

Case Study: Planning for the Future with Consolidated Wastewater Treatment in Montgomery Township, New Jersey

Erin Dovel, EIT, Kleinfelder

Co-author: Brian Friedlich, PE, Kleinfelder



February 8, 2017



Overview

- State of Wastewater Infrastructure
- Overview of Montgomery Twp & WWTPs
- 2012 Montgomery Twp Master Planning Study
 - Consolidation Analysis
 - Current & Future Flows Buildout Analysis
 - Cost Effectiveness of Alternatives
- Consolidation Design Components
- Wrap up

State of Wastewater Infrastructure

National Ranking*:

D

- ~750,000 miles of sewer pipe
- ~14,780 wastewater treatment facilities
- 98% of public facilities are municipally owned
- Capital investment estimated at ~300 billion over next 20 years

New Jersey Ranking**:

D

- ~90% of NJ is served by 200 public wastewater systems
- Most plants in NJ are relatively small (<2.5 MGD), and will not meet growing needs
- Capital investment estimated at ~32.5 billion over next 20 years

*2013 ASCE Infrastructure Report Card

**2016 ASCE Infrastructure Report Card

State of Wastewater Infrastructure... Pennsylvania!

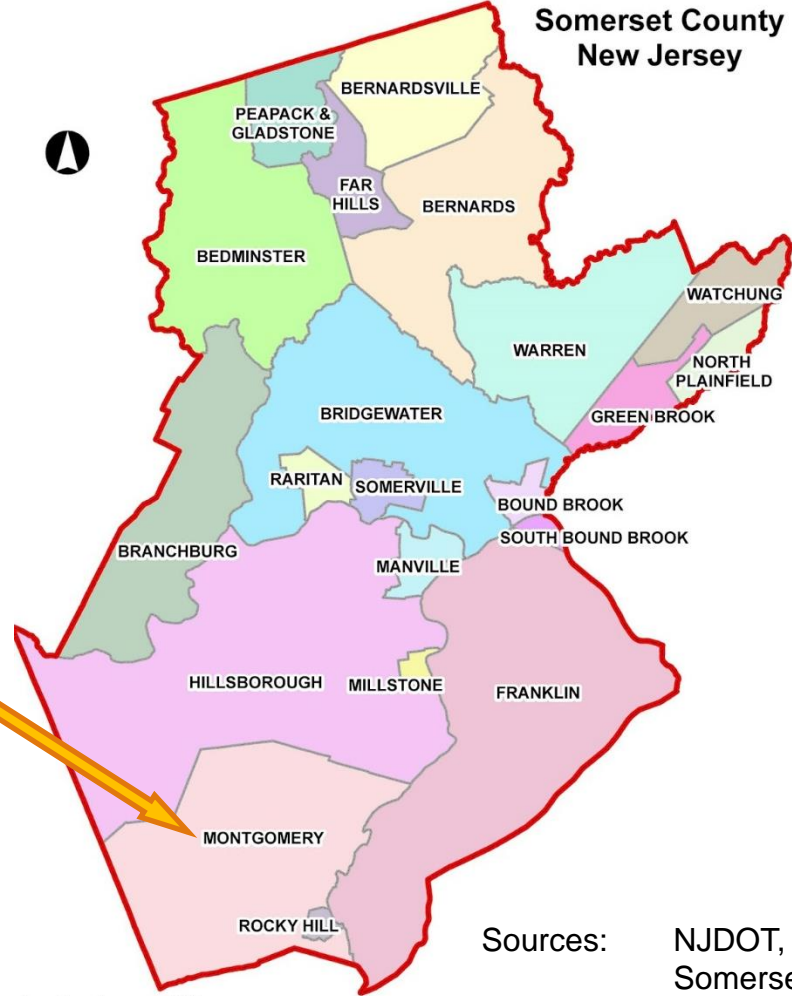
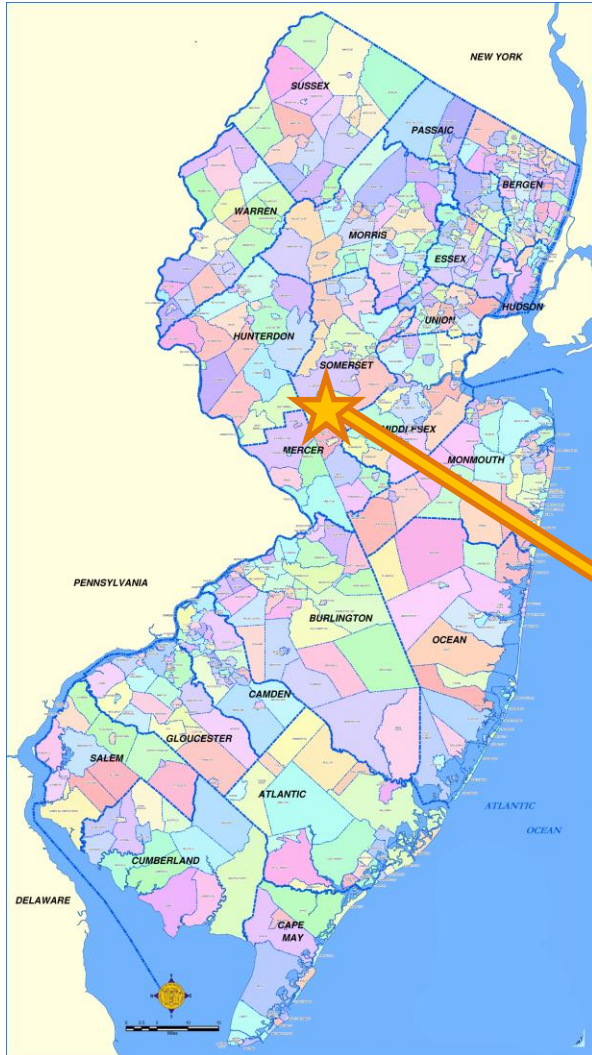
Pennsylvania Ranking*:

D

- ~10,000 permitted wastewater systems in PA (municipal + industrial)
- Approx. 1,569 CSOs in PA
- Capital investment estimated at ~28 billion over next 20 years

