

BUILDING A WORLD OF DIFFERENCE

September 29, 2016

PUBLIC HEARING

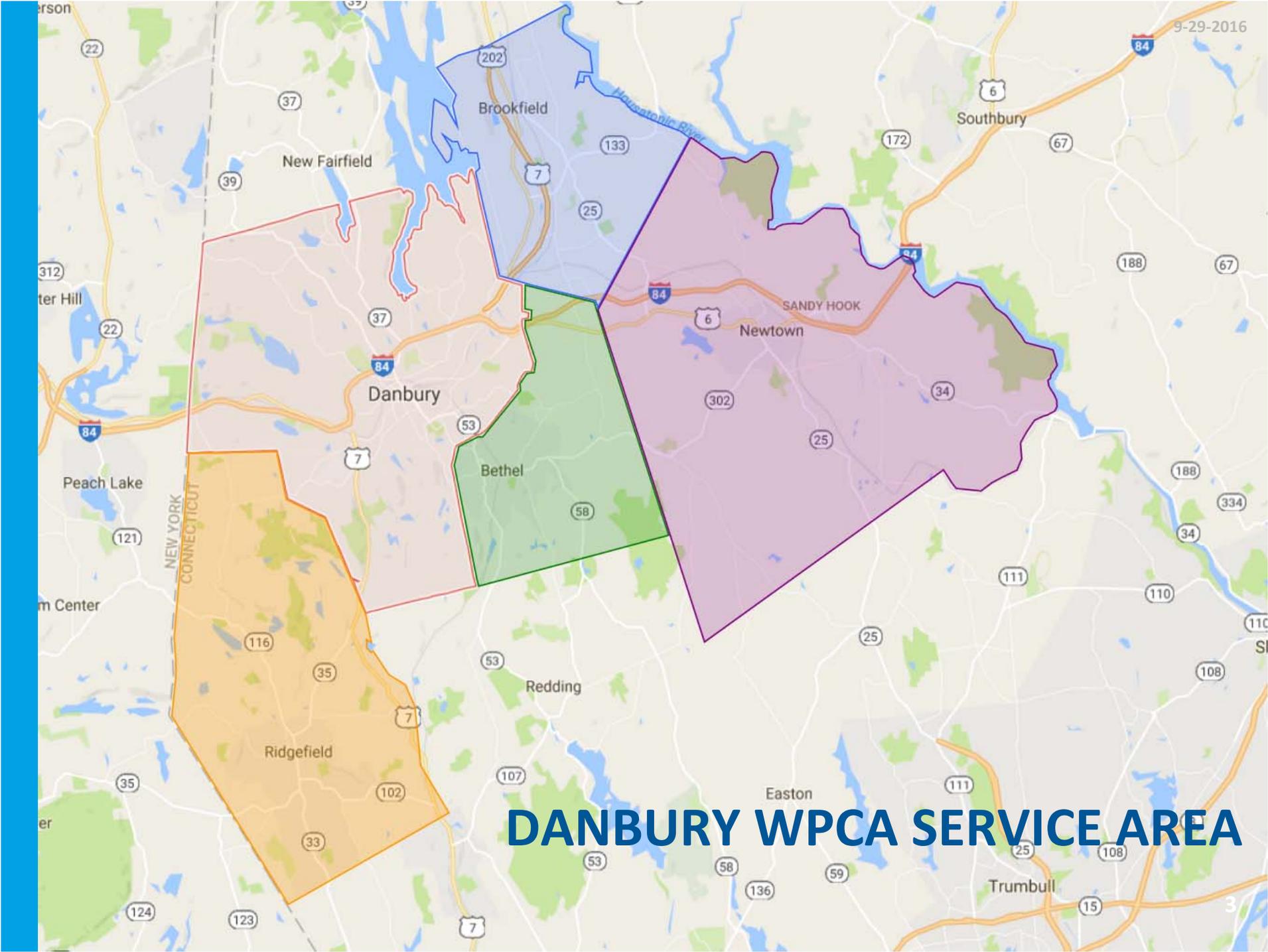
CITY OF DANBURY
WATER POLLUTION CONTROL PLANT
NUTRIENT REDUCTION FACILITIES PLAN



BLACK & VEATCH
Building a world of difference.®

OUTLINE

- Danbury WPCA Service Area
- Danbury WPCP
- Project Drivers & Objectives
- Facilities Planning Approach
 - Future Flows and Loads
 - Existing Treatment Systems
 - Tertiary Treatment for Phosphorous Removal
 - Liquid Stream Treatment - Long Term
 - Sludge Treatment Assessment
- Schedule
- Capital Costs
- Project Funding Plan
- What Are the Next Steps?
- Comments



