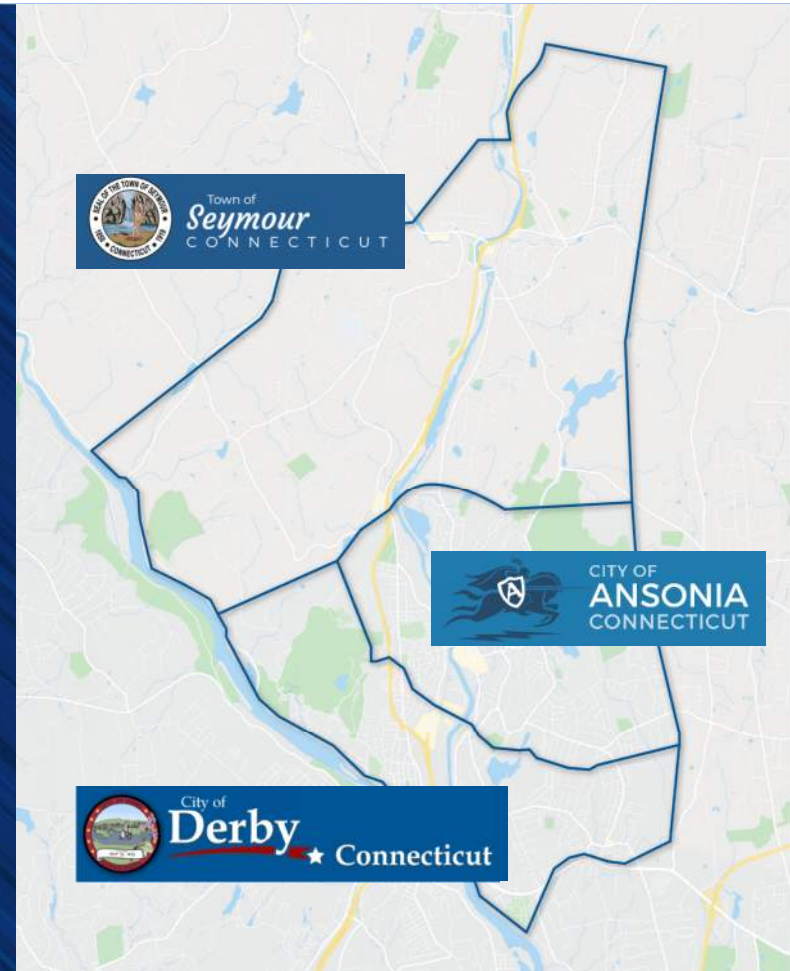


# Regional Wastewater Treatment Consolidation Study – Phase 2

Workshop #6 – Final Presentation

Naugatuck Valley Council of Governments

January 26, 2022

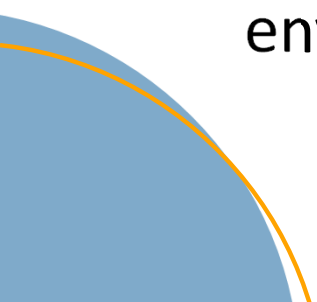


# AGENDA

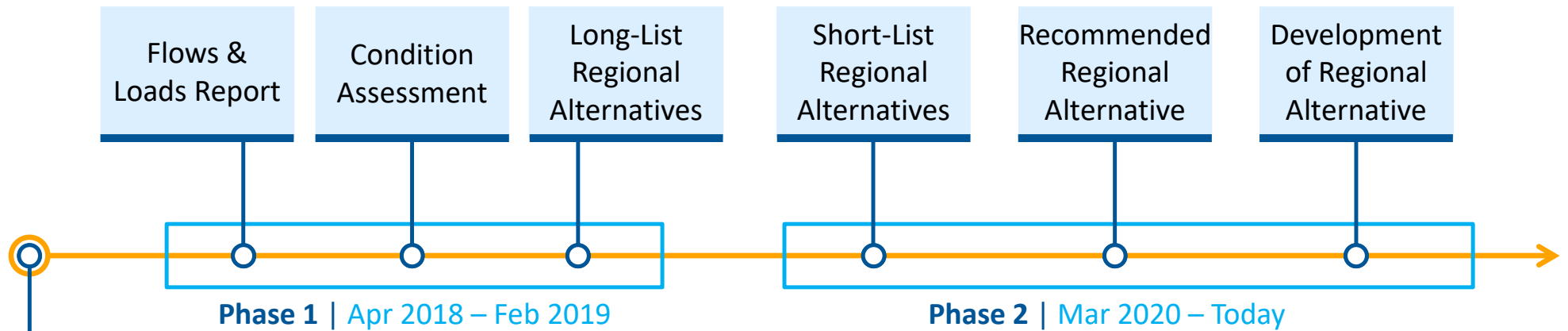
- **Why Regionalize?**
- **Timeline & Activities**
- **Phase 1 Deliverables & Activities**
- **Phase 1 Base Case Summary Points**
- **Phase 2 Deliverables & Activities**



## Why Regionalize?

- 1 Significant and high-cost wastewater system upgrades required in these communities
  - 2 Regionalization is the aggregation of utilities to realize economies of scale by providing services to a larger customer base, at a lower cost, with increased efficiency and greater environmental benefit
- 

# Regionalization Study – Timeline & Activities



**2016**

State CT announces grant for consolidation of Derby, Ansonia, Seymour, Beacon Falls, Naugatuck Wastewater Facilities

**Project Included Numerous Public Workshops & Stakeholder Meetings**





# PHASE 1

# Phase 1 – Deliverables/Activities

## Flows & Loads Report

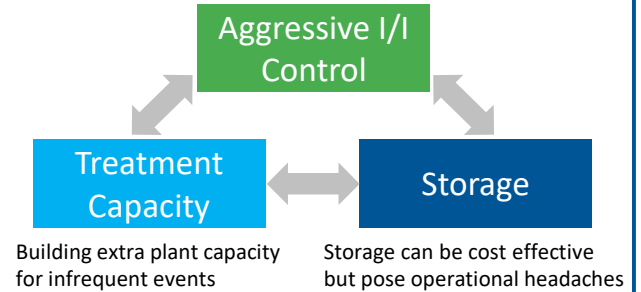
### REGIONAL WASTEWATER TREATMENT CONSOLIDATION STUDY

Phase 1 Report:  
Long List of Regional  
Wastewater System Alternatives

## Phase 1 Report

### Identification of Alternatives

Aggressive Rehabilitation is costly but may be the best long-term solution



## Initial Condition Assessment Report

Performance



Replacement Plan



## Workshops & Meetings





# INITIAL FINDINGS – BASE CASE

Derby  
Ansonia  
Seymour

# Derby WPCF Base Case



## Deep Consent Order (2015)

Requires: “modernization of entire treatment facility or abandonment and redirection of wastewater to another facility,” with construction to be completed by 12/31/2020.

- Plant upgraded to secondary treatment in 1972 limited modifications since then
- Overall condition is poor; overdue for major overhaul, approaching full replacement
- Replace headworks, grit removal, influent pumps/related systems, clarifiers/mechanisms, BNR facilities, aeration blowers, sludge processing systems, plant-wide electrical, SCADA, plant water and buildings upgrades
- Significant safety hazards must be remedied
- Capital Program to start as soon as practical



# Derby WPCF Base Case

1. Replace existing screening facility upstream of influent pump station
2. Replace grit removal facility
3. Complete electrical/mechanical upgrade of influent pump station (pumps, motors, valves, piping, controls, major upgrade of buildings)



# Derby Collection System

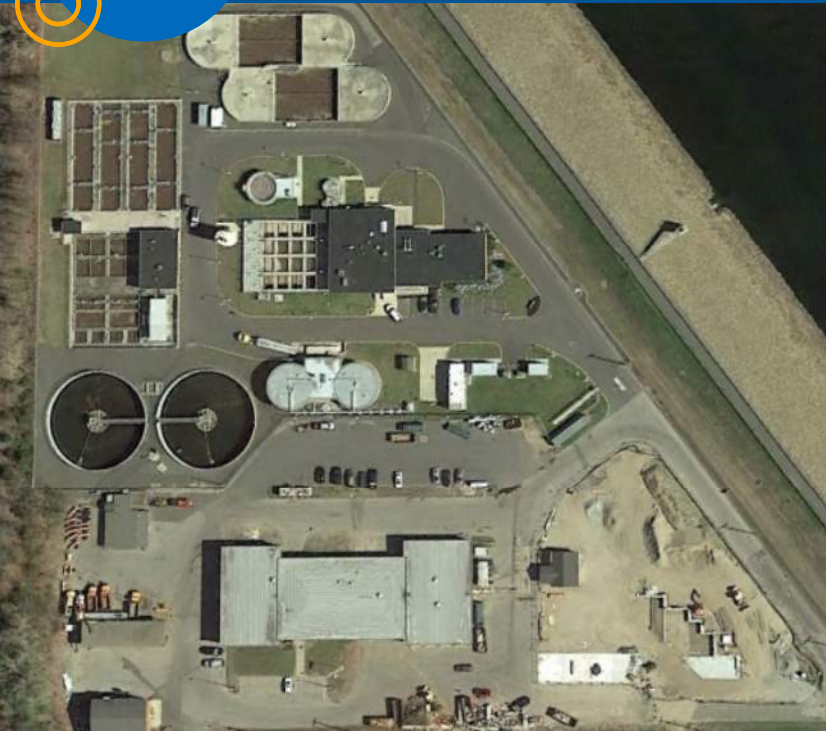


## Recommended

Five years of catch-up at a system-wide renewal rate of 1.0 mile/yr, followed by a more moderate annual investment for system strengthening/maintenance.

