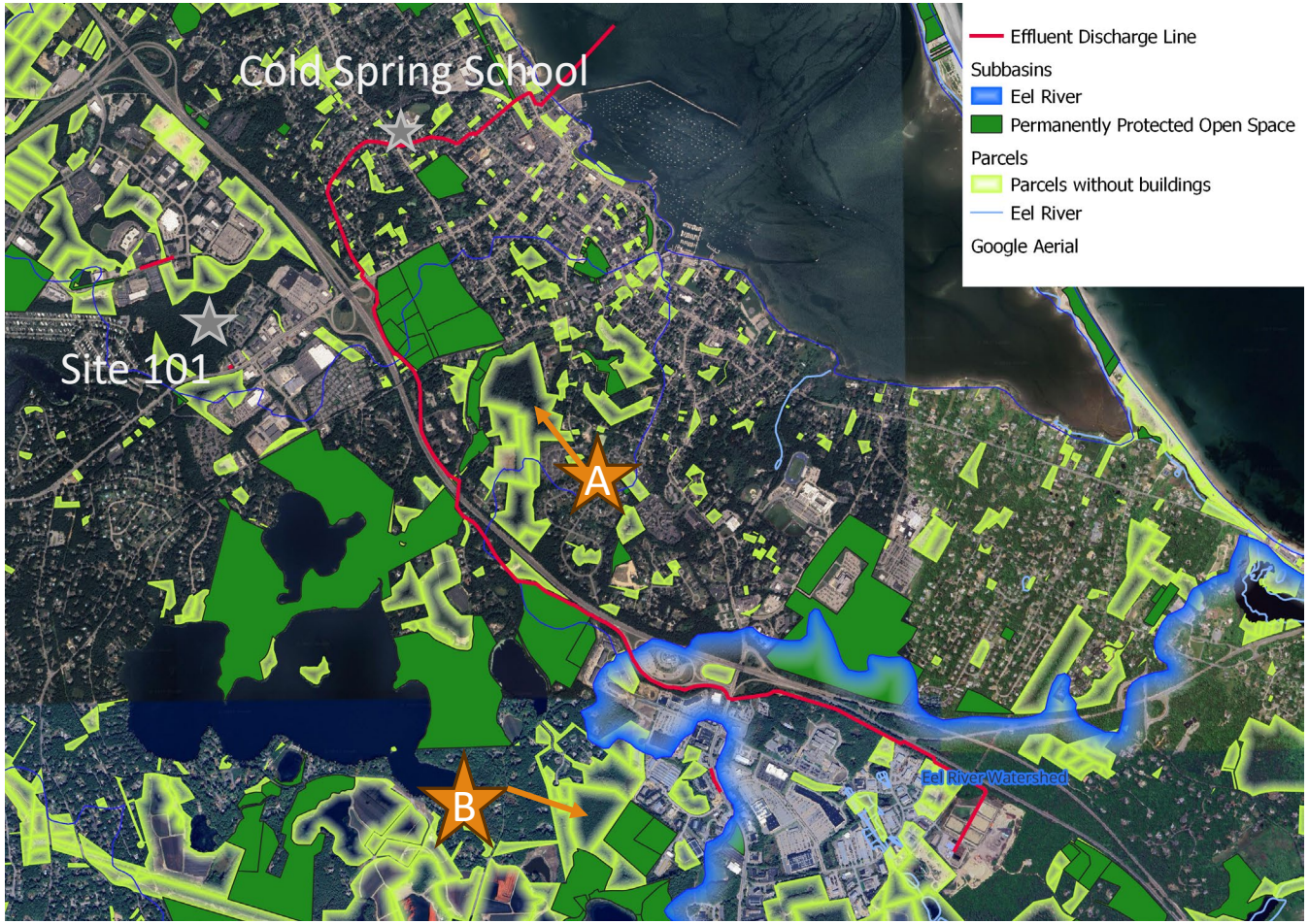
Natural boundaries limiting the search for alternatives include:

- Eel River/ Warren Wells Brooks to the south and east of Camelot Drive.
- Little Pond/Billington Sea and bogs west of Long Pond Road

These constraints drive focus towards downtown Plymouth and options west of Rt. 3 north of Summer Street