DANBURY WPCA SERVICE AREA

DANBURY WPCP

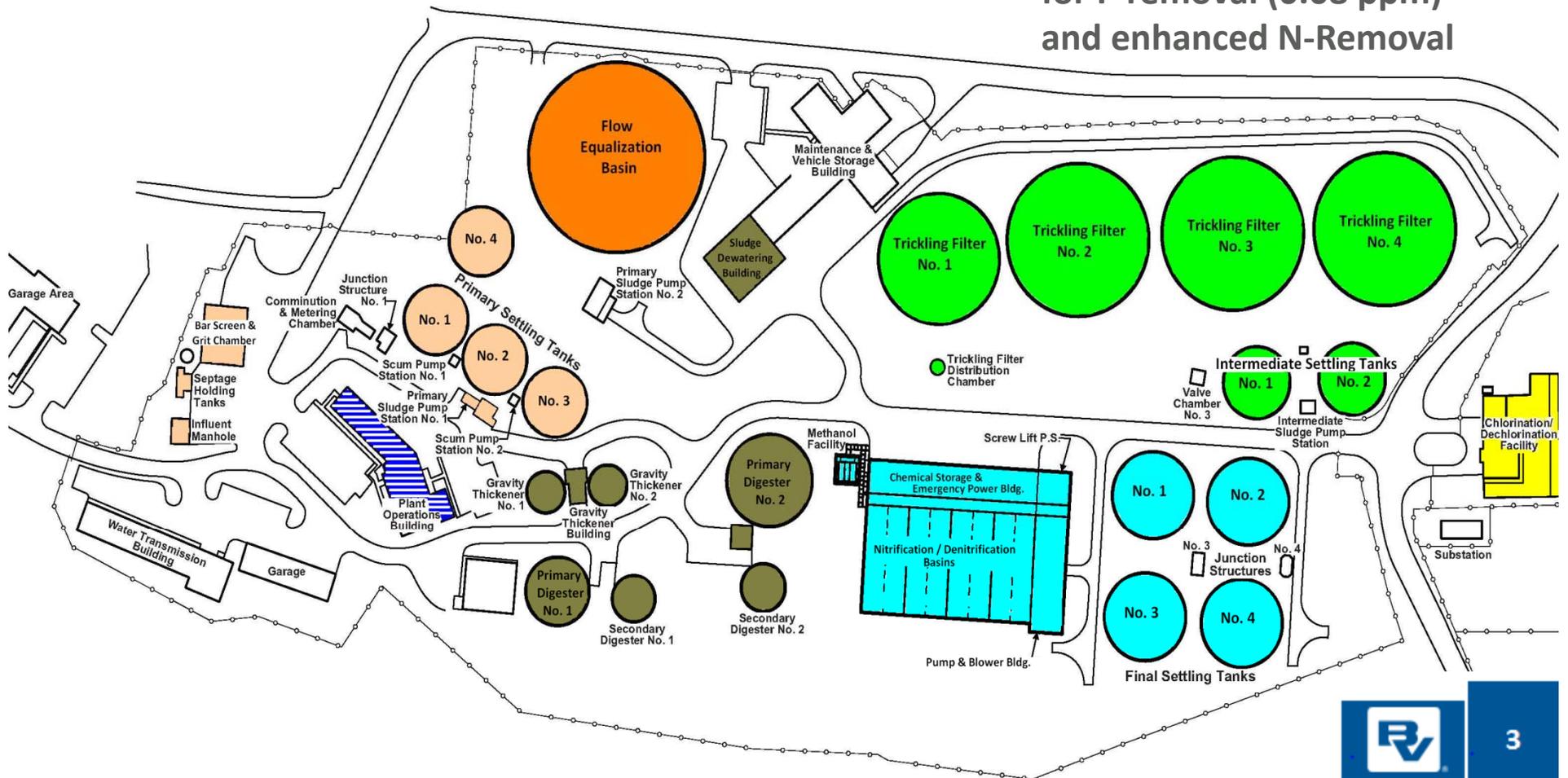
CURRENTLY

9-29-2016

- 15.5 MGD treatment capacity for BOD and TSS
- 11 MGD treatment capacity for interim N-Removal

PROPOSED

- 11 MGD treatment capacity for P removal (0.08 ppm) and enhanced N-Removal



PROJECT DRIVERS

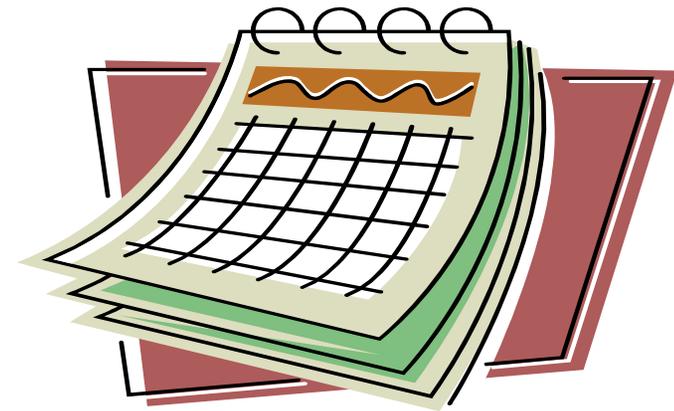


- **DEEP Order and NPDES Permit**
 - Order, July 14, 2008 - higher degree of P & N removal
 - Order modified January 11, 2011, 0.1 mg/L for P and 442 ppd for N
 - P is a concern for Limekiln Brook, Still River & Lake Lillinonah and N is a concern for LIS
 - NPDES permit (Oct 30, 2014) requires seasonal limit (April-Oct) for P=7.55 ppd, or 0.08 mg/L at 11 mgd
- **Pressure from environmental groups (FOTL, CFE, others)**
- **Aging systems and equipment**
 - Last major upgrade completed 1993
 - Some equipment in service since mid-1970's or longer and at or approaching useful life



OBJECTIVES

- Develop Facilities Plan addressing Plant needs through 2040 and meet more stringent P & N Limits
- Identify Required Capital Improvements
- Prepare Cost and Schedule