- Old collection system about 70% is vitrified clay pipe, characteristically with serious defects
- System is leaky, with very high I/I - peak wet weather flows can exceed plant capacity
- Significantly higher expenditures are required for sewer repairs due to poor condition of system and years of deferred replacement
- USEPA Order required collection system improvements, including I/I Control Plan and CMOM Corrective Action Plan

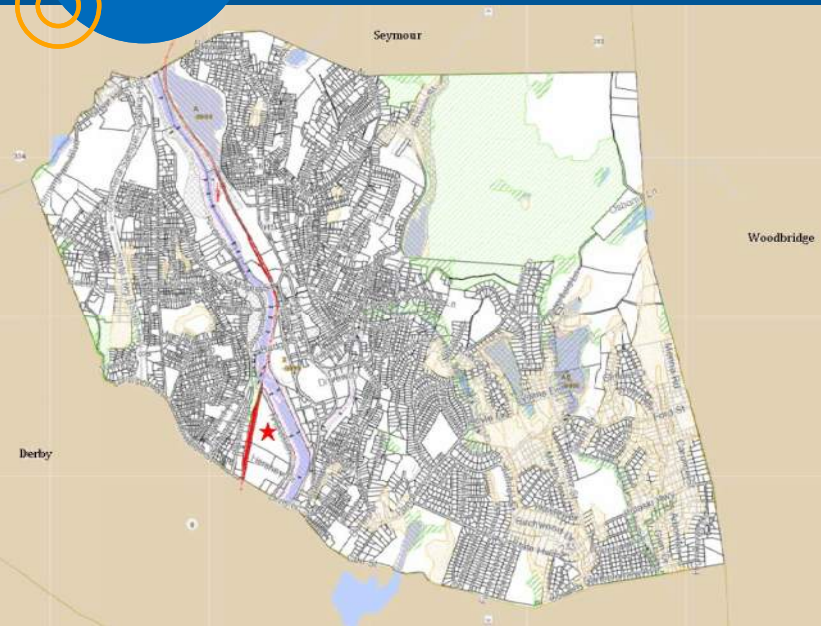
# Ansonia WPCF Base Case



- Extensive plant upgrade completed in 2011
- Overall condition of the plant is Satisfactory
- Hydraulic restrictions limit capacity during peak flows needs immediate resolution
- Sludge processing not efficient, resulting in higher costs - recommend replacement/major upgrade
- Several systems lack redundancy:
  - Influent Screenings
  - Headworks Grit Removal
  - Effluent Disinfection



# Ansonia Collection System



- Old collection system, much of which is vitrified clay pipe
- System is leaky, with very high I/I
- Much work needs to be done to catch up and to maintain this very old pipe system

Recommended: Five years of catch-up at a system-wide renewal rate of 1.3 miles/yr, followed by a more moderate annual investment for system strengthening/maintenance

# Seymour WPCF Base Case



Plant is now due for a major upgrade. Under base case, capital program should start as soon as practical

- Plant built in the 1970's, with most recent upgrade in the early 1990's
- Overall condition of the plant is Deficient
- Replace/rehab:
  - headworks screening, grit removal
  - influent pump station
  - primary clarifiers/mechanisms
  - secondary clarifier upgrades
  - BNR system, aeration blowers upgrade
  - sludge processing
  - plant-wide electrical
  - SCADA

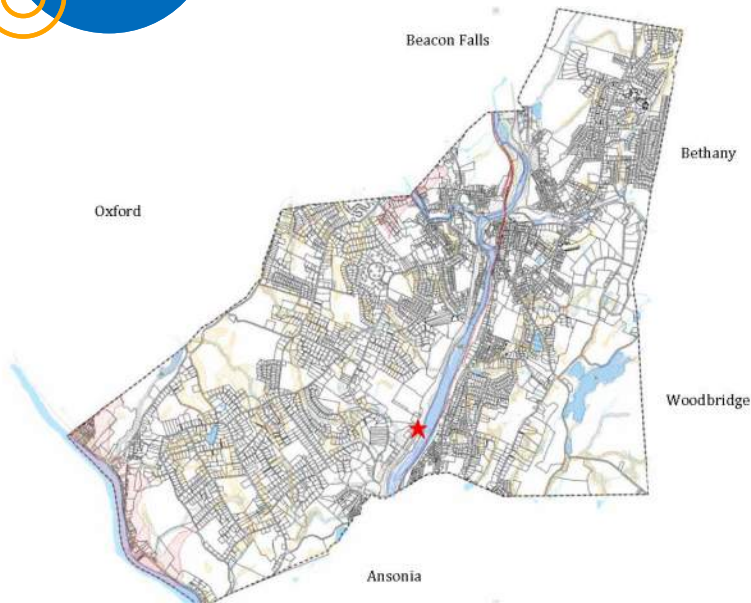
# Seymour WPCF Base Case

1. Replace Headworks Screenings & Grit systems
2. Influent Pump Station - Mechanical/Electrical Upgrade
3. Primary Clarifiers - Replace equipment & assess concrete structure
4. Secondary Clarifiers - Replace mechanisms
5. Upgrade electrical system MCCs and panels
6. SCADA upgrade





# Seymour Collection System













## Recommended:

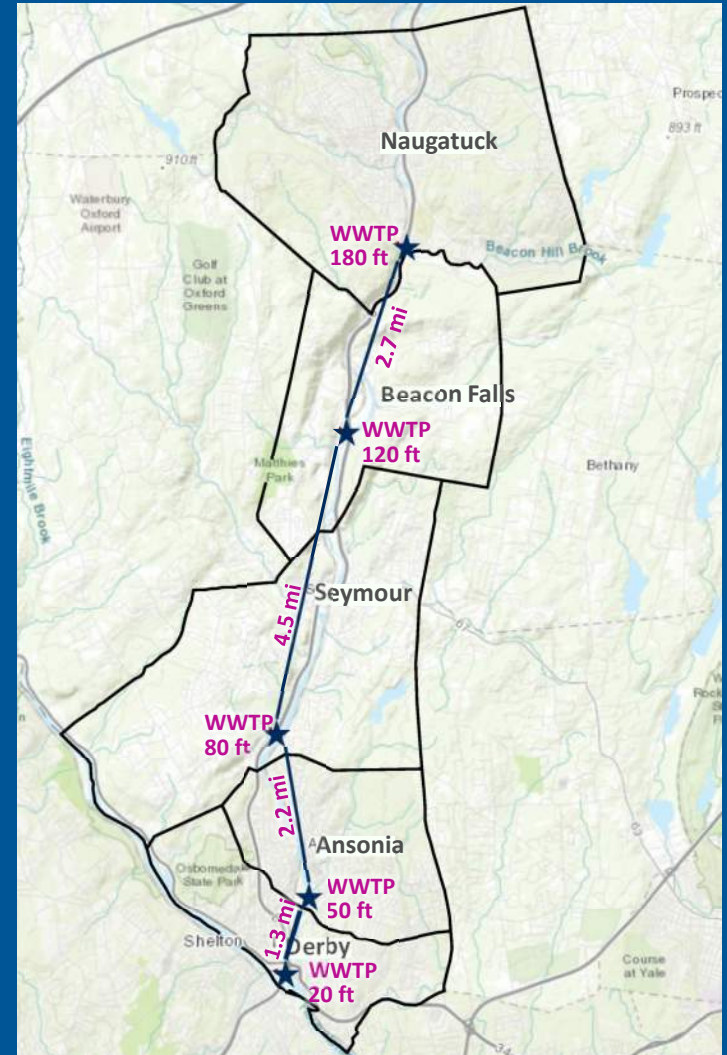
Five years of catch-up at a system-wide renewal rate of 1.3 miles/yr, followed by a more moderate annual investment for system strengthening/maintenance

- Old collection system (23% of which is vitrified clay pipe)
- Limited maintenance or inspections
- System is leaky, with very high I/I
- Significantly higher expenditures are required for sewer replacement/repairs due to poor condition of system and years of deferred replacement/upgrade

