Testimony by Ms. Bonnie Reemsnyder, First Selectwoman, Town of Old Lyme
To Public Health Committee
Wednesday February 27, 2013 Room 1D of LOB

Re: SB 352 An Act Concerning Municipal Sewage Systems

Purpose: Support authorization for a POTW to own onsite wastewater pretreatment and processing components with easements for service and maintenance.

The Town of Old Lyme has been assessing our wastewater management in the shoreline areas of the community over the last 18 months. Through that process, a plan for an Alternative Conveyance System was presented. Because of the cost efficiency of the system, and the ability to reuse and recycle the wastewater, we are working closely with the CT DEEP to complete a study that will hopefully support this plan.

Currently, general permits for wastewater discharges (DEP_WPED-GP-018) include private systems such as condominiums, where a corporation is responsible for the operation and performance of a collection system. This authorization does not specifically address collection systems that treat or process the wastewater, or that have shared wastewater components located on private property. The definition and authorization must be expanded to include components of alternative conveyance systems that may located on private property for use by more than one property owner.

Alternative conveyance systems include onsite components as part of the system, which allows for the wastewater to be transported by smaller pipes underground. The smaller pipes are much less expensive to install and are less prone to inflow from storm events, which makes them most appropriate for shorelines areas. The types of components may include interface valves for vacuum sewers, pumps and tanks that process or pre-treat the wastewater. Septic tanks, frequently called interceptor tanks with or without pumps, are the most common components, and thousands of communities and developments rely on these systems. Pumps would be used where properties are low or where shallow lines are preferred as shown in Figure XII-1 Profile of Small Diameter Variable Grade Effluent Sewer, DEP Section XII page 5 of 21, attached below.

When looking at options for the Old Lyme beach communities (October 2012), effluent sewers were considered the least costly option. The system uses smaller pipes, eliminates manholes and is much easier to build. The lowest cost design includes pretreatment components that are shared by individuals on private property. This design is similar to other utilities where the shared components are owned and managed by the utility, with easements for service on private property. Examples include electric lines, power transformers and components, water and electric meters, and storm sewers or recharge basins. Easements for service are authorized for all other publicly owned components located on private property. Expansion of this authority for any wastewater components that would be owned and serviced by the municipal authority is therefore needed.

Wastewater Discharges

Domestic Sewage (DEP-WPED-GP-018): This general permit applies to discharges of domestic sewage from a community sewerage system to a POTW. Registration is required for discharges from a community sewerage system. Privately owned "community sewerage systems" (such as those at condominiums) are to be properly managed and have a valid community sewerage system agreement with the municipality receiving the discharge as required by section 7-246f of the General Statues. Municipalities seeking to initiate, create or originate a discharge from a community sewerage system do not need to register. For all other discharges of domestic sewage to a POTW no registration is required to be submitted in order for the discharges to be authorized by this general permit. Registrations are non-transferrable.

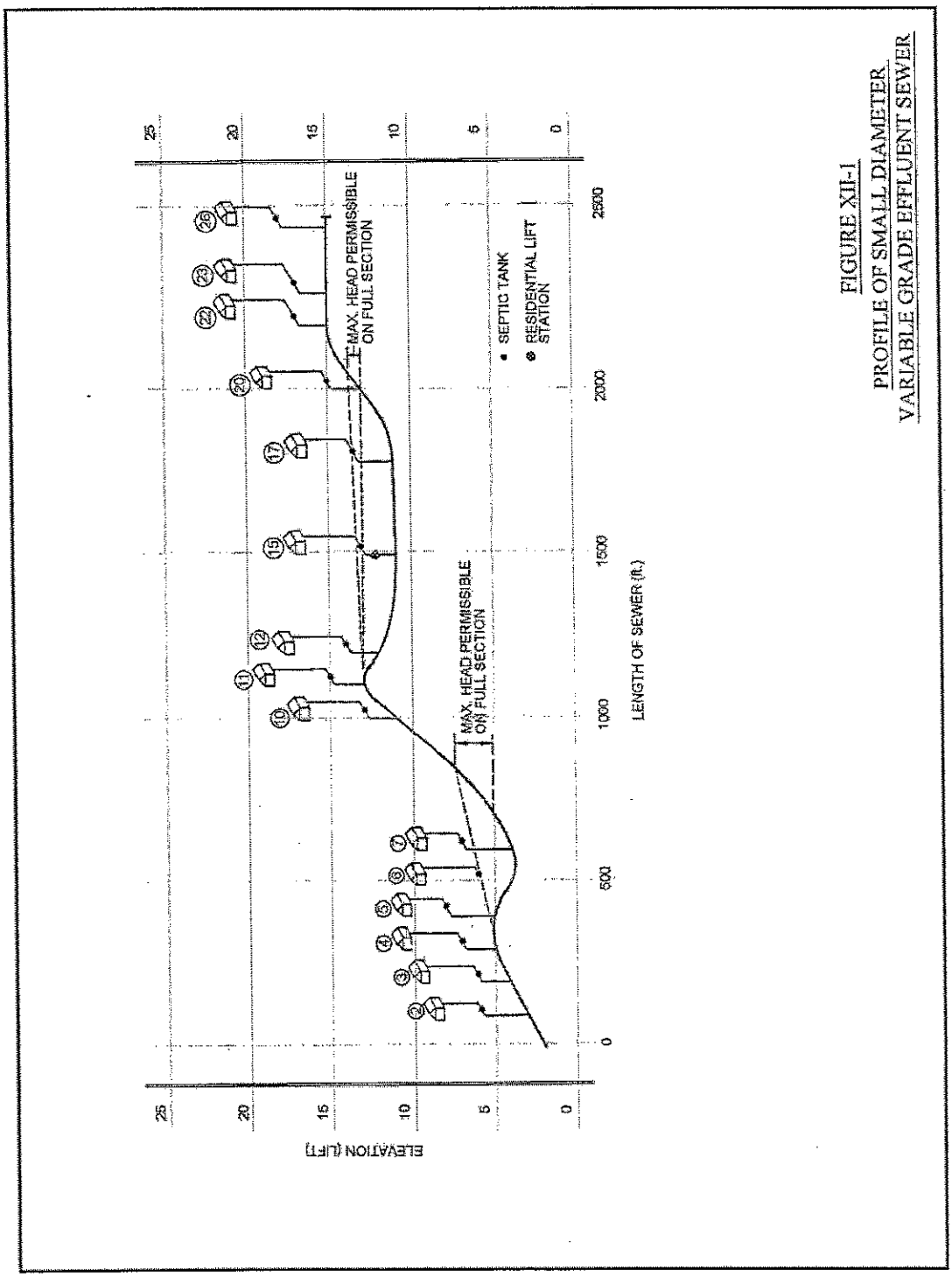

FIGURE XII-1
PROFILE OF SMALL DIAMETER
VARIABLE GRADE EFFLUENT SEWER

SECTION XII WASTEWATER CONVEYANCE SYSTEMS

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FUSS & O'NEILL

ADDENDUM TO
WASTEWATER FACILITIES PLANNING REPORT
FOR
OLD LYME SHORES BEACH ASSOCIATION
AND
OLD COLONY BEACH CLUB ASSOCIATION
OLD LYME, CT

JULY 2012

Add a new "**Section 0 – Shared Facilities Planning**" to both reports including the following:

1) Background for Shared Approach

The wastewater facilities plans composed for both the Old Lyme Shores Beach Association (OLSBA) and the Old Colony Beach Club (OCBC) have each independently concluded that continued on-site wastewater management is not a viable alternative for the study areas. Each report recommended centralized sewers as the optimum long term most cost effective solution to manage the wastewater disposal needs of the area. Subsequent discussions between the two communities have concluded that working together on a shared approach for a joint sewer extension to a termination manhole in East Lyme would provide significant cost sharing opportunities to reduce project costs for the two communities. This addendum to each planning study report provides the framework for the recommended shared public sewering approach to solve each association's long term wastewater renovation needs. Many details of this solution still need to be resolved, yet the leadership of each association has tacitly agreed to proceed with a shared sewer solution.

Under the shared solution, each community would evenly divide the design and construction costs of a single force main along Route 156. OCBC and OLSBA would be responsible for their own costs incurred during design and construction of the gravity sewers and pump stations within their individual communities. Additional cost savings would be achieved by jointly negotiating with downstream entities for sewer capacity and capital improvements, sharing engineering design services, potentially bidding a single larger project instead of separate smaller projects, economies of scale realized through mutual use of technical and investigative services during construction, and collective use of regulatory resources along with legal and administrative services during the project.

The recommended shared alternative for a sewer extension presented herein references and supersedes the recommended alternative within the wastewater facilities planning documents from each community. The two reports are:

- *October 2011 draft Wastewater Management Plan for the Old Colony Beach Club Association, prepared by RFP Engineering, and amended by email on January 20th, 2012*
- *December 2011 draft Wastewater Facilities Planning Report for Old Lyme Shores Beach Association, prepared by Fuss & O'Neill, Inc.*

Both associations have tacitly agreed to proceed with a single engineering firm for technical services. OCBC and OLSBA agreed to continue working with Fuss & O'Neill, Inc. for the remainder of the project. RFP Engineering had reportedly relocated to Maine during the creation of the OCBC report, and is reportedly unwilling to continue offering technical services beyond completion of the planning phase of the project.

2) Recommended Shared Alternative

The shared plan includes separate sewer collection systems for OCBC and OLSBA based on the conceptual gravity sewer piping layouts from the original facilities plans. The two collection systems are shown as a single conceptual layout on Figure 0-1. The gravity sewer collection systems could drain to separate pump stations located within their respective beach community. The discharge from each pump station would be conveyed in force main piping to the intersection of Route 156 and Sea Spray Road. The cost for shared construction, operation, and maintenance of the combined force main pipe begins at this junction and continues until the discharge manhole in East Lyme. The path of the shared force main would follow Route 156 and is shown in Figure 0-2.

The type of force main pipe is based on the pipe material would be the same type as Point O' Woods pipe (cement lined ductile iron). HDPE pipe could provide some cost savings for material cost and installation, but comes with different challenges such as thermal expansion, tracer wires, joint bead cutting, fusion joint testing, etc. The final pipeline material is a detailed design issue which will be explored in the future, subsequent to coordination with DOT. The budget numbers for unit prices include force main and gravity sewer excavation and backfill, but not the roadway restoration which is covered under a separate line item.

Detailed evaluation of the force main capacity for additional beach communities to the west of the two associations, such as Miami Beach and White Sands Communities, has not been completed at this time. However, it appears through cursory hydraulic computations that the recommended 6-inch force main will not be able to accommodate peak flows from all four communities. Flow equalization tanks with off-peak pumping, or a second force main may be required at a later date to extend sewers to additional beach communities west of Old Colony Beach Club. The 6-inch diameter force main proposed for this project would not be sized for future connections from additional beach communities. Installation of an additional dry force main (funded at 25% by the DEEP) for future use by White Sands and/or Miami Beach may be a possible solution, although technical challenges include a buried communications ductbank in one travel way and the POW force main and water mains generally occupying the other travel lane. This dry force main, if feasible, could be bid as a bid alternate and executed if construction bid prices for the base bid are favorable and budget is available to fund the work. Under such an arrangement, the additional beach communities to the west would be responsible for compensating the unfunded portion of the construction prior to connection to the dry force main.

It is noted that a more detailed evaluation to determine whether a shared pump station would be more advantageous to the communities may provide some overall cost savings to the communities. There is also a possibility that a third booster pump station, located along Route 156, could provide long term life cycle cost savings. However, those efforts are outside the scope of this planning document, and will be addressed in preliminary design phase should the projects go forward.

Exact pump station locations and negotiations for land acquisition or easements have not been conducted to date, though preliminary discussions have been held with property owners to gauge interest in siting the pump stations on the two properties. The OCBC reportedly has some association-owned land which may be available to site a pump station. During detailed design phase, the pump station amenities and land acquisition issues will be addressed.

