WASTEWATER FACILITIES MANAGEMENT PLAN

PHASE I: REVIEW OF OUTLYING AREAS

Town of Ledyard

A Report to: Ledyard Water Pollution Control Authority

December 15, 2009

Maguire Group Inc.
One Court Street
New Britain, CT 06051

Ledyard Wastewater Facilities Management Plan
Phase I: Review of Outlying Areas

Table of Contents

List of Figures

List of Tables

Deleted: 19
Formatted: Font: 10 pt
Deleted: 22
Deleted: 22
Deleted: 23
Deleted: 23
Deleted: 24
Deleted: 26
Deleted: 27
Deleted: 28
Deleted: 28
Deleted: Table 1: Town-owned parcels feasible of septic or treatment system . 22¶
Table 2: Alternatives for Aljen Heights . 22¶
Table 3: Alternatives for Avery Hill Trailer Park . 22¶
Table 4: Alternatives for Christy Hill . 23¶
Table 5: Alternatives for Gales Ferry . 24¶
Table 6: Sewage flow estimates for each study area . 24¶
Table 7: Aljen Heights alternatives analysis cost estimates . 26¶
Table 8: Avery Hill Trailer Park alternatives analysis cost estimates . 27¶
Table 9: Christy Hill alternatives analysis cost estimates . 28¶
Table 10: Gales Ferry alternatives analysis cost estimates 28¶

Introduction

The Town of Ledyard was asked by the Connecticut Department of Environmental to prepare a Wastewater Facilities Management Plan because outlying areas of Town may have the need for alternative sewage treatment or collection than currently in use. A multi-phased approach was taken. Phase I studied the extent of the need for alternative sewage treatment and/or collection and identify alternative treatment practices or systems for outlying areas for further detailed study in subsequent phases. This report summarized Phase I. Phase II will take a more detailed look at proposed alternatives identified in this phase as well as review the Town's existing wastewater treatment plant serving the Highlands neighborhood.

The Town of Ledyard is a suburban community in southeastern Connecticut with a population of approximately 14,700 (2000 US Census). Ledyard is bordered by the Thames River to the west and abuts Preston to the north, North Stonington and Stonington to the east and Groton to the south. It also hosts the Mashantucket Pequot Tribal Nation. While Ledyard is considered a suburban municipality, there are areas of Town that are rural in character. Because the Town is not serviced by public water and sewer in these parts of the community, development has been less intense and more residential in nature. Route 12 is the main commercial corridor and it runs north-south through the western side of town.

Data Gathering and Analysis

The first task in developing the Ledyard Wastewater Facilities Management Plan is a needs analysis. This involves data gathering, mapping and preliminary findings. Data gathering involved four primary steps: data collection, interviews, file review and geographic information system (GIS) mapping. The purpose was to gain knowledge of the existing on-site septic systems and their functionality in an attempt to identify areas of concern regarding failing systems or the potential for a failure or areas where natural features have been impacted or are threatened to be impacted by failing systems.

Data Collection

Available data were collected from the Town of Ledyard, including historic and current plat maps, the current zoning map and data from the Town's geographic information system (GIS) department, discussed below. Additional GIS data were obtained from MAGIC/CT DEP, also discussed below.

Interviews

Interviews were conducted with individuals involved in the management and planning of the town's wastewater facilities, including the Water Pollution Control Authority, Ledyard Planning Department and the Ledge Light Health District.

File Review

A file review of on-site septic systems was done with the purpose of identifying areas of Ledyard with chronic issues associated with failing systems or areas where failing systems may be an issue in the future. The Ledge Light Health District (LLHD) provides regional public health services to East Lyme, Groton, Ledyard, New London and Waterford. In 2001, the Town of Ledyard joined the district. LLHD has a current database of Permits to Discharge for on-site septic systems it has issued and for the past four years, the LLHD has begun to incorporate recent activities in Ledyard into its permit database management system. Older data have been scanned as staff and time permit. Therefore, most of the Town's on-site sewage discharge system permit data and other file information are not available electronically. A manual review of the paper file system was required. The primary focus was the more recent documentation (1984 to present, or the past 25 years).