## Base Case – Overall Summary

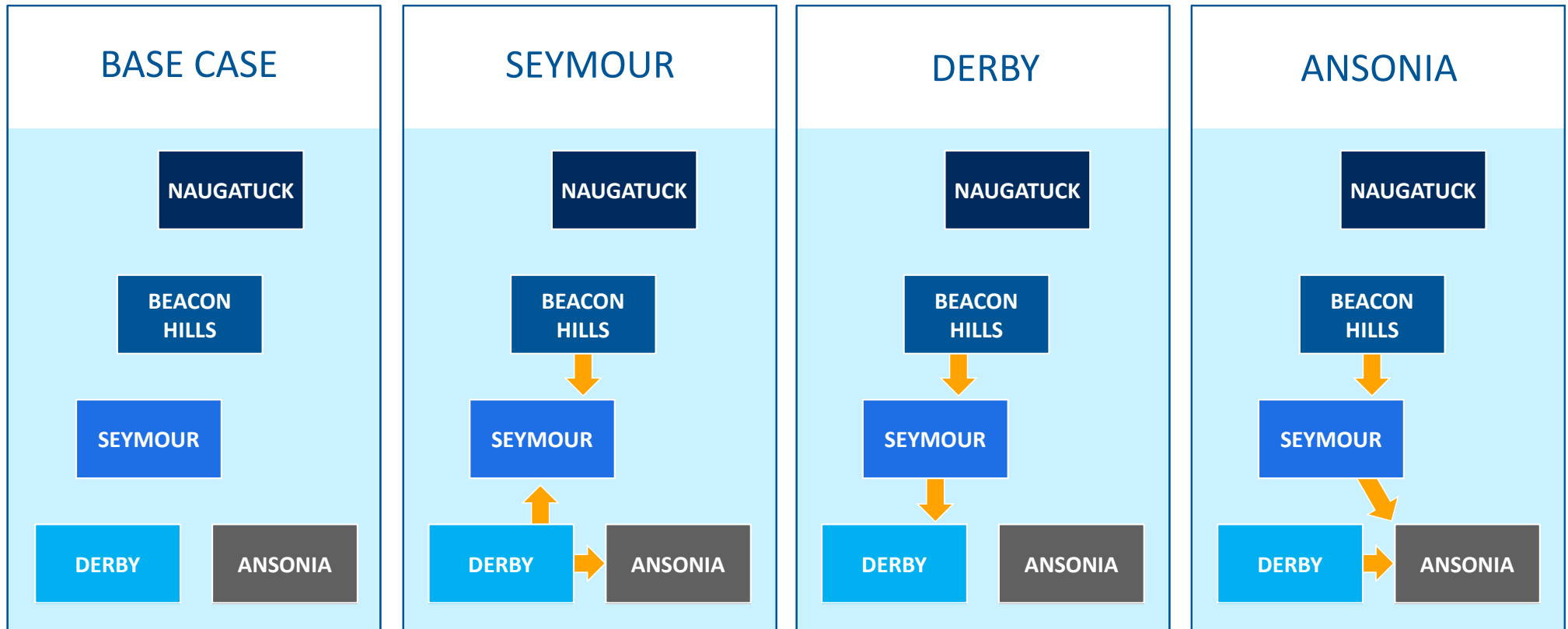
	Treatment	Collection System
	<i>Condition</i>	<i>Infiltration/ Inflow</i>
Seymour		
Ansonia		
Derby		
Naugatuck		
Beacon Falls		

# REGIONAL ALTERNATIVES





# Identify Alternatives



# Phase 1 – Long List Regional Alternatives

No.	Alternative Description
1	Beacon Falls to Naugatuck
2	Beacon Falls to Seymour
2a	Beacon Falls to Seymour, I/I Reduction
3	Derby to Ansonia
3a	Derby to Ansonia, I/I Reduction
4	Derby to Ansonia, Effluent Pumped to Housatonic
4a	Derby to Ansonia, I/I Reduction, Effluent Pumped to Housatonic
5	Derby and Seymour to Ansonia
5a	Derby and Seymour to Ansonia, I/I Reduction
5b	Derby and Seymour to Ansonia, Effluent Pumped to Housatonic
5c	Derby and Seymour to Ansonia, I/I Reduction, Effluent Pumped to Housatonic

No.	Alternative Description
6	Derby to Seymour and Ansonia
6a	Derby to Seymour and Ansonia, I/I Reduction
8	Ansonia to Derby
8a	Ansonia to Derby, I/I Reduction
9	Seymour and Ansonia to Derby
9a	Seymour and Ansonia to Derby, I/I Reduction
10	Seymour to Ansonia, Part of Ansonia to Derby
10a	Seymour to Ansonia, Part of Ansonia to Derby, I/I Reduction
11	Beacon Falls and Seymour to Ansonia, Part of Ansonia to Derby
11a	Beacon Falls and Seymour to Ansonia, Part of Ansonia to Derby, I/I Reduction
12	Beacon Falls, Seymour, and Ansonia to Derby
12a	Beacon Falls, Seymour, and Ansonia to Derby, I/I Reduction



# PHASE 2



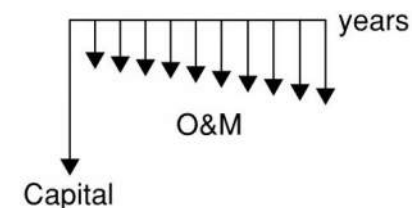
## Phase 2 – Deliverables/Activities

**Task 2** – Short List of Regional Wastewater Alternatives

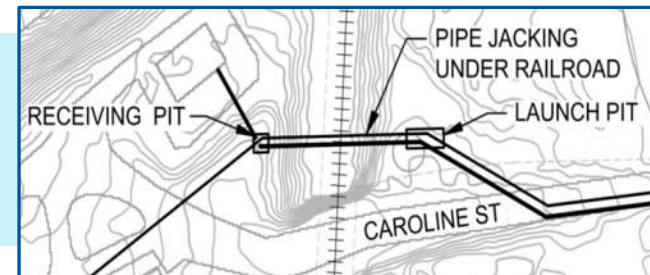
**REGIONAL WASTEWATER  
TREATMENT CONSOLIDATION STUDY**  
Technical Memorandum 3:  
Short List of Regional Wastewater  
Alternatives

**Task 3** – Final Recommendation

### Net Present Worth Analysis

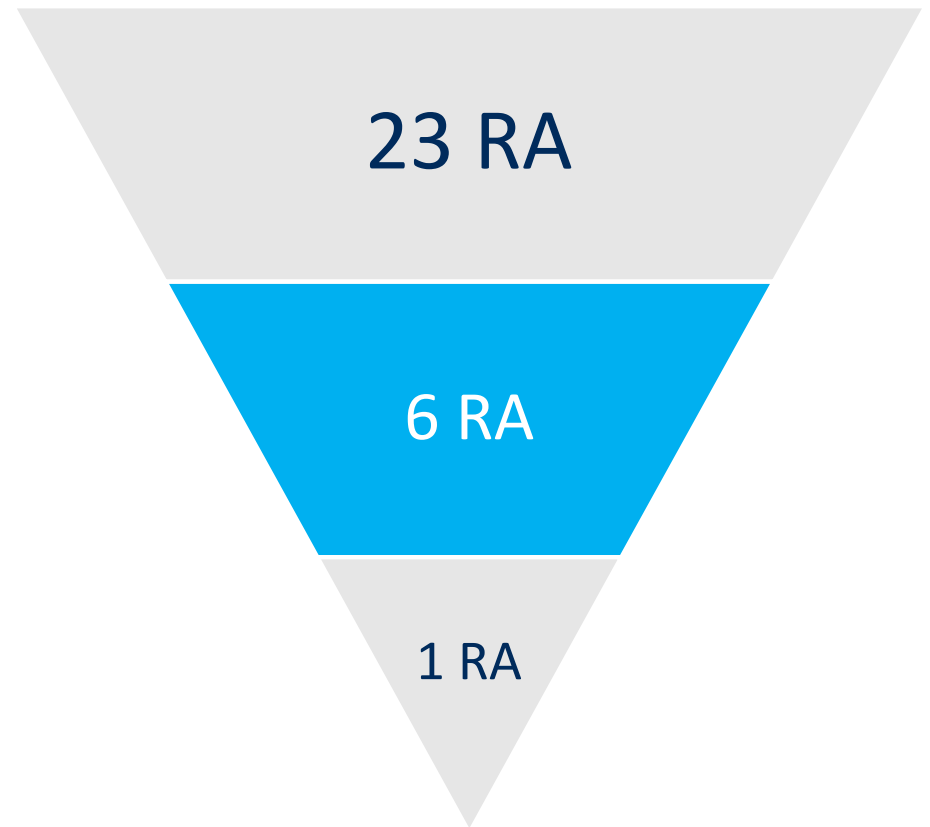


**Task 4** – Final Report & Development of Recommended Plan



## Task 2 Report Summary

- Phase I Long List of Regional Alternatives were Developed and Screened Out
- The Result – Six Short List Regional Wastewater Alternatives
  - Aggressive I/I Alternatives Screened Out
  - Alternatives from Beacon Falls to Naugatuck and to Seymour Screened Out