Figure 0-1:
Conceptual Gravity Sewer Collection System Mapping

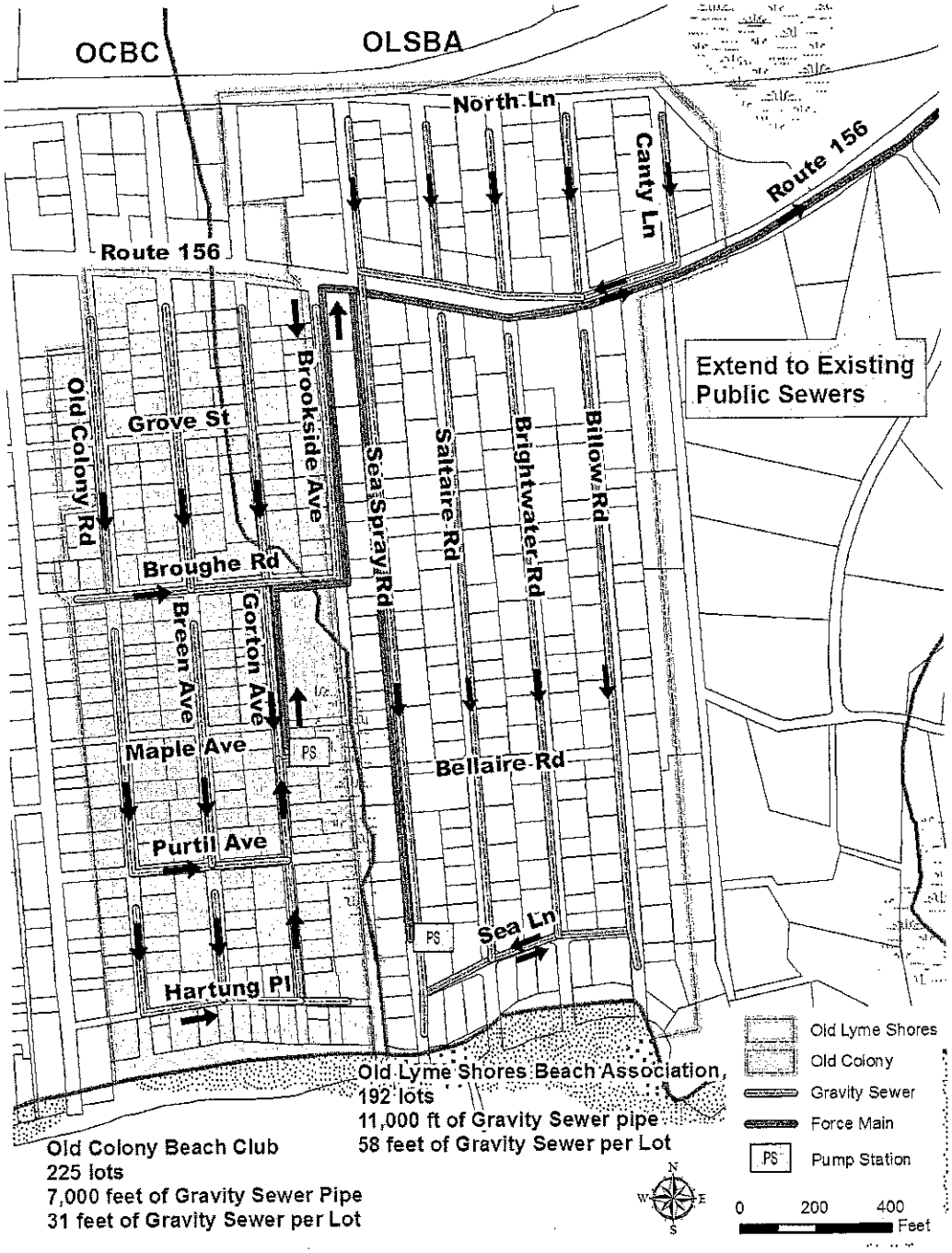
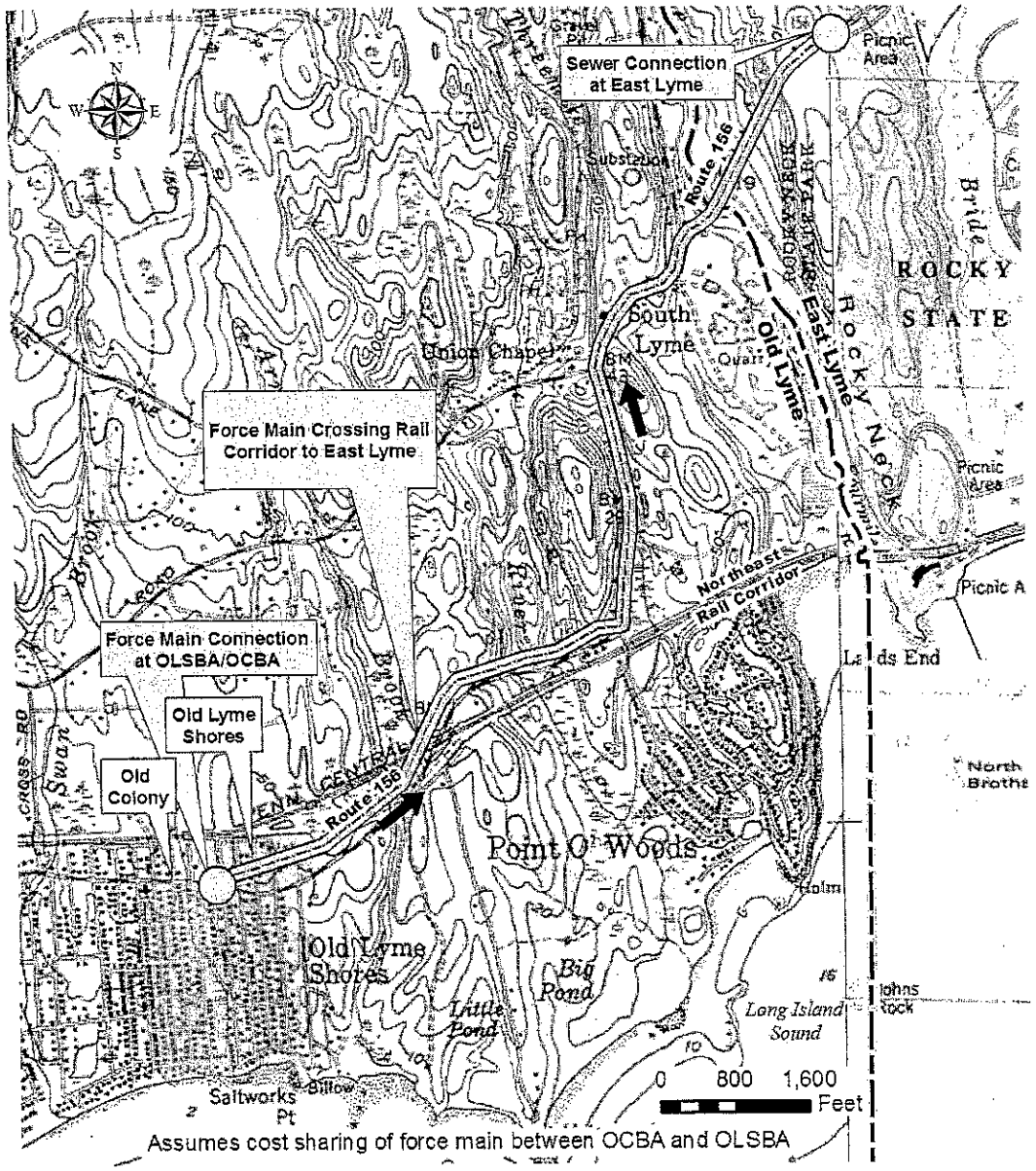


Figure 0-2:
Shared Force Main from OCBC/OLSBA to East Lyme



3) Permitting

This force main route may require a permit by the Office of Long Island Sound Programs (OLISP) due to the section of pipe that would cross the Three Mile River. This is envisioned to be an aerial crossing over an area under possible tidal influence regulated by OLISP. However, since there will be no direct ground disturbance within the regulated area, this work may be qualify for authorization under one of the more streamlined approvals (i.e. Certificate of Permission). A categorical exception may be granted, contingent upon agreement with a DEEP finding of no significant impact (FONSI). Otherwise an Environmental Impact Evaluation (EIE) may need to be performed. Local Planning and Zoning review

and approval will be required for the pump station site or sites. There will be an economy of scale by having the same entities designing, permitting, and constructing a single project for both study areas.

Refer to Section 2 the Old Lyme Shores Beach Association Facilities Report for wetland delineation (based on soil types) and Section 10 for additional permitting requirements anticipated for the shared project.

4) **Wastewater Flows**

The wastewater flows from the two communities are estimated in Table 0-1. The average daily summer wastewater flows were estimated based on 2.39 people/household (2010 US Census Bureau – Old Lyme, CT) and water usage of 75 gallons/person/day (CT Public Health Code). Due to the seasonal nature of the majority of the homes, the average daily flow would be significantly less than the Average Summer Day Flow. The max summer day flow was estimated to be two times the average summer day flow and a peaking factor of four was used to determine the peak hour flow rate. An additional 10,000 GPD of additional unallocated reserve capacity was added to the average summer day flow to account for minor infiltration/inflow and unanticipated future site build-out or increased water utilization. It is expected that the max summer day flow will be reached during the summer months due to seasonal usage, and there will be a significant decrease in flow during the winter months. Odor control provisions will be required, particularly during the low flow off-season period due to the extended detention times of the wastewater in the shared force main. The flow rate estimated in the Old Colony report is updated in Table 0-1 to match the flow apportionment methodology utilized for Old Lyme Shores.

Table 0-1: Summer Wastewater Flow Estimates

Beach Association	Dwelling Units	Average Summer Day (GPD)	Max Summer Day (GPD)	Peak Hour (GPM)
Old Lyme Shores	192	45,000	90,000	125
Old Colony	215	49,000	98,000	136
Total	**407**	**94,000**	**188,000**	**261**

Based on a cursory pump station analysis with submersible pumps, a preliminary hydraulic analysis has been summarized in Table 0-2 below with conveyance through a 6-inch force main. The analysis assumes a SCADA control interlock between the proposed Old Lyme Shores and Old Colony Beach Club pump stations to allow only one station to pump at a time. An interim pump station along the force main will be evaluated during detailed design phase of the project to determine if overall life cycle costs could be reduced.

Table 0-2: Pump Station Preliminary Hydraulic Analysis

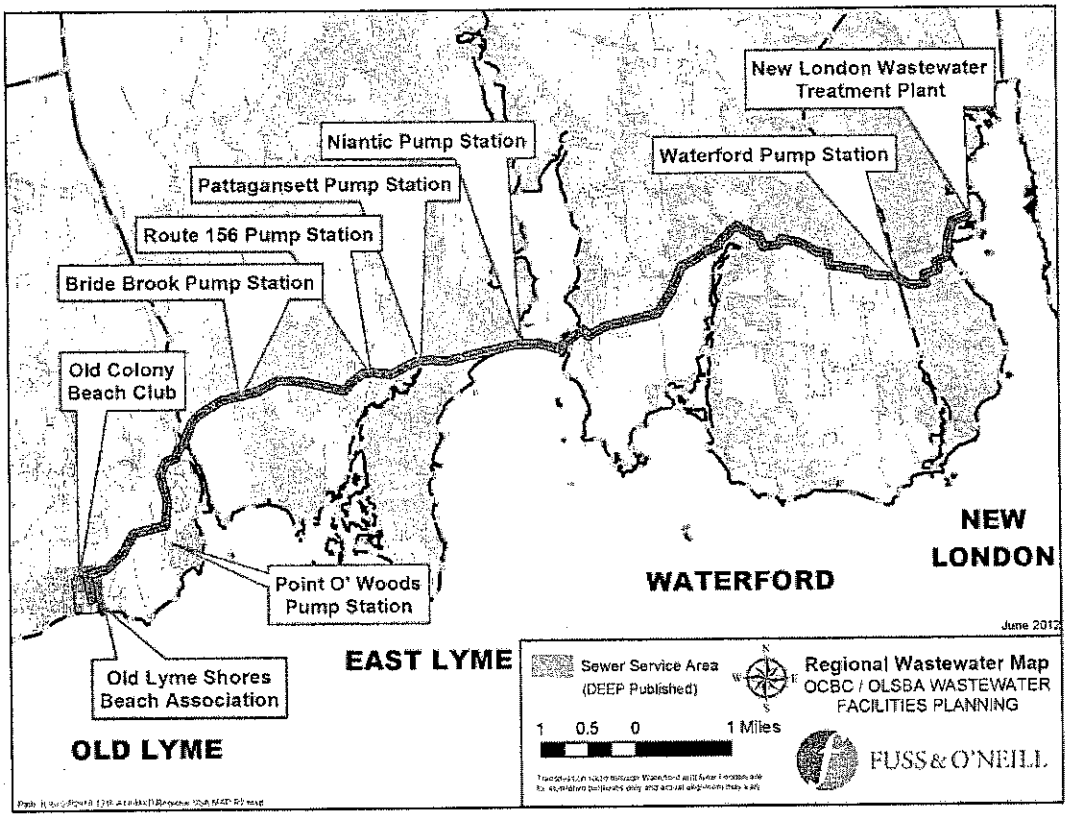
Community	Peak Hour Flow Rate	Pump Rate	Total Dynamic Head	Force Main Flow Velocity
Old Lyme Shores Beach Association	125 GPM	275 GPM	229 feet	3.12 ft/sec
Old Colony Beach Club	136 GPM	275 GPM	226 feet	3.12 ft/sec

5) Discussions with Downstream Municipalities

Several preliminary meetings have been conducted with officials from East Lyme, Waterford, and New London to negotiate treatment and conveyance capacity for the flows from OCBC and OLSBA. The two beach associations (with facilitation by DEEP) will continue to coordinate with downstream regional entities to obtain capacity and O&M cost sharing in the collection system prior to treatment at the Picenti Wastewater Treatment Plant in New London. Refer to Figure 0-3 for a regional map showing the sewer conveyance path from Old Lyme to the New London plant. It is conceivable that costs for the capacity at New London's wastewater treatment facility will be levied via a surcharge to the User Charge to the users rather than through a single buy-in charge to reserve the treatment capacity.

The Town of Waterford is interested in a corrosion and odor study prior to agreement to convey the flows from the two associations, and East Lyme has expressed a need to evaluate the hydraulic capacity of their infrastructure, including assessments of the Bride Brook and Route 156 pump stations. Costs for these evaluations are envisioned to be paid for by the associations, and recommendations therefrom will be considered when negotiating the agreements to convey the wastewater from the two associations.

Figure 0-3:
Regional Wastewater Map



Buy-in costs to share and upgrade (where needed) the existing wastewater infrastructure are issues that are currently being resolved. During design of the recommended combined alternative, these issues will be negotiated with terms detailed in future agreements between the applicable stakeholding parties.

Wastewater flows from each community are envisioned to be measured via magnetic flow meters installed at the discharge of each pump station. The recorded flow measurements would be used as the basis for determining sewer use fees for each community to pay for O&M to downstream communities to convey and treat the wastewater, and intra-association infrastructure O&M.

6) Implementation Plan

The implementation plan for the joint recommended plan has been created and shared activities have already been coordinated between OCBC and OLSBA to eliminate duplication of effort. The schedule is presented below as Table 0-4.

Table 0-4: Overall Schedule including Clean Water Funding Program

(Updated: June 2012)

Planning Phase (55% Grant) - Wastewater Facilities Planning Report	**Projected Completion Date**
• Submit CWF Amendment 3 for Reimbursement	February 2012
• Amend Facilities Plans and Issue Shared Plan	June 2012
• Adopt Recommended Plan	July 2012 (OC)/August 2012 (OLSBA)
• Schedule Meetings with East Lyme, Waterford, New London	February 2012 – June 2012
• Obtain Bond for 100% of Project Cost	August 2012
o Bond allows short term borrowing	
o Short term loan interest starts incurring	
• Negotiate Intermunicipal Agreements (up to 3)	March 2012 - December 2012
• Prepare Application for DEEP Grants/Loans	August 2012 – September 2012
• Submit CWF Application to DEEP	September 2012
Design Phase (25% Grant Funding)	
• Preliminary & Detailed Design - 7 to 12 Months	September 2012 – August 2013
o Aerial Photogrammetry	
o Survey	
o Subsurface Exploration	
o Design	
o Lateral Location Forms	
o Permitting	
• Submit 90% Design for DEEP Review - 1 Month	September 2013
• Finalize Design with DEEP Review Comments - 1 Month	October 2013
• Bid Project for Construction - 4 Months	February 2014
Construction Phase (25% Grant Funding)	
• DEEP Approves Funding Application	March 2014
o DEEP releases reimbursement money for the Design Phase	
o Close out bond	
o DEEP reimburses construction costs monthly	
• Project Construction begins	March 2014
• Project construction ends - 18 months	September 2015
State Clean Water Funding Loan Closing	
• Close loan at the completion of project - within 12 months	September 2016
Levy Benefit Assessments to Repay CWF Loans	October 2015 – October 2016

7) Environmental Impact Statement

The environmental impact from a shared project is expected to remain the same as the issues detailed in the original facilities planning reports. There will be no additional adverse environmental impact derived through the shared sewer approach. More likely, there will be less temporary disturbance during construction since only one force main will be required along Route 156 in lieu of two force mains. Once the project proceeds into design, the DEEP will perform a "jurisdictional determination" to determine whether this is a regulated area by OLISP. This determination will define whether the project warrants an EIE, or whether it qualifies for a categorical exclusion for Connecticut Environmental Protection Act (CEPA) purposes. It is currently envisioned that the shared project should qualify for a categorical exclusion since the work elements are beneath disturbed roadways.