The purpose of the file review was not to gather information on every detail associated with every property's on-site septic system, but rather, as stated above, to identify areas within town that have chronic issues with failing systems. One indication may be the system does not meet current system design standards because the system is more than 20 years old. Variances are granted for Permits to Discharge by the LLHD for repair to an existing system if it does not meet certain criteria established by the Connecticut Department of Environmental Protection (CT DEP), but still considered acceptable to repair. These variances or conditional approvals are detailed on the Permit to Discharge. Variances are granted for limited suitable area for the minimum lateral system spread (MLSS), setback distances between the system and property lines or well, or probable groundwater/high groundwater table. Properties that received a permit with a variance for repair of an on-site system or replacement of an existing system (considered new construction) were documented for this study.

Records are also kept on well testing. Regular well testing includes assessment of bacterial contamination (total coli-form and fecal coli-form), metals (lead, mercury, etc.), nitrates and manganese, among other health standards. Areas where bacterial contamination occurs may indicate a failing on-site septic system. Properties with a history of well contamination were documented for this study.

The LLHD also keeps records of inspections and complaints associated with a failing system. These include inspections associated with home sales, regular inspections by the health department staff, and public complaints. Properties with a history of complaints or violations were documented for this study.

Some properties were cited with one or more of the above conditions. Specific data collected on each property that had one or more of these conditions were:

- Address
- Permit to Discharge variance required for repair/new system (Y or N)
- Permit to Discharge variance required for limited suitable area for MLSS (Y or N)
- Variance required for probable groundwater/high groundwater table (Y or N)

- Variance required for separation distance (Y or N)
- Variance required for open watercourse or wetland (Y or N)
- Variance required for ledge (Y or N)
- Notes on variance
- History of well contamination at the property (Y or N)
- Date of testing when contamination was reported
- Total coli-form present (Y or N)
- Fecal coli-form present (Y or N)
- Follow up testing showed contaminant absent (Y or N)
- Follow up not documented (Y or N)
- Notes on well contamination
- Inspection found violation (Y or N)
- Complaint found violation (Y or N)
- Date of inspection/complaint
- Violation was for discharge of gray water (Y or N)
- Violation was for discharge of effluent/sewage on ground surface (Y or N)
- Notes of violation
- General notes on property

There were data limitations. First, the LLHD does not require businesses that maintain on-site septic systems to report their activities. Therefore, it is unknown which systems are maintained regularly or are consistently being pumped, an indication of a failing system. Second, because the LLHD has only managed the town's records in recent years and the information in the paper files was not consistent. Older properties may only have the original permit from the 1960s on file. Some files would contain well lab testing data indicating that fecal or total coli-form was found in a well above acceptable limits, but documentation of follow up testing would not be in the file. Conversely, some properties had very detailed documentation of system failures, repairs made to the system, or follow up inspections.

GIS Mapping

GIS was used to create mapping that showed the conditions of the natural and built environments of Ledyard as they relate to function and usage of on-site septic systems. These maps were used to assess conditions suitable and/or not suitable for on-site systems or potential alternatives to remedy adverse situations. GIS data were made available from the Town of Ledyard GIS Department, including hydrological features, parcels, sewer district, aquifer protections areas, coastal area management boundary, public wells, and zoning districts, among others. Data from the CT DEP and MAGIC were also used, including flood zone data from the Federal Emergency Management Agency (FEMA), soils and surficial data from the National Resources Conservation Service, bedrock details, streets, and political boundaries. Mapping was created to show environmentally sensitive areas such as aquifers, wetlands and floodplain as well as built conditions like high density neighborhoods.

The addresses collected during the file review were geocoded in GIS using the parcel shapefile provided by the Town. First, a database was created that contained addresses

and the information collected on these properties noted above. The database was linked to the address field of the parcel shapefile using the geocoding tool of ArcGIS, plotting a point in the center of the corresponding parcel polygon. In doing so, it was anticipated that patterns of variances, well contamination and violations would be revealed. Further, these properties were mapped in relation to natural and built environmental features.

Findings

Interviews

Interviews assisted in identifying areas known to have problems with on-site septic systems. Ryan McCammon, a sanitarian engineer with the Ledge Light Health District (LLHD), is assigned to do inspections and permit reviews in the Town of Ledyard for LLHD. He indicated that the Christy Hill neighborhood historical on-site septic system issues as well as Gales Ferry.

