

## MEMORANDUM



TO: Kurt Zemba, Chairman, Old Lyme WPCA  
FROM: Dave Prickett, PE, Vice President, Woodard & Curran  
DATE: November 12, 2013  
RE: Coastal Wastewater Management Plan Project – Collection System Alternatives

As a follow-up to questions and comments presented during and following the October 8, 2013 WPCA meeting, we offer the following summary of our collection system alternatives analysis that resulted in our recommendation of the gravity sewer alternative for the local alternative. There are five distinct advantages to the gravity sewer alternative, as compared to STEP/G systems, as follows:

- Disposal/Reuse Recommendations Dictate High-Level of Treatment: As discussed during this project, wastewater management infrastructure consists of collection, treatment and disposal/reuse systems. For the local alternative, it is critical to consider disposal and reuse needs, before considering treatment and collection options. For Old Lyme's local alternative, a combination of sub-surface disposal and reuse are proposed. Based on the State's water quality standards and permitting requirements, advanced wastewater treatment is anticipated. We recommended a membrane bioreactor (MBR) system with ultraviolet (UV) light disinfection. This treatment combination will maximize nutrient removal, solids separation, and pathogen reduction, providing a reuse quality effluent. Due to the nutrient removal requirements, a high carbon content in the wastewater is needed as a food source for the microorganism. Unfortunately, with the STEP/P collection system alternatives, a significant carbon volume is removed in the septic tanks. Supplemental carbon can be added to the treatment system, but these chemicals are either proprietary and expensive (i.e. Micro-C), or explosive and dangerous (methanol) for operations staff. Although the capital costs for treatment are slightly lower for the STEP/G alternatives than the gravity/low pressure alternatives, the annual O&M and lifecycle costs for the STEP/G alternatives are significantly higher for collection due to the price of individual septage hauling and the capital cost of the septic tanks and/or grinder pumps.
- Septic Tank Siting Requirements: It is critical that septic tanks function efficiently for the STEP/G systems, since they are an integral part of the overall systems. Based on our review of existing planning documents, discussions with WPCA members (some who have personally managed a local septage program for the past 10 to 15 years), and local contractors, we anticipate that at least 50% of the parcels would require a new septic tank for the STEP/G alternatives. These requirements are driven by lack of modern systems, deficient tank sizes, and tanks that were compromised during installation to mitigate high groundwater conditions. In addition, many of the parcels in the high-needs areas are very small lots in the 5,000 to 10,000 square foot size, with limited availability for septic tanks. This impacts set-backs, zoning, future home renovations and in some cases aesthetics. For these reasons, gravity sewers are preferred over all other collection system alternatives in the Project Area.
- Our Experiences Designing, Constructing and Operating These Systems: Because we have designed, constructed and operated all of the alternatives considered as part of this project, we understand the post-construction administrative and operational needs, have learned from these experiences, and stand-ready to provide Old Lyme with an objective alternatives analysis, a first-hand operators perspective, and recommendations that balance capital costs, annual O&M costs, and long-term sustainability for the Town and its residents. For example, we operate the only municipal STEP/G system in New England in Gloucester. During this project, we have dealt with the challenges of managing septage on private properties, experienced pump-out rates higher than expected during the planning phase, and have seen text book guidelines not pan out over the long-haul.



- Emergency Readiness and Storm Preparedness: As we evaluated the collection system alternatives, we realized that the topography of the land within the Project Area lends itself to certain sewer alternatives being more resistant to coastal storms. For example, both the low pressure and STEP alternatives would be subject to extended power outages and electrical shorts due to the power requirements for those systems. Conversely, the gravity alternative allows for a limited number of pump stations, each of which can be elevated, made watertight, reinforced for storm surges, and outfitted with emergency generators. During our experiences in Provincetown, operating a municipal vacuum sewer system in a coastal community, we have first-hand experience planning and maintaining systems through severe coastal storms. This gives us unique perspective to recommend collection systems that are most resilient to extreme weather events in Old Lyme.
- Cost Differential: Overall, we presented total costs to the homeowners over the 20 year planning horizon. These include capital, annual O&M and financed costs. All capital costs reflect publicly-constructed unit prices and prevailing wage rates, as will be required by CT-DEEP CWF requirements if the Town uses CWF loan/grant funds. Considering collection, treatment and disposal/reuse capital costs for the local alternative, the STEG alternative is \$3.8 million more costly (9%) than the gravity sewer alternative if only 50% of the existing septic systems are replaced. If all septic systems are replaced, the STEG alternative is \$6.8 million more costly (16%) than the gravity alternative. In addition, the anticipated annual O&M costs for the STEG alternative are \$165,000 more costly (25%) than the gravity sewer alternative.