8) Overview of Revised Program Costs for the Recommended Alternative

Program costs have been reviewed and updated to reflect a shared approach, based on the subsequent discussions between the two associations since submission of their respective draft facilities planning reports. Refer to Table 0-5 and 0-6 below. A cost sharing approach provides significant savings for the project. Utility improvements vary with each community, but include improvements such as storm drainage, extensive road reconstruction, water distribution system improvements, and/or installation of fire hydrants. Although most of the work is not DEEP Clean Water Fund grant eligible, the communities could proceed with additional infrastructure improvements to achieve additional savings from performing the work when the roadways are already opened up.

The opinions of cost have been modified based on refinement of the centralized sewer alternative and inclusion of cost sharing of construction costs between OCBC and OLSBA. The OCBC projects costs have also been updated to reflect the cost evaluation methods presented in the OLSBA report.

Table 0-5: Estimated TOTAL Cost per EDU for Centralized Sewers

Description	No Utility Improvements -15% to +30%	With Utility Improvements -15% to +30%
No Cost Sharing		
Old Colony Beach Club	$22,000 to $32,000	$28,000 to $41,000
Old Lyme Shores Beach Association	$27,000 to $39,000	$36,000 to $52,000
With Cost Sharing		
Old Colony Beach Club	$15,000 to $22,000	$21,000 to $31,000
Old Lyme Shores Beach Association	$19,000 to $28,000	$28,000 to $41,000

Table 0-6: Estimated ANNUAL Cost per EDU for Centralized Sewers

Description	No Utility Improvements -15% to +30%	With Utility Improvements -15% to +30%
No Cost Sharing		
Old Colony Beach Club	$1,300 to $2,000	$1,700 to $2,500
Old Lyme Shores Beach Association	$1,700 to $2,400	$2,200 to $3,200
With Cost Sharing		
Old Colony Beach Club	$900 to $1,300	$1,300 to $1,900
Old Lyme Shores Beach Association	$1,200 to $1,700	$1,700 to $2,500

Note: Annual costs based upon a 20 loan at 2% interest

Tables 0-7 thru 0-10 show a detailed breakout of the program costs for the remaining design and construction costs for the project utilizing the Clean Water Fund program.

Note that some of the legal and administrative costs may/may not be eligible costs for reimbursement under the program depending on the type of work performed.

The buy-in costs may/may not be eligible reimbursement costs for this project and require further discussion with the DEEP and the downstream regional conveyance and treatment authorities. Capital improvements to downstream communities could be paid through a surcharge to the O&M costs, but any such surcharges would not be eligible for CWF reimbursement.

The project includes Technical Services estimated at 20% of the construction opinion of cost with Clean Water Fund program limits of 17.5% profits on direct and indirect labor fees and 5% markups on direct costs.

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Table 0-7 for Old Lyme Shores Beach Association

Recommended Plan - Sanitary Sewers with Discharge to East Lyme without Additional Association Improvements

ORDER OF MAGNITUDE OPINION OF CAPITAL COSTS [1]

OLD LYME SHORES BEACH ASSOCIATION

June 30, 2012

	NO COST SHARING		SHARE COSTS WITH OCBC	
	Low Range Costs[2] -15%	High Range Costs[2] +50%	Low Range Costs[2] -15%	High Range Costs[2] +50%
Procure Agreements for Recommended Plan				
1. Technical Services to Procure Stakeholder Agreements	$ 21,250	$ 32,500	$ 10,625	$ 16,250
2. Legal and Administrative Services to Procure Stakeholder Agreements (2)	$ 34,000	$ 52,000	$ 17,000	$ 26,000
3. Total - Procure Agreements for Recommended Plan (Rounded)	**$ 55,000**	**$ 85,000**	**$ 28,000**	**$ 42,000**
Project Construction				
4. Construction Cost-Gravity Sewer with Central Pump Station [3]	$ 2,184,500	$ 3,341,000	$ 2,184,500	$ 3,341,000
5. Construction Cost-Force Main Along Route 156 to East Lyme [3]	$ 2,448,000	$ 3,744,000	$ 2,448,000	$ 3,744,000
6. Construction Cost-Cost Sharing Along Route 156	$ -	$ -	$ (1,224,000)	$ (1,872,000)
7. Buy-In Fee to East Lyme/Waterford/New London [3]	$ 1,000,000	$ 1,000,000	$ 500,000	$ 500,000
8. Technical Services-Design, Permitting & Construction Administration [4]	$ 926,500	$ 1,417,000	$ 681,700	$ 1,042,600
9. Legal & Administrative [5]	$ 171,000	$ 268,000	$ 127,000	$ 194,000
10. Total - Project Construction Costs (Rounded)	**$ 6,730,000**	**$ 9,770,000**	**$ 4,720,000**	**$ 6,950,000**
DEEP CWF Eligible Design & Construction Costs				
11. Procure Agreements for Recommended Plan (Excluding Legal & Admin)	$ 21,250	$ 32,500	$ 10,625	$ 16,250
12. Project Construction Costs (Excluding Legal & Admin)	$ 6,560,000	$ 9,500,000	$ 4,590,000	$ 6,760,000
13. DEEP CWF 25% Design & Construction (Small Community) Grant Amount	$ (1,645,313)	$ (2,383,125)	$ (1,150,156)	$ (1,694,063)
14. Total - DEEP CWF Loan Eligible Costs (Rounded) [6]	**$ 4,936,000**	**$ 7,149,000**	**$ 3,450,000**	**$ 5,082,000**
DEEP Ineligible Costs[7]				
15. Short Term Financing at 1.5% [8]	$ -	$ -	$ -	$ -
15a. Legal and Administrative Fees (Table Line Items #2, #9)	$ 205,000	$ 320,000	$ 144,000	$ 220,000
16. Storm Drainage Improvements[9]	$ -	$ -	$ -	$ -
17. Extensive Road Reconstruction[10]	$ -	$ -	$ -	$ -
18. Fire Hydrants (Quantity: 16)	$ -	$ -	$ -	$ -
19. Drinking Water System Improvements[11]	$ -	$ -	$ -	$ -
20. Technical Services-Design,Permitting & Construction Administration[4]	$ -	$ -	$ -	$ -
21. TOTAL - DEEP Ineligible Costs (Rounded)	**$ 205,000**	**$ 320,000**	**$ 144,000**	**$ 220,000**
Estimated Local Share				
22. DEEP CWF Loan Eligible Costs [7]	$ 4,936,000	$ 7,149,000	$ 3,450,000	$ 5,082,000
23. DEEP Ineligible Costs	$ 205,000	$ 320,000	$ 144,000	$ 220,000
24. Estimated Local Cost Share (Rounded)	**$ 5,141,000**	**$ 7,469,000**	**$ 3,594,000**	**$ 5,302,000**
	5141000	7469000	3594000	5302000
Net Capital Cost Per EDU				
25. Estimated Local Cost Share	$ 5,141,000	$ 7,469,000	$ 3,594,000	$ 5,302,000
26. Number of EDU's (Properties) Served	192	192	192	192
27. Net Cost Per EDU (Rounded)	**$ 27,000**	**$ 39,000**	**$ 19,000**	**$ 28,000**
			34	37
Annual Capital Cost Per EDU (Rounded) [12]	**$1,700**	**$2,400**	**$1,200**	**$1,700**

Notes:

(1) All Phase III costs developed in 2011 dollars.

(2) Typical planning level costs carry contingencies of -15% to + 30%. Opinion of costs will continue to be refined during subsequent phases. See Facilities Planning Cost Document for more Detailed Cost Breakdown.

(3) Does not include cost of gravity service connections from the building to sewer stub in street and abandonment of septic system (this cost to be paid by homeowner). Average connection cost to sewer stub estimated to be $2,000-$2,500. Assumes $1M Connection Fee apportioned to East Lyme, Waterford, and New London. Actual Connection Fees and apportionment breakdown are not defined at this juncture. Assumes cost sharing of force Main to East Lyme with Old Colony.

(4) Technical Services During Design and Construction estimated @ 20% of construction for planning purposes. Services include engineering design, permitting, topographic survey, test borings, bidding services, construction administration and resident representative services.

(5) Legal and Administrative Costs estimated based on construction cost. Services include Bond Counsel costs, Finance Director Costs, setup assessment policy, setup user fee policy, create programatic administrative policies, and miscellaneous legal and administrative costs during design and construction of the project.

(6) DEEP eligible costs include roadway improvements composed of temporary pavement repair, permanent pavement repair, and pavement mill & overlay to dimensions prescribed by DOT approval.

(7) Ineligible costs include project costs not directly related to sewer design or construction; including daily WPCA Operating Administrative Costs and construction costs not required for the sewer project. Legal costs other than land acquisition are loan eligible only.

(8) Assume DEEP funding of design and construction work within 3 months of CWF application submittal.

(9) Assumes 4000 feet of storm sewer with 10 catch basins

(10) Based on $300,000 per street for road reconstruction (per quotes obtained by Paul Rowean) less $406,000 pavement allowance in sewer project road restoration.

(11) Assumes 10,800 feet of water main pipe installation. Assume F&O designs water system.

(12) Annual cost per EDU is over a 20 year period at an annual interest rate of 2%. Does not include connection to sewer, connection charge, or annual O&M costs.

Fire hydrants include estimate of $6,000 for materials and $4,000 for installation

FUSS & O'NEILL

Table 0-8 for Old Lyme Shores Beach Association

Recommended Plan - Sanitary Sewers with Discharge to East Lyme with Additional Association Improvements

ORDER OF MAGNITUDE OPINION OF CAPITAL COSTS [1]

OLD LYME SHORES BEACH ASSOCIATION

June 30, 2012

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17. Extensive Road Reconstruction [10]	$ 674,900	$ 1,032,200	$ 674,900	$ 1,032,200
18. Fire Hydrants (Quantity: 16)	$ 136,000	$ 208,000	$ 136,000	$ 208,000
19. Drinking Water System Improvements [11]	$ 403,325	$ 616,850	$ 403,325	$ 616,850
20. Technical Services-Design,Permitting & Construction Administration [4]	$ 282,795	$ 432,510	$ 282,795	$ 432,510
21. TOTAL - DEEP Ineligible Costs (Rounded)	**$ 1,902,000**	**$ 2,915,000**	**$ 1,841,000**	**$ 2,815,000**
Estimated Local Share				
22. DEEP CWF Loan Eligible Costs [7]	$ 4,936,000	$ 7,149,000	$ 3,450,000	$ 5,082,000
23. DEEP Ineligible Costs	$ 1,902,000	$ 2,915,000	$ 1,841,000	$ 2,815,000
24. Estimated Local Cost Share (Rounded)	**$ 6,838,000**	**$ 10,064,000**	**$ 5,291,000**	**$ 7,897,000**
Net Capital Cost Per EDU				
25. Estimated Local Cost Share	$ 6,838,000	$ 10,064,000	$ 5,291,000	$ 7,897,000
26. Number of EDU's (Properties) Served	192	192	192	192
27. Net Cost Per EDU (Rounded)	**$ 36,000**	**$ 52,000**	**$ 28,000**	**$ 41,000**
			34	37
Annual Capital Cost Per EDU (Rounded) [12]	**$2,200**	**$3,200**	**$1,700**	**$2,500**

Notes:

(1) All Phase III costs developed in 2011 dollars

(2) Typical planning level costs carry contingencies of -15% to + 30%. Opinion of costs will continue to be refined during subsequent phases. See Facilities Planning Cost Document for more Detailed Cost Breakdown.

(3) Does not include cost of gravity service connections from the building to sewer stub in street and abandonment of septic system (this cost to be paid by homeowner). Average connection cost to sewer stub estimated to be $2,000-$2,500. Assumes $1M Connection Fee apportioned to East Lyme, Waterford, and New London. Actual Connection Fees and apportionment breakdown are not defined at this juncture. Assumes cost sharing of force Main to East Lyme with Old Colony.

(4) Technical Services During Design and Construction estimated @ 20% of construction for planning purposes. Services include engineering design, permitting, topographic survey, test borings, bidding services, construction administration and resident representative services.

(5) Legal and Administrative Costs estimated based on construction cost. Services include Bond Counsel costs, Finance Director Costs, setup assessment policy, setup user fee policy, create programatic administrative policies, and miscellaneous legal and administrative costs during design and construction of the project.

(6) DEEP eligible costs include roadway improvements composed of temporary pavement repair, permanent pavement repair, and pavement mill & overlay to dimensions prescribed by DOT approval.

(7) Ineligible costs include project costs not directly related to sewer design or construction; including daily WPCA Operating Administrative Costs and construction costs not required for the sewer project. Legal costs other than land acquisition are loan eligible only.

(8) Assume DEEP funding of design and construction work within 3 months of CWF application submittal.

(9) Assumes 4000 feet of storm sewer with 10 catch basins

(10) Based on $300,000 per street for road reconstruction (per quotes obtained by Paul Rowean) less $406,000 pavement allowance in sewer project road restoration.

(11) Assumes 10,600 feet of water main pipe installation. Assume F&O designs water system.

(12) Annual cost per EDU is over a 20 year period at an annual interest rate of 2%. Does not include connection to sewer, connection charge, or annual O&M costs.

