



TETRA TECH

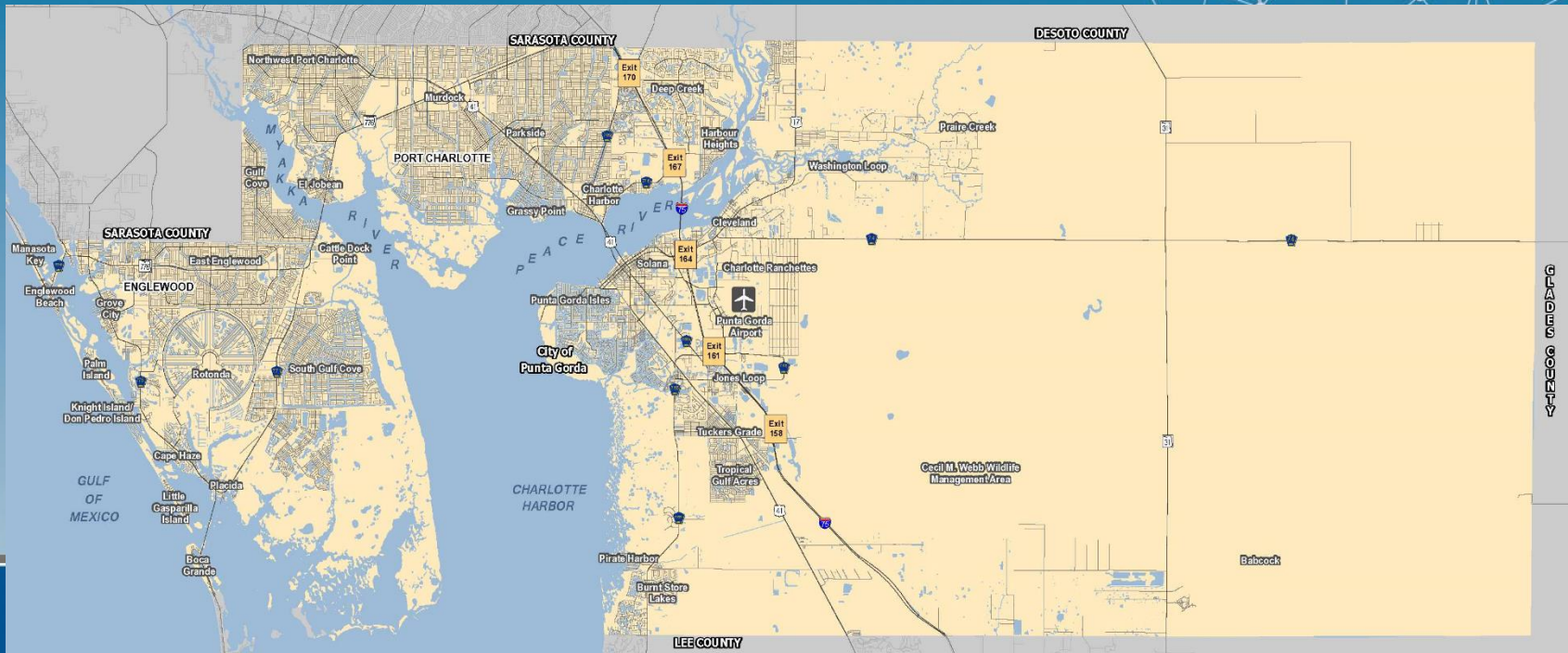


Septic-to-Sewer Program Water Quality Review

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North Shore – pilot project

- Small scale project of 42 lots along Charlotte Harbor
- Typical ¼ acre residential area with roadside swales
- Septic systems from 1960s are inadequate and failing
- Possible health concerns
- Drains to Peace River (impaired for nutrients)
- Stormwater monitoring required as part of EPA 319 grant received for \$183,000



Legend

- NS - GW 3
- NS - GW 2
- NS - GW 1
- NS - INF 1
- NS - OUT 1
- NS - OUT 2
- NS - W 1
- Project Area

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Monitoring

- **Stormwater (after rain events)**
 - Stormwater outfall site
 - Pre-construction (2013)
 - Post-construction (2015 – 2017)