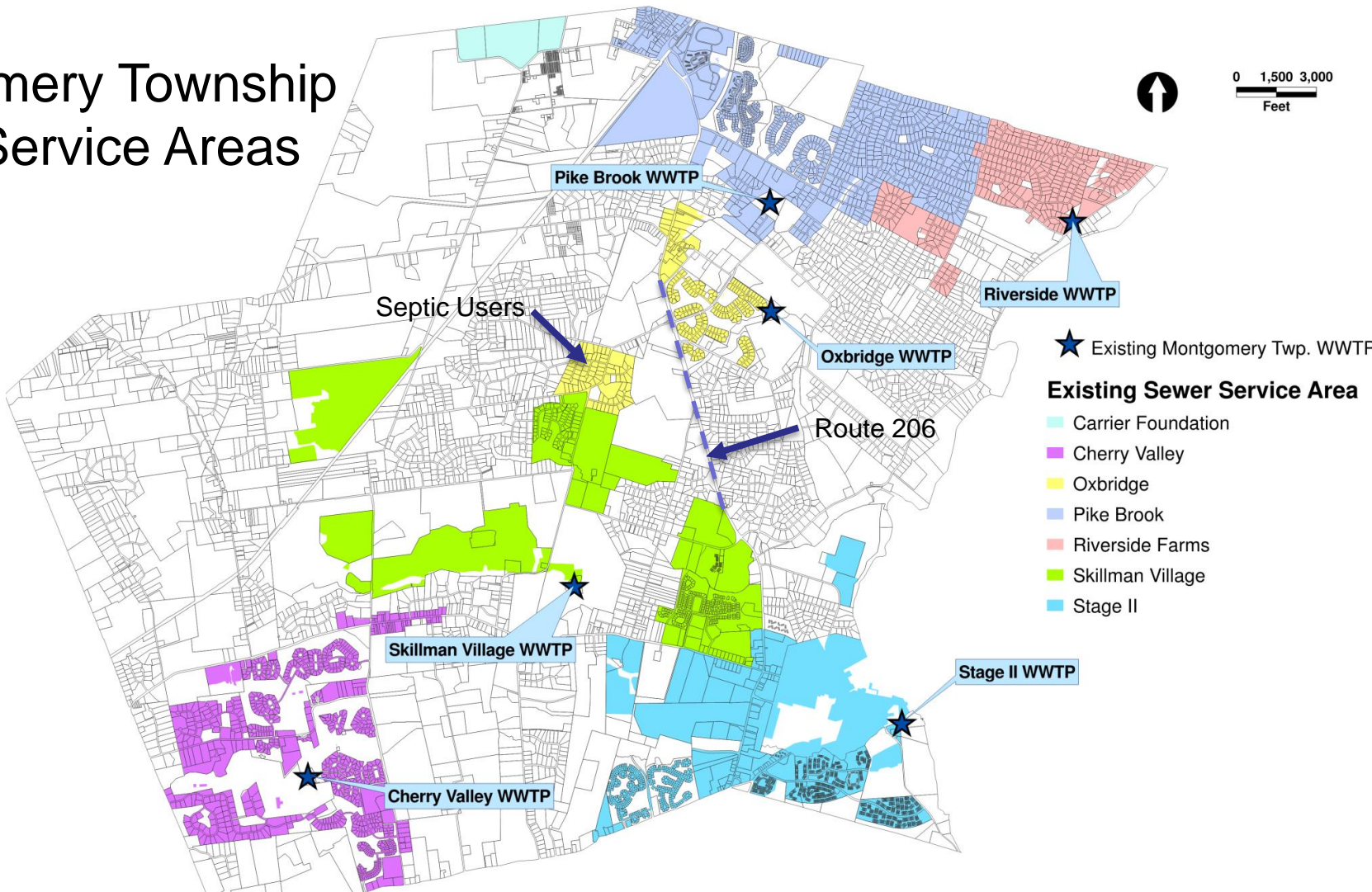
*2014 ASCE Infrastructure Report Card

Montgomery Twp (Somerset County, NJ)



Sources: NJDOT,
Somerset County
Planning Board

Existing Montgomery Township Sewer Service Areas



Reference: Somerset County Wastewater Management Plan

Montgomery Township

WWTP Name	Year Constructed	Year(s) Upgraded	Design Capacity (gpd)
Pike Brook	1990	2012	700,000
Stage II	1970	1985 & 2002	680,000
Skillman Village	1938	1980s & 2012	500,000
Cherry Valley	1993	-	286,000
Riverside Farms	1982	-	145,000
Oxbridge	1994	-	80,000
High School	1968	-	35,000
Burnt Hill School	1960	-	15,300

- School Plants closed in 2012, consolidated to Skillman Village
- Oxbridge and Riverside approaching end of service life; will require near-term capital improvements.

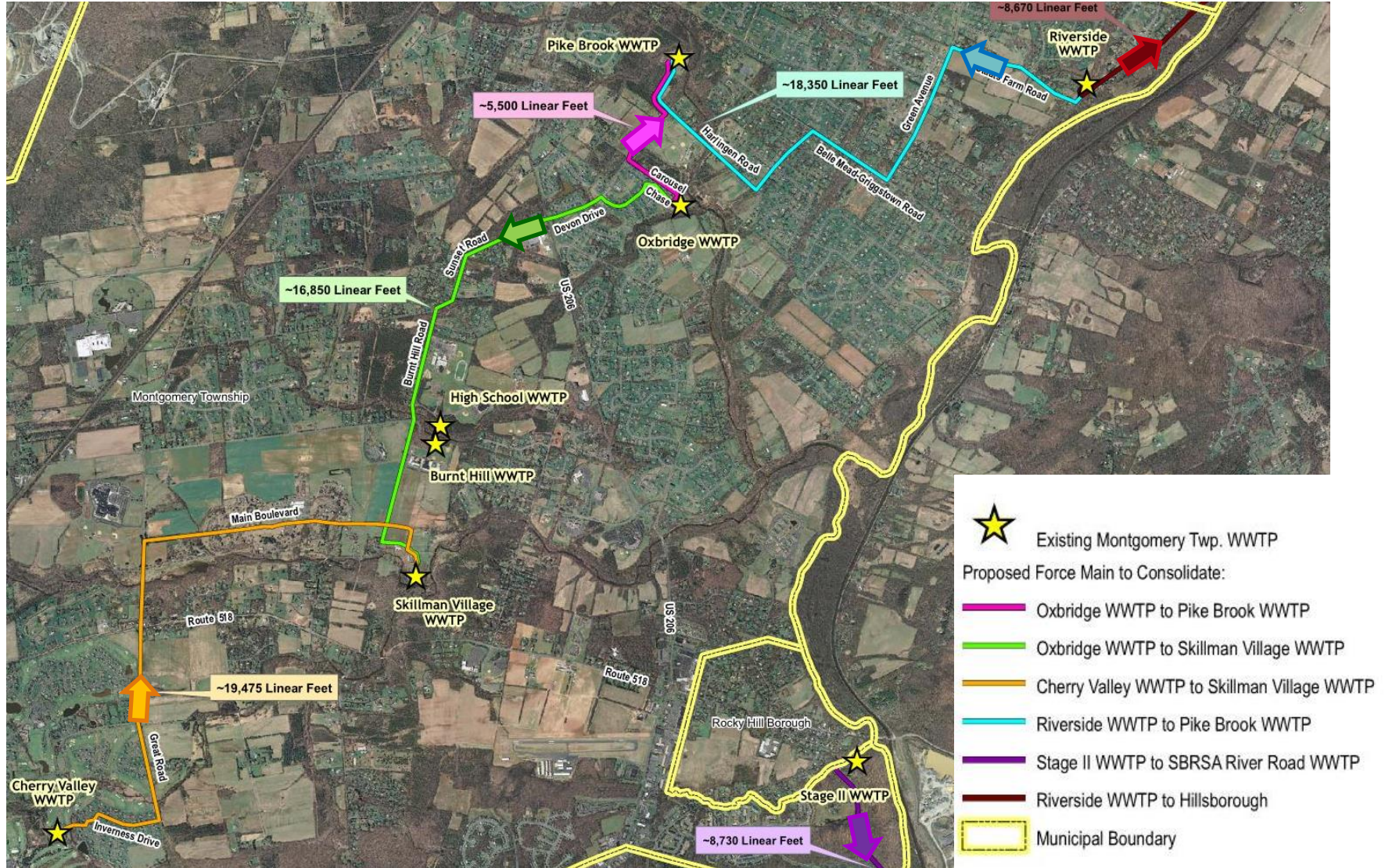
Why Consolidate Wastewater Treatment?

- Ensure water quality protection and satisfy effluent limitations through treatment and upgraded facilities
- Utilize new advanced treatment plants (Pike Brook and Skillman Village) to improve receiving streams
- Avoid cost of rebuilding aging treatment plants
- Operation logistics of multiple small treatment plants versus a few larger ones
- Reduce O&M costs through economies of scale

Wastewater Treatment Plant Consolidation Master Planning Study (June 2012)

- Evaluated 9 consolidation alternatives:
 - Oxbridge flow to Pike Brook
 - Oxbridge flow to Skillman Village
 - Oxbridge flow (east of 206) to Pike Brook & Oxbridge flow (west of 206) to Skillman Village
 - Riverside flow to Pike Brook
 - Riverside & Oxbridge flow to Pike Brook
 - Riverside flow to Somerset Raritan Valley Sewerage Authority
 - Cherry Valley flow to Skillman Village
 - Cherry Valley & Oxbridge flow to Skillman Village
 - Stage II flow to Stony Brook Regional Sewerage Authority