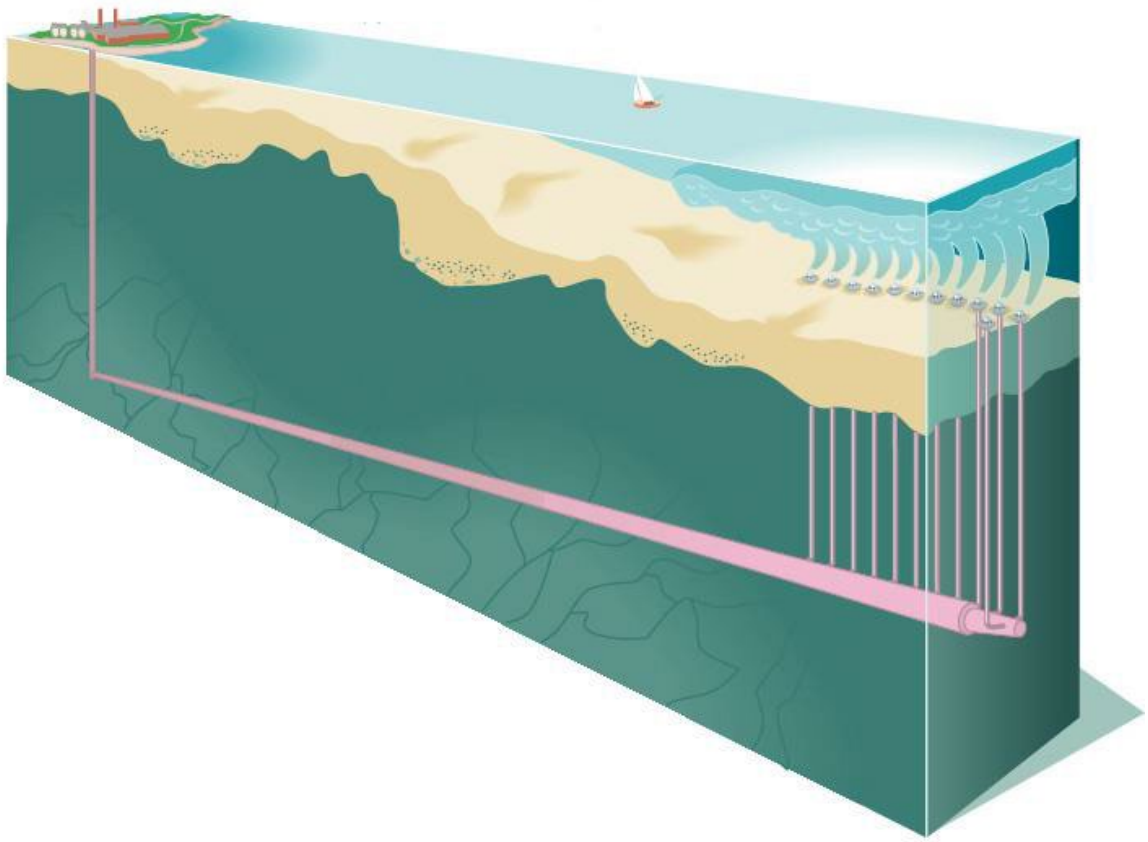
No other viable alternatives identified

- A: 0 Jackson's Lane/60 Off Billington St.
  - Two privately owned parcels totaling approximately 44 acres.
  - Immediately adjacent to Town Brook
- B: 0 off Orchard Hill Road
  - Privately owned open space totaling approximately 30 acres
  - In the Bradford Well Zone II