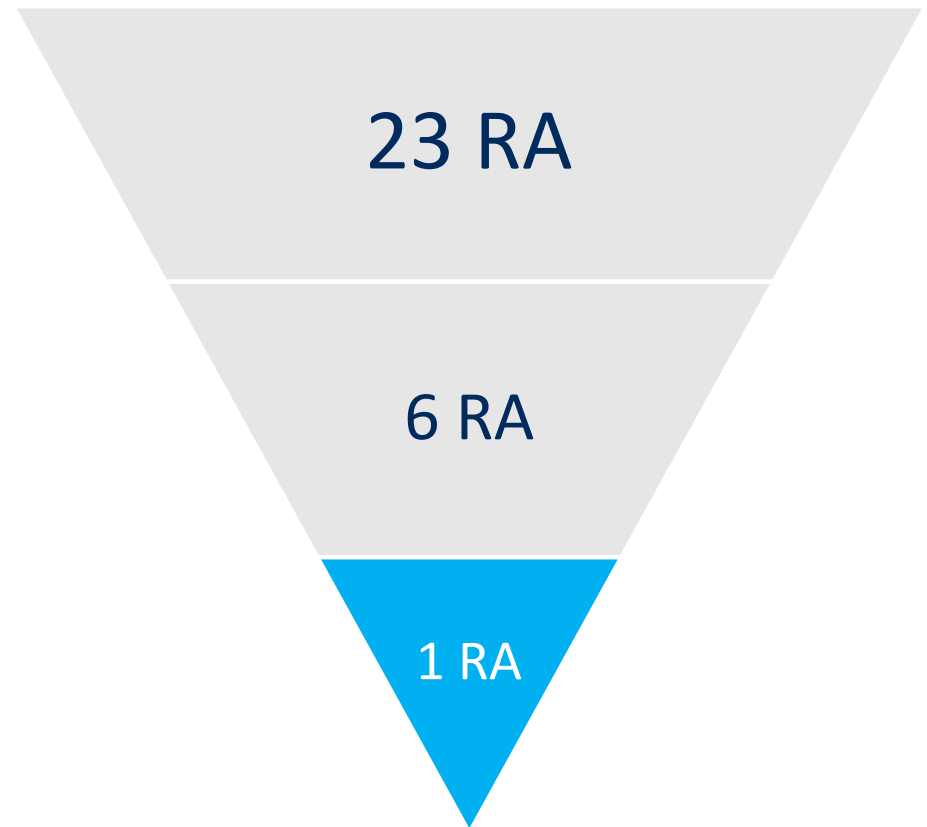
## Short List of Regional Alternatives

No.	Alternative Description
<b>Ansonia Regional Alternatives</b>	
3	Derby to Ansonia
4	Derby to Ansonia, Effluent Pumped to Housatonic River
5	Derby and Seymour to Ansonia
5b	Derby and Seymour to Ansonia, Effluent Pumped to Housatonic River
<b>Derby Regional Alternatives</b>	
8	Ansonia to Derby
9	Seymour and Ansonia to Derby



## Task 3 Purpose & Methodology

- Further development of the six Short List Regional Alternatives and Base Case Scenarios
  - Infrastructure needs
    - WWTPs and conveyance systems
    - Collection Systems
  - Cost development and analysis
    - Capital Costs
    - Operations & Maintenance Costs
      - Operating needs
    - Present Worth Cost evaluation
- Identification of the preferred alternative(s) on a cost analysis basis

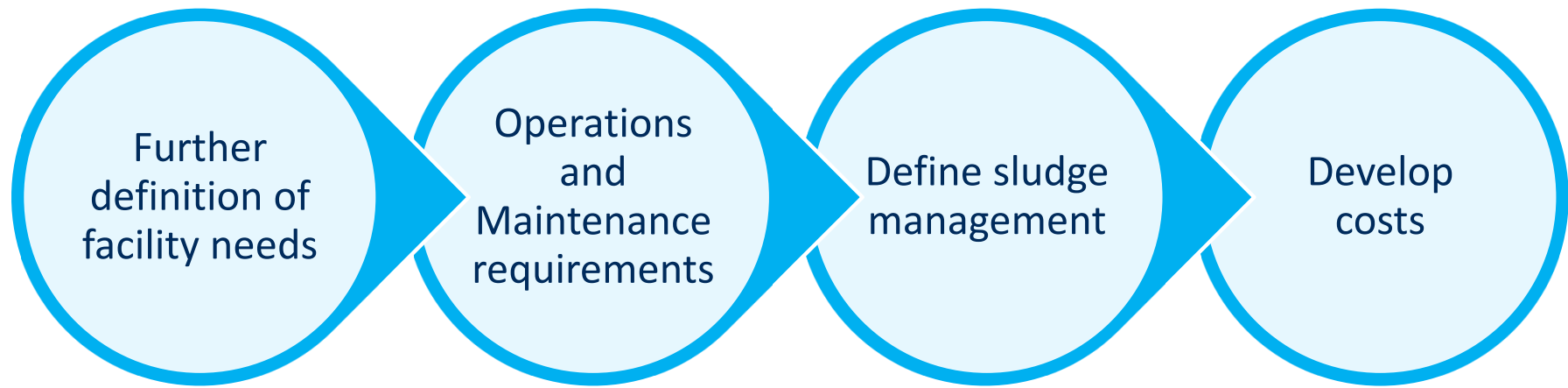




# **BASE CASE & REGIONAL ALTERNATIVES DEVELOPMENT**

Wastewater Treatment Plants

# Wastewater Treatment Plants



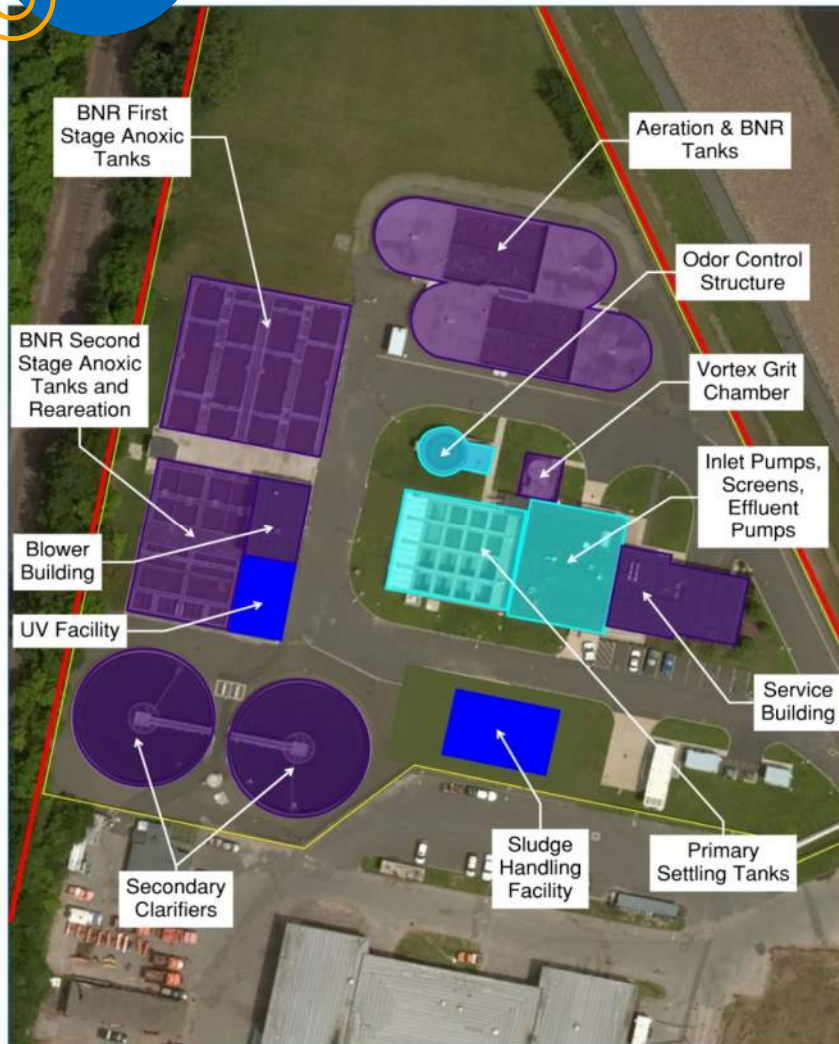


# Derby Base Case



Area/Facility	Upgrades Required
Influent Screening & Pump Station	<ul style="list-style-type: none"> <li>Major Upgrade &amp; Configuration Changes – new equipment &amp; building systems</li> </ul>
Grit Removal Facility	<ul style="list-style-type: none"> <li>Replace with new vortex grit removal facility</li> </ul>
Primary Clarifiers	<ul style="list-style-type: none"> <li>Replace mechanical systems; Crack repair</li> </ul>
Aeration Basins	<ul style="list-style-type: none"> <li>Replace mechanical systems and equipment</li> </ul>
Secondary Control Building	<ul style="list-style-type: none"> <li>Replace blowers, RAS and WAS pumps; Building systems reconfiguration</li> </ul>
Secondary Clarifiers	<ul style="list-style-type: none"> <li>Replace mechanisms</li> <li>Upgrade flow splitter box</li> </ul>
Disinfection	<ul style="list-style-type: none"> <li>Chemical Feed systems replacement</li> </ul>
Sludge Handling Facility	<ul style="list-style-type: none"> <li>New thickened liquid sludge treatment/handling facility</li> </ul>
Primary Control Building	<ul style="list-style-type: none"> <li>Major interior remodeling all systems</li> </ul>
Electrical and Control Systems	<ul style="list-style-type: none"> <li>Replace main electrical gear and motor control centers</li> <li>Add new (SCADA) system</li> </ul>
General	<ul style="list-style-type: none"> <li>Numerous site related improvements &amp; treatment subsystems upgrades</li> </ul>