Fire hydrants include estimate of $6,000 for materials and $4,000 for installation

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Table 0-9 for Old Colony Beach Club Association

Recommended Plan - Sanitary Sewers with Discharge to East Lyme without Additional Association Improvements

ORDER OF MAGNITUDE OPINION OF CAPITAL COSTS [1]

OLD COLONY BEACH CLUB

June 30, 2012

	NO COST SHARING		SHARE COSTS WITH OLSBA	
	Low Range Costs [2] -15%	High Range Costs [2] +30%	Low Range Costs [2] -15%	High Range Costs [2] +30%
Procure Agreements for Recommended Plan				
1. Technical Services to Procure Stakeholder Agreements	$ 21,250	$ 32,500	$ 10,625	$ 16,250
2. Legal and Administrative Services to Procure Stakeholder Agreements	$ 34,000	$ 52,000	$ 17,000	$ 26,000
3. Total - Procure Agreements for Recommended Plan (Rounded)	**$ 55,000**	**$ 85,000**	**$ 28,000**	**$ 42,000**
Project Construction				
4. Construction Cost-Gravity Sewer with Central Pump Station [3]	$ 1,683,000	$ 2,574,000	$ 1,683,000	$ 2,574,000
5. Construction Cost-Force Main Along Route 156 to East Lyme [3]	$ 2,448,000	$ 3,744,000	$ 2,448,000	$ 3,744,000
6. Construction Cost-Cost Sharing Along Route 156	$ -	$ -	$ (1,224,000)	$ (1,872,000)
7. Buy-In Fee to East Lyme/Waterford/New London [3]	$ 1,000,000	$ 1,000,000	$ 500,000	$ 500,000
8. Technical Services-Design, Permitting & Construction Administration [4]	$ 826,200	$ 1,263,600	$ 581,400	$ 889,200
9. Legal & Administrative [5]	$ 148,000	$ 238,000	$ 105,000	$ 164,000
10. Total - Project Construction Costs (Rounded)	**$ 6,110,000**	**$ 8,820,000**	**$ 4,090,000**	**$ 6,000,000**
DEEP CWF Eligible Design & Construction Costs				
11. Procure Agreements for Recommended Plan (Excludes Legal & Admin)	$ 21,250	$ 32,500	$ 10,625	$ 16,250
12. Project Construction Costs (Excludes Legal & Admin)	$ 5,960,000	$ 8,580,000	$ 3,990,000	$ 5,840,000
13. DEEP CWF 25% Design & Construction (Small Community) Grant Amount	$ (1,495,313)	$ (2,153,125)	$ (1,000,156)	$ (1,464,063)
14. Total - DEEP CWF Loan Eligible Costs (Rounded) [6]	**$ 4,486,000**	**$ 6,459,000**	**$ 3,000,000**	**$ 4,392,000**
DEEP Ineligible Costs [7]				
15. Short Term Financing at 1.5% [8]	$ -	$ -	$ -	$ -
15a. Legal and Administrative Fees (Table Line Items #2, #9)	$ 182,000	$ 290,000	$ 122,000	$ 190,000
16. Storm Drainage Improvements [9]	$ -	$ -	$ -	$ -
17. Extensive Road Reconstruction [10]	$ -	$ -	$ -	$ -
18. Fire Hydrants (Quantity: 16)	$ -	$ -	$ -	$ -
19. Drinking Water System Improvements [11]	$ -	$ -	$ -	$ -
20. Technical Services-Design, Permitting & Construction Administration [4]	$ -	$ -	$ -	$ -
21. TOTAL - DEEP Ineligible Costs (Rounded)	**$ 182,000**	**$ 290,000**	**$ 122,000**	**$ 190,000**
Estimated Local Share				
22. DEEP CWF Loan Eligible Costs [7]	$ 4,486,000	$ 6,459,000	$ 3,000,000	$ 4,392,000
23. DEEP Ineligible Costs	$ 182,000	$ 290,000	$ 122,000	$ 190,000
24. Estimated Local Cost Share (Rounded)	**$ 4,668,000**	**$ 6,749,000**	**$ 3,122,000**	**$ 4,582,000**
Net Capital Cost Per EDU				
25. Estimated Local Cost Share	$ 4,668,000	$ 6,749,000	$ 3,122,000	$ 4,582,000
26. Number of EDU's (Properties) Served	213	213	213	213
27. Net Cost Per EDU (Rounded)	**$ 22,000**	**$ 32,000**	**$ 15,000**	**$ 22,000**
Annual Capital Cost Per EDU (Rounded) [12]	**$1,300**	**$2,000**	**$900**	**$1,300**

Notes:

(1) All Phase III costs developed in 2011 dollars.

(2) Typical planning level costs carry contingencies of -15% to + 30%. Opinion of costs will continue to be refined during subsequent phases. See Facilities Planning Cost Document for more Detailed Cost Breakdown.

(3) Does not include cost of gravity service connections from the building to sewer stub in street and abandonment of septic system (this cost to be paid by homeowner). Average connection cost to sewer stub estimated to be $2,000-$2,500. Assumes $1M Connection Fee apportioned to East Lyme, Waterford, and New London. Actual Connection Fees and apportionment breakdown are not defined at this juncture. Assumes cost sharing of force-Main to East Lyme with Old Colony. Assumes cost sharing of force Main to East Lyme with Old Colony.

(4) Technical Services During Design and Construction estimated @ 20% of construction for planning purposes. Services include engineering design, permitting, topographic survey, test borings, bidding services, construction administration and resident representative services.

(5) Legal and Administrative Costs estimated based on construction cost. Services include Bond Counsel costs, Finance Director Costs, setup assessment policy, setup user fee policy, create programatic administrative policies, and miscellaneous legal and administrative costs during design and construction of the project.

(6) DEEP eligible costs include roadway improvements composed of temporary pavement repair, permanent pavement repair, and pavement mill & overlay to dimensions prescribed by DOT approval.

(7) Ineligible costs include project costs not directly related to sewer design or construction; including daily WPCA Operating Administrative Costs and construction costs not required for the sewer project. Legal costs other than land acquisition are loan eligible only.

(8) Assume DEEP funding of design and construction work within 3 months of CWF application submittal.

(9) Assumes 4000 feet of storm sewer with 10 catch basins.

(10) Based on $300,000 per street for road reconstruction (per quotes obtained by Paul Rowean) less $406,000 pavement allowance in sewer project road restoration.

(11) Assumes 10,800 feet of water main pipe installation. Assume F&O designs water system.

(12) Annual cost per EDU is over a 20 year period at an annual interest rate of 2%. Does not include connection to sewer, connection charge, or annual O&M costs.

(13) Assumes no land acquisition cost for Pump Station.

FUSS & O'NEILL

Table 0-10 for Old Colony Beach Club Association

Recommended Plan - Sanitary Sewers with Discharge to East Lyme with Additional Association Improvements

ORDER OF MAGNITUDE OPINION OF CAPITAL COSTS [1]

OLD COLONY BEACH CLUB

June 30, 2012

	NO COST SHARING		SHARE COSTS WITH OLSBA	
	Low Range Costs[2] -15%	High Range Costs[2] +30%	Low Range Costs[2] -15%	High Range Costs[2] +20%
Procure Agreements for Recommended Plan				
1. Technical Services to Procure Stakeholder Agreements	$ 21,250	$ 32,500	$ 10,625	$ 16,250
2. Legal and Administrative Services to Procure Stakeholder Agreements	$ 34,000	$ 52,000	$ 17,000	$ 26,000
3. Total - Procure Agreements for Recommended Plan (Rounded)	**$ 55,000**	**$ 85,000**	**$ 28,000**	**$ 42,000**
Project Construction				
4. Construction Cost-Gravity Sewer with Central Pump Station [3]	$ 1,683,000	$ 2,574,000	$ 1,683,000	$ 2,574,000
5. Construction Cost-Force Main Along Route 156 to East Lyme [3]	$ 2,448,000	$ 3,744,000	$ 2,448,000	$ 3,744,000
6. Construction Cost-Cost Sharing Along Route 156	$ -	$ -	$ (1,224,000)	$ (1,872,000)
7. Buy-In Fee to East Lyme/Waterford/New London [3]	$ 1,000,000	$ 1,000,000	$ 500,000	$ 500,000
8. Technical Services-Design, Permitting & Construction Administration [4]	$ 826,200	$ 1,263,600	$ 581,400	$ 889,200
9. Legal & Administrative [5]	$ 206,550	$ 315,900	$ 145,350	$ 222,300
10. Total - Project Construction Costs (Rounded)	**$ 6,160,000**	**$ 8,900,000**	**$ 4,130,000**	**$ 6,060,000**
DEEP CWF Eligible Design & Construction Costs				
11. Procure Agreements for Recommended Plan (Excludes Legal and Admin)	$ 55,000	$ 85,000	$ 28,000	$ 42,000
12. Project Construction Costs (Excludes Legal & Admin)	$ 5,960,000	$ 8,580,000	$ 3,990,000	$ 5,840,000
13. DEEP CWF 25% Design & Construction (Small Community) Grant Amount	$ (1,503,750)	$ (2,166,250)	$ (1,004,500)	$ (1,470,500)
14. Total - DEEP CWF Loan Eligible Costs (Rounded) [6]	**$ 4,511,000**	**$ 6,499,000**	**$ 3,014,000**	**$ 4,412,000**
DEEP Ineligible Costs[7]				
15. Short Term Financing at 1.5% [8]	$ -	$ -	$ -	$ -
15a. Legal and Administrative Fees (Table Line Items #2, #9)	$ 240,550	$ 367,900	$ 162,350	$ 248,300
16. Storm Drainage Improvements[9]	$ 199,750	$ 305,500	$ 199,750	$ 305,500
17. Extensive Road Reconstruction[10]	$ 875,500	$ 1,339,000	$ 875,500	$ 1,339,000
18. Fire Hydrants (Quantity: 16)	$ -	$ -	$ -	$ -
19. Drinking Water System Improvements[11]	$ -	$ -	$ -	$ -
20. Technical Services-Design,Permitting & Construction Administration[4]	$ 215,050	$ 328,900	$ 215,050	$ 328,900
21. TOTAL - DEEP Ineligible Costs (Rounded)	**$ 1,531,000**	**$ 2,341,000**	**$ 1,453,000**	**$ 2,222,000**
Estimated Local Share				
22. DEEP CWF Loan Eligible Costs [7]	$ 4,511,000	$ 6,499,000	$ 3,014,000	$ 4,412,000
23. DEEP Ineligible Costs	$ 1,531,000	$ 2,341,000	$ 1,453,000	$ 2,222,000
24. Estimated Local Cost Share (Rounded)	**$ 6,042,000**	**$ 8,840,000**	**$ 4,467,000**	**$ 6,634,000**
Net Capital Cost Per EDU				
25. Estimated Local Cost Share	$ 6,042,000	$ 8,840,000	$ 4,467,000	$ 6,634,000
26. Number of EDU's (Properties) Served	213	213	213	213
27. Net Cost Per EDU (Rounded)	**$ 28,000**	**$ 42,000**	**$ 21,000**	**$ 31,000**
Annual Capital Cost Per EDU (Rounded) [12]	**$1,700**	**$2,600**	**$1,300**	**$1,900**

Notes:

(1) All Phase III costs developed in 2011 dollars.

(2) Typical planning level costs carry contingencies of -15% to + 30%. Opinion of costs will continue to be refined during subsequent phases. See Facilities Planning Cost Document for more Detailed Cost Breakdown.

(3) Does not include cost of gravity service connections from the building to sewer stub in street and abandonment of septic system (this cost to be paid by homeowner). Average connection cost to sewer stub estimated to be $2,000-$2,500. Assumes $1M Connection Fee apportioned to East Lyme, Waterford, and New London. Actual Connection Fees and apprtionment breakdown are not defined at this juncture. Assumes cost sharing of force Main to East Lyme with Old Colony Assumes cost sharing of force Main to East Lyme with Old Colony.

(4) Technical Services During Design and Construction estimated @ 20% of construction for planning purposes. Services include engineering design, permitting, topographic survey, test borings, bidding services, construction administration and resident representative services.

(5) Legal and Administrative Costs estimated based on construction cost. Services include Bond Counsel costs, Finance Director Costs, setup assessment policy, setup user fee policy, create programatic administrative policies, and miscellaneous legal and administrative costs during design and construction of the project.

(6) DEEP eligible costs include roadway improvements composed of temporary pavement repair, permanent pavement repair, and pavement mill & overlay to dimensions prescribed by DOT approval.

(7) Ineligible costs include project costs not directly related to sewer design or construction; including daily WPCA Operating Administrative Costs and construction costs not required for the sewer project. Legal costs other than land acquisition are loan eligible only.

(8) Assume DEEP funding of design and construction work within 3 months of CWF application submittal.

(9) Assumes 4000 feet of storm sewer with 10 catch basins

(10) Based on $300,000 per street for road reconstruction (per quotes obtained by Paul Rowean) less $406,000 pavement allowance in sewer project road restoration.

(11) Assumes 10,800 feet of water main pipe installation. Assume F&O designs water system.

(12) Annual cost per EDU is over a 20 year period at an annual interest rate of 2%. Does not include connection to sewer, connection charge, or annual O&M costs.

(13) Assumes no land acquisition cost for Pump Station

A conservative estimated annual O&M cost for a centralized sewer system with discharge directly to East Lyme has been updated in Table 0-11 below.

Table 0-11:
Estimated Annual O&M Cost for Centralized Sewer System to East Lyme

O&M COSTS (2012)	Gravity Sewers
Contract Operation Fee	$10,000
Annual Payment to East Lyme for flow treatment at New London WPCF[1]	$25,000
Annual Payment to Point O' Woods for shared pump station cost[2]	$0
Grinder pump equipment short lived asset account[4]	$0
Gas and oil for generator(s)	$200
General Engineering/Legal	$2,000
Audit	$500
Discretionary Fund	$500
Odor Control	$20,000
Short lived asset account (Reserve for capital non-reoccurring)	$10,000
State fees	$300
Billing & Collection	$5,000
Annual O&M Cost (Rounded)	**$74,000**

1) Based on an assumed $5/1000 gallons of w astewater
2) Based on an assumed $5/1000 gallons of w astewater
3) Based on i=4%, t=20 years, PV=-$100,000
4) Based on $40 per Grinder Pump per year

The costs to extend a shared force main to Point O' Woods (POW) and then upgrade the POW pump station for the increased flow rate were evaluated from a shared project perspective. The life cycle cost of connecting to the POW system appears to be more expensive than a connection directly to the East Lyme sewer system. This is based on projected additional sewer user fees POW would charge OCBC and OLSBA, POW pump station upgrade costs, one time infrastructure buy-in fee, and ongoing sharing of O&M costs. The life cycle cost comparison in Table 0-12 summarizes the estimated 20-year savings of discharging directly to East Lyme.