Mrs. Mabel Stimpson was also interviewed. She owns eight existing homes with separate septic systems on one lot along Long Pond. According to Mrs. Stimpson, one of the existing systems failed recently. She is afraid the others are not long behind, since they are all about 40 years old. To be proactive, Mrs. Stimpson, in talking with Ledge Light Health District, is proposing one system to service all eight homes. The system is proposed on property she owns across the street from the home, away from Long Pond. The property contains 109 acres of woodland. Because there is more than one home on the lot, she must work with CT DEP on this project. Her consultant, Boundaries LLC, has drawn up plans (as of July 30) and they were scheduled to meet with representatives from CT DEP and others in early August at the site to determine additional areas for testing, etc.

Data Summary

Parcel acreage is a characteristic important to on-site septic systems. There must be adequate space to provide a system that meets the needs of a residence while maintaining adequate setbacks from property lines, wells and structures. Parcels of interest are smaller lots, typically less than half an acre, that are not serviced by sewer. It is assumed that residences on these parcels may require some sort of variance to repair their existing system to meet modern standards. As shown in Figure 1, lots less than one quarter of an acre are found along the Thames River in the Gales Ferry area (Bluff Road). Parcels less than a quarter acre are also found off of Colonel Ledyard Highway (Route 27) on Hickory Drive.

Other areas with smaller lots include the Christy Hill, Gales Ferry and Aljen Heights neighborhoods. Christy Hill is dominated by parcels between a quarter and half an acre north of Christy Hill Road and half to one acre to the south. Gales Ferry also has a mix of parcels less than an acre. The Aljen Heights neighborhood off of Avery Hill Road, near the Preston border, is dominated by properties less than a half acre.

Figure 1 also shows some patterns seen when addresses from the file review were plotted. Clusters of Permits to Discharge with variances appeared at Aljen Heights and in the

Insert Figure 1

Figure 1: File Review and Parcel Acreage

Gales Ferry area. Properties with a history of wells testing positive for bacterial contamination were also clustered in Aljen Heights as well as on Albatross Drive and Windfield Way off of Iron Street. According the Ledyard Plan of Conservation and Development (see below), there are plans to extend water service to the Preston border along Avery Hill Road for service to Aljen Heights. Violations associated with inspections by the LLHD or citizen complaints were concentrated in the Gales Ferry area and north of Christy Hill Road with a few in Aljen Heights. These areas should be examined more closely.

It should be noted that the Sanitary Engineer at LLHD indicated that the Christy Hill neighborhood had a history of issues associated with failing systems or issuances of variances for Permits to Discharge; however, the file review did not show a concentration of either of these conditions when mapped. This is an example of the data limitations associated with the paper file system. Therefore, the maps produced from this exercise should be considered with other sources of information available.

Limiting Environmental Factors

Several environmental conditions were considered limiting in developing on-site wastewater treatment systems or larger facilities. Mapping used to analyze potential sites for possible alternatives included:

- Flood zones (including 100 year floodplain, Zone AE and other flooded areas identified by the Federal Emergency Management Agency)
- Wetlands and hydric soils
- Soils with slopes greater than 15 %
- Locations of municipal water supply wells

These factors are shown in Figure 2.

Plan of Conservation and Development

Future Land Use and Growth

According to the Ledyard Plan of Conservation and Development (POCD), the focus of future growth is design districts that also require better development design and access management strategies. These areas include commercial development in the Gales Ferry Village and industrial development along Route 12 north of the Groton line, both in the form of infill development. The POCD also recommends focusing future economic development efforts towards a 27-acre vacant parcel northwest of Routes 117 and 214 as well as in the Ledyard Center Village District. The intent is to promote office and retail activities in a more concentrated downtown cluster that can be easily serviced by future water, sewer and roadway infrastructure. This plan must also be consistent with the State Conservation and Development Plan for the Town of Ledyard, shown in Figure 3.