Consolidation Force Main Routes Considered



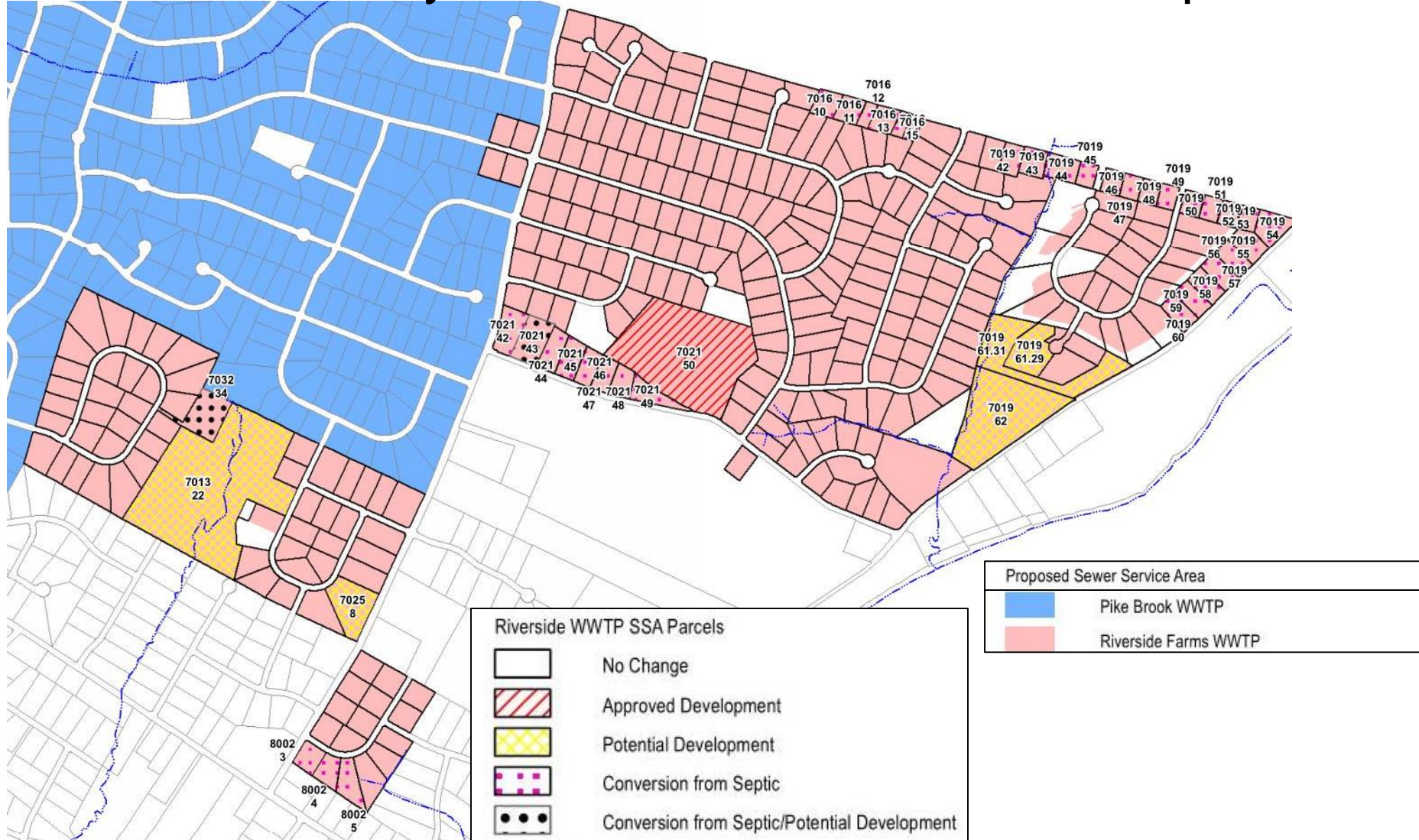
Current and Future Wastewater Flow Analysis

- Current flows utilized DMR data January 2008 – August 2011
- Build-out analyses performed in accordance with NJDEP's Projected Flow Criteria

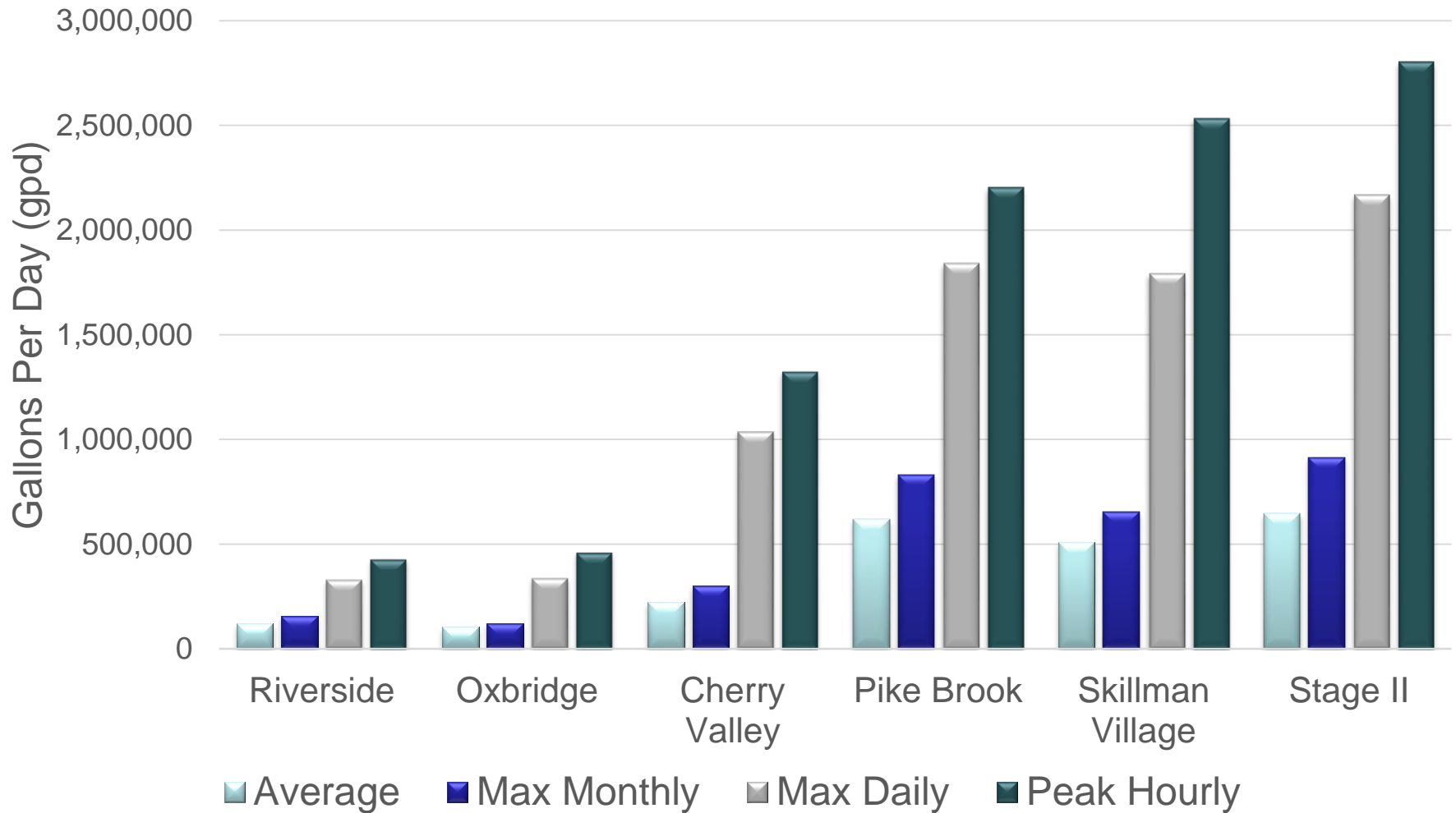
- Total Future Build-out Calculations:
 - Avg. Annual = Future Avg. Annual + Current Avg. Annual
 - Max. Monthly = Future Avg. Annual + Current Max. Monthly
 - Max. Daily = 1.5(Future Avg. Annual) + Current Max. Daily
 - Peak Hourly = 2.5(Future Avg. Annual) + Current Peak Hourly

Note: NJDEP Projected Flow Criteria include allowances for I&I and are more representative of the maximum monthly flows