- **Ground water (quarterly)**
 - 3 monitor wells



Construction

- Septic tanks removal, sewer connection, and swale restoration fall 2014 – spring 2015



Stormwater Sampling

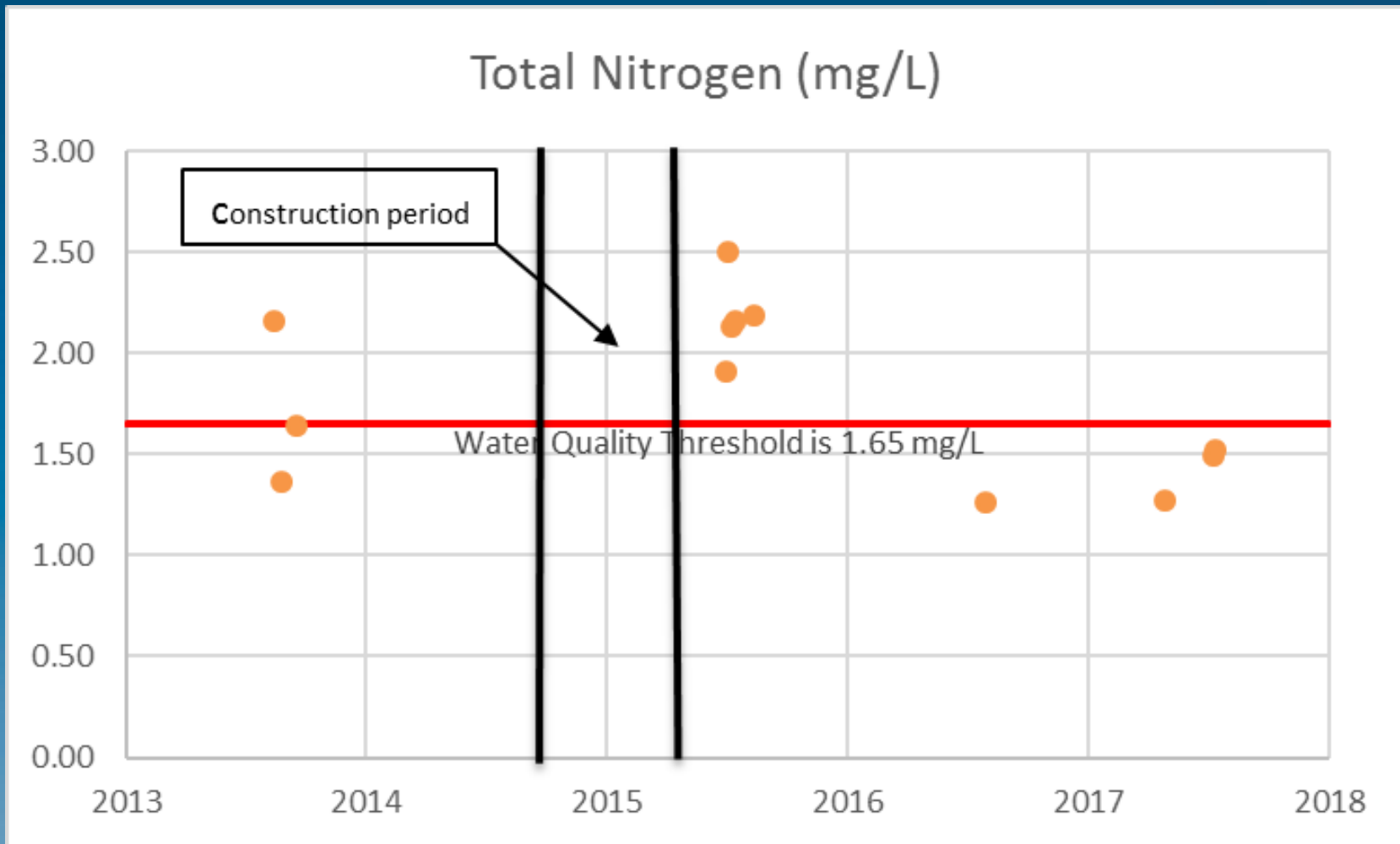


Pre-construction



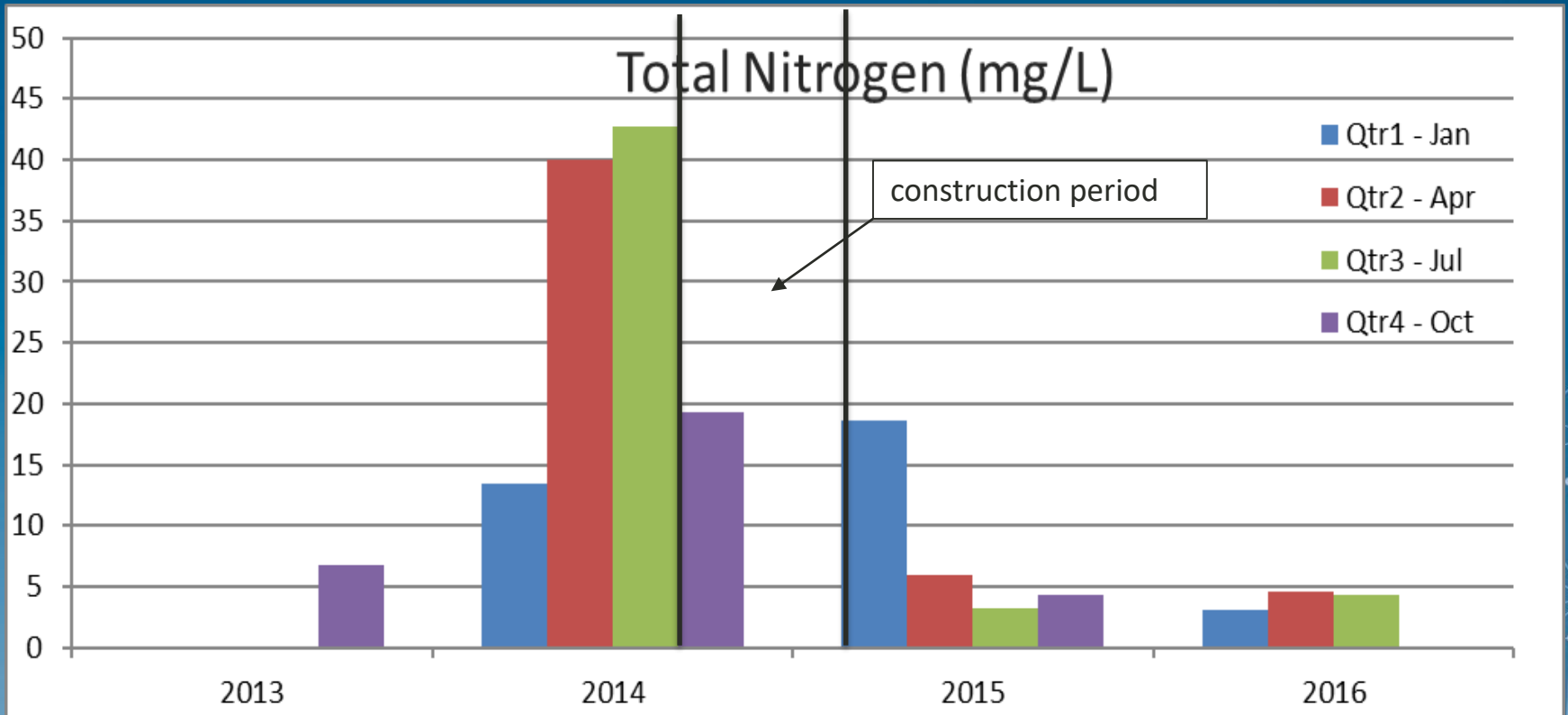
Post-construction

Stormwater Sampling



Ground Water Sampling

GW-1



North Shore Project Findings

- **Stormwater monitoring**
 - Limited Total Nitrogen concentration reductions in first 6 months after construction
 - Significant Total Nitrogen concentration reductions within 2 years after construction
- **Groundwater monitoring**
 - Significant reduction in Total Nitrogen at Groundwater monitor wells within 6 months after construction