Extending the Harbor Outfall Line

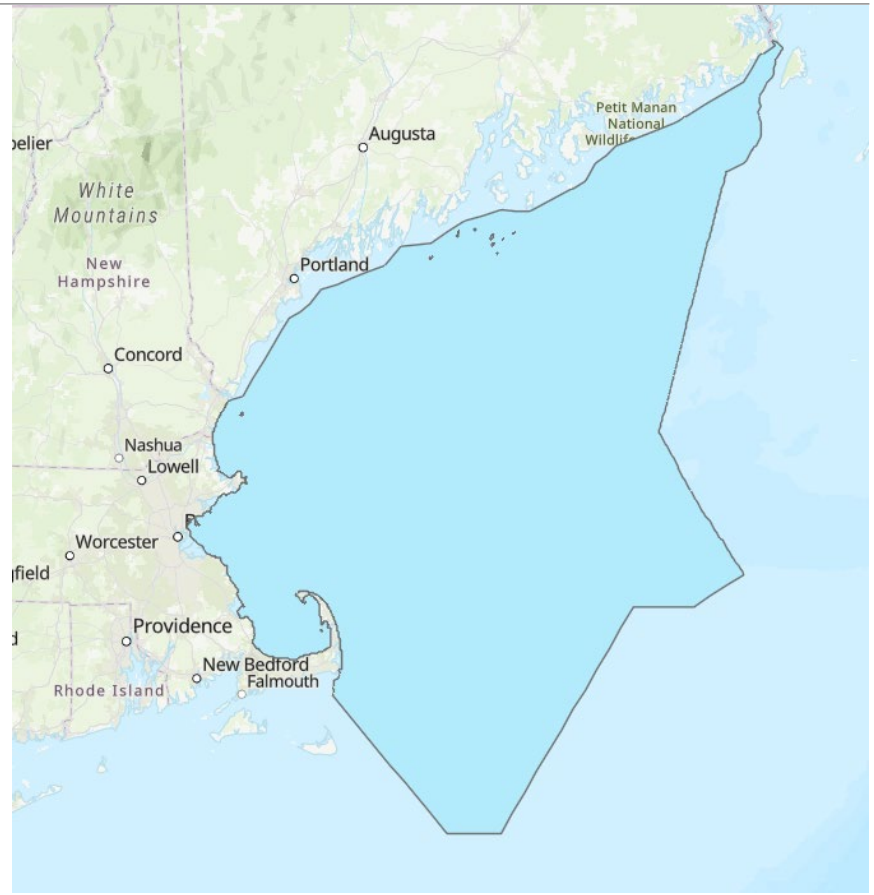
- Closest equivalent to this alternative: MWRA outfall
  - Deep rock tunnel extending 9.5 miles to reach waters 100-feet deep
  - Completed in 2000 at a cost of $390 million (roughly $740 million in 2025 dollars)
  - 5 lives lost during construction
  - Extensive permitting and ongoing monitoring to ensure no impact to North Atlantic Right Whale (Critical Habitat 16 miles away from end of outfall at time of project)



Schematic of outfall tunnel and effluent diffusers. Source: mwra.com

Extending the Harbor Outfall Line

- Harbor outfall line extension
  - Would have to extend at least 6 miles to reach waters 100-feet deep
  - In 2016 NOAA adjusted the North Atlantic Right Whale Critical Habitat– now begins at Plymouth Harbor entrance
  - Length of pipe required to avoid critical habitat: 95 miles



North Atlantic Right Whale Critical Habitat Unit 1.
Source: https://www.fisheries.noaa.gov/resource/map/north-atlantic-right-whale-critical-habitat-map-and-gis-data

Environmental Justice Update

- PUBLIC MEETING

Environmental Justice/Public Health Analysis

The Project Block Group 5, Census Tract 5306, Plymouth County, Massachusetts, which is classified as an Environmental Justice (EJ) population via the minority criteria. Per the Massachusetts Department of Health EJ Mapper, the EJ characteristics of this block group are:

- Minority population: 38.48%;
- Median household income: $138,929 (164.637% of the Massachusetts median household income);
- Households with language isolation: 0%; and
- Population of 1,710 in 356 households.

Environmental Justice/Public Health Analysis

Sources of Pollution within the Designated Geographic Area of the Project:

- Air Operating Permits: None identified
- Groundwater Discharge Permit: WWTF
- Hazardous Waste Treatment, Storage/Disposal: None identified
- Hazardous Waste Recycler: None identified
- Large Quantity Generators: Honda of Plymouth, Frank C. Dunlap Inc., WWTF, Petro Home Services
- Large Quantity Toxic User: None identified
- MassDEP Tier Classified 21E Sites: None identified
- MA Tier II Facilities: First Student, Inc., Colonial Municipal Group, Dunlap's Propane Inc. Bulk Storage Terminal, Armstrong Arena, BJ's Wholesale Club, TruGreen Limited Partnership, WWTF
- MassDEP Sites with Activity and Use Limitation: 62 Long Pond Road

Environmental Justice/Public Health Analysis

Sources of Pollution within the Designated Geographic Area of the Project:

- Draft NPDES Points: None identified
- Underground Storage Tanks: 20 Long Pond Road
- Airports: None identified
- Freight Rail Yards: None identified
- Nuclear Power Plants: None identified
- Power Plants: Camelot Wind LLC

Analysis of Greenhouse Gas Benefits Associated with the Project

Existing outfall pipe requires that the effluent be pumped to the high point onWesterley Road

Discharge at the beds would reduce total energy consumption of the WWTF by approximately 22,572 kilowatt-hours monthly

- Monthly avoidance of 10 metric tons of carbon dioxide;
- Equivalent to the amount of carbon sequestered by 10 acres of forest in one year

Discharge at other alternatives would require effluent pumping to the high point on Westerley Road – no greenhouse gas benefits associated with alternatives