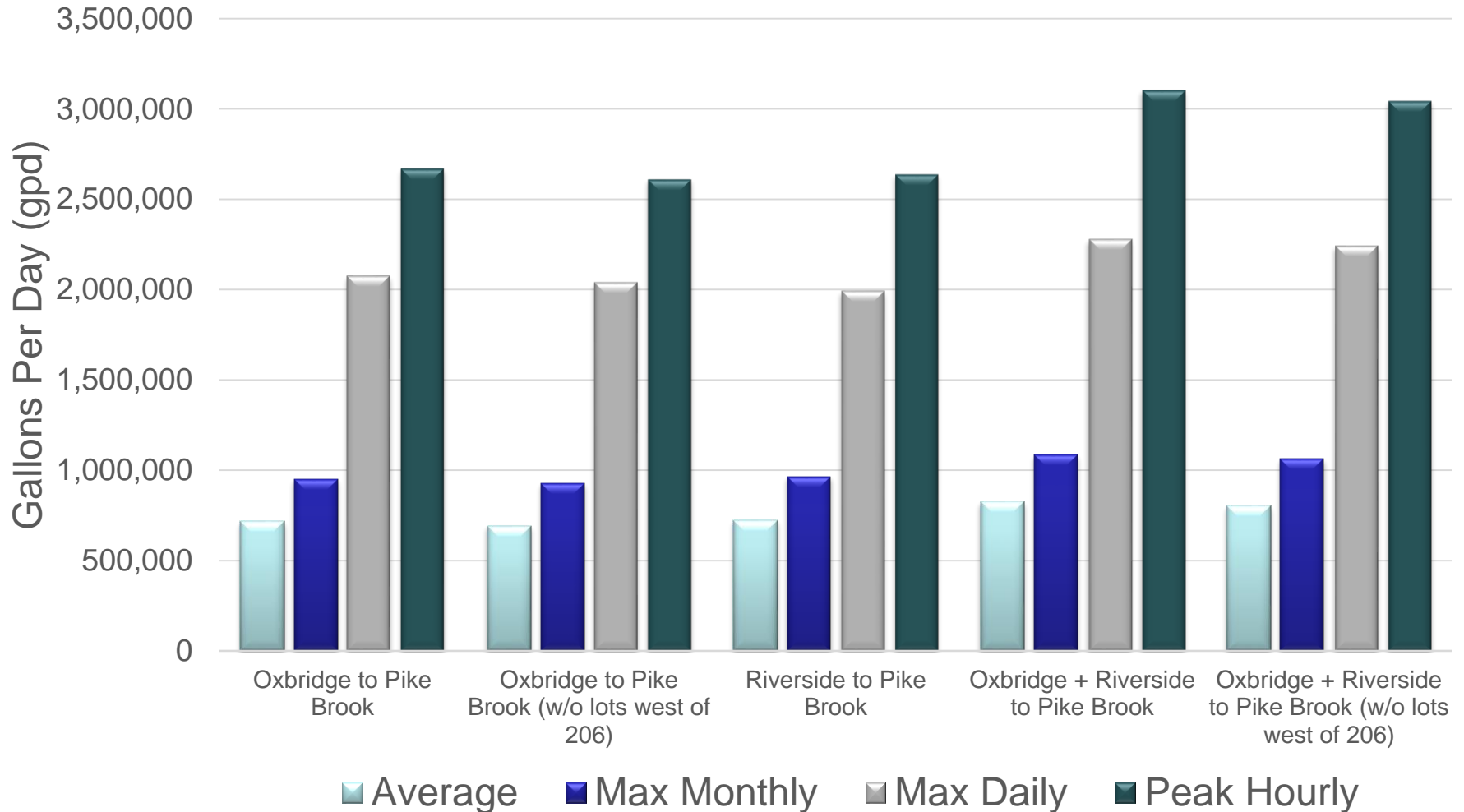
Build Out Analysis – Riverside WWTP Example



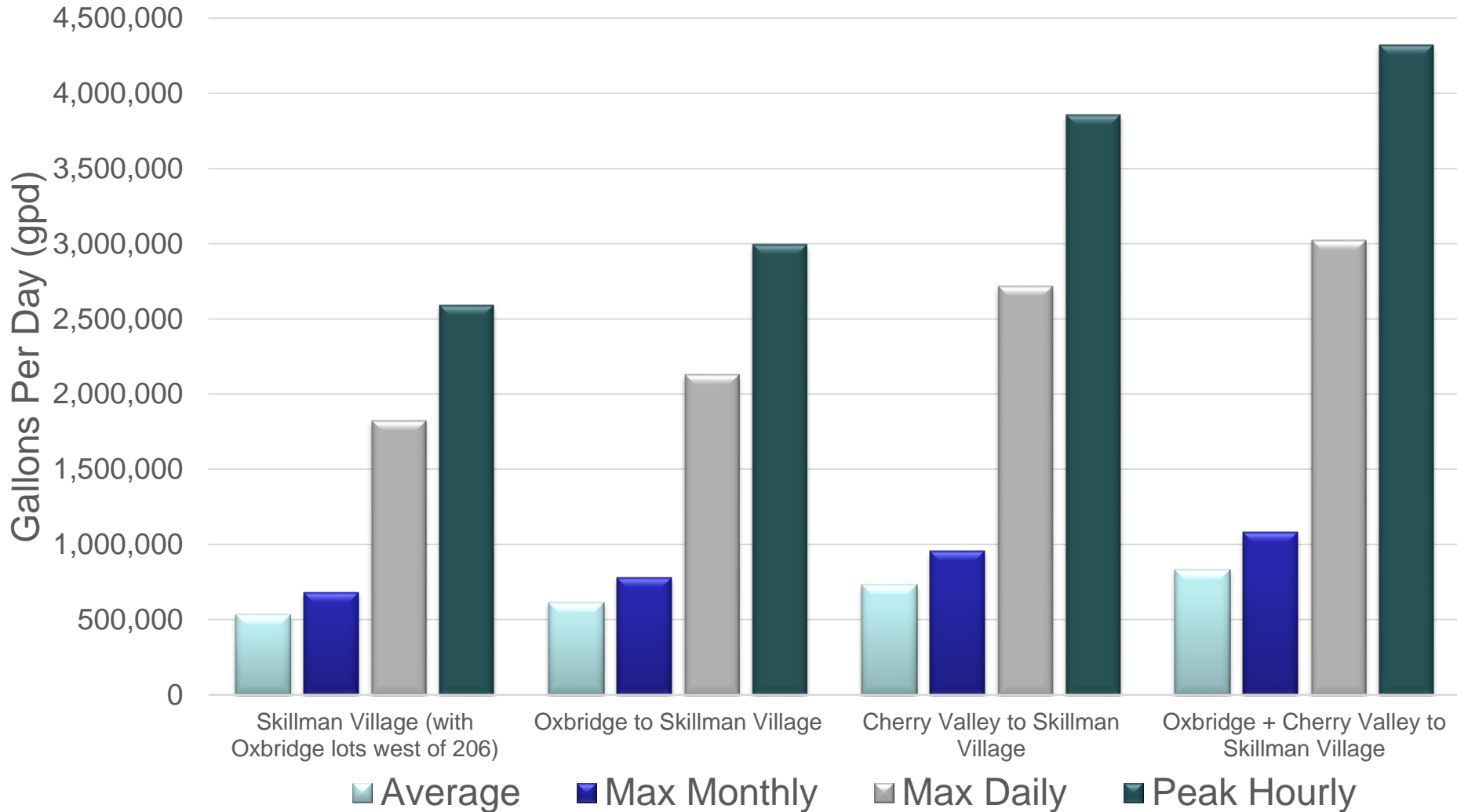
Total Build-Out Flows



Build-Out Flows – Consolidation To Pike Brook



Build-Out Flows – Consolidation To Skillman



Cost Effectiveness Evaluation Metrics

- Capital cost estimates for improvements required for plant shut down and receiving plant improvements
- Capital cost estimates for receiving plant improvements (if any) to have sufficient capacity
- Capital cost estimates for the future improvements that would be avoided via shut down of aging plants
- Development of net reduction in annual O&M costs
- Comparison of the sum of capital costs for conveyance plus treatment vs sum of capital costs avoided plus net savings in O&M

Cost Analysis Summary of Consolidation

- Oxbridge flow to Pike Brook
- Oxbridge flow to Skillman Village
- Oxbridge flow (east of 206) to Pike Brook & Oxbridge flow (west of 206) to Skillman Village
- Riverside flow to Pike Brook
- Riverside & Oxbridge flow to Pike Brook
- Riverside flow to Somerset Raritan Valley Sewerage Authority
- Cherry Valley flow to Skillman Village
- Cherry Valley & Oxbridge flow to Skillman Village
- Stage II flow to Stony Brook Regional Sewerage Authority

Green = cost effective (recommended)

Red = not cost effective (not recommended)