Table 0-12: Life Cycle Cost of Alternatives

Estimated 20-Year Annual Life Cycle Cost Summary for a Centralized Sewer System with Gravity Sewers (costs per EDU)

Discharge Location	OLSBA	OCBC
	(-30% to +50%)	*(-30% to +50%)*
Point O' Woods	$1,400 to $2,300	$1,100 to $1,800
East Lyme	$1,200 to $2,200	$1,000 to $1,700

Includes one time capital cost annualized over 20 years at 2% interest plus 20 years of annual O+M at 3% inflation.

Estimated 20-Year Total Life Cycle Cost Summary for a Centralized Sewer System with Gravity Sewers (costs per EDU)

Discharge Location	OLSBA	OCBC
	(-30% to +50%)	*(-30% to +50%)*
Point O' Woods	$35,300 to $57,200	$28,700 to $45,200
East Lyme	$30,700 to $53,900	$24,600 to $42,300

Includes one time capital cost with 20 year/2% loan interest plus 20 years of annual O+M at 3% inflation.

Estimated 20-Year Total Life Cycle Cost Summary

Discharge Location	OLSBA	OCBC
	(-30% to +50%)	*(-30% to +50%)*
Point O' Woods	$6,784,000 to $10,974,000	$6,237,000 to $9,804,000
East Lyme	$5,889,000 to $10,346,000	$5,343,000 to $9,176,000

Includes one time capital cost with 20 year/2% loan interest plus 20 years of annual O+M at 3% inflation.

9) Detailed Breakdown of Revised Construction Costs

The order of magnitude opinion of costs in both facilities reports were combined to create detailed project cost estimates as updated in Tables 0-13 thru 0-18. The updates include addition of more detailed item descriptions to be more comparable to items listed in OCBC draft facilities plan cost estimate tables.

Table 0-13: Revised Order of Magnitude Opinion of Construction Costs

Description	Cost Range	
	-15%	+30%
Gravity Sewer Collection System in OLSBA Study Area	$2,190,000	$3,350,000
Gravity Sewer Collection System in OCBC Study Area	$1,690,000	$2,580,000
Force Main Crossing Rail Corridor from OLSBA to East Lyme	$2,450,000	$3,750,000
Force Main Crossing Rail Corridor from OLSBA to Point O' Woods	$2,080,000	$3,180,000
Force Main under Tidal Wetlands to Point O' Woods	$3,100,000	$4,740,000

Note: Costs provided are for sewers only and do not include additional association infrastructure repair/replacements

FUSS & O'NEILL

Table 0-14

ORDER OF MAGNITUDE OPINION OF COST		FUSS & O'NEILL *Disciplines to Deliver*	SHEET: 1 OF 1
PROJECT:	WASTEWATER FACILITIES PLANNING		DATE 05/03/12
LOCATION:	OLD LYME SHORES BEACH ASSOCIATION		ESTIMATOR: MMJ
DESCRIPTION:	**Gravity Sewer Collection System in OLSBA Study Area**		CHECKED BY: KAM
			PROJECT NO.: 2010.1210.A10

Since Fuss & O'Neill has no control over the cost of labor, materials, equipment or services furnished by others, or over the Contractor(s)' methods of determining prices, or over competitive bidding or market conditions, Fuss & O'Neill's opinion of probable Total Project Costs and Construction Cost are made on the basis of Fuss & O'Neill's experience and qualifications and represent Fuss & O'Neill's best judgment as an experienced and qualified professional engineer, familiar with the construction industry; but Fuss & O'Neill cannot and does not guarantee that proposals, bids or actual Total Project or Construction Costs will not vary from opinions of probable cost prepared by Fuss & O'Neill. If prior to the bidding or negotiating Phase the Owner wishes greater assurance as to Total Project or Construction Costs, the Owner shall employ an independent cost estimator.

ITEM DESCRIPTION	UNITS	NUM. OF UNITS	COST PER UNIT	TOTAL COST
8-inch Gravity Sewer	FT	10,800	$85	$918,000
6-inch Force Main, Cleanouts and Valve Chambers	FT	2,220	$75	$166,500
6-inch Service Connection	FT	3,840	$50	$192,000
Sanitary Sewer Manhole	EA	36	$4,000	$144,000
OLSBA Municipal Pump Station	EA	1	$500,000	$500,000
Pump Station Land Easement	EA	1	$25,000	$25,000
Rock Excavation Note 1	CY	1,700	$90	$153,000
Construction Mobilization	LS	1	$50,000	$50,000
Temporary Bituminous Pavement Repair (Association Road)	LF	12,400	$13	$161,200
Mill and Overlay (Association Road) Note 2	SY	14,400	$17	$244,800
Temporary Bituminous Pavement Repair (State Road) Note 3	LF	35	$15	$525
Permanent Bituminous Pavement Repair (State Road) Note 3	LF	35	$20	$700
Mill & Overlay (State Road) Note 3	SY	100	$50	$5,000
TOTAL CONSTRUCTION COST				$2,570,000
SUBTOTAL				$2,570,000
TOTAL COST (-15% TO +30% ROUNDED)				**$2,190,000 TO $3,350,000**

Notes:
1) Assume 1 feet of rock excavation for gravity pipe trenches and no rock excavation for pump station or force main
2) Based on 24' wide road
3) Assume State Road full travel lane Pavement Mill + Overlay with Traffic Control Included
3) Assumes one crossing of Route 156 and pipes to connect northerly streets will be installed in the state road shoulder. Assume State Road crossing is Pavement Mill + Overlay. Includes traffic protection.
4) Assume pump station easement negotiation to include waived assessment for property - value $25,000

FUSS & O'NEILL

Table 0-15

ORDER OF MAGNITUDE OPINION OF COST		FUSS & O'NEILL *Disciplines to Deliver*	SHEET: 1 OF 1
PROJECT:	WASTEWATER FACILITIES PLANNING		DATE 05/03/12
LOCATION:	Old Colony Beach Club		ESTIMATOR: MMJ
DESCRIPTION:	**Gravity Sewer Collection System in OCBC Study Area**		CHECKED BY: KAM
			PROJECT NO.: 2010.1210.A10

Since Fuss & O'Neill has no control over the cost of labor, materials, equipment or services furnished by others, or over the Contractor(s)' methods of determining prices, or over competitive bidding or market conditions, Fuss & O'Neill's opinion of probable Total Project Costs and Construction Cost are made on the basis of Fuss & O'Neill's experience and qualifications and represent Fuss & O'Neill's best judgment as an experienced and qualified professional engineer, familiar with the construction industry; but Fuss & O'Neill cannot and does not guarantee that proposals, bids or actual Total Project or Construction Costs will not vary from opinions of probable cost prepared by Fuss & O'Neill. If prior to the bidding or negotiating Phase the Owner wishes greater assurance as to Total Project or Construction Costs, the Owner shall employ an independent cost estimator.

ITEM DESCRIPTION	UNITS	NUM. OF UNITS	COST PER UNIT	TOTAL COST
8-inch Gravity Sewer	FT	7,600	$85	$646,000
6-inch Force Main, Cleanouts and Valve Chambers	FT	1,800	$75	$135,000
6-inch Service Connection	FT	4,500	$50	$225,000
Sanitary Sewer Manhole	EA	25	$4,000	$101,333
OCBA Municipal Pump Station	EA	1	$500,000	$500,000
Pump Station Land Easement	EA	1	$25,000	$25,000
Rock Excavation Note 1	CY	0	$90	$0
Construction Mobilization	LS	1	$50,000	$50,000
Temporary Bituminous Pavement Repair (Association Road)	LF	9,200	$13	$119,600
Mill and Overlay (Association Road) Note 2	SY	10,200	$17	$173,400
Temporary Bituminous Pavement Repair (State Road) Note 3	LF	0	$15	$0
Permanent Bituminous Pavement Repair (State Road) Note 3	LF	0	$20	$0
Mill & Overlay (State Road) Note 3	SY	0	$50	$0
TOTAL CONSTRUCTION COST				$1,980,000
SUBTOTAL				$1,980,000
TOTAL COST (-15% TO +30% ROUNDED)				**$1,690,000 TO $2,580,000**

Notes:
1) Assume 1 feet of rock excavation for gravity pipe trenches and no rock excavation for pump station or force main
2) Based on 24' wide road
3) Assume State Road full travel lane Pavement Mill + Overlay with Traffic Control Included
3) Assumes one crossing of Route 156 and pipes to connect northerly streets will be installed in the state road shoulder. Assume State Road crossing is Pavement Mill + Overlay. Includes traffic protection.
4) Assume pump station easement negotiation to include waived assessment for property - value $25,000

FUSS & O'NEILL

Table 0-16

ORDER OF MAGNITUDE OPINION OF COST		FUSS & O'NEILL *Disciplines to Deliver*	SHEET: 1 OF 1
PROJECT:	WASTEWATER FACILITIES PLANNING		DATE 06/12/11
LOCATION:	OLD LYME SHORES BEACH ASSOCIATION		ESTIMATOR: MMJ
DESCRIPTION:	**Force Main Crossing Rail Corridor from OLSBA to East Lyme**		CHECKED BY:
			PROJECT NO.: 2010.1210.A10

Since Fuss & O'Neill has no control over the cost of labor, materials, equipment or services furnished by others, or over the Contractor(s methods of determining prices, or over competitive bidding or market conditions, Fuss & O'Neill's opinion of probable Total Project Costs and Construction Cost are made on the basis of Fuss & O'Neill's experience and qualifications and represent Fuss & O'Neill's best judgment as an experienced and qualified professional engineer, familiar with the construction industry; but Fuss & O'Neill cannot and do not guarantee that proposals, bids or actual Total Project or Construction Costs will not vary from opinions of probable cost prepared by Fuss & O'Neill. If prior to the bidding or negotiating Phase the Owner wishes greater assurance as to Total Project or Construction Costs the Owner shall employ an independent cost estimator.

ITEM DESCRIPTION	UNITS	NUM. OF UNITS	COST PER UNIT	TOTAL COST
6-inch Force Main, Cleanouts and Valve Chambers	FT	13,000	$85	$1,105,000
OLSBA Pump Station Pump Size Increase	EA	1	$60,000	$60,000
Rock Excavation Note 1	CY	722	$90	$65,000
Temporary Bituminous Pavement Repair (State Road) Note 2	LF	13,000	$15	$195,000
Permanent Bituminous Pavement Repair (State Road) Note 2	LF	13,000	$20	$260,000
Mill & Overlay (State Road) Note 2	SY	17,400	$50	$870,000
Stream Crossing	EA	4	$30,000.00	$120,000
East Lyme Sewer Connection Fee Note 3	ALL	0	$1,000,000	$0
Railroad Bridge Crossing Premium Note 4	ALL	1	$200,000	$200,000
TOTAL CONSTRUCTION COST				$2,880,000
SUBTOTAL				$2,880,000
TOTAL COST (-15% TO +30% ROUNDED)				**$2,450,000 TO $3,750,000**

Notes:
1) Rock Excavation Assumed
2) Assume State Road full travel lane Pavement Mill + Overlay. Includes traffic control.
3) Assumes no East Lyme Sewer Connection Fee
4) Assume significant Railroad and DOT work restrictions

FUSS & O'NEILL

Table 0-17

ORDER OF MAGNITUDE OPINION OF COST		FUSS & O'NEILL *Disciplines to Deliver*	SHEET: 1 OF 1
PROJECT:	WASTEWATER FACILITIES PLANNING		DATE 05/03/12
LOCATION:	OLD LYME SHORES BEACH ASSOCIATION		ESTIMATOR: MMJ
DESCRIPTION:	**Force Main Crossing Rail Corridor from OLSBA to Point O' Woods**		CHECKED BY:
			PROJECT NO.: 2010.1210.A10

Since Fuss & O'Neill has no control over the cost of labor, materials, equipment or services furnished by others, or over the Contractor(s methods of determining prices, or over competitive bidding or market conditions, Fuss & O'Neill's opinion of probable Total Project Costs and Construction Cost are made on the basis of Fuss & O'Neill's experience and qualifications and represent Fuss & O'Neill's best judgment as an experienced and qualified professional engineer, familiar with the construction industry; but Fuss & O'Neill cannot and do not guarantee that proposals, bids or actual Total Project or Construction Costs will not vary from opinions of probable cost prepared by Fuss & O'Neill. If prior to the bidding or negotiating Phase the Owner wishes greater assurance as to Total Project or Construction Costs the Owner shall employ an independent cost estimator.

ITEM DESCRIPTION	UNITS	NUM. OF UNITS	COST PER UNIT	TOTAL COST
6-inch Force Main, Cleanouts and Valve Chambers	FT	6,084	$75	$456,300
Rock Excavation Note 1	CY	550	$90	$49,500
Temporary Bituminous Pavement Repair (State Road) Note 2	LF	5,484	$15	$82,260
Permanent Bituminous Pavement Repair (State Road) Note 2	LF	5,484	$20	$109,680
Mill & Overlay (State Road) Note 2	SY	7,400	$50	$370,000
Stream Crossing	EA	2	$30,000	$60,000
East Lyme Sewer Connection Fee Note 3	ALL	0	$1,000,000	$0
Railroad Bridge Crossing Premium Note 4	ALL	1	$200,000	$200,000
POW Pump Station Upgrade	LS	1	$200,000	$200,000
Point O' Woods Connection Fee Note 6	ALL	1	$909,091	$909,091
TOTAL CONSTRUCTION COST				$2,440,000
SUBTOTAL				$2,440,000
TOTAL COST (-15% TO +30% ROUNDED)				**$2,080,000 TO $3,180,000**

Notes:
1) Rock Excavation Assumed
2) Assume State Road full travel lane Pavement Mill + Overlay. Includes traffic protection.
3) Assumes no East Lyme Sewer Connection Fee
4) Assume significant Railroad and DOT work restrictions
5) Cost does not include collection system piping
6) Connection Fee has not yet been negotiated with Point O' Woods and may vary.