**Table A**

SUMMARY OF LOCAL TREATMENT COSTS						
Item No.	Description	Gravity	LPS	STEG	STEP	
1	Headworks Building <sup>1</sup>	\$807,000	\$767,000	\$646,000	\$613,700	
2	MBR Building <sup>2</sup>	\$4,994,000	\$4,994,000	\$4,744,000	\$4,744,000	
3	Pre-anoxic & Anoxic Tanks <sup>3</sup>	\$458,000	\$435,000	\$412,000	\$391,000	
4	Administration Building addition	\$144,000	\$144,000	\$144,000	\$144,000	
5	Influent Equalization <sup>4</sup>	\$465,000	\$442,000	\$465,000	\$233,000	
6	Effluent Equalization <sup>5</sup>	\$2,850,000	\$2,708,000	\$2,850,000	\$2,708,000	
	Subtotal	\$9,800,000	\$9,500,000	\$9,300,000	\$8,900,000	
	Contingency	\$3,000,000	\$2,900,000	\$2,800,000	\$2,700,000	
	Engineering	\$2,000,000	\$1,900,000	\$1,900,000	\$1,800,000	
	Local Treatment Total	\$14,800,000	\$14,300,000	\$14,000,000	\$13,400,000	

1. STEP and STEG systems assume no course screening is needed in the headworks.

2. STEP and STEG systems assume 5% reduction in total MBR building costs.

3. STEG System assumes a 10% reduction in Pre & Post Anoxic tanks.

4. STEP Systems assume 50% reduction for influent equalization and 5% reduction in Pre & Post Anoxic tanks.

5. LPS and STEP systems assume a 5% decline in effluent equalization.

**Table B**

**Summary of Annual Collection System O&M Costs**

Category	Annual Cost Details		Collection Systems									
	Annual Description		Old Lyme Collection Systems					Regional Costs				
	Gravity	LPS	STEP	STEG	Gravity	LPS	STEP	STEG	Gravity	LPS	STEP	STEG
Labor	Operations <sup>1</sup>	\$99,200	\$99,200	\$99,200	\$99,200							
	Engineering & legal	\$5,000	\$5,000	\$5,000	\$5,000							
	Tech Support <sup>2</sup>	\$19,700	\$19,700	\$19,700	\$19,700							
Power & Billing	Electricity	\$11,000	\$31,000	\$31,000	\$11,000							
	Billing (Additional Town Admin)	\$5,000	\$5,000	\$5,000	\$5,000							
Liquid/Solids	Chemical additon (odor Control) <sup>3</sup>	\$10,200										
	Setpic Pumping <sup>4</sup>			\$215,800	\$215,800							
	Chemical additon (Carbon Addition)											
Mech.	Equip. Replacement <sup>5</sup>	\$42,000	\$54,000	\$54,000	\$27,000							
Other	Downstream East Lyme and Waterford Fees <sup>6</sup>				\$413,000				\$375,000			\$413,000
	Black Hall Fee											
	<b>Sub-Totals</b>	<b>\$192,000</b>	<b>\$214,000</b>	<b>\$430,000</b>	<b>\$383,000</b>				<b>\$413,000</b>	<b>\$375,000</b>		<b>\$413,000</b>
	<b>Regional Totals<sup>7</sup></b>								<b>\$605,000</b>	<b>\$589,000</b>		<b>\$796,000</b>