Net Savings from Cost Effective Alternatives

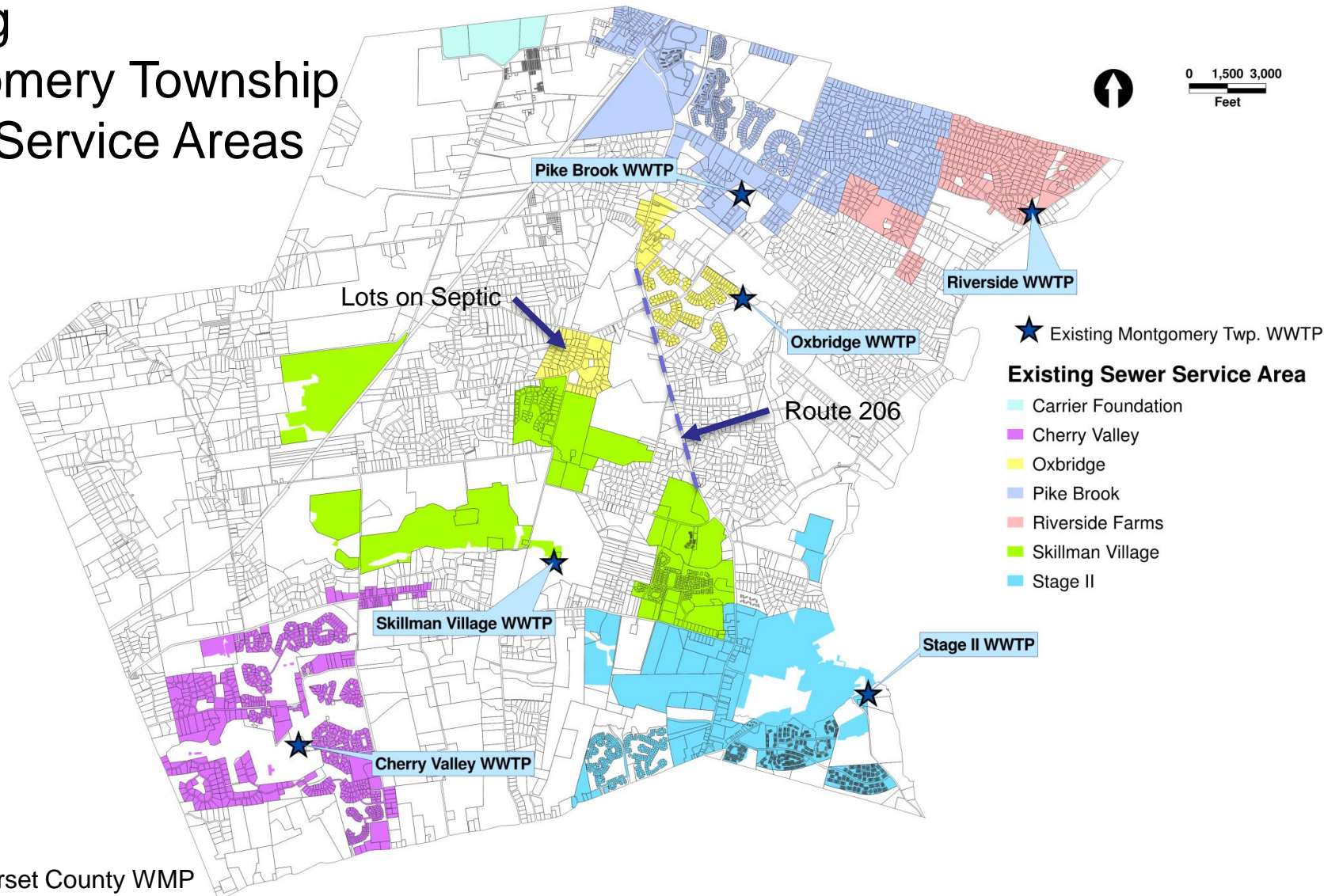
Scenario	Capital <u>C</u>osts for Consolidation Conveyance & Treatment	<u>S</u>avings from Avoided Future Capital Improvements	<u>O</u>&M <u>S</u>avings	Net Savings
Oxbridge to Pike Brook	2,100,000	3,400,000	1,800,000	3,100,000
Oxbridge (east of 206) to Pike Brook & Oxbridge (west of 206) to Skillman Village	2,600,000	3,400,000	1,800,000	2,600,000
Riverside & Oxbridge to Pike Brook	8,100,000	7,200,000	3,000,000	2,100,000
Riverside to Pike Brook	3,700,000	3,800,000	1,200,000	1,300,000

Recommended Alternative

Scenario	Capital <u>Costs</u> for Consolidation Conveyance & Treatment	<u>Savings</u> from Avoided Future Capital Improvements	O&M Savings or Costs (+/-)	Net Savings
Riverside & Oxbridge (East of 206) to Pike Brook; Oxbridge (West of 206) to Skillman Village	8,100,000	7,200,000	3,000,000	2,100,000

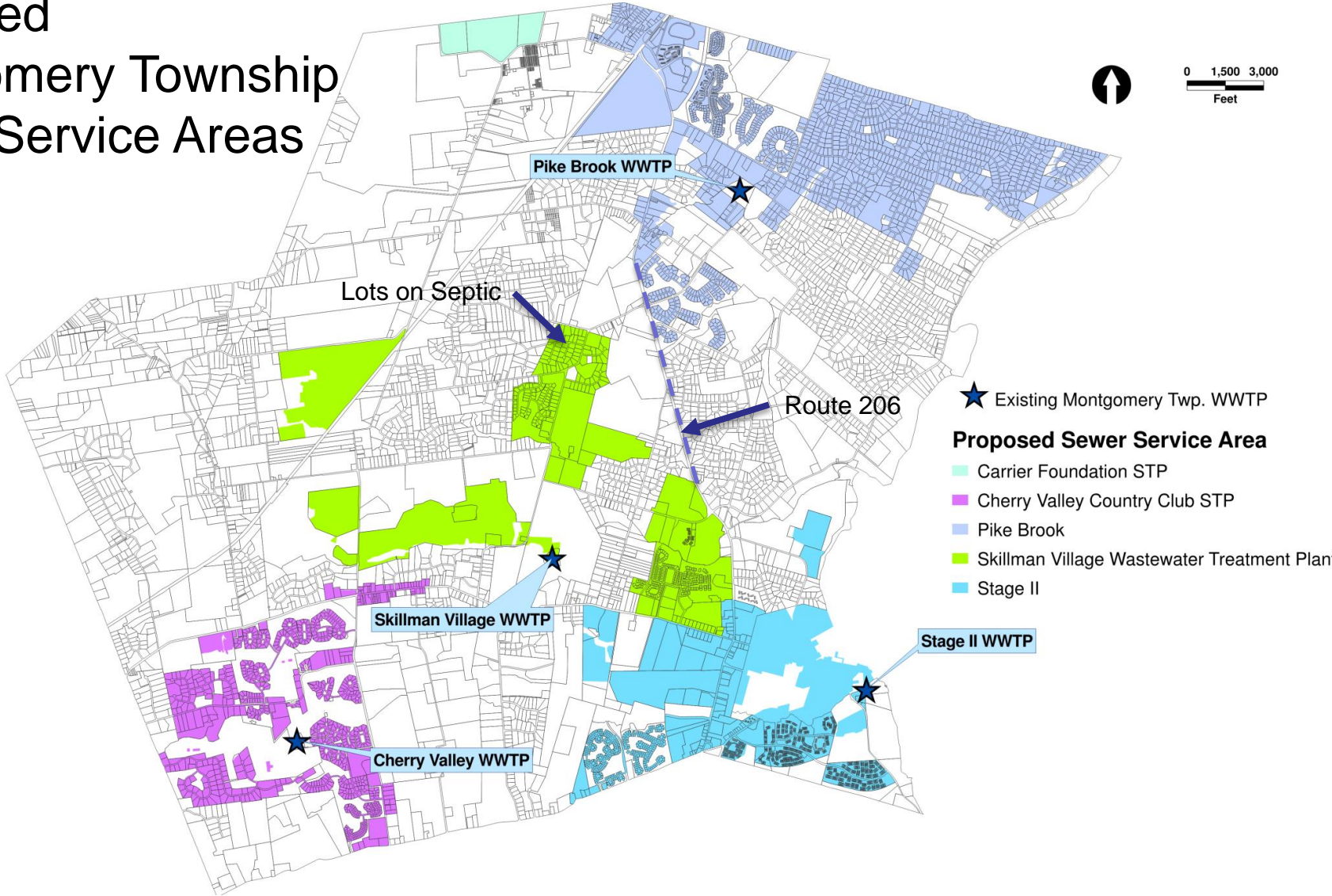
- Consolidation will avoid the need to upgrade Riverside and Oxbridge in the near future
- No immediate plan to remove lots West of 206 from septic, however spatially located closer to Skillman Village if connected in future
- Exclusion of lots West of 206 reduces the extent of capacity expansion required at Pike Brook in the future
- Montgomery Twp is planning sewer rehabilitation to maximize available capacity at the receiving WWTPs