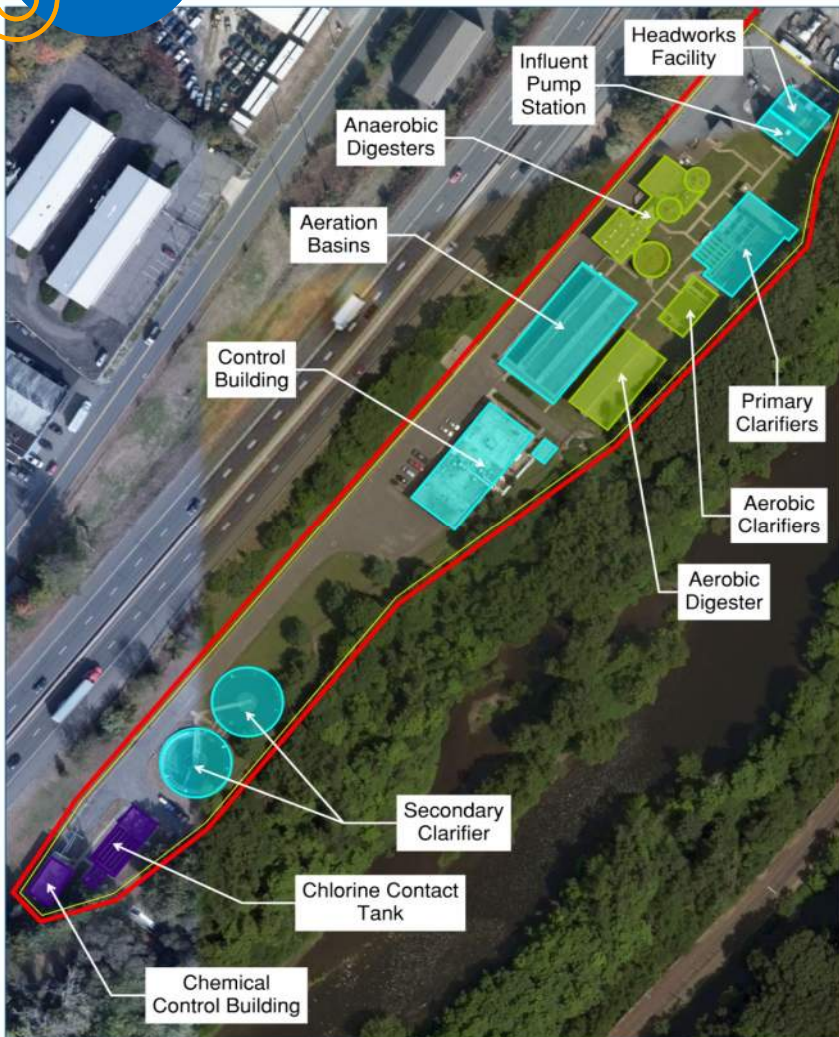
# Ansonia Base Case



Area/Facility	Upgrades Required
Headworks	<ul style="list-style-type: none"> <li>Add second mechanical screen</li> <li>Replace ventilation and odor control system for headworks</li> </ul>
Disinfection	<ul style="list-style-type: none"> <li>Build new UV disinfection channel</li> </ul>
Effluent Pump Station	<ul style="list-style-type: none"> <li>Upgrade effluent pumps to meet peak flows</li> </ul>
Sludge Handling Facility	<ul style="list-style-type: none"> <li>New thickened liquid sludge treatment/handling facility</li> </ul>
General	<ul style="list-style-type: none"> <li>Demolish non-functioning soda ash storage and feed system</li> <li>Plant-wide structural concrete repairs</li> </ul>



# Seymour Base Case



## Area/Facility

## Upgrades Required

### Headworks

- Replace mechanical screen, add redundant unit & WGC
- Replace grit removal equipment
- Add enclosure structure, ventilation (with odor control)

### Influent Pump Station

- Replace pumps, piping, valves, VFDs and controls

### Primary Clarifiers

- Replace mechanisms; modify for more efficient operation

### Aeration Basins

- Replace mechanical systems and equipment

### Old Digester Complex

- Add on additional aeration turbo blower for redundancy
- Demolish existing multi-stage centrifugal blowers

### Control Building

- Replace RAS and WAS pumps
- Demolish rotary drum thickener, belt filter press, and polymer system
- Add new gravity belt thickeners and associated systems
- Upgrade HVAC and odor control systems

### Secondary Clarifiers

- Replace mechanisms

### Sludge Handling Facility

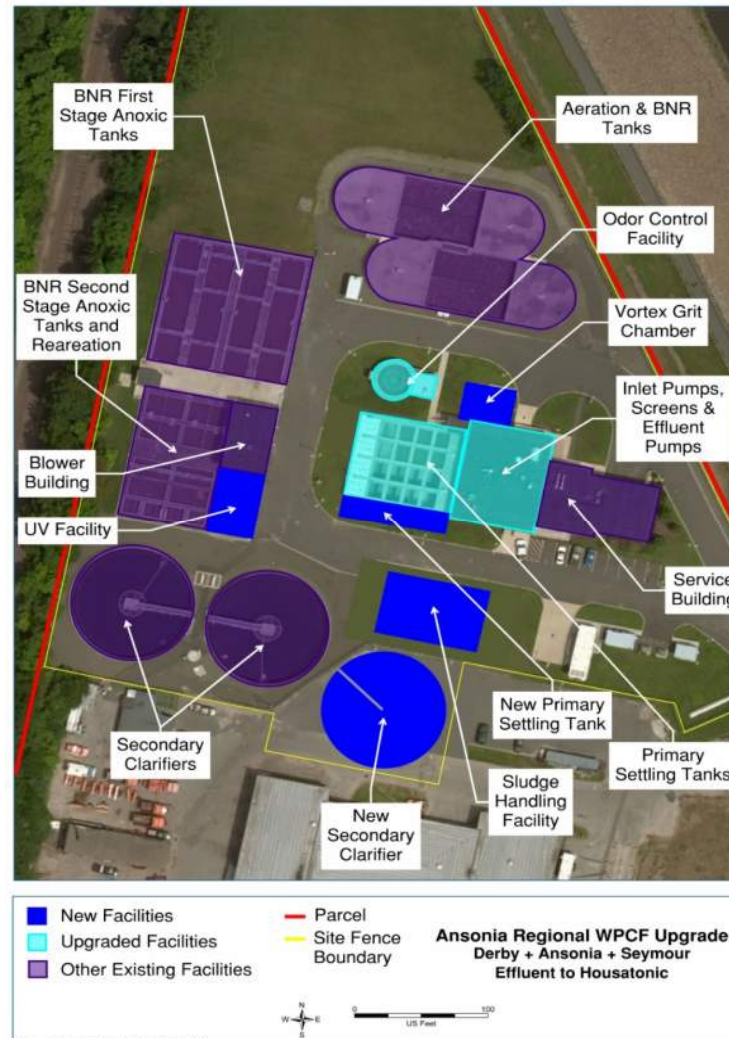
- Build new sludge handling facility

### Primary Control Building

- Upgrade/refurbish control building interior



# Ansonia Regional Alternative



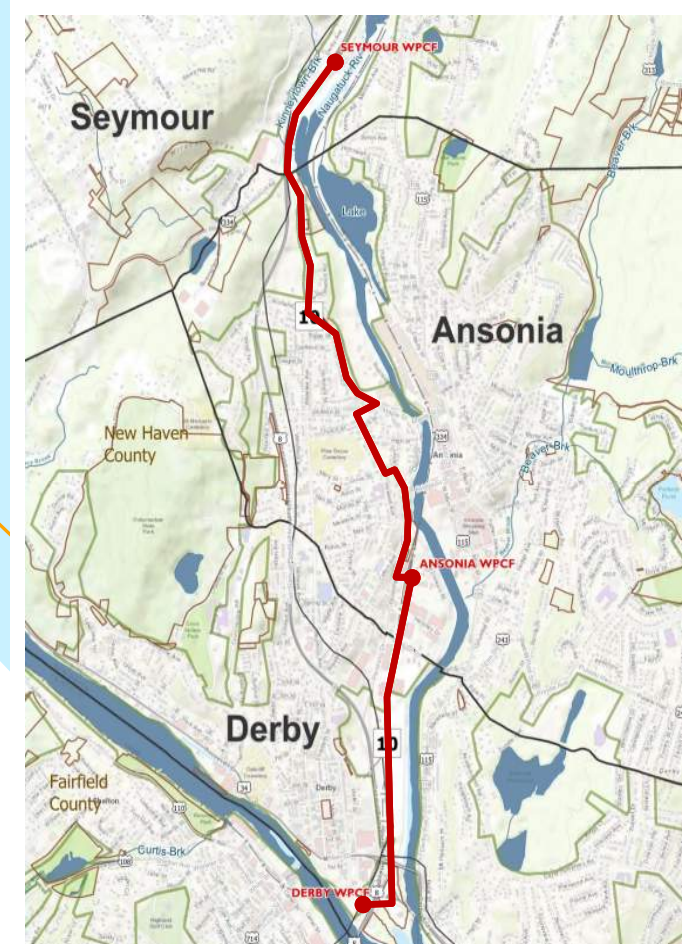


# **REGIONAL ALTERNATIVES DEVELOPMENT**

Conveyance Pipelines and Pumping

# Conveyance Pipelines and Pumping

- Routes considered for short-list alternatives:
  - Derby to/from Ansonia
  - Seymour to Ansonia
- Evaluated using GIS data, aerial imagery, and on-site investigations
- Flow rates, topography, pump pressure requirements
- Pre-treatment screening and grit removal