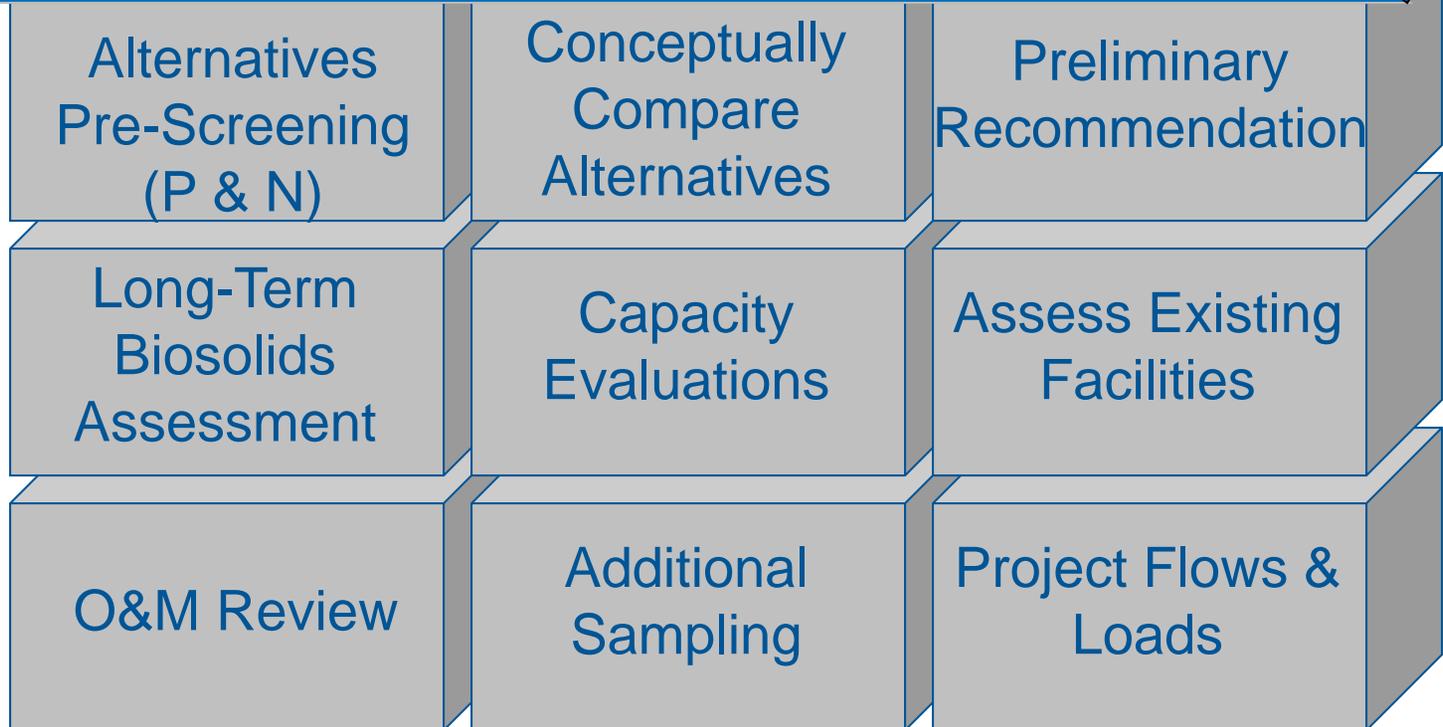
FACILITIES PLAN APPROACH

Develop Recommended Plan

Regulatory Review & Approval



Public Participation



FUTURE FLOWS & LOADS



FUTURE FLOWS AND LOADS

9-29-2016

PARAMETER	EXISTING ⁽¹⁾ (2010-11)	PROJECTED ⁽²⁾ FUTURE (2040)
FLOW		
Annual Average (MGD)	8.9	11.0
Maximum Month (MGD)	13.4	16.5
Peak Day-Headworks (MGD)	23.1	28.6
BOD₅ (biochemical oxygen demand)		
Annual Average (lbs/d)	17,900	22,100
Maximum Month (lbs/d)	21,500	26,500
TSS (total suspended solids)		
Annual Average (lbs/d)	19,400	24,000
Maximum Month (lbs/d)	27,200	33,600
N (Nitrogen)		
Annual Average (lbs/d)	3,040	3,750
Maximum Month (lbs/d)	3,650	4,500
P (Phosphorous)		
Annual Average (lbs/d)	350	440
Maximum Month (lbs/d)	420	530
⁽¹⁾ Reflects current WPCP Flows		
⁽²⁾ Do not anticipate reaching current plant design flow of 15.5 MGD		