FUSS & O'NEILL

Table 0-18

ORDER OF MAGNITUDE OPINION OF COST		FUSS & O'NEILL *Disciplines to Deliver*	SHEET: 1 OF 1
PROJECT:	WASTEWATER FACILITIES PLANNING		DATE 06/12/11
LOCATION:	OLD LYME SHORES BEACH ASSOCIATION		ESTIMATOR: MMJ
DESCRIPTION:	**Off Road Sewer Construction with Directional Drill under Tidal Wetlands to Point O' Woods**		CHECKED BY:
			PROJECT NO.: 2010.1210.A10

Since Fuss & O'Neill has no control over the cost of labor, materials, equipment or services furnished by others, or over the Contractor(s methods of determining prices, or over competitive bidding or market conditions, Fuss & O'Neill's opinion of probable Total Project Costs and Construction Cost are made on the basis of Fuss & O'Neill's experience and qualifications and represent Fuss & O'Neill's best judgment as an experienced and qualified professional engineer, familiar with the construction industry; but Fuss & O'Neill cannot and do not guarantee that proposals, bids or actual Total Project or Construction Costs will not vary from opinions of probable cost prepared by Fuss & O'Neill. If prior to the bidding or negotiating Phase the Owner wishes greater assurance as to Total Project or Construction Costs the Owner shall employ an independent cost estimator.

ITEM DESCRIPTION	UNITS	NUM. OF UNITS	COST PER UNIT	TOTAL COST
6-inch Force Main, Cleanouts and Valve Chambers	FT	4,550	$75	$341,250
Directional Drilling Note 1	LF	1,250	$400	$500,000
Rock Excavation Note 2	CY	15,000	$90	$1,350,000
Private Property Sewer Easements	SY	10,000	$10	$100,000
Temporary Bituminous Pavement Repair (Town & POW Road)	LF	700	$13	$9,100
Mill and Overlay (Town & POW Road) Note 3	SY	2,000	$17	$34,000
Temporary Bituminous Pavement Repair (State Road) Note 4	LF	1,600	$15	$24,000
Permanent Bituminous Pavement Repair (State Road) Note 4	LF	1,600	$20	$32,000
Mill & Overlay (State Road) Note 4	SY	2,200	$50	$110,000
Stream Crossing	EA	1	$30,000	$30,000
East Lyme Sewer Connection Fee Note 5	ALL	0	$1,000,000	$0
POW Pump Station Upgrade	LS	1	$200,000	$200,000
Point O' Woods Connection Fee Note 7	ALL	1	$909,091	$909,091
TOTAL CONSTRUCTION COST				$3,640,000
SUBTOTAL				$3,640,000
TOTAL COST (-15% TO +30% ROUNDED)				**$3,100,000 TO $4,740,000**

Notes:
1) Based on past work experience. Actual soil conditions may change price.
2) Rock Excavation Assumed
3) Based on 12 ft wide road
4) Assume State Road is Pavement Mill + Overlay. Includes traffic protection.
5) Assumes no East Lyme Sewer Connection Fee
6) Cost does not include collection piping
7) Connection Fee has not yet been negotiated with Point O' Woods and may vary.

Fall 2000
Vol. 11 No. 4

Pipeline

Decentralized Wastewater Treatment Systems

The town of Pegram sits along the scenic Harpeth River approximately 10 miles west of Nashville, Tennessee. Pegram has a population of about 2,000 people and supports several businesses including a bank, a restaurant, a flower shop, and the locally famous Harpeth Clock and Quilt Company.

In 1997, Pegram faced a difficult situation. Many of the businesses that used septic tanks and drainfields had failing systems. The Pegram Elementary School, as well as several homes, also had failing systems.

Town leaders evaluated their options for providing wastewater treatment service to the area. They initially looked at a centralized system to collect and treat wastewater and dispose of it in the Harpeth River.

This option proved to be impossible because of the close proximity of a neighboring town's drinking water intake. Besides, many of the town's residents were actively working to protect their local environment and did not want to see treated wastewater (effluent) discharged into the river.

The town also looked into installing a centralized collection system and running sewage pipes to Nashville's treatment system. However, the cost for the extensive piping to go the 10 miles was prohibitive, and the cost of having the city of Nashville treat their wastewater would have resulted in high sewer bills for Pegram's residents.

The last option city leaders looked into was installing a cluster system that uses watertight effluent collection pipes, sand-gravel filter treatment, and effluent disposal by subsurface drip irrigation in a nearby farm pasture.

This choice takes what is known as a "decentralized approach," using a combination of processes to treat and dispose of wastewater. The town of Pegram decided that a cluster system, using new watertight interceptor (septic) tanks at each home or business and a watertight collection system running to a treatment facility, was the most feasible way for them to

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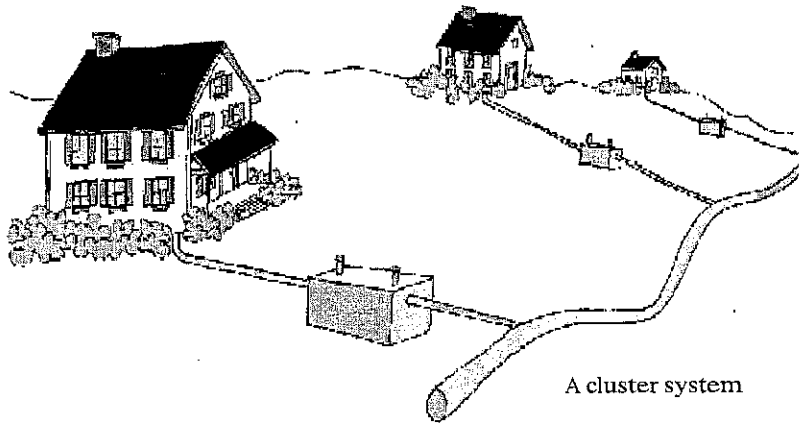

A cluster system

Key Terms

An **onsite system** is a natural system or mechanical device used to collect, treat, and discharge or reclaim wastewater from an individual dwelling without the use of community-wide sewers or a centralized treatment facility. A conventional onsite system includes a septic tank and a drainfield. Other types of alternative onsite systems include at-grade systems, mound systems, media filters, small aerobic units, and pressure distribution systems.

A **cluster system** is a wastewater collection and treatment system that serves two or more dwellings, but less than an entire community. Individual septic tanks or aerobic units may pretreat wastewater from several homes before it is transported through low cost, alternative sewers to a treatment unit that is relatively small compared to centralized systems.

A **decentralized system** is an onsite or cluster wastewater system that is used to treat and dispose of relatively small volumes of wastewater, generally originating from individual or groups of dwellings and businesses that are located relatively close together. Onsite and cluster systems are commonly used in combination.

Adapted from the *Response to Congress on use of Decentralized Wastewater Treatment Systems.*

What's Right for Your Town?

Why Decentralize?

The decentralized approach to wastewater treatment is seen as beneficial for a number of reasons. This approach:

- saves money by deciding on a preventive strategy (such as assessing a community's needs and conditions) to manage wastewater before a crisis occurs, thereby avoiding unnecessary cost;
- allows homeowners to continue to use their properly functioning septic systems;
- enables better watershed maintenance by eliminating the large transfers of water from one watershed to another that happens with central ized treatment;
- may be the most cost-effective treatment strategy for rural communities with sparse populations; and
- is appropriate for varying site conditions including ecologically sensitive areas—treatment methods can be tailored to suit different site conditions.

When town leaders face having to upgrade wastewater treatment, the first choice usually is to build a centralized collection and treatment facility. However, centralized collection and treatment may not be the right answer for every community's wastewater disposal needs. (See table on page 3.)

Small and rural communities often cannot afford these expensive facilities, and their populations may be too spread out to make centralized treatment a realistic option. Additionally, some existing onsite systems may function effectively, so they don't need to be replaced.

In circumstances like these, decentralized wastewater treatment is often the best solution for wastewater management. Decentralized treatment involves using a combination of treatment technology options, both traditional and innovative, where they are most appropriate in a community. Conventional onsite systems, alternative onsite systems, cluster systems for groups of homes and businesses, and some use of centralized treatment can all be included when considering decentralized community wastewater management. The decentralized system is then managed (with varying degrees of control) to ensure each component functions properly.

Two Options Usually Considered

In the time since wastewater treatment has been an issue, only two options were ordinarily considered, the previously mentioned centralized systems and conventional septic systems. Onsite systems have been used for centuries, evolving from simple outhouses to cesspools to septic tanks and drainfields to the more advanced treatment units available now.

A conventional septic system, consisting of a tank and drainfield, treats wastewater at its source. But, older septic systems that were built without thought of adequate soil depth and/or that have not been properly maintained can fail, leading to surface and groundwater contamination. This potential for failure most often results from neglect of maintenance or inappropriate drainfield siting. Nevertheless, this process remains an option where soils are suitable.

Centralized systems require a network of collection pipes (sewers) leading from all homes and businesses

continued on next page

Introduction

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achieve their wastewater treatment goals.

All of the businesses in town were required to hook into the cluster system, while homes had the option of connecting, depending on whether or not their existing septic systems worked properly.

Taking this decentralized wastewater treatment approach was not only financially realistic, but Pegram was able to build the system and serve the businesses, as well as many of the failing home systems. The project was financed through available town funds and through revolving loan funds from the state of Tennessee.

Many towns find themselves in circumstances similar to Pegram's. They may need to upgrade or replace most of their wastewater treatment processes. And, they may find that running extensive sewer lines or building a single, centralized treatment facility cannot be done for any number of reasons.

This issue of *Pipeline* discusses decentralized wastewater treatment systems and how they can meet both public health and environmental protection goals in areas where centralized treatment is impractical or not cost-effective. Management and funding issues are presented plus the various treatment options that may be part of a decentralized system.

Readers are encouraged to reprint this issue or any *Pipeline* articles in flyers, newspapers, newsletters, or educational presentations. We ask that you include the name and phone number of the National Small Flows Clearinghouse (NSFC) on the reprinted information and send us a copy for our files.

If you have questions about reprinting articles or about the topics discussed in the newsletter, please contact the editor at (800) 624-8301 or (304) 293-4191.

Decentralized Systems

Hypothetical Rural Community Wastewater Treatment Costs

Technology option	Total capital cost	Annual O&M* cost	Total annual cost (annualized capital plus O&M)	Average monthly cost per household
Centralized systems	$2,585,600 – $4,176,590	$33,110– $44,830	$241,480 – $381,410	$149 – $235
Alternative SDGS** collection and small cluster systems	$666,040	$8,120	$61,800	$38
Onsite systems	$567,940	$14,920	$60,690	$37

Note: The rural community consists of 450 people in 135 homes.

*O&M means operation and maintenance

** SDGS stands for small-diameter gravity sewers

(Adapted from the Environmental Protection Agency, 1997—extrapolated to year 2000 costs)

What's Right for Your Town?

continued from previous page

to a central wastewater treatment facility. Urban and suburban areas with high population densities (more than three to four dwellings per acre) would probably be better served by centralized wastewater collection and treatment, but these facilities may be cost prohibitive for more sparsely populated, rural communities. Centralized treatment facilities also face increasing environmental constraints on discharging effluent into surface waters.

Septic systems have often been considered a temporary solution to be used only until public sewerage became available. So when deciding between options, many people consider onsite systems to be "second class" or the less desirable choice for treating wastewater.

Although opinions are changing, this prejudice against onsite systems still exists today. However, onsite systems are available now that treat wastewater more thoroughly than septic tanks. When operated under a management program, these systems can be used as a true alternative to large treatment plants.

Decentralized Systems Offer Flexibility

A decentralized system employs a combination of onsite and/or cluster systems and is used to treat and dispose of wastewater from dwellings and businesses close to the source. Decentralized wastewater systems allow for flexibility in wastewater management, and different parts of the system may be combined into "treatment trains," or a series of processes to meet treatment goals, overcome site conditions, and to address environmental protection requirements.

Managed decentralized wastewater systems are viable, long-term alternatives to centralized wastewater treatment facilities, particularly in small and rural communities where they are often most cost-effective. These systems already serve a quarter of the population nationwide and half the population in some states. They should be considered in any evaluation of wastewater management options for small and mid-sized communities.

So, how does a community decide which management approach is right for its wastewater treatment? Community leaders first need to ask some questions and then create a management plan. What circumstances are causing a reevaluation of present wastewater treatment? Are local septic systems failing? Is residential development stifled because of a lack of adequate wastewater treatment facilities? An organized plan will help managers clearly define the problems, review the possibilities, and assess the costs associated with each potential solution.

Many options now exist for wastewater treatment and disposal in rural areas and small communities. Each technology has advantages, as well as limitations, so a treatment technology must be selected specifically to meet local conditions and treatment objectives. Similarly, every community's own financial, physical, and regulatory factors must be evaluated to find the best technology for their circumstances.

Onsite systems now include a number of alternatives that surpass conventional septic tank and drainfield systems in their ability to treat wastewater. Alternative onsite processes, such as sand filters, peat filters, aerobic treatment units, pressure distribution systems, drip irrigation, and disinfection systems, can be employed in a wide

continued on page 4

continued from page 3

range of soil and site conditions. Alternative systems require more monitoring and maintenance, making a strong case for these systems to be managed.

Small satellite treatment plants or soil absorption systems that have low-cost collection sewers are called cluster systems. Cluster systems treat wastewater from a group of dwellings and/or businesses and are most appropriate in moderately populated areas. These systems serve two or more dwellings (but not usually an entire community) and are located near the buildings they serve.

The wastewater from each dwelling or business flows into its own interceptor (septic) tank to settle out and allow solids to break down. From the tank, the effluent is able to travel through smaller diameter, therefore less expensive, collection pipes.

These pipes are buried at a shallower depth than full sewers and run relatively short distances to smaller, less maintenance-intensive treatment and disposal units. These units often use soil absorption fields or effluent recycling rather than discharging the treated wastewater into surface waters.

Funding Changes Affect Choices

Cost is always a primary consideration in deciding among wastewater treatment options. Costs include the money needed to install the system and the annual cost to operate and maintain it. Depending on whether a community is an isolated, rural town or is on the fringes of a larger municipality, different circumstances play a role in what system will best serve the community's needs.

System costs are related to population size and density, topography, distance to an existing treatment facility, and state and local performance standards. In sparsely populated areas, upgrading or replacing failing onsite systems and building smaller, cluster treatment systems to serve the community's core is usually most cost-effective.

During the 1970s and 1980s, the federal government provided direct funding to help build wastewater treatment facilities. Federal funds for wastewater systems increased significantly in 1972 as a result of the Federal Water Pollution Control Act (later called the Clean Water Act). Between 1972 and 1990, the federal government spent more than $62 billion to build or upgrade treatment facilities through the Construction Grants and the Innovative and Alternative (I&A) Technology programs.

This money more often made its way to larger municipalities, and many smaller towns across the U.S. never received any of these funds. Consequently, wastewater management problems were never resolved in many small communities.