Monitoring & MitigationUpdate

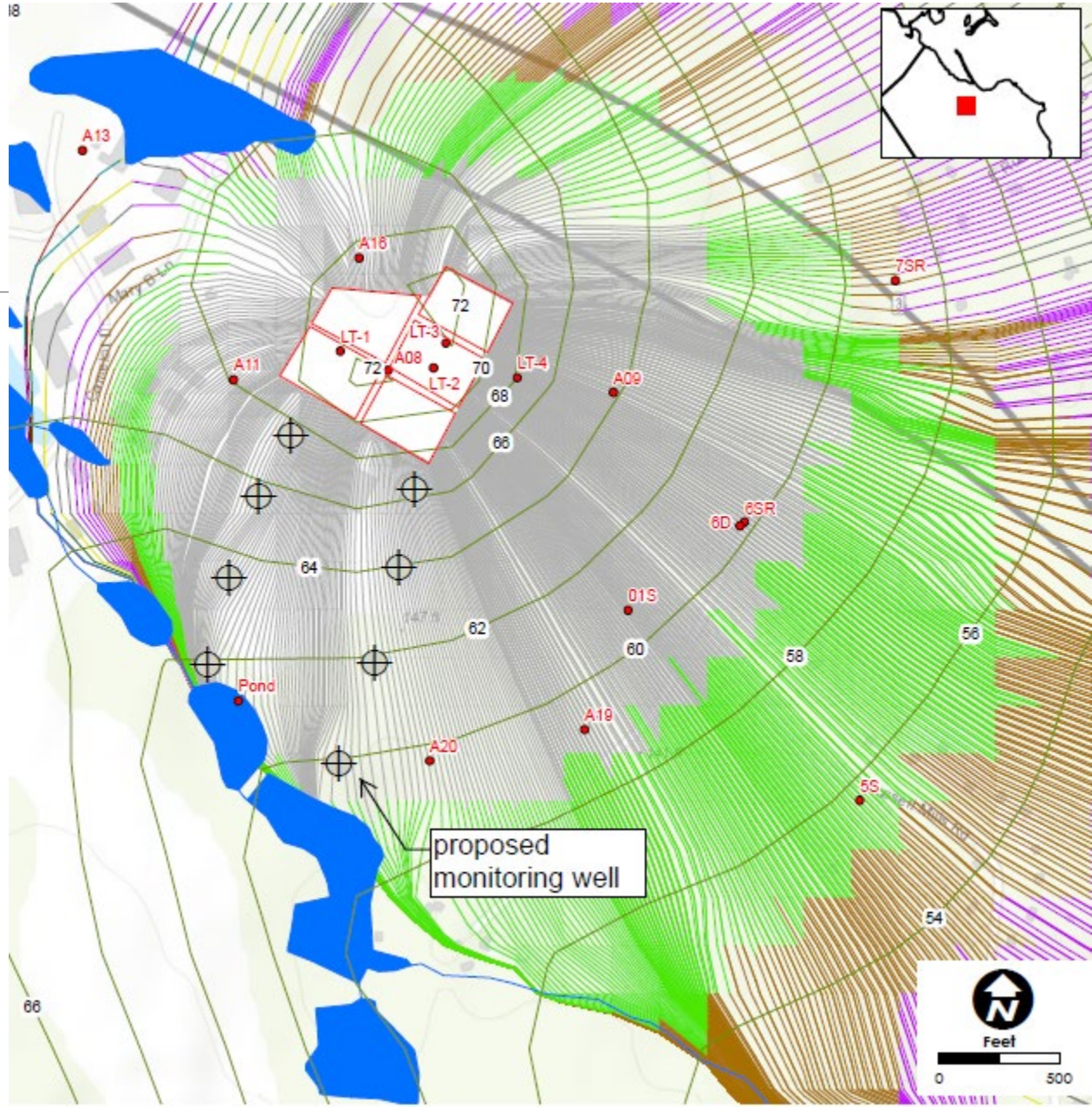
Phosphorus Migration

P GEOCHEMISTRY (USGS)

- Sorbs to Sand so migration much slower than groundwater movement
- Initial binding in vertical transport through unsaturated zone
- Once in GW, P front migrates ~12 ft per year.
- Migration accelerates after discharge stops before stabilizing ~ 20 years after discharge stops

USGS P MIGRATION STUDY

- 50 years of WWTF discharge followed by 20 years of inactivity estimated to allow for 1,300 feet of P migration.
- Straightline distance from WWTF beds to Warren Wells Brook is 1,400 feet