CONDITION ASSESSMENTS - EXISTING TREATMENT SYSTEMS



MAJOR EQUIPMENT & SYSTEMS WERE INSPECTED



HEADWORKS BUILDING



BELT FILTER PRESS



SCREW PUMPS



TRICKLING FILTER

MAJOR EQUIPMENT & SYSTEMS WERE INSPECTED



NITRIFICATION BASINS



INTERMEDIATE SETTLING BASINS



GRAVITY THICKENER



MOTOR CONTROL CENTER

EXTENSIVE EXISTING SYSTEMS ASSESSMENTS SUMMARY OF FINDINGS & RECOMMENDATIONS

9-29-2016

EQUIPMENT	LOCATION	DESCRIPTION	CONDITION & AGE	RECOMMENDATION
Mechanical Fine Screen	Headworks Building	1 - Huber step screen, 5 ft	2004; good condition; inadequate capacity for high flows	Replace with new Headworks Building
Grit Chamber	Int. Collector	Intermediate Settling Tanks	2 - 80 ft diameter with 12 ft SWD	1993; fair condition
Scum Concentrator	Methanol Pumps	Primary Sludge Pumps/Grinders	Gravity Thickener Pump Station	1 cavity pump, 1 hose pump, 2 grinders
Comminutors	Blowers	Gravity Belt Thickeners	1993 and prior; poor condition	Replace pumps, grinders, valves and piping
Flowmeter	Collector	Gravity Belt Thickeners	1993; out of service; floating roof broken	Replace/repair floating roof
Primary Settling Tank Mechanisms	Mechanisms	Thickeners	1993; fair condition	Replace pumps, piping and valves
Primary Sludge Pumps	RAS Pumps	GBT Polymer Pumps	1993; fair condition	Replace pumps, piping and valves
Primary Sludge Pumps	WAS Pumps	GBT Filtrate Pumps	1993; fair condition	Replace pumps, piping and valves
Primary Scum Pump & Mixer	Lime Slurry Pumps	Thickened WAS Pumps	1993; fair condition	Replace pumps, piping and valves
Primary Scum Pump & Mixer	Foam and Spray Water Pumps	Anaerobic Primary Digester No. 1	2 - Horizontal recessed impeller @ 350 gpm	1993; fair condition
Floating Aerators	Sec. Scum/Dewatering Pumps	Anaerobic Sec. Digester No. 1	Tube-in-tube hot water heat exchanger	1993; fair condition
Trickling Filter No. 1	Sodium Hypo Feed Pumps	Digester No. 1 Sludge Pumps	3 - two meter BFPs	1993; poor condition
Trickling Filter No. 2	Sulfur Dioxide Gas Feed System	Digester No. 1 Sludge Recirc. Pumps	2 - Horizontal recessed impeller @ 350 gpm	1993; fair condition
Trickling Filter/EQ Basin Pumps	Aeration Blowers	Digester No. 1 Heat Exchanger	Tube-in-tube hot water heat exchanger	1993; fair condition
Sludge Cake Conveyor	Plant Water Pumps	Anaerobic Primary Digester No. 2	3 - two meter BFPs	1993; poor condition
	Primary Sludge Degritters	Anaerobic Sec. Digester No. 2	5 pumps: 2 pumps @ 20 gpm, 4 pumps @ 5 gpm	1993; good condition
	Collector Mechanisms	Digester No. 2 Sludge Pump	1 - 24 inch belt, 7,000-24,000 lbs/hr	1993; fair condition
		Anaerobic Prim. Digester No. 2	Tube-in-tube hot water heat exchanger	1993; fair condition
			3 - two meter BFPs	1993; poor condition
			5 pumps: 2 pumps @ 20 gpm, 4 pumps @ 5 gpm	1993; good condition

TERTIARY TREATMENT- PHOSPHORUS REMOVAL



TERTIARY TREATMENT FOR PHOSPHOROUS REMOVAL

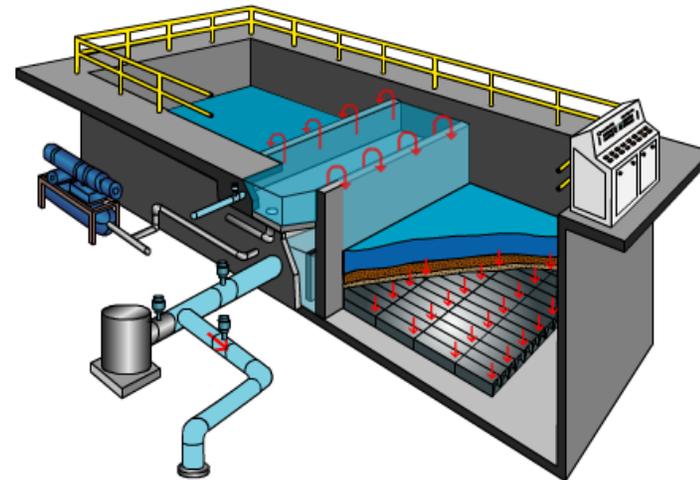
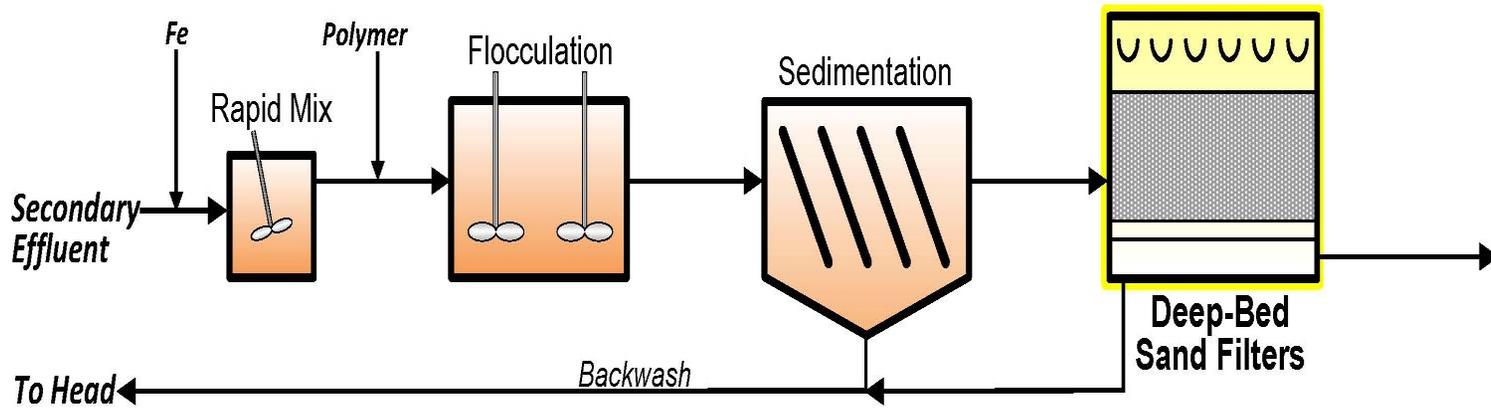
After screening analysis, three alternatives were selected for further consideration