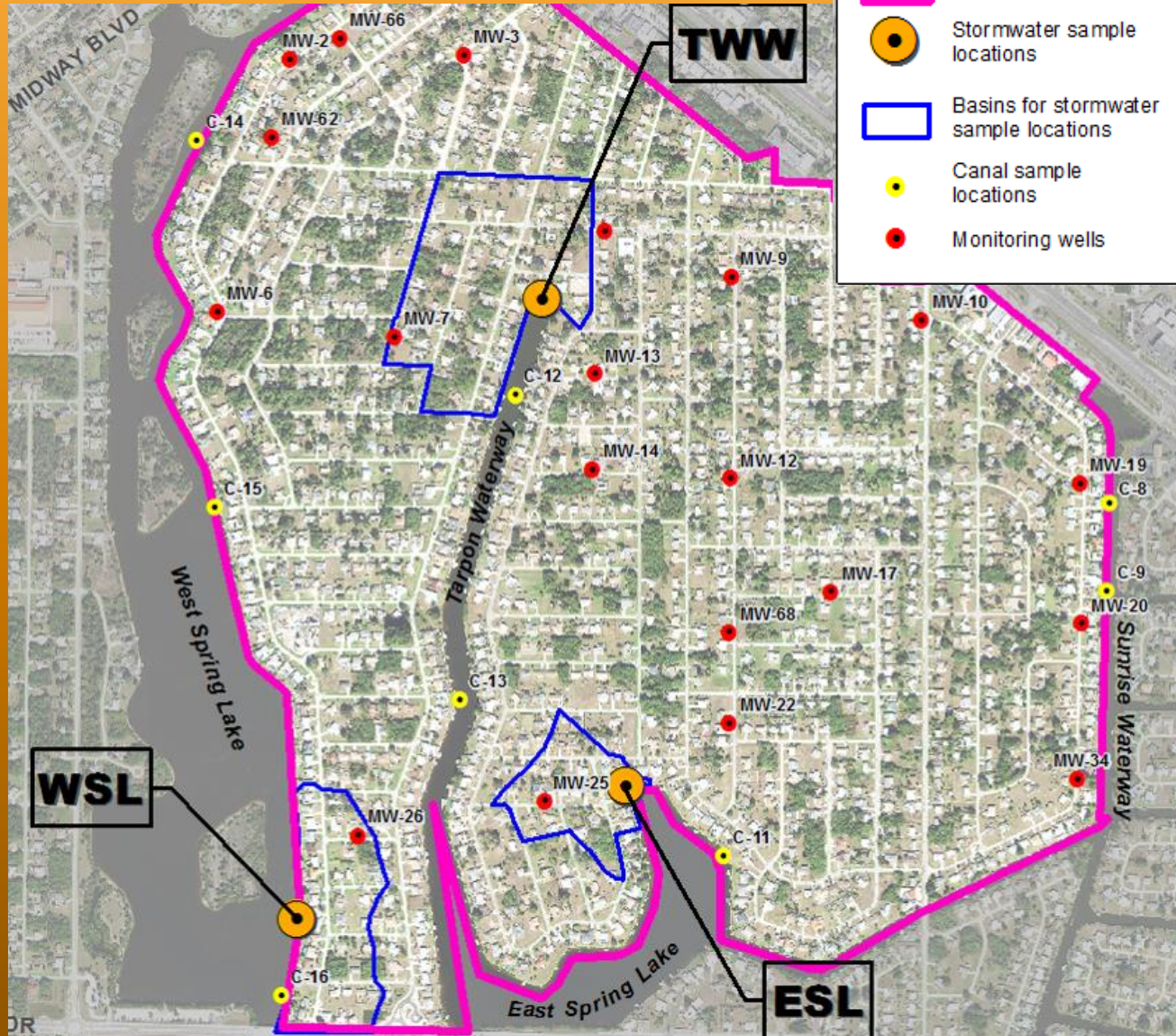
East and West Spring Lakes

- Large scale project of over 2,000 properties
- Septic systems were constructed between the 1950s and early 1980s
- Many were in failure and did not meet current regulations
- Discharges to Peace River basin (impaired for nutrients)
- Stormwater monitoring required as part of TMDL grants received for a total of \$2.7 M