Existing Montgomery Township Sewer Service Areas



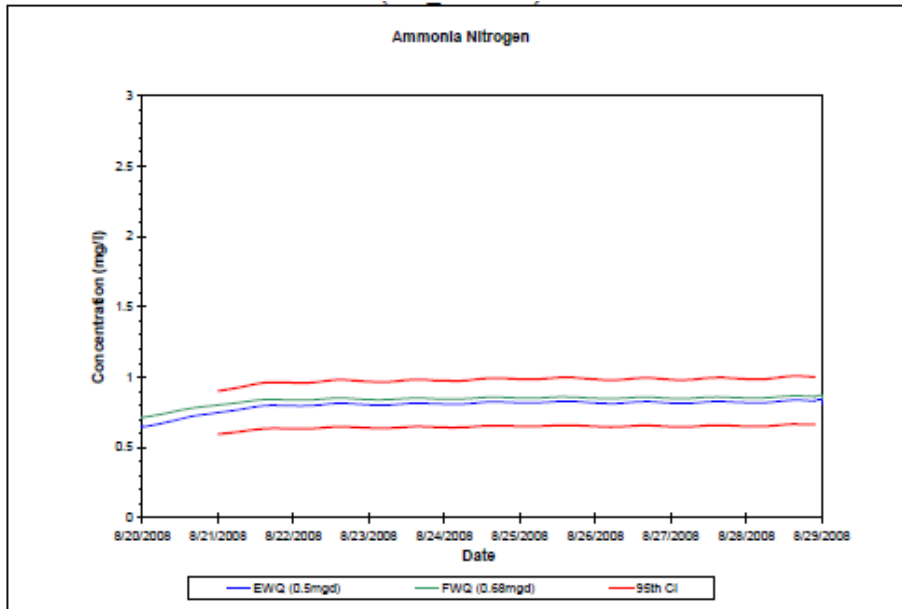
Source: Somerset County WMP

Proposed Montgomery Township Sewer Service Areas



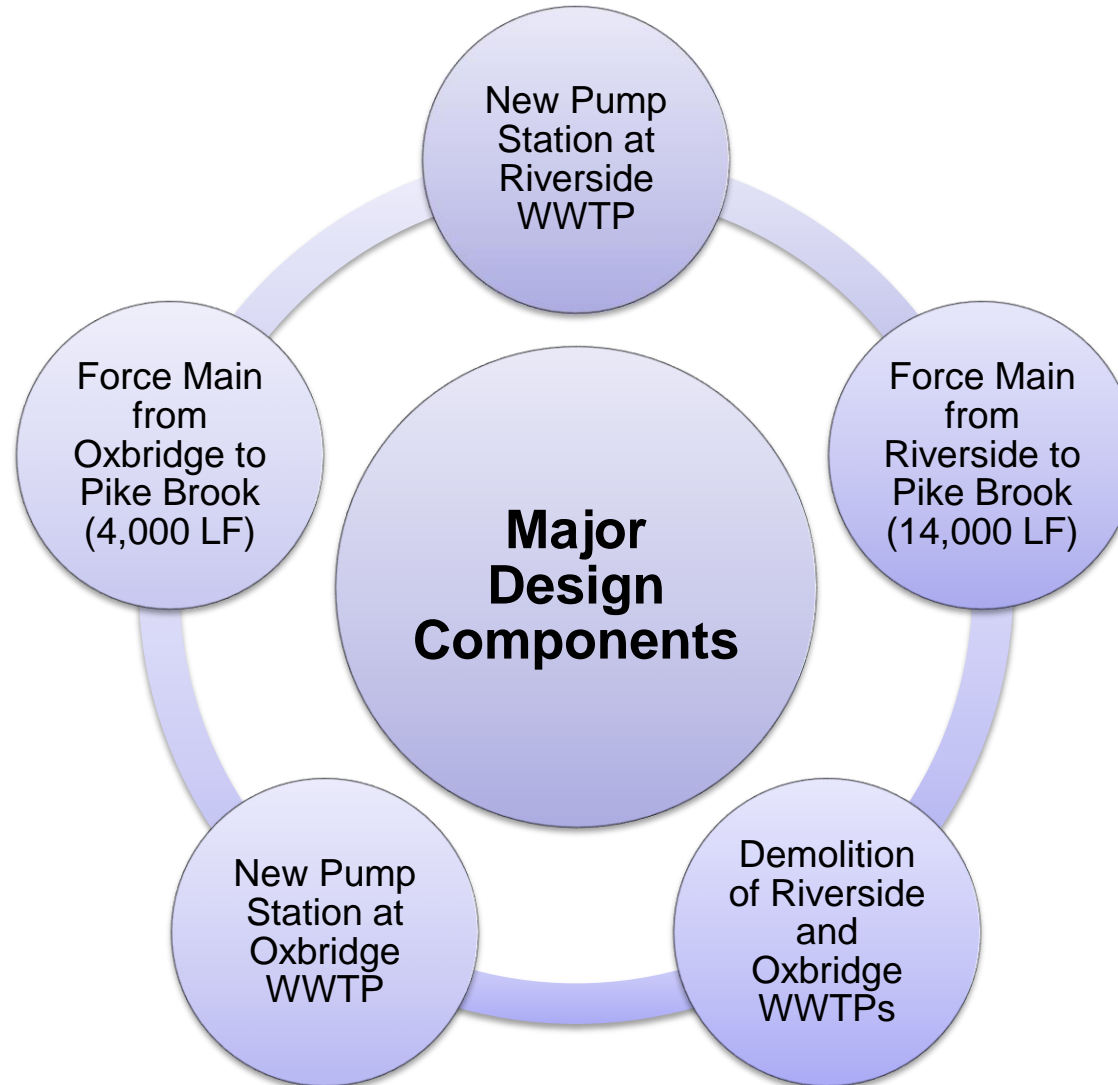
Environmental Improvements

- Anti-degradation analysis
 - No measurable change in downstream water quality as a result of expanded flows
 - Does not give “credit” for plants taken off line
- Overall pollutant load decrease
 - Pike Brook / Skillman Village versus Oxbridge / Riverside
 - TP decreases from 1.96 mg/L to 0.13 mg/L
 - Nitrate decreases from 33.6 mg.L to 6.8 mg/L
 - Flow-weighted concentrations used for comparison



- Conclusions
 - No measurable impact from expanded plants
 - Significant decrease in pollutant load
 - WIN-WIN!!