- Alternative A – Flocculation/Sedimentation with Deep Sand Filters
- Alternative B – Flocculation/Sedimentation with Cloth Disk Filters
- Alternative C – Flocculation with Membrane Filters

Alternative A selected – most cost effective and best able to meet low P limits



RECOMMENDED TERTIARY P FILTRATION SYSTEM (ALTERNATIVE A)



BIOLOGICAL NUTRIENT REMOVAL TREATMENT EVALUATION

STARTED WITH EIGHT ALTERNATIVES



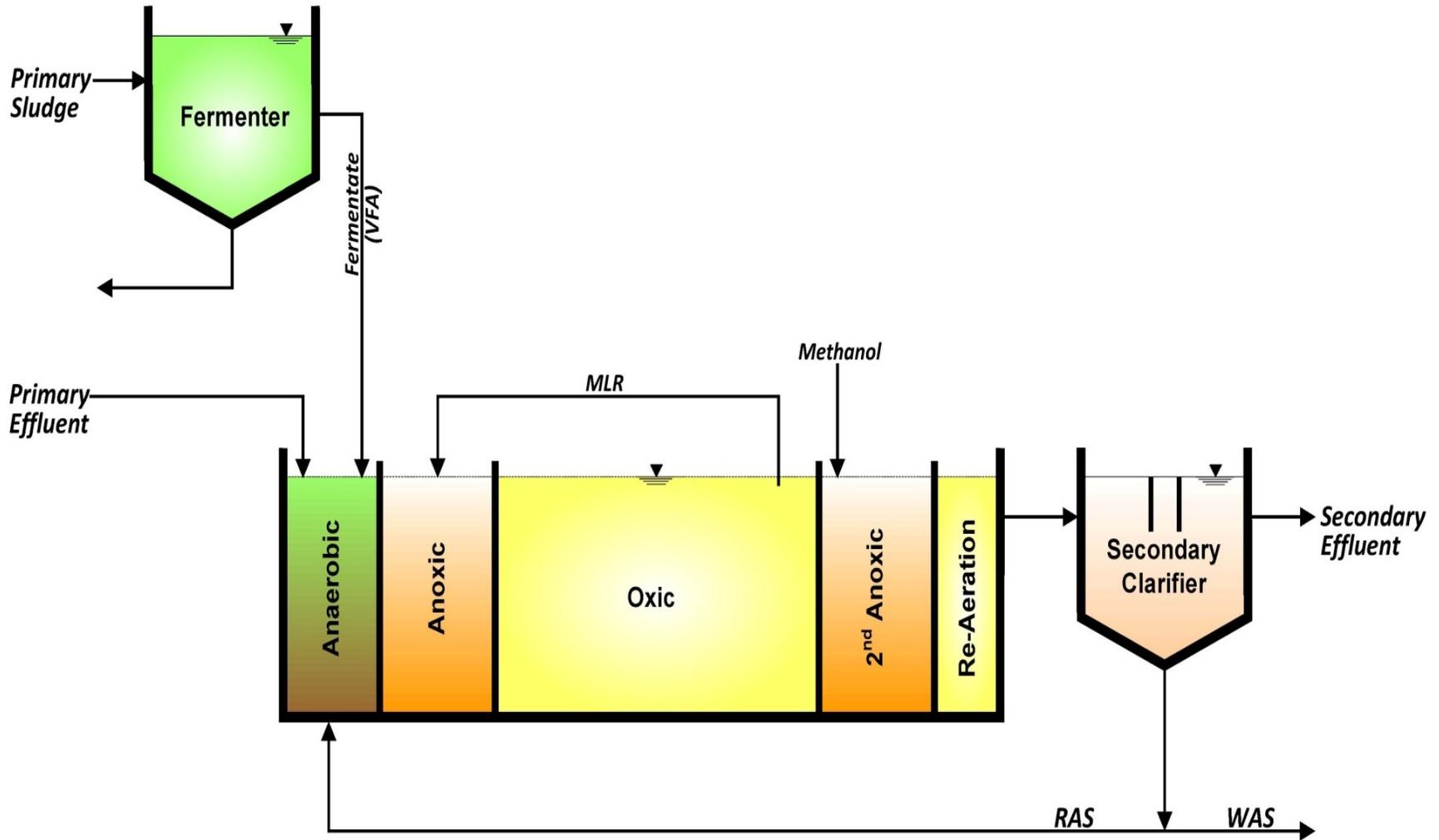
BIOLOGICAL NUTRIENT REMOVAL (P & N) TREATMENT EVALUATION

Four BNR Treatment Alternatives were short-listed for in-depth Engineering Evaluation

- ALTERNATIVE 1 – Five Stage Bardenpho activated sludge process
- ALTERNATIVE 2 – Five Stage Bardenpho using IFAS media
- ALTERNATIVE 3 – Three-Stage Activated Sludge followed by MBBR
- ALTERNATIVE 4 – Modified Existing Process (continued use of TFs)

ALTERNATIVE 1 selected – most cost effective and, has a well established performance record, with process flexibility, & operational simplicity