Monitoring

- Stormwater outfall monitoring sites
 - Phase II area – 3 sites (WSL, TWW, ESL)
 - Phase I area – 2 sites (SRC, EWW)
- Groundwater monitor wells
 - evenly spaced across grid + critical areas
 - initially 70 wells
- Canal monitoring sites – 21 locations

Phase II Monitoring



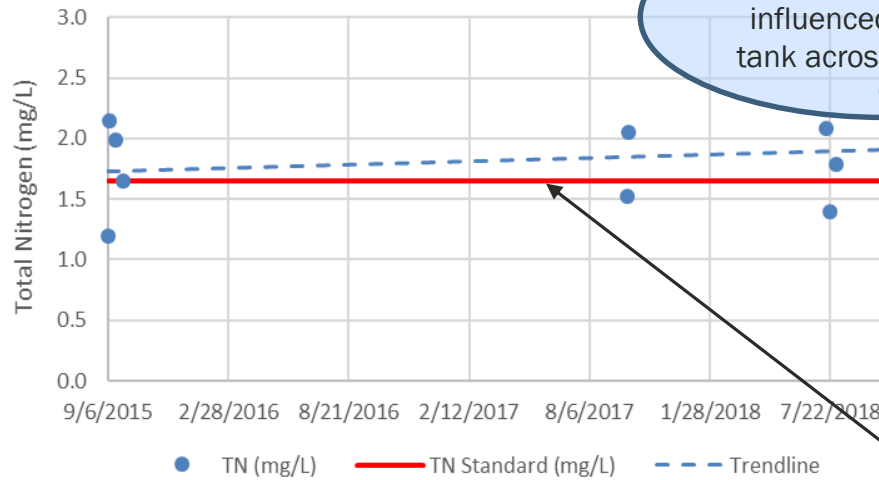
Phase II Construction

- **Pre-construction samples collected 2015–2016**
- **Swales regrading/rehabilitation 2016–2017**
- **Connections in WSL basin 2016 - 2017**
 - 1 septic tank remained across the street from WSL location
- **Connections in TWW basin 2016 – 2018**
- **Connections in ESL basin in 2017**
- **Post-construction samples collected in 2018**
 - 2 more samples scheduled in fall 2019