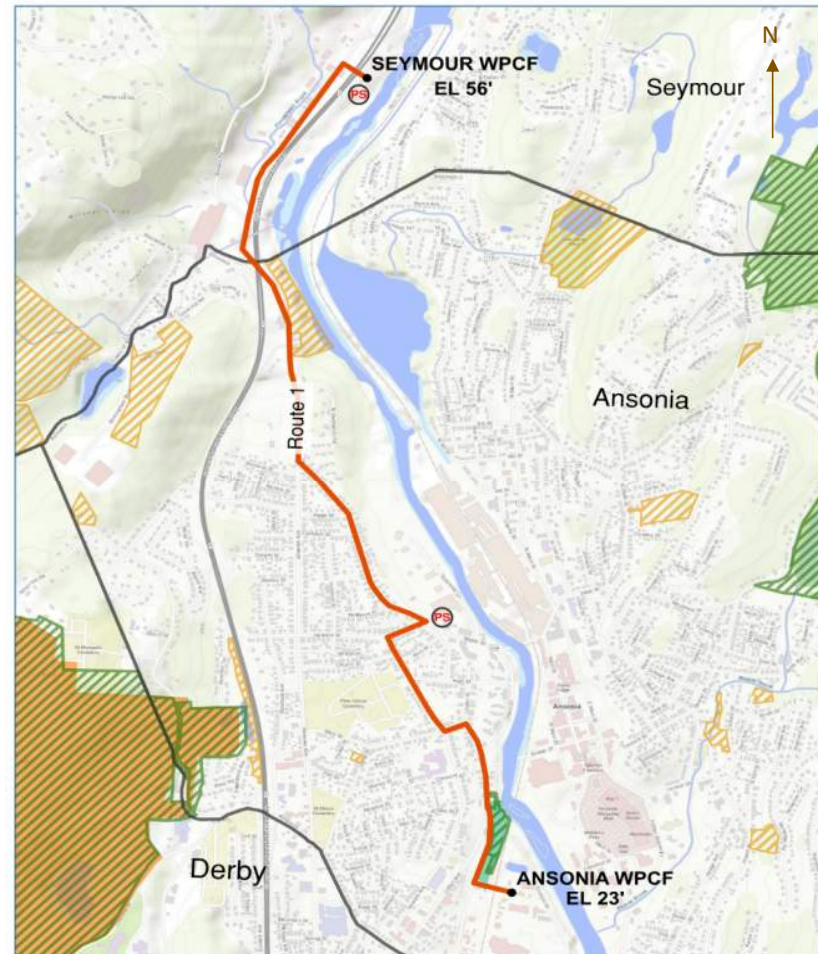




## Derby to/from Ansonia



## Seymour to Ansonia





# COMPARATIVE COSTS & EVALUATIONS

- Capital Costs
- Operations & Maintenance Costs
- Present Worth Cost

# Capital Costs

- Estimated using standard industry methods and cost data
- Unit prices standardized where possible
- Estimated costs for WWTPs, conveyance pipelines, collection systems
- Include contractor overhead and profit, contingency, ELA allowance



# Wastewater Treatment Plants – Base Case

Area/Facility	Derby	Ansonia	Seymour
Headworks	\$11,600,000	\$2,400,000	\$9,300,000
Primary Clarifiers	\$2,600,000	NA	\$1,500,000
BNR Process Upgrades	\$14,600,000	NA	\$4,100,000
Secondary Clarifiers	\$1,200,000	NA	\$2,200,000
Disinfection	\$900,000	\$2,200,000	NA
Effluent Pumps	NA	\$1,900,000	NA
Primary & Secondary Control Building Upgrades	\$4,200,000	NA	NA
Sludge Handling Facility	\$8,700,000	\$8,700,000	\$2,500,000
Sitewide Electrical and Controls	\$5,300,000	NA	\$4,400,000
Sitework	\$1,400,000	\$900,000	\$400,000
General Upgrades/Miscellaneous	\$1,200,000	\$400,000	\$500,000
<b>Total (2020 dollars)</b>	<b>\$51,700,000</b>	<b>\$16,500,000</b>	<b>\$24,900,000</b>



# Wastewater Treatment Plants – Derby Regional Alternatives

Area/Facility	Derby + Ansonia	Derby + Ansonia + Seymour
Influent Pump Station and Screening	\$6,600,000	\$6,600,000
New Grit Removal Facility	\$7,600,000	\$7,600,000
Primary Clarifiers	\$2,600,000	\$2,600,000
BNR Process Upgrade and Fitout	\$26,200,000	\$27,200,000
New BNR Tankage	6,300,000	\$10,400,000
New Secondary Clarifier	NA	\$4,700,000
Existing Secondary Clarifier	\$1,200,000	\$1,200,000
New UV Disinfection Facility	\$4,100,000	\$4,100,000
Primary Control Building	\$2,700,000	\$2,700,000
Secondary Control Building	\$1,500,000	\$1,500,000
New Sludge Handling Facility	\$9,100,000	\$9,500,000
Sitewide Electrical and I&C	\$5,300,000	\$5,300,000
Sitework	\$1,600,000	\$1,600,000
General Upgrades/Miscellaneous	\$1,200,000	\$1,200,000
<b>Total (2020 dollars)</b>	<b>\$76,000,000</b>	<b>\$86,200,000</b>





# Wastewater Treatment Plants – Ansonia Regional Alternatives

Area/Facility	Derby + Ansonia	Derby + Ansonia + Seymour
Influent Screening	\$1,600,000	\$1,700,000
New Grit Removal Facility	\$4,100,000	\$4,100,000
Headworks Odor Control	\$800,000	\$900,000
New Primary Clarifier and CEPT	\$3,400,000	\$4,300,000
New Secondary Clarifier	NA	\$7,500,000
Influent and Effluent Pumps	\$3,800,000	\$3,900,000
New Sludge Handling Facility	\$9,200,000	\$9,600,000
New Phosphorous Treatment Facility	NA	NA
UV Disinfection Facility	\$2,200,000	\$2,200,000
Sitework	\$900,000	\$1,000,000
General Upgrades/Miscellaneous	\$500,000	\$500,000
<b>Total (2020 dollars)</b>	<b>\$26,500,000</b>	<b>\$35,700,000</b>



## Capital Costs for Conveyance Pipelines and Pump Station

	Ansonia to Derby	Ansonia Plus Seymour to Derby	Derby to Ansonia	Seymour to Ansonia
Conveyance Pipeline	\$13,600,000	\$21,400,000	\$19,400,000	\$20,200,000
Pump Stations, Screenings, Grit Removal	\$4,200,000	\$4,300,000	\$6,600,000	\$11,400,000
Total (2020 dollars)	\$17,800,000	\$25,700,000	\$26,000,000	\$31,600,000

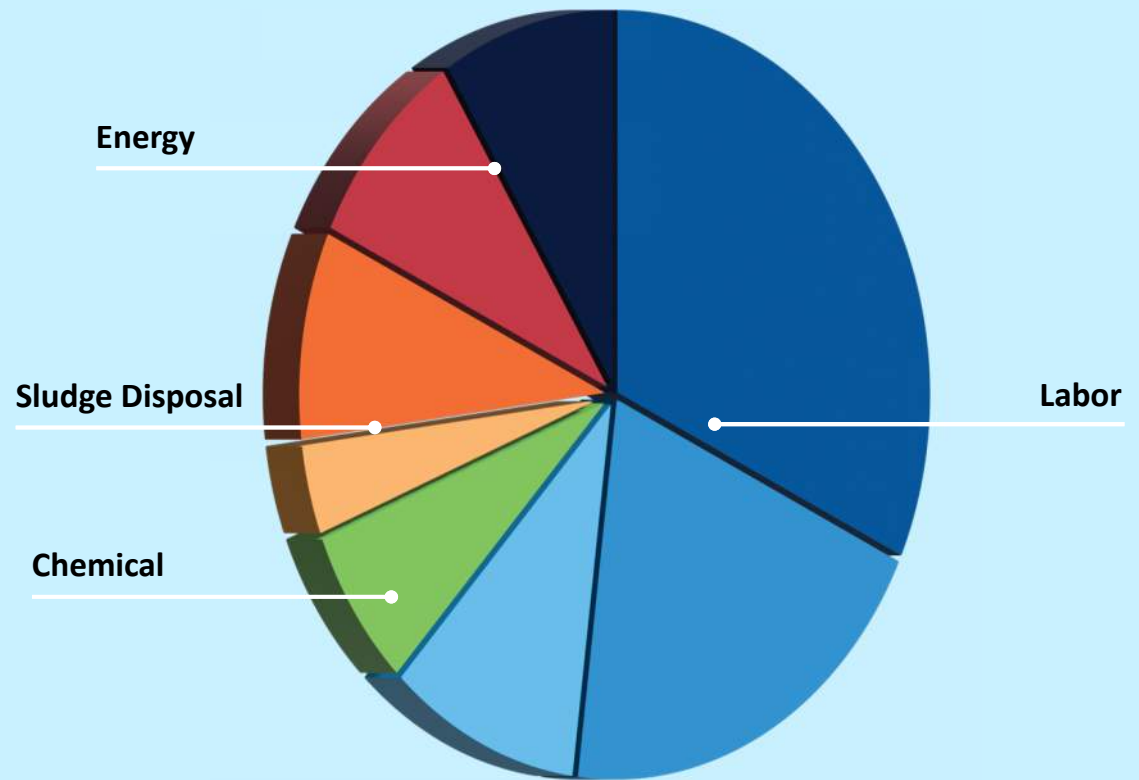


## Capital Cost – Collection Systems

	Derby	Ansonia	Seymour
Collection System Length (miles)	41.2	65.3	63.0
System Replacement Rate (yr 1-5)	2.5%	2%	2%
System Replacement Rate (yr 6-25)	1.2%	1%	0.75%
System Replacement Cost (yr 1-5)	\$2,860,000	\$3,620,000	\$3,500,000
System Replacement Cost (yr 6-25)	\$7,030,000	\$9,280,000	\$6,720,000
Pump Station Replacement Cost	\$4,380,000	\$3,150,000	\$2,100,000
Total (2020 dollars)	\$14,300,000	\$16,100,000	\$12,300,000