1. Operations assumes 1 full time class III CT operator for the collection system in Old Lyme
2. Tech Support assumes 40 hours annually for mechanical, electrical, and instruments a year
3. Odor control assumes small amount of chemical addition needed for off season conditions at gravity pump stations
4. Septic Pumping Rates assume 3,500 gal tanks pumped every 2 years at 8 Cents per gallon and \$20 tipping fee
5. Equipment Replacement Assumes 1% to 3% of potential equipment capital costs annually
6. Regional Downstream costs assumes \$3.93 per 1000 gallons for East Lyme Waterford O&M fees (based on East Lyme current costs)
7. Total Regional combines Downstream costs to the annual collection costs in Old Lyme

**Table C**

**Summary of Annual Treatment System O&M Costs**

Category	Annual Cost Details	Treatment			
		Local		Regional	
	Annual Description	Gravity & LPS	STEP / STEG	Gravity / STEG	LPS / STEP
Labor	Operations <sup>1</sup>	\$195,100	\$195,100		
	Engineering & legal	\$5,000	\$5,000		
	Tech Support <sup>2</sup>	\$39,500	\$39,500		
	Electricity	\$22,500	\$22,500		
Power & Billing	Billing (Additional Town Admin)				
Liquid/Solids	Chemical Additon <sup>3</sup>	\$14,000	\$4,200		
	Setpic / Solids Pumping <sup>3</sup>	\$19,700	\$5,900		
	Carbon Addition <sup>4</sup>	\$6,800	\$15,000		
	Equip. Replacement <sup>5</sup>	\$104,000	\$93,600		
Mech.					
Other	New London WPCF Fees <sup>6</sup>			\$186,000	\$169,000
	Black Hall Fee <sup>7</sup>	\$65,000	\$65,000		
	<b>Totals</b>	<b>\$472,000</b>	<b>\$446,000</b>	<b>\$186,000</b>	<b>\$169,000</b>

1. Local Treatment Operations assumes 2 full-time class III operators for treatment in addition to the collection system oper
2. Techsupport assumes 80 hours annually for mechanical, electrical, and instruments a year
3. STEP/STEG assumes a 30% decrease in solids handling and chemical addition (not including carbon addition)
4. Carbon addition needed to supplement BOD Losses for STEP/STEG assumed to be 10,000 Gallons Annually at \$1.50/gallon
5. Equipment Replacement Assumes 1% to 3% of potential equipment capital costs annually
6. Regional Treatment Costs are based on \$1.77 per 10,000 gallons annually
7. Black Hall Reuse fee assumed to be a tax credit for use of property or O&M fee

**Table D**

STEG Sewer Items	Unit Costs	Sub-Area					
		2	5	6	7	8	
Dwelling Units		204	392	342	218	192	
8" Gravity Pipe <sup>1</sup> (LF)	\$ 174	9500 \$ 1,653,000	15900 \$ 2,767,000	15200 \$ 2,645,000	12250 \$ 2,131,500	10800 \$ 1,879,000	
Force Main 3" 6" HDPE (LF)	\$ 91	2800 \$ 255,000	2850 \$ 259,000	1900 \$ 172,900	1900 \$ 172,900	1900 \$ 173,000	
Septic Tanks <sup>2</sup>	\$ 4,500	102 \$ 459,000	196 \$ 882,000	171 \$ 769,500	109 \$ 490,500	96 \$ 432,000	
Spare Build Out Equipment <sup>3</sup>	\$ 2,000	2 \$ 4,000	21 \$ 42,000	3 \$ 6,000	1 \$ 2,000	15 \$ 30,000	
Pump Stations <sup>4</sup> (LS)	\$ 500,000	2 \$ 1,000,000	2 \$ 1,000,000	1 \$ 500,000	1 \$ 500,000	1 \$ 500,000	
Temp Trench Repair <sup>5</sup> (lf)	\$ 20	9500 \$ 190,000	15900 \$ 318,000	15200 \$ 304,000	12250 \$ 245,000	10800 \$ 216,000	
Mill / Overlay <sup>6</sup> (SF)	\$ 5	15000 \$ 75,000	28000 \$ 140,000	30000 \$ 150,000	22000 \$ 110,000	21600 \$ 108,000	
Rock Excavation <sup>7</sup> (CY)	\$ 70	2000 \$ 140,000	2900 \$ 203,000	3000 \$ 210,000	2000 \$ 140,000	2000 \$ 140,000	
Sub-Totals		\$ 3,776,000	\$ 5,611,000	\$ 4,757,000	\$ 3,792,000	\$ 3,478,000	
30% Contingency		\$ 1,133,000	\$ 1,683,300	\$ 1,427,000	\$ 1,138,000	\$ 1,043,000	
20% Engineering Services		\$ 755,000	\$ 1,122,200	\$ 951,400	\$ 758,400	\$ 696,000	
<b>TOTAL</b>		<b>\$ 5,664,000</b>	<b>\$ 8,416,500</b>	<b>\$ 7,135,400</b>	<b>\$ 5,688,400</b>	<b>\$ 5,217,000</b>	
Combined Wastewater Service Area							
						<b>\$ 32,100,000</b>	