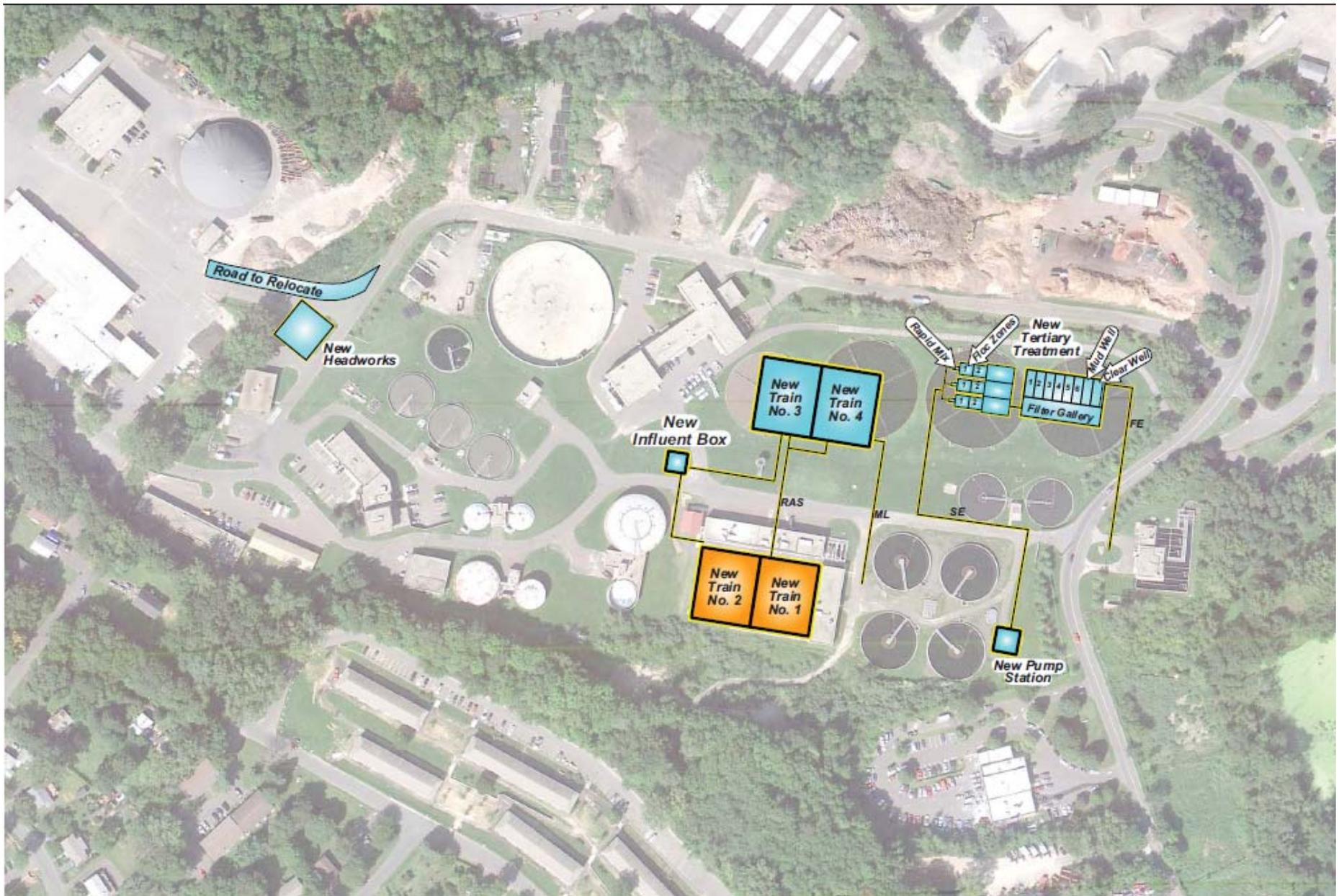
RECOMMENDED BIOLOGICAL NUTRIENT REMOVAL TREATMENT ALTERNATIVE



ALTERNATIVE 1 - Five-Stage Bardenpho Activated Sludge Process

Alt 1 – Five Stage Bardenpho & Tertiary P Deep Bed Sand Filters

9-29-2016



Modified Structure; New Structure

SLUDGE TREATMENT SYSTEM EVALUATION

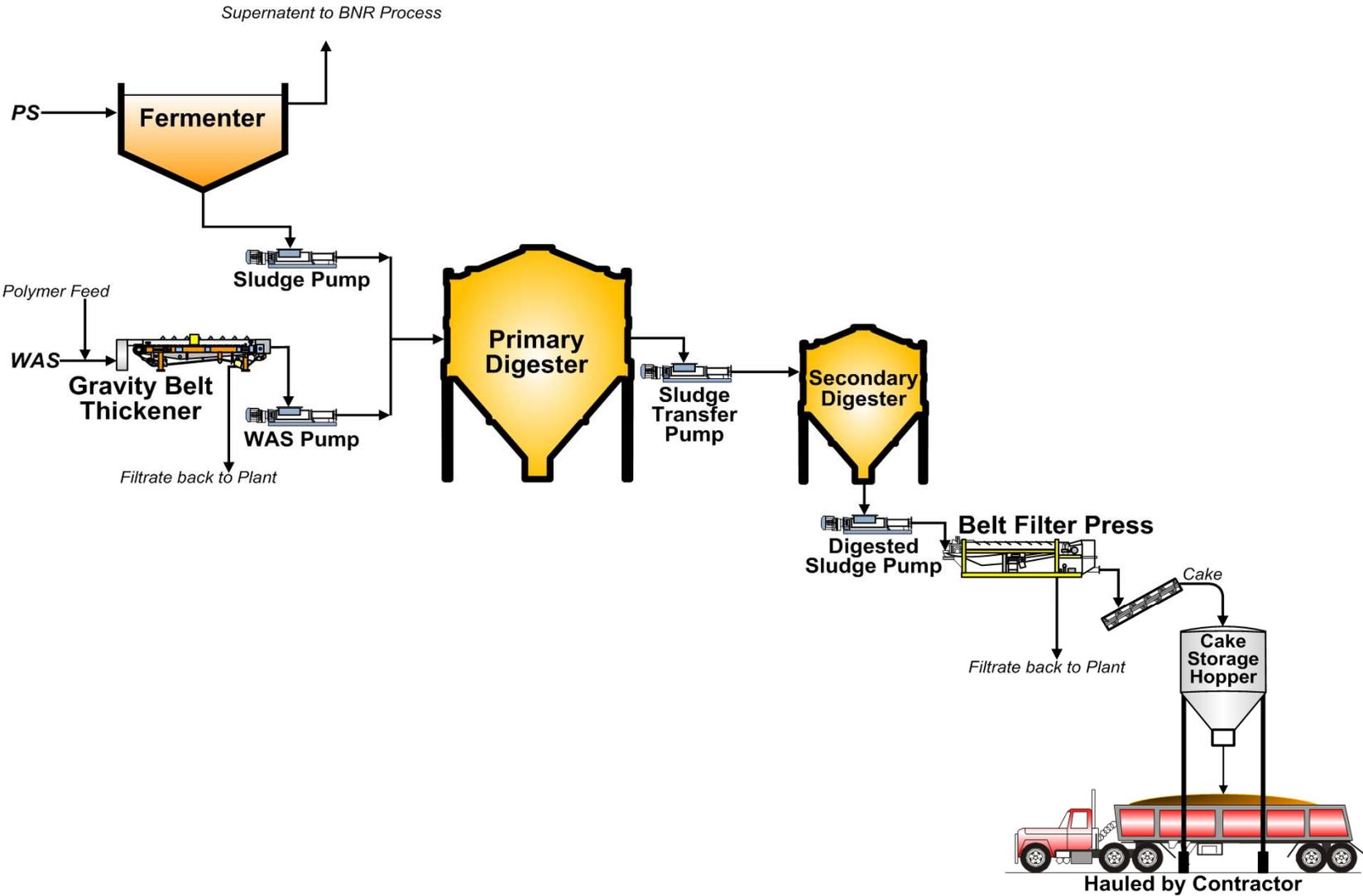


FOUR SLUDGE PROCESSING ALTERNATIVES

- ALTERNATIVE 1 – Raw Thickened Liquid Sludge
- ALTERNATIVE 2 – Raw Dewatered Sludge
- ALTERNATIVE 3 – Anaerobically Digested Thickened Liquid Sludge