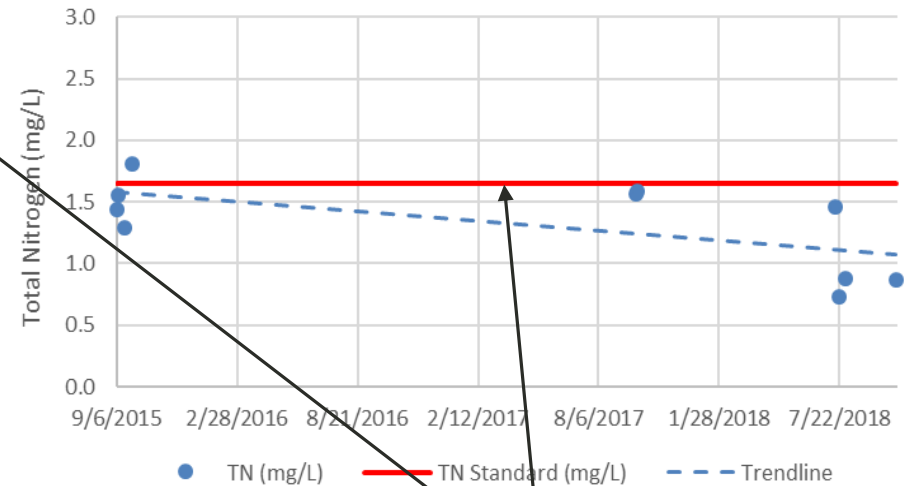
Phase II Storm Event Results

Total Nitrogen

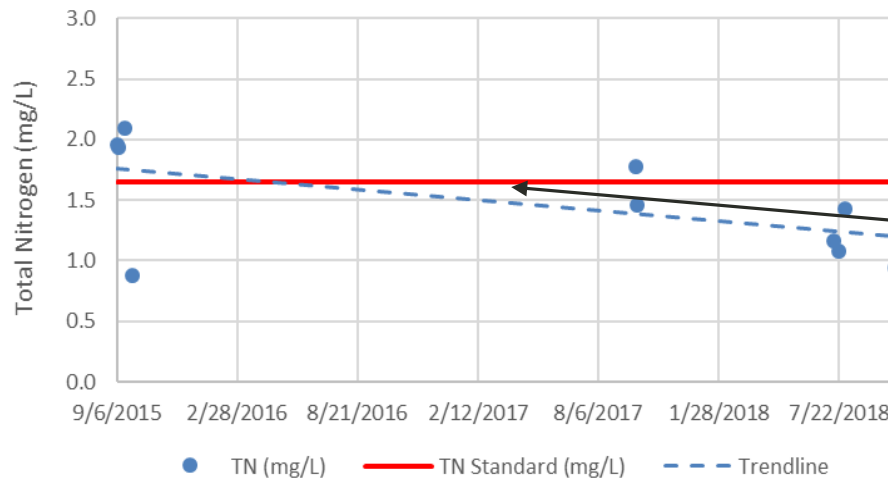
West Spring Lake (WSL)



Tarpon Waterway (TWW)



East Spring Lake (ESL)



Class III fresh stream standard of 1.65 mg/L Total Nitrogen (annual geometric mean not to be exceeded more than once in any 3 consecutive years)

Phase I Monitoring

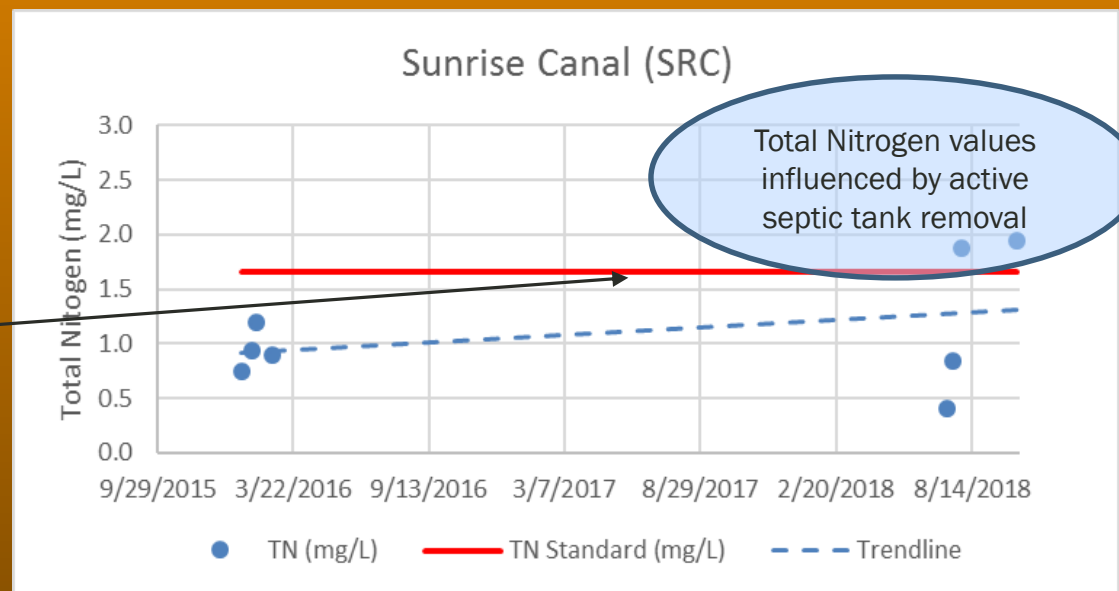
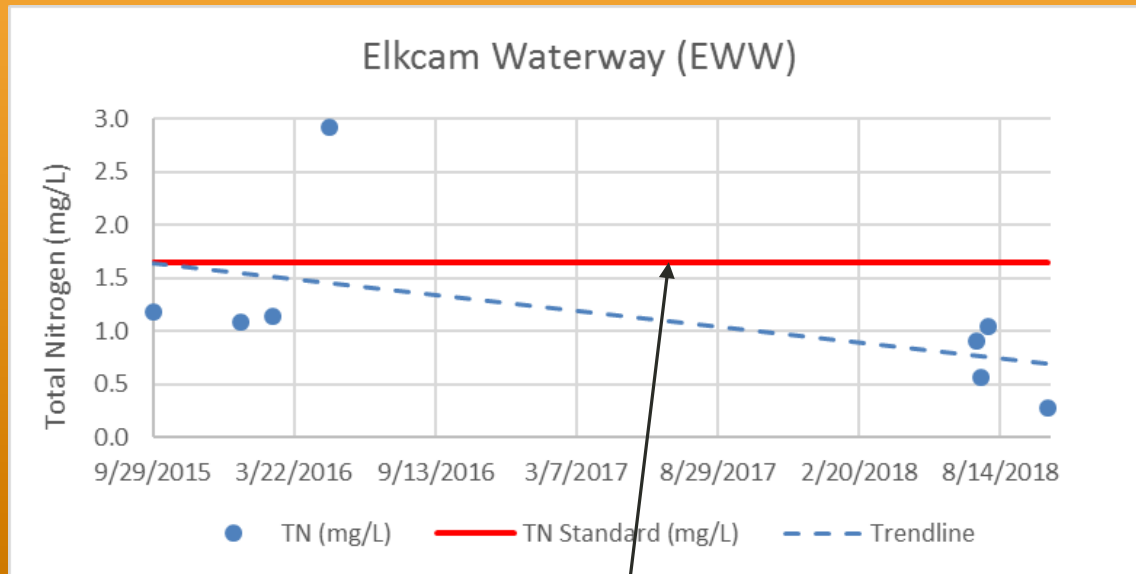