Today, direct federal funding to communities is nearly nonexistent. The Construction Grants and I&A programs were eliminated in the early part of the 1990s. The Clean Water State Revolving Fund (CWSRF) Program replaced them. Communities now must depend on CWSRFs and other sources of money for infrastructure improvements. (*See the Fall 1999* Pipeline *for more funding sources.*)

Systems Must be Managed

Management is the key to keeping decentralized treatment systems functioning properly. Management can encompass planning, siting, design, installation, operation, maintenance, and monitoring onsite and cluster systems. Regular inspection and maintenance form the basis of any management program.

Using one management strategy over another may depend upon local environmental sensitivities, the complexity of treatment technology and equipment, and the local regulatory agency's authority and resources.

More than one management model might be effective under particular circumstances, but any model should give the regulatory agency enough authority to make sure failing systems are repaired or replaced.

The National Onsite Wastewater Recycling Association (NOWRA) suggests these seven elements be included in any management model:

- system performance requirements that protect human health and the environment;
- system management to fulfill specific and measurable performance requirements;
- compliance monitoring and enforcement to ensure adequate system performance;
- guidelines for all aspects of siting, design, construction, and operation;
- education for all service providers, regulators, planners, and owners;

continued on next page

Previous Issues with Related Topics

***Funding Sources for Wastewater Projects*—Fall 1999**

***Inspections Equal Preventative Care for Onsite Systems*—Spring 1998**

***Choose the Right Consultant for Your Wastewater Project*—Winter 1997**

***Alternative Sewers: A Good Option for Many Communities*—Fall 1996**

***Management Programs Can Help Small Communities*—Spring 1996**

***Septic Systems—A Practical Alternative for Small Communities*—Fall 1995**

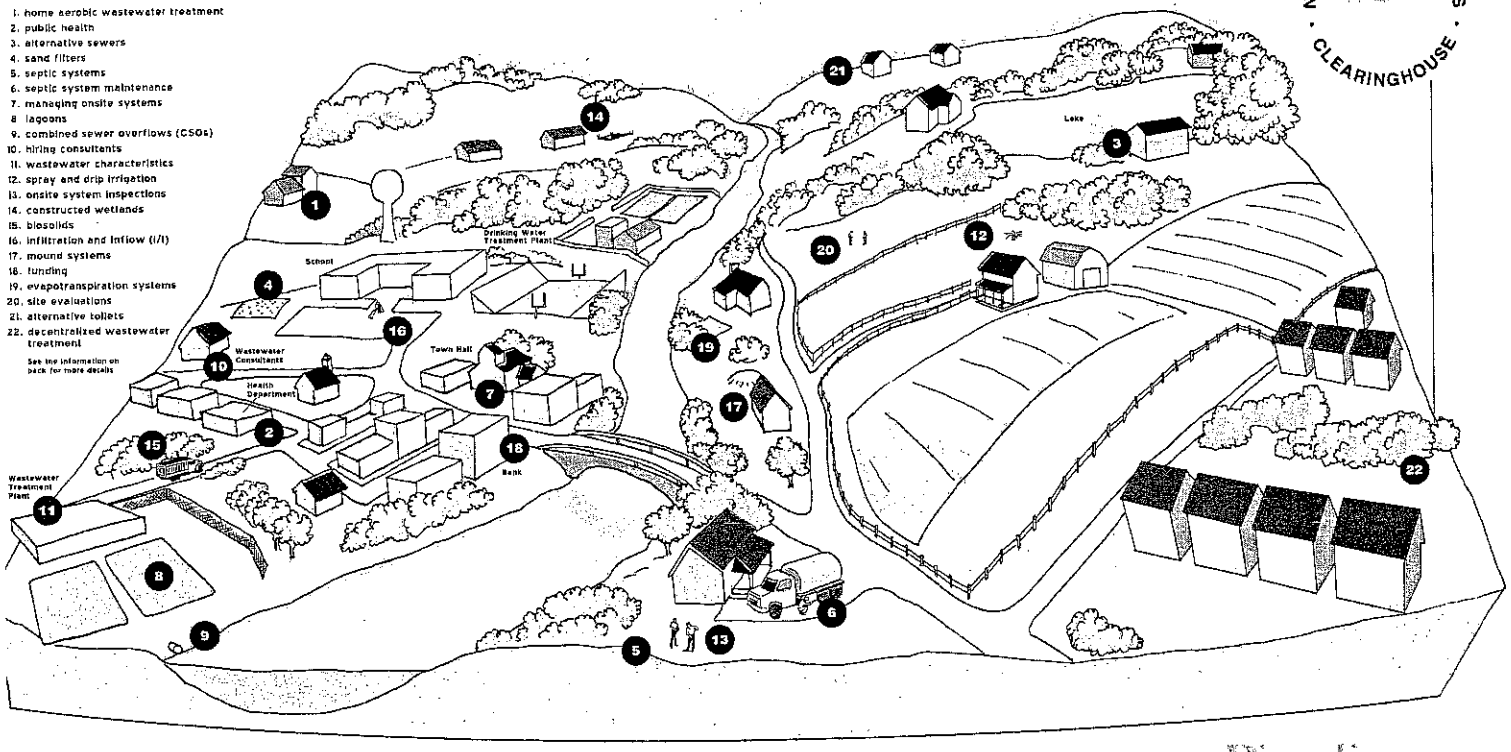
Small Community

Options Resources

NATIONAL SMALL FLOWS CLEARINGHOUSE

1. home aerobic wastewater treatment
2. public health
3. alternative sewers
4. sand filters
5. septic systems
6. septic system maintenance
7. managing onsite systems
8. lagoons
9. combined sewer overflows (CSOs)
10. hiring consultants
11. wastewater characteristics
12. spray and drip irrigation
13. onsite system inspections
14. constructed wetlands
15. biosolids
16. infiltration and inflow (I/I)
17. mound systems
18. funding
19. evapotranspiration systems
20. site evaluations
21. alternative toilets
22. decentralized wastewater treatment

See the information on back for more details



For more information please contact the NSFC at (800) 624-8301 or (304) 293-4191, fax (304) 293-3161, e-mail *nsfc_orders@mail.pstd.wvu.edu*, or write NSFC, West Virginia University, P.O. Box 6064, Morgantown, WV 26506-6064

Pipeline

Small Community Wastewater Issues Explained to the Public

Small Community

Options Resources

For more information or to order any of the following products, please contact the NSFC at (800) 624-8301 or (304) 293-4191, fax (304) 293-3161, e-mail *nsfc_orders@mail.estd.wvu.edu*, or write NSFC, West Virginia University, P.O. Box 6064, Morgantown, WV 26506-6064. Please request each item by title and item number. A shipping and handling charge will apply to all orders.

1 home aerobic wastewater treatment
Aerobic treatment can be a good option for homes on sites unsuitable for septic systems or in environmentally sensitive areas. The Winter 1996 *Pipeline* (vol. 7, no. 1) explains the advantages and disadvantages of these systems, how they work, and their operation and maintenance. The price is 20 cents. Request item #SFPLNL04 *Home Aerobic Wastewater Treatment: An Alternative to Septic Systems.*

2 public health
Whether you are a homeowner with a septic system or a local official responsible for a community system, wastewater treatment is an important issue for you. The Summer 1996 *Pipeline* (vol. 7, no. 3) describes the dangers associated with inadequate wastewater treatment and how to avoid them. The price is 20 cents. Request item #SFPLNL06 *Wastewater Treatment Protects Small Community Life, Health.*

3 alternative sewers
Small diameter sewers can be used to collect and transport wastewater from small clusters of homes, developments, and communities. Because they don't require deep excavation, alternative sewers are often a more practical and economical choice than conventional gravity sewers. The Fall 1996 *Pipeline* (vol. 7, no. 4) provides an overview of alternative sewer technologies. The price is 20 cents. Request item #SFPLNL07 *Alternative Sewers: A Good Option for Many Communities.*

4 sand filters
Sand filters are used by many communities as an alternative to centralized wastewater treatment. Because they provide high quality treatment, sand filters are one of the best options for environmentally sensitive areas or for providing additional treatment where septic tank/soil absorption systems have failed. The Summer 1997 *Pipeline* (vol. 8, no. 3) describes open, buried, and recirculating sand filters, how they work, and their operation and maintenance. The price is 20 cents. Request item #SFPLNL10 *Sand Filters Provide Quality, Low-maintenance Treatment.*

5 septic systems
Septic tank/soil absorption systems are the most common type of onsite wastewater treatment. When properly designed, sited, constructed, and maintained, they are the best and most economical choice for many homes and businesses. The Summer 1995 *Pipeline* (vol. 6, no. 3) explains when septic systems are a good idea, how they work, and their advantages and disadvantages. The price is 20 cents. Request item #SFPLNL02 *Septic Systems—a Practical Alternative for Small Communities.*

6 septic system maintenance
Proper operation and maintenance are essential to prolonging the life of septic systems and preventing system failures. Homeowners and community leaders will find the Fall 1995 *Pipeline* (vol. 6, no. 4) full of helpful information. It explains how to care for septic systems, when to pump, what to and what not to flush, and what to expect at an inspection visit. The price is 20 cents. Request item #SFPLNL03 *Maintaining Your Septic System—a Guide for Homeowners.*

7 managing onsite systems
For many small communities, onsite and decentralized wastewater systems are more practical and economical than centralized systems. However, many communities view lack of individual control of these systems as a disadvantage. The Spring 1996 *Pipeline* (vol. 7, no. 2) explains why community management of wastewater systems is a good idea and gives several strategies for developing programs for the operation, maintenance, or monitoring of these systems. The price is 20 cents. Request item #SFPLNL05 *Management Programs Can Help Small Communities.*

8 lagoons
Lagoons are common around the world because they are a low-cost, low-maintenance, and energy-efficient wastewater treatment technology. The Spring 1997 *Pipeline* (vol. 8, no. 2) presents an overview of different types of lagoon systems, how they work, their operation and maintenance, and their advantages and disadvantages. The price is 20 cents. Request item #SFPLNL09 *Lagoons Systems can Provide Low-cost Wastewater Treatment.*

9 combined sewer overflows (CSOs)
Combined sewer overflows (CSOs) are remnants of the country's early infrastructure, when cities built combined sewer systems for collecting both wastewater and stormwater. Combined sewers can become overloaded during wet weather, causing untreated wastewater to overflow into the nearest body of water. The Spring 1995 *Pipeline* (vol.6, no. 2) explains the U.S. Environmental Protection Agency's CSO Control Policy and its requirements for small communities. The price is 20 cents. Request item #SFPLNL01 *Combined Sewer Overflows —A Priority for Small Communities.*

10 hiring consultants
Consultants are not all the same. Like doctors, lawyers, and other professionals they have different talents, interests, and levels of experience. The Winter 1997 *Pipeline* (vol. 8, no. 1) offers some strategies for hiring consultants that can be used by small communities and homeowners. Topics include developing requests for proposals (RFPs), conducting interviews, and negotiating contracts. The price is 20 cents. Request item #SFPLNL08 *Choose the Right Consultant for Your Wastewater Project.*

11 wastewater characteristics
The water we use may disappear from sight, but it never really goes away. Wastewater continues to affect our lives long after it swirls down the drain. How? Because certain wastewater components degrade water quality and can endanger public health. The Fall 1997 *Pipeline* (vol. 8, no. 4) answers some basic questions about wastewater and its potential to impact public health and the environment. The price is 20 cents. Request item #SFPLNL11 *Basic Wastewater Characteristics.*

12 spray and drip irrigation
Reusing water to irrigate land can help protect surface water resources by preventing pollution and by conserving potable water for other uses. The soil provides additional treatment through naturally occurring physical, biological, and chemical processes. The Winter 1999 *Pipeline* (vol. 10, no. 1) discusses two types of wastewater irrigation systems—spray systems and subsurface drip systems—plus operation and maintenance issues that go along with land-applied disposal methods. The price is 20 cents. Request item #SFPLNL16 *Spray and Drip Irrigation for Wastewater Reuse, Disposal.*

13 onsite systems inspections
Routine onsite system inspections help protect the health of families, their neighbors, and communities. They help homeowners determine when and how often maintenance is needed. The Spring 1998 *Pipeline* (vol. 9, no. 2) focuses on inspections of existing onsite systems to determine whether they are functioning properly and to diagnose problems before they lead to expensive repairs. The price is 20 cents. Request item #SFPLNL13 *Inspections Equal Preventative Care for Onsite Systems.*

14 constructed wetlands
Constructed wetlands can treat wastewater from a variety of sources—homes, businesses, and communities. The Summer 1998 *Pipeline* (vol. 9, no. 3) offers basic information for homeowners and community leaders about the types of constructed wetlands, how they work, and some of their advantages and disadvantages. The price is 20 cents. Request item #SFPLNL14 *Constructed Wetlands: A Natural Treatment Alternative.*

15 biosolids
Treating and disposing of sewage sludge and domestic septage can significantly add to wastewater treatment costs. These materials called "biosolids" have a variety of beneficial agricultural uses and help to rehabilitate land damaged by mining and other industries. The Fall 1998 *Pipeline* (vol. 9, no. 4) presents a brief overview of options for managing biosolids and discusses the regulations that are involved in biosolid recycling and disposal. The price is 20 cents. Request item #SFPLNL15 *Managing Biosolids in Small Communities.*

16 infiltration and inflow (I/I)
High groundwater or water remaining in the soil after rain or snow can infiltrate mainline pipes, joints, service laterals, connections, and other parts of older, damaged collection systems. Additional water can also enter collection systems from above-ground sources. Extra water entering collection systems is referred to as infiltration and inflow (I/I). The Spring 1999 *Pipeline* (vol. 10, no. 2) provides an overview of common methods for evaluating and correcting I/I problems, plus maintenance practices to prevent I/I from occurring. The price is 20 cents. Request item #SFPLNL17 *Infiltration and Inflow can be Costly for Communities.*

17 mound systems
Mound systems were developed to overcome three natural conditions: slow or rapidly permeable soils, shallow soils, and/or a high water table. A site with any of these conditions is not suited for a conventional septic system. The Summer 1999 *Pipeline* (vol. 10, no.3) discusses mounds and how they are designed, operated, and maintained. The price is 20 cents. Request item #SFPLNL18 *Mounds: A Septic System Alternative.*