- ALTERNATIVE 4 – Anaerobically Digested Dewatered Sludge

ALTERNATIVE 4 selected – most cost effective and provides the most flexibility

RECOMMENDED SLUDGE PROCESSING ALTERNATIVE



ALTERNATIVE 4 - Anaerobically Digested Dewatered Sludge

DIGESTER GAS ENERGY RECOVERY



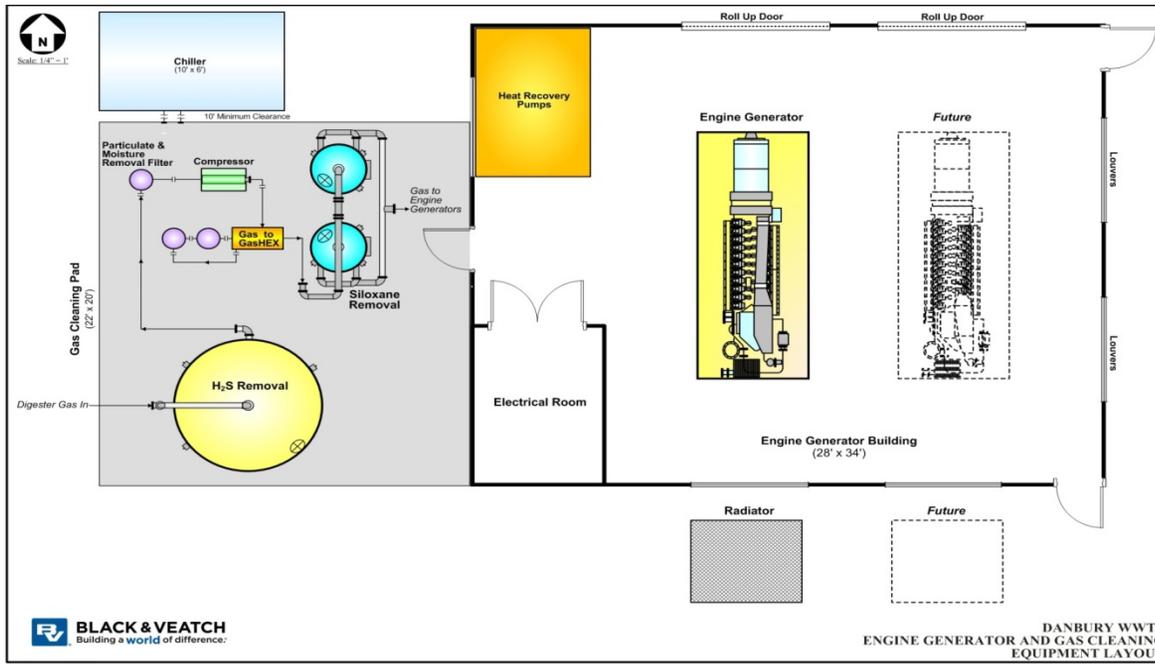
DIGESTER GAS ENERGY RECOVERY EVALUATION

- Compared Engine Generators and Microturbines in a CHP application
 - Conclusion - 13 year payback with E-G, w/o green power grants. Green Energy Credits may apply
 - City is reviewing Co-Digestion