Phase I Construction

- **Pre-construction samples collected 2015–2016**
- **Swales regrading/rehabilitation 2017–2018**
- **Connections in SRC basin 2018**
 - Connections actively being made during sample collection
- **Connections in EWW basin 2018 - 2019**
- **Post-construction samples collected in 2018**
- **- 2 more samples scheduled in fall 2019**

Phase I Storm Event Results

Total Nitrogen



Class III fresh stream standard of 1.65 mg/L Total Nitrogen (annual geometric mean not to be exceeded more than once in any 3 consecutive years)

Water Quality Benefits

Calculations

- Total Nitrogen concentration measured in a lift station near the project
- Total Phosphorus concentration was taken from the model used in the grant
- Water use per household was recorded for the project area (84% estimated as septic tank use)
- Pre-construction loads = concentration x septic tank use per household x number of homes to be converted
- Post-construction loads = pre-construction loads x percent reductions measured at stormwater outfalls

Phase II Estimated Load Reductions

- Measured benefit to stormwater quality from the stormwater system improvements and septic system removal
- The monitoring results from the groundwater wells also show an improvement

Annual Values	Total Nitrogen (lbs/yr)	Total Phosphorus (lbs/yr)
Pre-construction Loads	35,350	12,408
Post-construction Loads	23,334	9,577
Load Reduction	12,016	2,831
Percent Reduction	34%	23%

Phase I Estimated Load Reductions

- The load reduction for Total Nitrogen is lower than expected and Total Phosphorus shows a negative load reduction
- Post-construction samples were collected while septic systems were being connected and soon after swale restoration

Annual Values	Total Nitrogen (lbs/yr)	Total Phosphorus (lbs/yr)
Pre-construction Loads	9,963	3,497
Post-construction Loads	7,639	3,893
Load Reduction	2,324	-396
Percent Reduction	23%	-11%

Items to Consider

- **Marked improvement is expected as the remaining septic systems are connected**
- **Septic systems in place for decades and will take time for the nutrients to be flushed out**
- **Many failed systems throughout the project area may have caused extended period of higher nutrient concentrations**
- **Additional reductions expected over time as in North Shore**
- **Measured load reductions are for stormwater runoff only – groundwater load reductions are likely similar or higher**
- **Septic system removal has an impact on groundwater levels**
 - **Measured groundwater levels were 0.4 feet lower after septic removal**

Summary

- Monitoring results show benefit to stormwater quality from swale restoration and septic system removal
- Groundwater quality results from wells in Phase II also show an improvement in post-construction samples
- Additional water quality improvements have likely been realized since the samples collected last year
- The County will continue to sample in the project area to gather more data

Questions?

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