1. Sewer Manholes and Service connections are included in the unit cost of gravity piping
  2. Septic tank unit costs include installation and are assumed for 50% of all existing homes
  3. Additional Cost of equipment for possible build out equipment costs only
  4. Pump Stations unit costs are typical for all pump stations and include structures and equipment
  5. Temporary Trench Paving assumes a 5 foot wide trench for all depths up to 12 feet
  6. Mill overlay costs at \$63 per square yard for Association roads only
  7. Rock Excavation is assumed to be a 1 foot depth for every linear feet of trench for Gravity Piping
- No permanent trench patch needed for Association roads only

**Table E**

STEP Sewer Items	Unit Costs	Sub-Area					
		2	5	6	7	8	
Dwelling Units		204	392	342	218	192	
3"-6" HDPE <sup>1</sup> (lf)	\$ 91	9500	17,100	14,100	13,000	11,000	\$1,001,000
Grinder Pumps <sup>2</sup>	\$ 9,000	204	392	342	218	96	\$864,000
Septic Tanks <sup>3</sup>	\$ 4,500	102	196	171	109	192	\$864,000
Spare Build Out Equipment <sup>4</sup>	\$ 6,000	2	21	3	1	15	\$90,000
Temp Trench Repair <sup>5</sup> (lf)	\$ 20	9500	17,100	14,100	13,000	11,000	\$220,000
Mill / Overlay <sup>6</sup> (SF)	\$ 5	15000	30000	28000	23000	22000	\$110,000
Rock Excavation <sup>7</sup> (CY)	\$ 70	1000	1,600	1,000	1,200	1,000	\$70,000
Sub-Totals		\$ 3,507,000	\$ 6,696,000	\$ 5,640,500	\$ 4,100,500	\$ 3,219,000	
30% Contingency		\$ 1,052,100	\$ 2,008,800	\$ 1,692,150	\$ 1,230,150	\$ 965,700	
20% Engineering Services		\$ 701,400	\$ 1,339,200	\$ 1,128,100	\$ 820,100	\$ 643,800	
TOTAL		\$ 5,260,500	\$ 10,044,000	\$ 8,460,750	\$ 6,150,750	\$ 4,828,500	
Combined Wastewater Service Area							\$ 34,700,000

1. HDPE unit costs include all cleanouts and valve connections
  2. Grinder pump unit costs include installation and electrical upgrades
  3. Septic tank unit costs include installation and are assumed for 50% of all existing homes
  4. Additional Cost of equipment for possible build out equipment costs only
  5. Temporary Trench Paving assumes a 5 foot wide trench for all depths up to 12 feet
  6. Mill overlay costs at \$63 per square yard for Association roads only
  7. Rock Excavation is assumed to be a 0.5 foot depth for every linear feet of trench for LPS Piping
- No permanent trench patch needed for Association roads only