Engine Generator



Low-emission Microturbines



SCHEDULE



SCHEDULE DRIVERS

- **CT DEEP requires new facilities to be operational and NPDES permit compliant by April 2022**
- **Eligible for 50% phosphorous treatment grant requires construction start by July 2019**

PROJECT TIMELINE

- Sept 29, 2016 – Public Hearing For Facilities Plan
- November 2016 – \$10M Bond Referendum for Engineering Design
- By end 2016 – DEEP Approval of Facilities Plan
- Nov 2016 thru 2018 – Design & Construction Bidding
- November 2017 – Bond Referendum WPCP Construction
- March 2019 – Award Construction Contract
- April 2019 to April 2022 – Construction & Commissioning

TOTAL CAPITAL COST



RECOMMENDED PLAN

Liquid Treatment Alternative 1 -New Headworks -P Treatment Systems -Secondary/N Improvements -Plant Improvements and Upgrades -Sitework, Yard Piping, Appurtenances, & Demo	\$73,930,000
Solids Treatment Alternative B-1 Digested Cake	\$8,092,000
Energy Recovery Engine Generator	\$4,862,000
Total in 2016 Dollars	\$86,884,000
Total @ Mid-point of Construction (approx. October 2020)	\$97,000,000
¹ Capital costs include equipment, construction installation and startup. Also include general requirements, sitework, system-specific electrical and instrumentation.	

PROJECT FUNDING PLAN



INTER-LOCAL AGREEMENTS & FLOWS TO WPCP

	CURRENT DESIGN CAPACITY AT WPCP (MGD)	FLOW COMMITMENT PER FACILITIES PLAN (MGD)	FLOW COMMITMENT RECENT DISCUSSIONS (MGD)
BETHEL	2.0	1.5	2.0
BROOKFIELD	0.5	0.38	0.38
NEWTOWN	0.15	0.11	0.15
RIDGEFIELD	0.14	0.14	0.14
DANBURY	12.7 ⁽¹⁾	8.87	8.87
TOTAL	15.5 MGD	11 MGD	11.54 MGD
⁽¹⁾ Includes 0.85 MGD Regional Reserve Capacity paid by Danbury			

Bethel & Newtown flows add a total of 0.54 MGD to Facility Plan plant average flow capacity, thus 11.54 MGD now vs 11 MGD in the FP



RECOMMENDED PLAN

Liquid Treatment Alternative 1 -New Headworks -P Treatment Systems -Secondary/N Improvements -Plant Improvements and Upgrades -Sitework, Yard Piping, Appurtenances, & Demo	\$77,560,000
Solids Treatment Alternative B-1 Digested Cake	\$8,490,000
Energy Recovery Engine Generator	\$5,100,000
Total in 2016 Dollars	\$91,150,000
Total @ Mid-point of Construction (approx. October 2020)	\$101,800,000
¹ Capital costs include equipment, construction installation and startup. Also include general requirements, sitework, system-specific electrical and instrumentation.	

CT CLEAN WATER FUND

- Allows for partial grant and long term low interest loan

FACILITIES	ELIGIBLE GRANT (%)
Phosphorus Treatment	50 ⁽¹⁾
Nitrogen Treatment	30
All Other Work	20
⁽¹⁾ Through coalition group efforts grant was increased from 30% to 50%	

TOTAL CAPITAL COST	GRANT ⁽²⁾ AMOUNT	LOAN AMOUNT
\$101,800,000	\$34,000,000	\$67,800,000
⁽²⁾ DEEP to Confirm		



SUMMARY OF PROPOSED COST BY MUNICIPALITY

TOTAL CAPITAL COST	GRANT ^{(1) (2)} AMOUNT	LOAN AMOUNT
\$101,800,000	\$34,000,000	\$67,800,000
<p>⁽¹⁾ DEEP to confirm</p> <p>⁽²⁾ Grant risk due to state funding issues would result in large increase to allocated costs</p>		

TOWN/CITY	LOAN SHARE AMOUNT, ROUNDED (\$)		
	Original	New Increment	Total
BETHEL	8,812,000	2,963,000	11,775,000
BROOKFIELD	2,229,000	N/A	2,229,000
NEWTOWN	646,000	237,000	883,000
RIDGEFIELD	820,000	N/A	820,000
DANBURY	52,262,000	N/A	52,262,000
TOTAL LOAN AMOUNT	\$64,600,000	3,200,000	67,800,000

WHAT ARE THE NEXT STEPS?



NEXT STEPS

- 1. Comments received tonight are being documented and will be submitted to DEEP.**
- 2. There is a thirty day public comment period. This began on Sept 20, 2016 and will end on Oct 20, 2016.**
- 3. Submit public comments to the City.**
 - a) Send to David Day, Danbury Superintendent of Public Utilities at either:
 - d.day@danbury-ct.gov or,
 - City of Danbury, 155 Deer Hill Avenue, Danbury, CT 06810
- 4. DEEP completes the Facilities Plan review process.**

COMMENTS