2016 Consolidation Design Components







Oxbridge Force Main Route

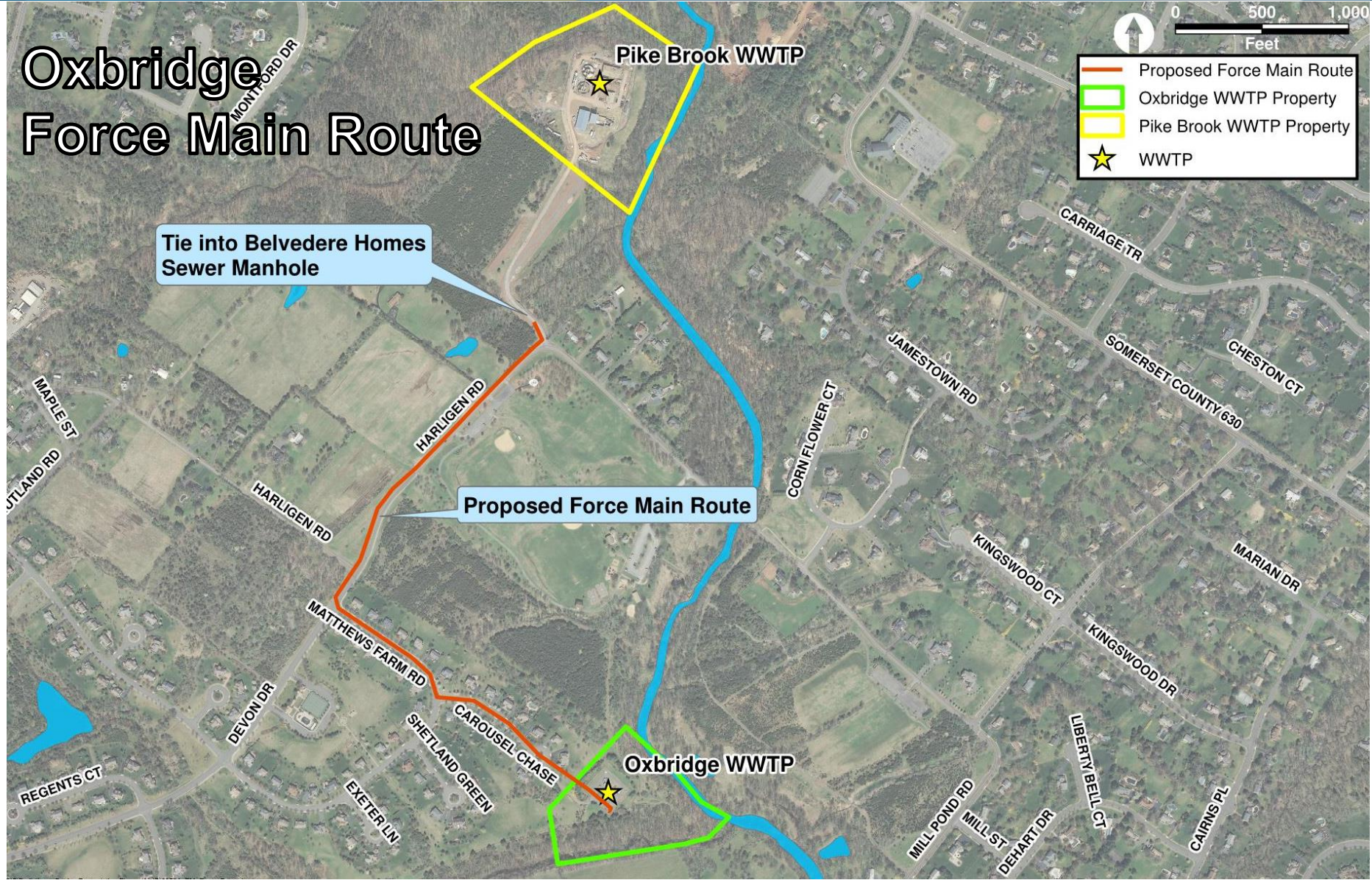
Tie into Belvedere Homes Sewer Manhole

Proposed Force Main Route

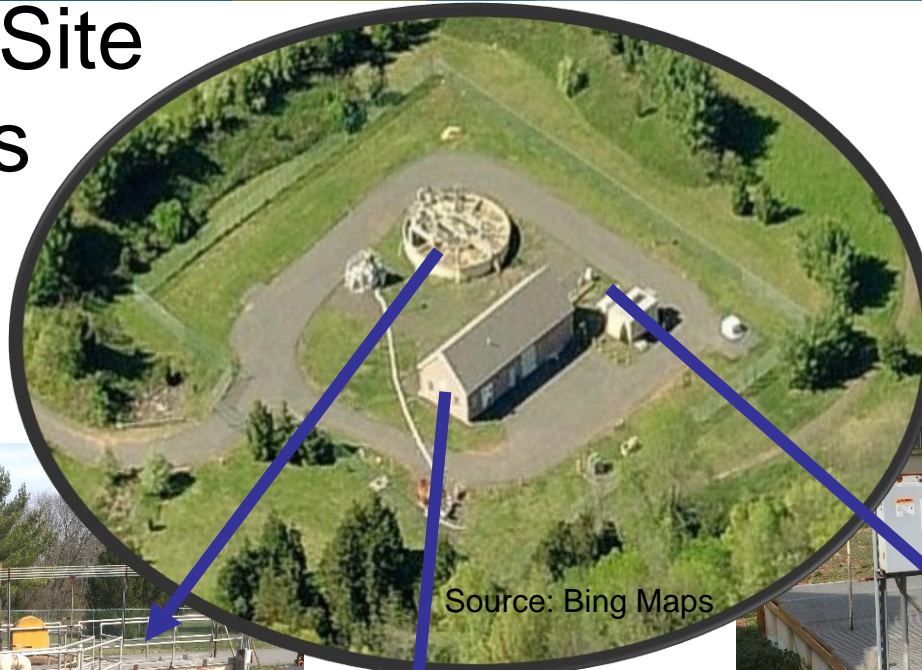
Pike Brook WWTP

Oxbridge WWTP

-  Proposed Force Main Route
-  Oxbridge WWTP Property
-  Pike Brook WWTP Property
-  WWTP