# O&M Costs

- Categories:
  - Energy
  - Chemicals
  - Sludge Disposal
  - Disinfection
  - Labor
- Unit costs standardized and based on actual O&M cost data







## O&M Costs – Base Cases

Annual Costs	Ansonia	Derby	Seymour
Electricity	\$313,500	\$145,600	\$97,000
Chemical	\$90,900	\$66,700	\$46,600
Chemical Disinfection Costs	\$0	\$8,300	\$8,300
Sludge Disposal Costs	\$379,200	\$249,000	\$228,500
Labor Cost	\$1,070,800	\$1,215,100	\$1,070,800
Total Annual O&M Costs	\$1,878,000	\$1,685,000	\$1,451,000



## O&M Costs – Derby Regional Alternatives

Annual Costs	Derby + Ansonia	Derby + Ansonia + Seymour
Electricity Costs	\$438,000	\$579,700
Chemical Costs	\$355,900	\$460,300
Chemical Disinfection Costs	\$38,300	\$42,800
Sludge Disposal Costs	\$627,000	\$832,600
Labor Cost	\$1,503,800	\$1,792,000
Total Annual O&M Costs	\$5,648,000	\$7,282,000

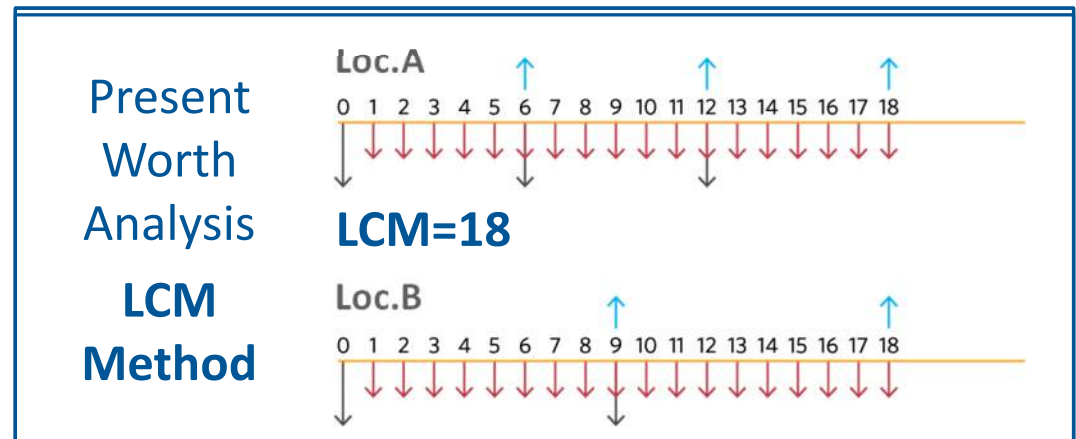


## O&M Costs – Ansonia Regional Alternatives

Annual Costs	Ansonia + Derby	Ansonia + Derby + Seymour
Electricity Costs	\$508,300	\$669,900
Chemical Costs	\$127,800	\$160,000
Chemical Disinfection Costs	\$38,300	\$42,800
Sludge Disposal Costs	\$627,000	\$832,600
Labor Cost	\$1,503,800	\$1,792,400
Total Annual O&M Costs	\$6,185,000	\$7,995,000

# Present Worth Costs

- Present Worth analysis compares alternatives over the life of the project
- Considers capital cost, annual O&M cost, time period, interest rate and inflation
- Present Value of the alternatives is expressed as an equivalent monetary value now
- The most cost effective alternative is the one with the lowest PW value





# Wastewater Treatment Plants – Ansonia Regional Alternatives

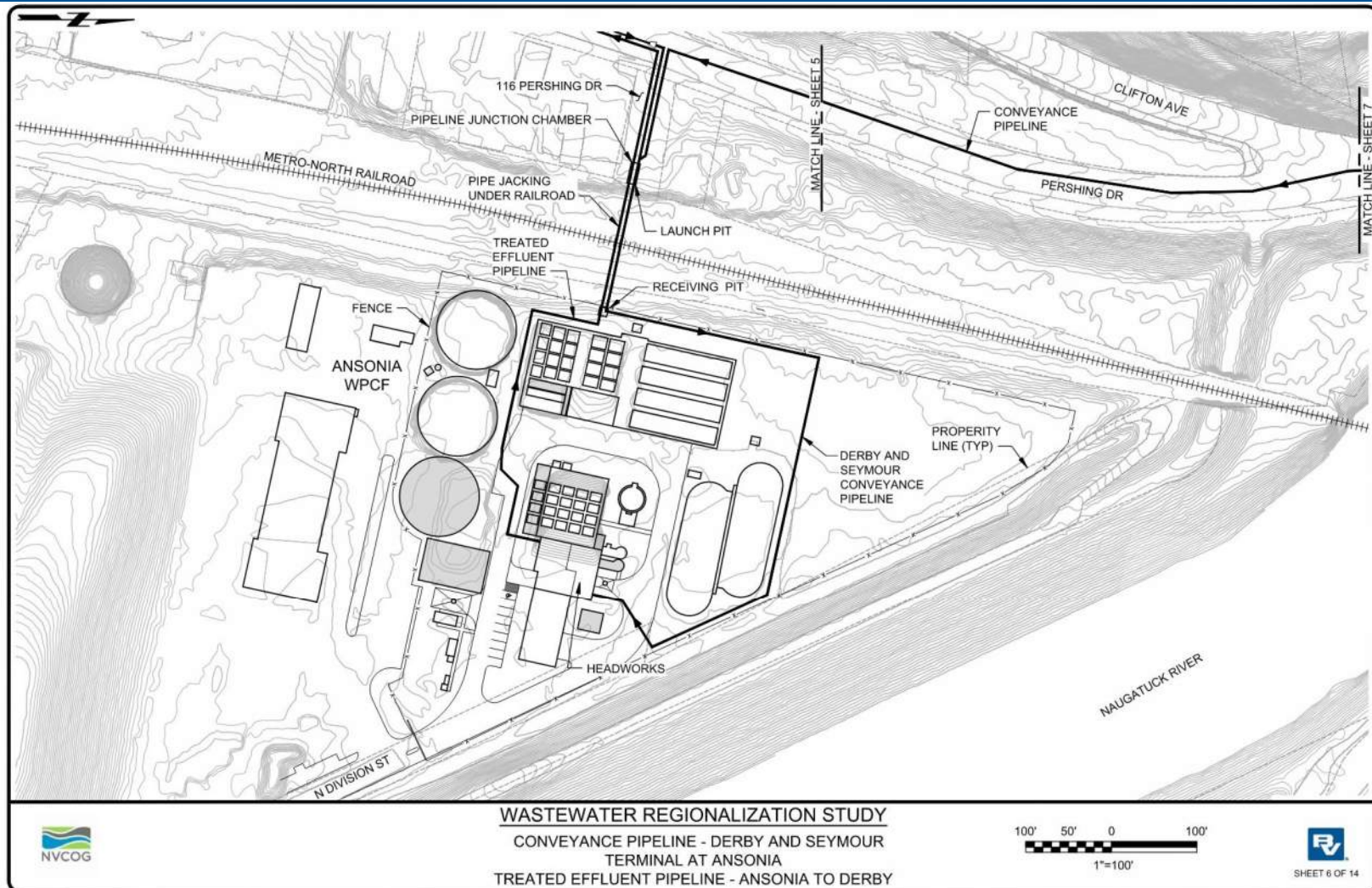
No.	Regional Alternative	Regional Alternative Costs (millions)			Base Cases	Base Case Costs (millions)			Present Worth Difference (millions)
		Capital	O&M	Total		Capital	O&M	Total	
Ansonia Regional Alternatives									
3	Derby to Ansonia	\$78.2	\$57.5	\$135.7	Derby + Ansonia	\$85.7	\$67.9	\$153.6	\$17.9
4	Derby to Ansonia, Effluent Pumped to Housatonic River	\$71.1	\$57.1	\$128.2	Derby + Ansonia	\$85.7	\$67.9	\$153.6	\$25.4
5	Derby + Seymour to Ansonia	\$125.8	\$74.2	\$200.0	Derby + Ansonia + Seymour	\$118.1	\$95.6	\$213.7	\$13.7
5b	Derby + Seymour to Ansonia, Effluent Pumped to Housatonic River	\$117.6	\$73.8	\$191.4	Derby + Ansonia + Seymour	\$118.1	\$95.6	\$213.7	\$22.3
Derby Regional Alternatives									
8a	Ansonia to Derby	\$109.2	\$59.3	\$168.5	Derby + Ansonia	\$85.7	\$67.9	\$153.6	(\$14.9)
9a	Seymour + Ansonia to Derby	\$157.2	\$76.8	\$234.0	Derby + Ansonia + Seymour	\$118.1	\$95.6	\$213.7	(\$20.3)

*Alternatives 4 and 5b most financially attractive  
Alternative 5b has additional environmental benefit*

The background is a dark blue field filled with fine, lighter blue diagonal lines. On the left side, there is a large, solid blue circular shape, partially cut off by the edge of the frame. A thin, light blue arc is visible just inside the edge of this circle.