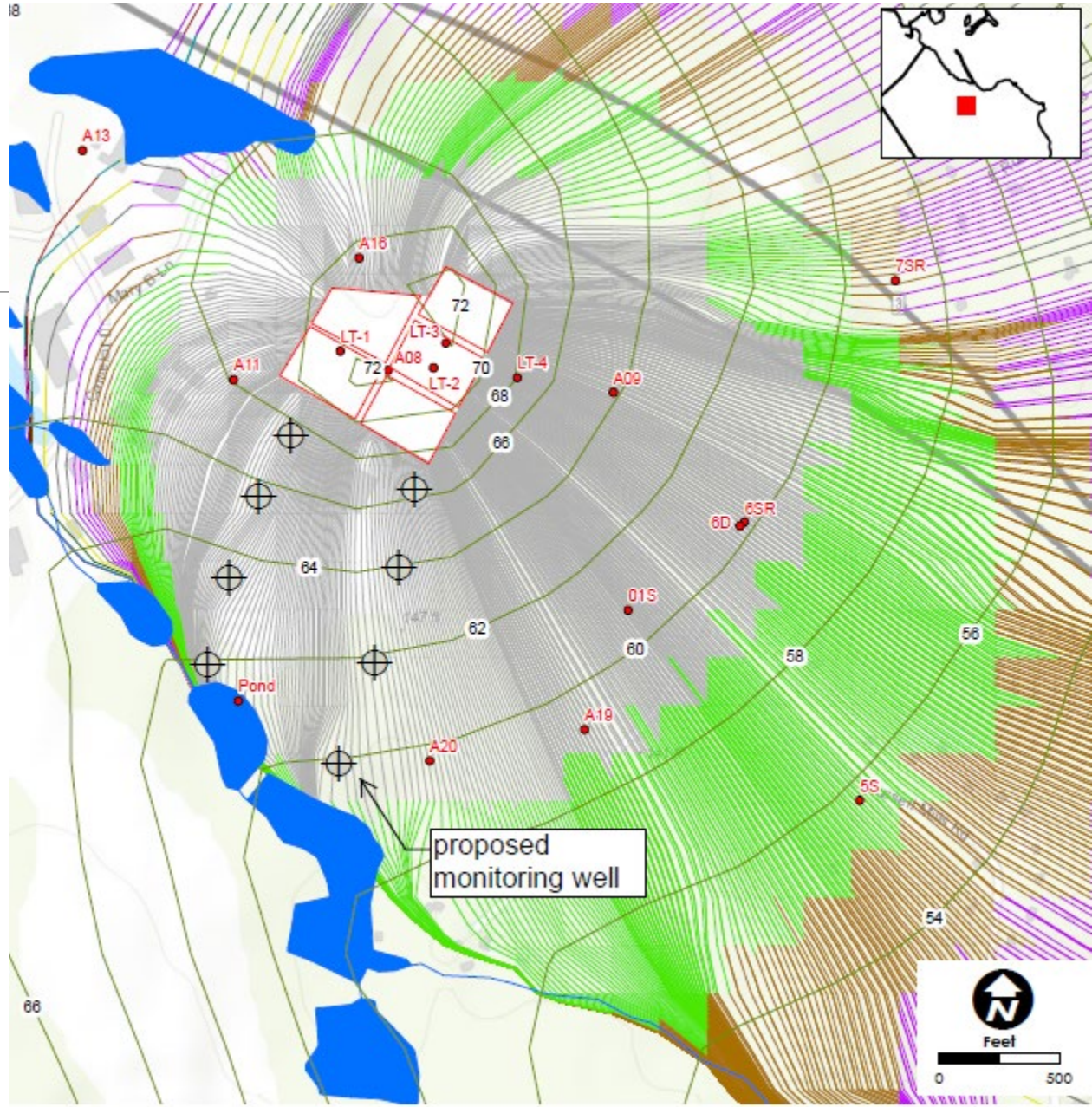
Mitigation Measures

CURRENT (TO REMAIN IN PLACE)

- Nutrient Management Plan and Eel River Watershed Monitoring Program
  - Consistent monitoring of groundwater, surface waters, and biological indicators.
  - Annual report summarizing data.

PROPOSED

- Eight additional monitoring well to better assess the potential for phosphorus migration to Warren Wells Brook.
- Replacement or relocation of private septic as necessary.



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Other Ongoing Analyses for EIR

Estimate N loading offsets available from extending sewer service and treatment upgrades.

Further evaluation of P control, monitoring, and mitigation options.