Oxbridge Site Conditions



Source: Bing Maps



Equalization/ Clarifier
Tank

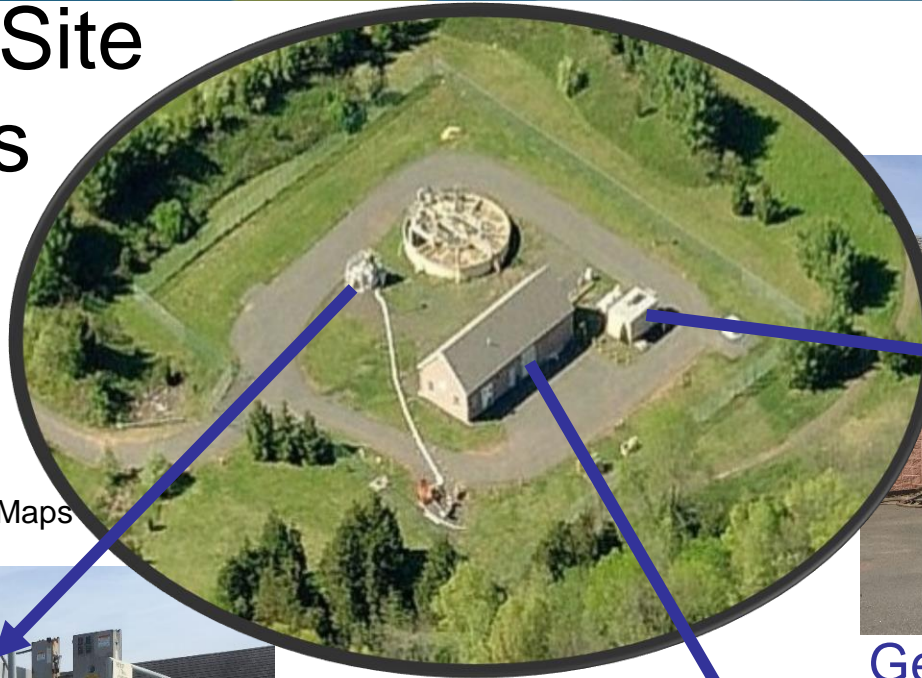


Post Aeration Tank



Control/ Operations Bldg

Oxbridge Site Conditions



Source: Bing Maps



Generator & Enclosure

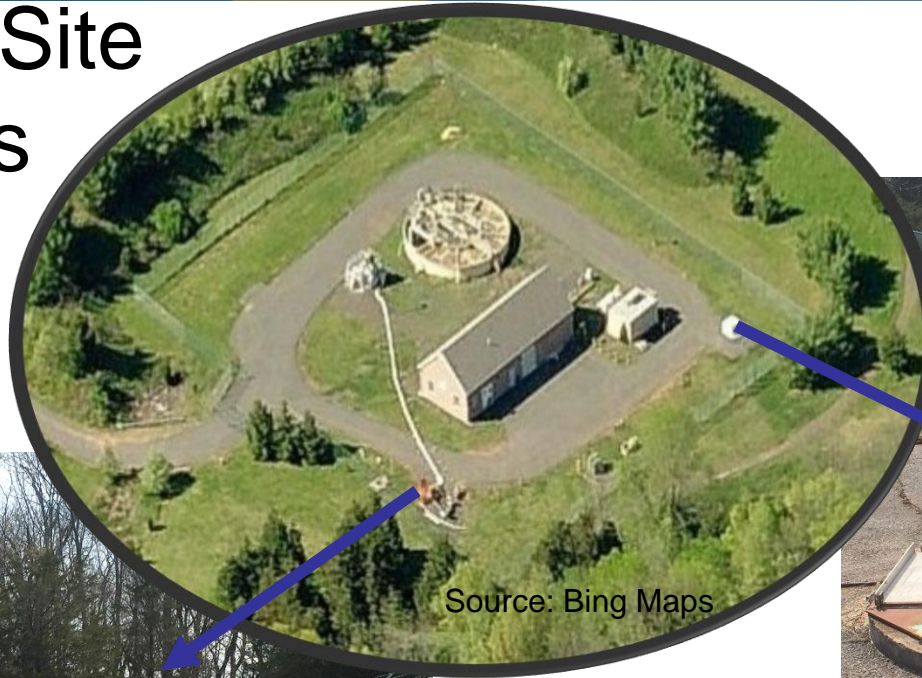


Splitter Box



Rear of Operations Bldg

Oxbridge Site Conditions



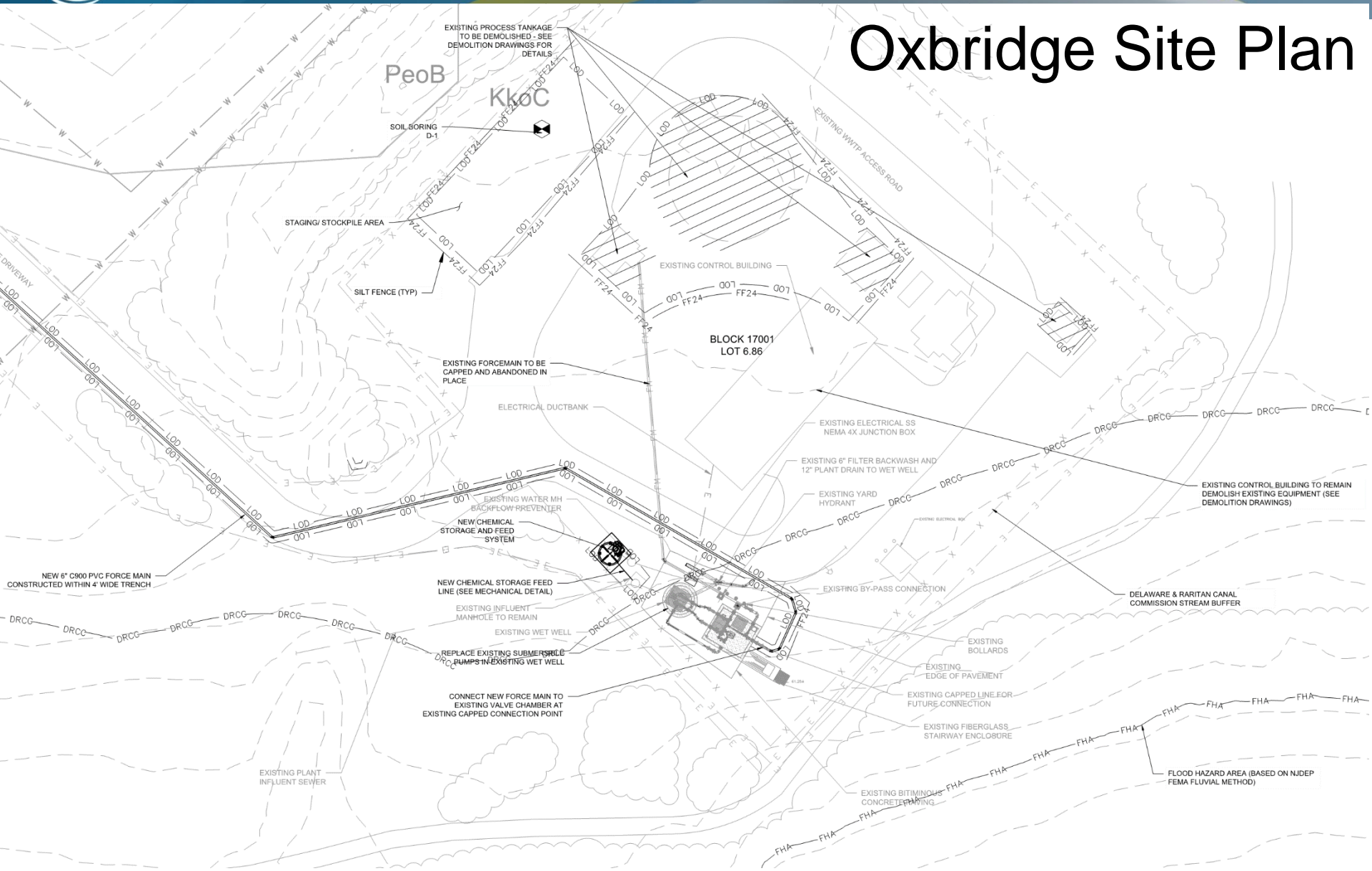
Effluent Pump Station



Wet Well & Dry Well



Oxbridge Site Plan



Riverside Force Main Route



Riverside Site Conditions



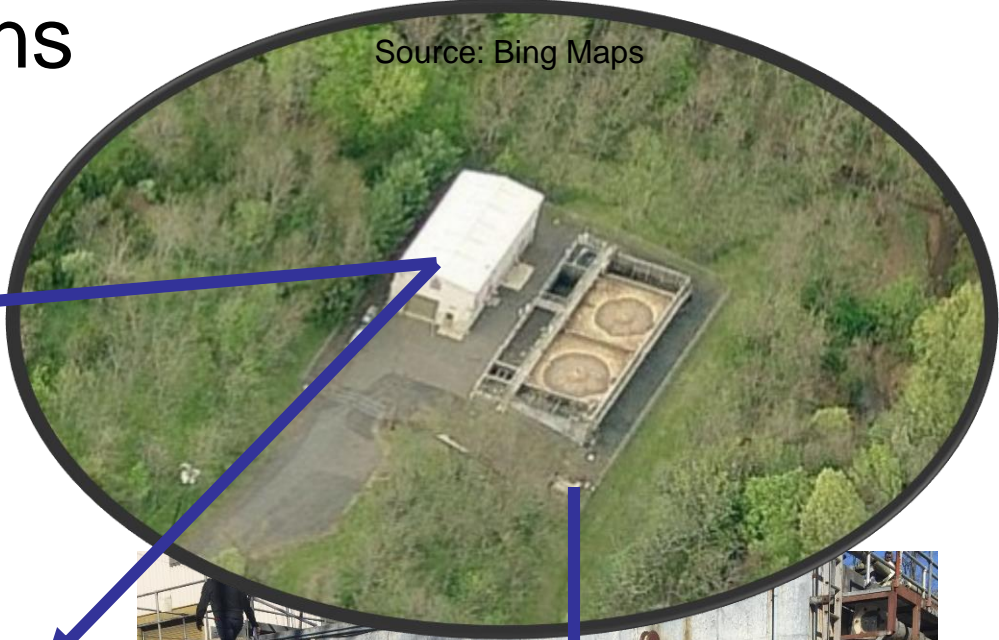
Source: Bing Maps

Aeration Tanks



Chemical Storage, Sand Filters,
& Office Bldg

Riverside Site Conditions



Source: Bing Maps



THIS CONTAINER (TANK) CONTAINS: WATER CAS 7732-18-6 CONENTE PARCIALMENTE CONOCIDA

Rapid Sand Filter Tank

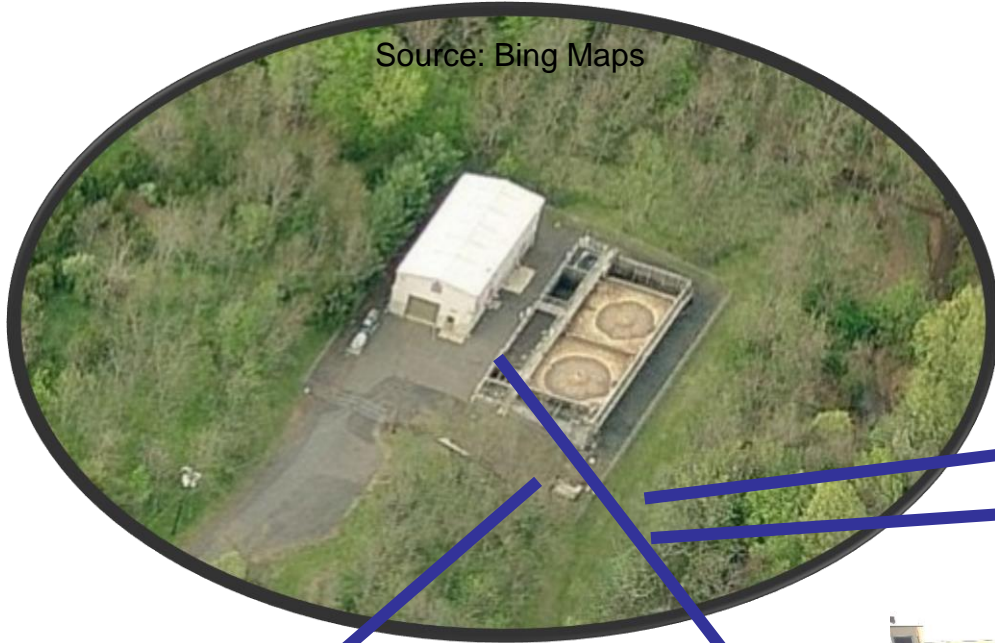


Chemical Reactor Tank



Wet Well

Riverside Site Conditions



Grassed Access Path



Wet Well



Aerobic
Sludge
Digester

Next Steps

- August 2016: 90% Design milestone ✓

- August 2016: Permit Submission ✓
 - Freshwater Wetlands Presence/Absence Verification
 - Flood Hazard Area Individual Permit
 - Delaware & Raritan Canal Commission Application

- January 2017: Response to Permit Comments ✓
 - Riparian vegetation disturbance mitigation (riverside)

- Spring 2017: 100% Design & Go out to Bid

Questions?

Contact Information:

Edovel@Kleinfelder.com

609-454-4551

Bfriedlich@Kleinfelder.com

609-454-4562