## **TASK 4 – DEVELOPMENT OF RECOMMENDED REGIONAL ALTERNATIVE**

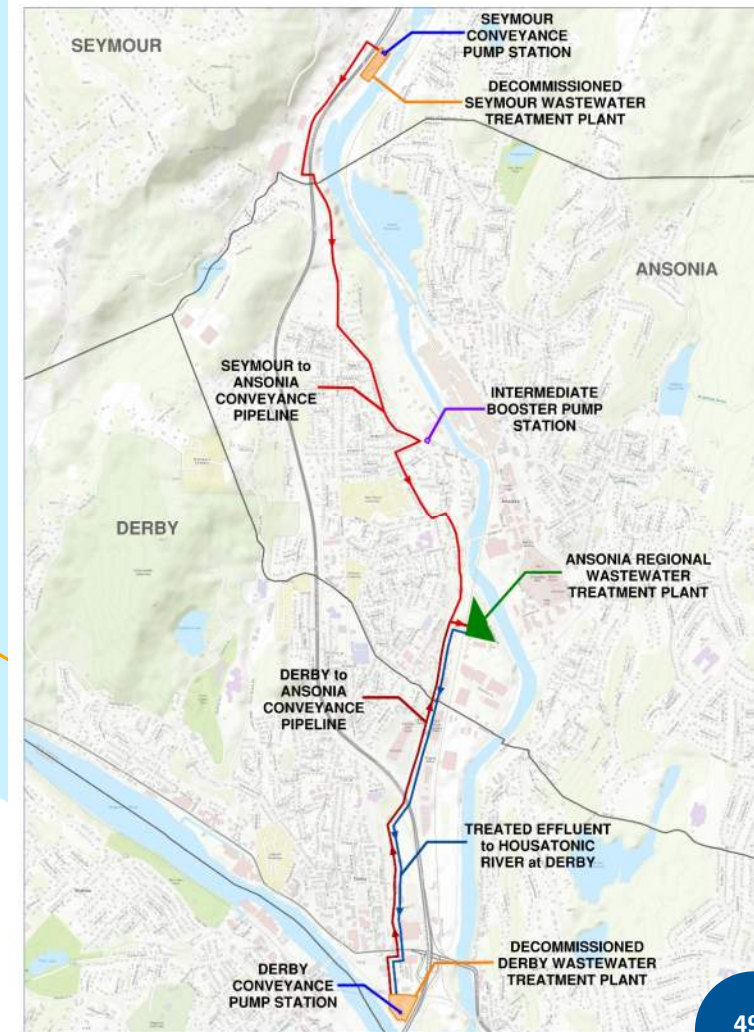
# Further Development of Regional Alternative





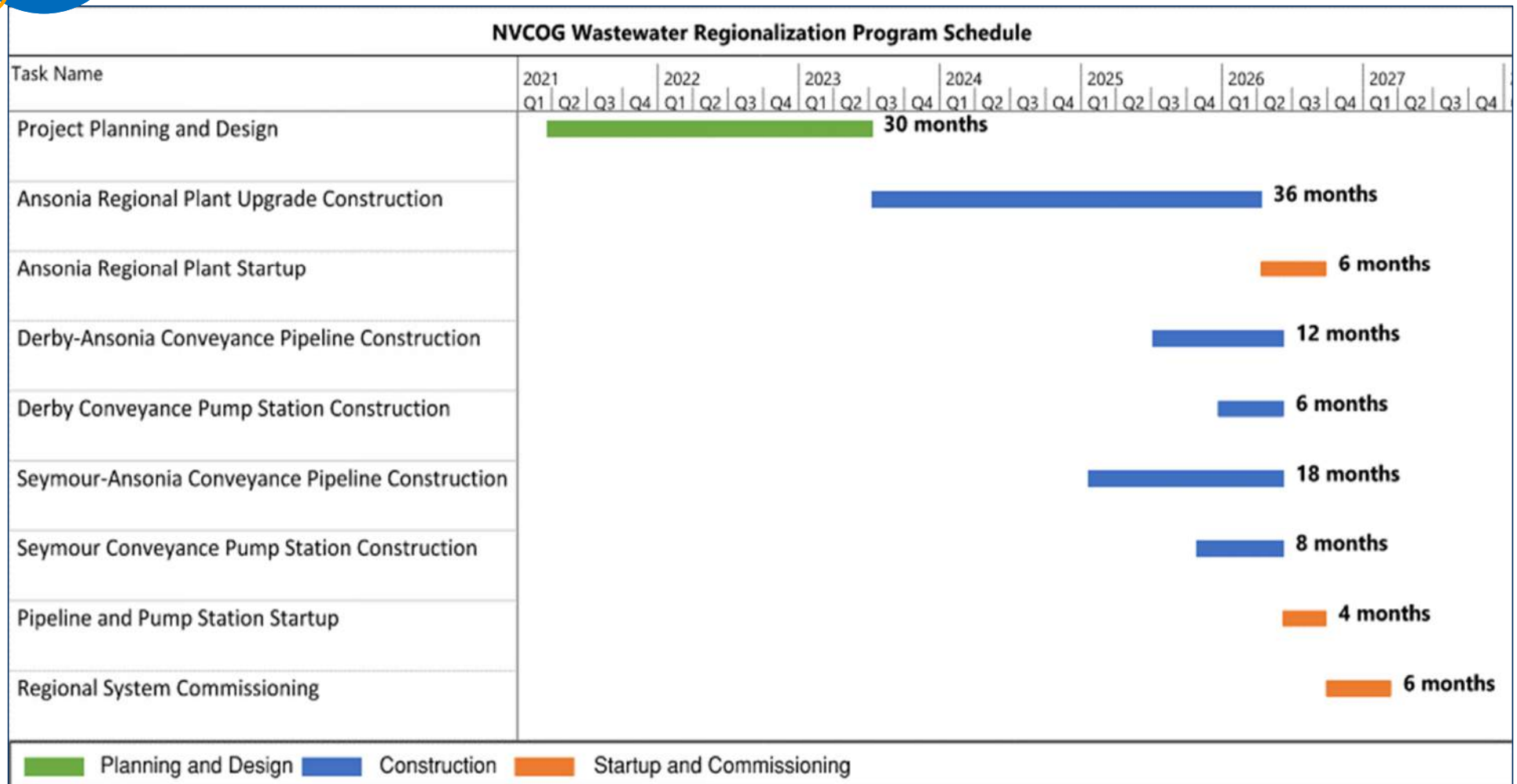
# Conveyance Pipeline Routine

- Seymour intermediate booster pump station
- Trenchless crossings – Jack and Bore
  - Route 8 crossings
  - Railroad crossings
- Property easements and acquisitions
- Effluent Discharge to Housatonic





# Overall Schedule



# Project Funding

- A combination of Grant & Low-interest loans for eligible wastewater capital project
- Eligible Municipal Projects receive:
  - 20% Grant
  - 80% Low-Interest Loan

## The Clean Water Fund Financial Assistance for Municipal Projects

The Clean Water Fund is the mechanism through which CT DEEP provides financial assistance to municipalities for projects addressing wastewater needs.

Due to resource constraints, municipalities should allocate a minimum of 90 calendar days from the date of submission to CT DEEP for the review and comment or approval of a document submitted related to the Clean Water Fund. These documents may include, but are not limited to, funding applications, engineering reports, plans and specifications, and professional services contracts.

**Implementation of or execution of such documents without prior written approval by CT DEEP will result in loss of funding eligibility for the subject of the document.**

Reports regarding CWF

- [Clean Water Fund Annual Reports to the Governor](#)
- [The Clean Water Fund Dilemma, Increasing Demands with Diminishing Fiscal Resources](#): A Report from the Clean Water Fund Advisory Workgroup to DEEP Commissioner Gina McCarthy



## Regional Wastewater Authority Pursuant to C.G.S Section 22a-500

- Involving – Regional WPCF, conveyance pipelines and collection systems
- Benefits:
  - Higher grant percentage (25%) for initial eligible project
  - Greater population served and WQ benefits – often more fundable
- Recommend Regional Wastewater Authority – CGS Section 22a-500
  - Full Ownership
  - Greater accountability and compliance with federal, state, local laws governing wastewater infrastructure and treatment

# Recommended Alternative

No.	Regional Alternative	Regional Alternative Costs (\$M)			Base Case, No Realization	Base Case Costs (\$M)			Present Worth Savings in Regionalization (\$M)
		Capital	O&M	Total		Capital	O&M	Total	
3	Derby to Ansonia	\$58.7	\$57.5	<b>\$116.2</b>	WPCF's Remain in Derby, Ansonia	\$68.6	\$67.9	<b>\$136.5</b>	<b>\$17.9</b>
4	Derby to Ansonia, Effluent Pumped to Housatonic River	\$53.3	\$57.1	<b>\$110.4</b>	WPCF's Remain in Derby, Ansonia	\$68.6	\$67.9	<b>\$136.5</b>	<b>\$26.1</b>
5	Derby + Seymour to Ansonia	\$94.4	\$74.2	<b>\$168.6</b>	WPCF's Remain in Derby, Ansonia, Seymour	\$94.5	\$95.6	<b>\$190.1</b>	<b>\$21.5</b>
<b>5b</b>	<b>Derby + Seymour to Ansonia, Effluent Pumped to Housatonic River</b>	<b>\$88.4</b>	<b>\$73.8</b>	<b>\$162.2</b>	<b>WPCF's Remain in Derby, Ansonia, Seymour</b>	<b>\$94.5</b>	<b>\$95.6</b>	<b>\$190.1</b>	<b>\$27.9</b>

*Alternative 5b provides greatest financial and environmental benefits*



# Thank you!