18 funding
If your town is like other small communities, the most important—and perhaps the most difficult—part of a wastewater treatment project is securing the funding. Fewer residents help pay for a project, and fewer experts and resources are available to help find funding sources. The Fall 1999 *Pipeline* (vol. 10, no. 4) discusses funding sources for wastewater treatment projects. The price is 20 cents. Request item #SFPLNL19 *Funding Sources are Available for Wastewater Projects.*

19 evapotranspiration systems
Evapotranspiration (ET) systems use an alternative onsite treatment technology suitable for areas where risks of groundwater and surface water contamination might exist. The Winter 2000 *Pipeline* focuses on two versions of ET systems, how they are designed, how they treat wastewater effluent, and what climate and soil conditions warrant their use. The price is 20 cents. Request item #SFPLNL20 *Evapotranspiration Systems.*

20 site evaluations
More than one-fourth of Americans use some type of onsite wastewater treatment systems, and thousands of new onsite permits are issued each year. The Spring 2000 *Pipeline* explains the importance of a site evaluation, what steps are taken in the process, and how an evaluator uses test results to determine the best type of treatment system for a site. The price is 20 cents. Request item #SFPLNL21 *Site Evaluations.*

21 alternative toilets
Reduced amounts of water for toilet flushing is standard in the industry today. In addition to low-volume toilets, other alternatives have been developed. The Summer 2000 *Pipeline* (vol. 11, no. 3) discusses several designs of alternative toilets, and what circumstances may be suited to their use in the home or in public restrooms. The price is 20 cents. Request item #SFPLNL22 *Alternative Toilets: Options for Conservation and Specific Site Conditions.*

22 decentralized wastewater treatment
Small communities are frequently faced with needing to upgrade or replace their wastewater infrastructure, but centralized sewerage and treatment may not be the answer for everyone. The Fall 2000 *Pipeline* (vol. 11, no. 4) discusses ways to improve community wastewater treatment by using managed individual onsite and cluster systems. The price is 20 cents. Request item #SFPLNL23 *Decentralized Wastewater Treatment Systems.*

Environmental Services and Training Division

The Environmental Services and Training Division (ESTD) helps small communities protect their public and environmental health. Located at West Virginia University, ESTD houses four national programs:

- **The National Drinking Water Clearinghouse (NDWC)**
- **The National Small Flows Clearinghouse (NSFC)**
- **The National Environmental Training Center for Small Communities (NETCSC)**
- **The National Onsite Demonstration Project (NODP)**

Each organization has a separate mission and distinct goals, but they work collectively to provide a one-stop shop for small community drinking water, wastewater, and environmental training information and technical assistance.

To receive an information packet about the ESTD and its services, call (800) 624-8301 or (304) 293-4191, or visit ESTD's Web site at *http://www.estd.wvu.edu*.

NATIONAL SMALL FLOWS CLEARINGHOUSE

Public Acceptance of Decentralized Wastewater Treatment

When appropriately designed, sited, operated, and maintained, decentralized wastewater systems meet public health and water quality goals as well as centralized systems. Still, barriers exist, both real and imagined, that can hamper widespread acceptance of decentralized wastewater systems. These obstacles may be due to several factors:

- lack of knowledge and misperceptions about decentralized systems;
- state and local regulatory barriers;
- lack of adequate management programs;
- liability and engineering fee issues; and
- financial limitations of the community.

If decentralized systems are to become accepted as a wastewater treatment solution, people need to be educated about the benefits of this choice. Some states (Arizona, Missouri, North Carolina, Rhode Island, Texas, Florida,Washington, and others) have training programs on the subject for sanitarians and installers. Because of training programs, some states'regulatory officials allow a broader use of alternative onsite technologies—with the condition that these systems be managed by professional, certified operators.

Educational materials directed to homeowners should explain proper wastewater disposal and maintenance practices, as well as provide information about the consequences of system failures. Increased awareness about decentralized systems ought to help reduce the number of failing systems and the eventual negative effects on groundwater and surface water.

Managing individual onsite systems within the community presents one of the biggest hurdles officials may face. Brochures, newspaper articles, helplines, and other forms of public information will help homeowners become aware of the importance of managing and maintaining onsite systems.

Decentralized Systems

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- certification/licensing for service providers and regulators; and
- program reviews to resolve shortcomings and to correct problems.

The U.S. Environmental Protection Agency (EPA) is in the process of developing a number of management models for decentralized wastewater systems. The EPA's models start from a hands-off level of involvement where a regulatory agency inventories systems, but property owners are responsible for their own systems' maintenance.

Four additional models have been proposed with increasing levels of oversight. The far end of the scale suggests a public or private utility own and manage all aspects of the decentralized system, including both onsite and cluster systems. This model is most appropriate where a complex network of advanced onsite systems and cluster systems is in place, and where the environment may be especially sensitive.

National Small Flows Clearinghouse (NSFC)

The NSFC offers a variety of technical assistance and free and low-cost information and materials about wastewater technologies for small communities. Just a few of the NSFC's many resources and services are mentioned in this newsletter. Call the NSFC at (800) 624-8301 or (304) 293-4191 or visit our Web site at www.nsfc.wvu.edu for more information.

National Onsite Demonstration Program (NODP) Phase IV

The NODP Phase IV was established to promote, develop, and demonstrate management strategies for onsite wastewater treatment in our nation's small communities. Program staff can assist local officials in setting up management districts around the country by identifying successful management models and providing educational information about these models. Call the NODP at (800) 624-8301, or (304) 293-4191, or visit their Web site at *www.estd.wvu.edu/nodp4.*

National Onsite Wastewater Recycling Association, Inc.

The National Onsite Wastewater Recycling Association, Inc. (NOWRA) is a national professional organization created to advance and promote the onsite wastewater industry. NOWRA serves all aspects of the industry including governmental regulatory personnel, installers, field practitioners, suppliers, distributors, engineers, research professionals, designers, consultants, educators, soil scientists and manufacturers. Call NOWRA at (301) 776-7468 or visit their Web site at *www.nowra.org.*

Cranberry Lake: A Management Case Study

Cranberry Lake and Byram Township officials started looking into septic system management in the 1980s because the water quality of the lake was being threatened by household wastewater. Aging and poorly-maintained septic systems, small lot sizes, and an increasing number of homes used year-round converged to create problems.

Byram Township is one of four municipalities in Sussex County, New Jersey, that shared a $500,000 state grant to help establish wastewater management programs. The township appointed a steering committee (to provide input and guidance) that included the town manager, a board of health representative, members of the Cranberry Lake Association, and members of the Byram Environmental Commission.

The steering committee initially met with the county's planning department to discuss their principal concerns including:

- financial assistance to residents to repair or replace their systems;
- technical assistance to identify appropriate, cost-effective technologies that would perform well given Cranberry Lake's soil limitations; and
- educational assistance for the committee and residents to learn about all aspects of onsite wastewater treatment.

As word spread about the potential for a wastewater management ordinance,which could mean septic system inspections and fees for residents, friction arose in the community. The steering committee realized that its most urgent task was to educate the community. They obtained materials from the county health department and from Rutgers University to begin a vigorous educational campaign.

Committee members and county officials made presentations and gave seminars at local meetings. The committee developed newspaper articles to explain the issues. They also manned a booth at the Cranberry Lake Community Club's annual meeting, and they inserted wastewater management flyers in various township mailings.

Because some residents declared that they'd never had their septic systems pumped in 25 years, and others were not even sure they had septic systems, the committee distributed all kinds of information, from broad environmental concepts to basic information about how a septic system works. The steering committee dedicated itself to dispelling rumors and to making sure Cranberry Lake residents were fully aware of the seriousness of their dilemma.

After several more public meetings, the board of health finally passed the ordinance, and its regulations impose very straightforward basic maintenance requirements. Key provisions of the ordinance require that all homeowners obtain a $15 septic system operator's permit, valid for three years. Property owners must submit a plot plan showing the location of the property's well and septic tank and drainfield. They must also attach a brief description of the septic system. Homeowners receive an educational packet with each permit renewal.

To renew the three-year permit, homeowners must pay the fee and submit proof that the septic system had either been pumped out or that they had received a board of health waiver. Waivers might be issued under certain circumstances, such as infrequent use of a vacation home, so that a six-year pumping period is granted instead of the usual three years.

"I see getting a septic license as similar to getting a dog license. It costs twice as much, but it's no big deal. People know it's for everybody's protection." *Ronald Gatti*

Failure to comply can result in a fine of up to $1,000 per day and/or up to 90 days of community service. Even though compliance has not been perfect, the township doesn't want to fine anybody.

Margaret McGarrity, a member of the Byram Township Environmental Commission, said they send out a notice when it's time for license renewal and pumping. If there's no response, another notice follows in

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Photo courtesy of Cathie Falvey

Former *Pipeline* Editor Cathie Falvey and her brother, Jim, enjoyed spending time at Cranberry Lake when they were children.

How Homeowners Can Help Themselves

The Clean Water State Revolving Fund (CWSRF) is a low- or no-interest source of funding for installing, repairing, and upgrading decentralized wastewater systems in small towns and rural and suburban areas. Federal and state contributions are used to capitalize or set up the programs. These assets, in turn, are used to make low or no-interest loans for important water quality projects. Funds are then repaid to the CWSRF over terms as long as 20 years.

Repaid loans are recycled to fund other water quality projects. These CWSRF resources can help supplement the limited financial resources currently available for decentralized treatment systems. Projects that may be eligible for CWSRF monies include:

- new system installation (single and cluster systems) to correct an existing nonpoint source problem;
- replacing, upgrading, or modifying inadequate or failing systems;
- costs associated with establishing a centralized management entity* (e.g., permitting fees and legal fees); and
- capital costs associated with centralized management programs (e.g., trucks, storage buildings, and spare parts).

Ohio is an example of a state that is helping residents improve their onsite wastewater systems. In August 1997, the Ohio EPA and Mahoning County General Health District agreed to create a linked deposit program to make low-interest loans available to individual homeowners who needed to upgrade or replace their home sewage disposal systems. Ohio's process for obtaining a CWSRF loan is outlined below.

The homeowner obtains a permit from the county that outlines specifications about proper installation, operation, and maintenance of the onsite system. The homeowner is then issued a certificate, which he or she can take to any bank that participates in the linked deposit program.

The lending institution, using its own criteria, decides whether or not to offer the applicant a loan and at what interest rate and term. The lending institution notifies the Ohio EPA, who then deposits the loan amount in the bank at a reduced interest rate.Savings from the reduced interest rate are then passed on to the loan applicant.

Ten individuals have received loans totaling $53,335. Over the next three years, Ohio's EPA Water Pollution Control Loan Fund will make $1,425,000 available for use in this program. A similar program is being launched in Cuyahoga County, Ohio, with $1,950,000 earmarked for the first three years of the program.

**The EPAencourages establishing or designating a management entity for all decentralized projects. Acceptable management entities include cities and counties, special governmental units (e.g., sanitary districts and county service districts) public or private utilities, private corporations, and nonprofit organizations.*

Cranberry Lake Case Study

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one month. If after another month has lapsed and the property owner still has not responded, a notice of violation can lead to a summons.

Community support for the wastewater management program has grown stronger each year as residents come to understand its importance. Ronald Gatti, township manager, said, "Having to stand before a judge and defend against willful violation of the law isn't an attractive prospect. Besides, I see getting a septic license as similar to getting a dog license. It costs twice as much, but it's no big deal. People know it's for everybody's protection."

Web Links—Funding for Onsite Wastewater Treatment

EPA State Revolving Fund (SRF) Program General Information
www.epa.gov/owm/finan.htm

EPA SRF Program State Revolving Fund State Contacts
www.epa.gov/owm/srfcon.htm

Funding Decentralized Wastewater Systems Using EPA's Clean Water SRF
www.epa.gov/owm/septic3.htm

HUD State Community Development Block Grant (CDBG) Program
www.hud.gov/progdesc/cdbg-st.html

HUD Community Connections Information Center
www.comcon.org/

National Small Flows Clearinghouse National Onsite Demonstration Program
www.estd.wvu.edu/NODP

USDA Rural Development Field Offices
www.usda.gov/rus/water/states/usamap.htm

USDA Rural Utilities Service Water Programs
http://www.usda.gov/rus/water/index.htm

RESOURCES AVAILABLE FROM NSFC

To order any of the following products, call the National Small Flows Clearinghouse (NSFC) at (800) 624-8301 or (304) 293-4191, fax (304) 293-3161, e-mail nsfc_orders@mail.estd.wvu.edu, *or write NSFC, West Virginia University, P.O. Box 6064, Morgantown, WV 26506-6064. Be sure to request each item by number and title. A shipping and handling charge will apply.*

Choices for Communities: Wastewater Management Options for Rural Areas

This booklet examines alternatives to the conventional septic system, alternative wastewater collection technologies, and land-based treatment and disposal technologies. It begins with a history of onsite systems and discusses alternatives to centralized sewering, stressing that management, maintenance, and inspection are key. The cost for the booklet is 50 cents. Item #WWBLMG09.

Rural Community Assistance Program (RCAP) Help for Small Community Wastewater Projects

Developed by the EPA Office of Water, this free, two-page fact sheet describes RCAP, a national network of nonprofit organizations, and how they provide onsite technical assistance to communities to help them attain or maintain adequate wastewater treatment services. Item #WWFSFM32.

Wastewater Treatment and Disposal for Small Communities

This manual is designed to guide planners and designers through the required steps for developing small community wastewater management systems. The book provides general descriptions of alternative treatment technologies available for small communities. The cost is $16.55. Item #WWBKDM70.

Funding Decentralized Wastewater Systems Using the Clean Water State Revolving Fund

The Clean Water State Revolving Fund (CWSRF) is a low- or no-interest funding source for installing, repairing, and upgrading decentralized wastewater systems in small-town, rural, and suburban areas. This free, four-page fact sheet describes how the CWSRF operates and lists eligible projects, as well as who may qualify and how to get a project funded. Item #WWFSFN07.

Wastewater Products Catalog 2000

This newly updated catalog lists and describes the many products and services that the NSFC offers. The catalog may also be downloaded from the NSFC Web site at *http://www.nsfc.wvu.edu* or is available free upon request. Item #WWCAT.

PIPELINE

Pipeline is published quarterly by the National Small Flows Clearinghouse at West Virginia University, P.O. Box 6064, Morgantown, WV 26506-6064

Pipeline is funded through a grant from the U.S. Environmental Protection Agency
Washington, D.C.
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Office of Wastewater Management

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ISSN 1080-0043

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