Insert Figure 2

Figure 2: Environmental Conditions

Insert Figure 3

Figure 3: State C&D Plan

Sewers and Septic Systems

There are three sewage treatment facilities in the Town of Ledyard: a municipal facility serves Highlands neighborhood, the Mashantucket Pequot Tribe build a facility to serve Foxwoods Casino and a small private treatment plant serves Dow Chemical. The remainder of homes and businesses in town use on-site septic systems. Figures 4 and 5 show the 260,000 gallon-per-day Highlands Wastewater Treatment Plant and seepage beds that provide for final effluent disposal. Only during high groundwater or when there are extremely high flows received at the plant does any effluent discharge to Seth Williams Brook. The seepage beds function in a manner similar to septic systems in that they rely on the subsurface conditions for effluent disposal. The next phase of this project will provide a more detailed analysis of the capacity of these seepage beds to accommodate future growth.

Formatted: Font color: Auto

Therefore, future growth of the Town must be done within the capacity of existing infrastructure and natural environments or the ability to expand to meet future needs. Goals of the Ledyard POCD with regards to public sewer are as follows:

Formatted: Font color: Auto

- Ensure effective and efficient private and public wastewater collection systems
- Increase sewer tie-ins to the upgraded (1997) Highlands sewage treatment plant in conformance with capacity limits established by the CT DEP
- Improve and support expansion of infrastructure in appropriately zoned areas to enhance economic/commercial development opportunities
- Improve and support expansion of infrastructure to protect groundwater and surface water in environmentally sensitive areas.

The POCD also has a policy to expand infrastructure to enhance economic development opportunities to commercial and industrially zoned areas along Route 12 and Ledyard Center. The costs and benefits of expansion would have to be considered, particularly if the costs associated with expansion would be off set by associated property tax revenues. These areas are highlighted on a map entitled "Draft Sewer Service Area Map for Inclusion in the Plan of Conservation and Development" dated September 12, 2008. Also included are portions of Gales Ferry and Christie Hill. These areas are shown in Figure 6.

Public Water

Providing public water service may be a remedy to reduce the impact of failing septic systems on private wells. According to the POCD, the Ledyard Water Pollution Control Authority (WPCA) or the Southeastern Connecticut Water Authority (SCWA) wellfields serve about 40% of the town's population. Additional wellfields are located on the Mashantucket Pequot Reservation and serve their needs. The remaining community water systems are small and serve individual subdivisions, mobile home parks and apartments.

Figure 7 provides a Water Resources Map of the community with key delineations of aquifer protection zones, well and dam locations, water bodies, streams by water quality, 100-year flood zones and wetlands by soils.

Formatted: Font color: Auto

Figure 4: Effluent Disposal Field Test Pit Locations (Source: Weston and Sampson)

Figure 5: Effluent Disposal Field Test Pit Locations (Source: Weston and Sampson)

Insert Figure 6

Figure 6: Draft Sewer Service Area Map (September 12, 2008)

Insert Figure 7

Figure 7: Water Resources Map (Source: Town of Ledyard)

The POCD supports expansion of the town's public water service in an effort to protect water quality. Public water and water supply source protection goals include:

- Ensure adequate potable water sources, supplies and distribution systems for Ledyard
- Protection water quality and implement a source protection strategy through: proactive zoning, natural resource planning and site design, use of BMPs and water company review of proposed development projects located within designated source protection areas.
- Increase public water supply through an interconnected regional water supply system
- Effectively manage and control stormwater drainage to minimize impacts to the environment

The POCD identifies priority areas for expanding water supply:

- Aljen Heights
- Avery Hill
- Ledyard Center
- Neighborhoods east of Route 12 (Terry Road, Woodland Circle, Oakridge Drive)
- Existing homes surrounding Long Pond.

Interconnections are also proposed to increase reliability, supply redundancy and decrease instances of reduced capacity. The following areas should be considered for interconnection, according to the POCD:

- WPCA's Route 12 system with SCWA's FerryView Heights and Tower Divisions
- City of Groton and Ledyard Center via Route 117
- WPCA's Loftus wellfield and Ledyard Center via Gallup Hill Road, Colonel Ledyard Highway.
- WPCA's Gales Ferry system, with Groton, Preston and Norwich along the Route 12 corridor and Montville, Waterford and New London across the river.
- WPCA's wellfield on Route 214 with the Route 12 pipeline.

Alternatives Analysis

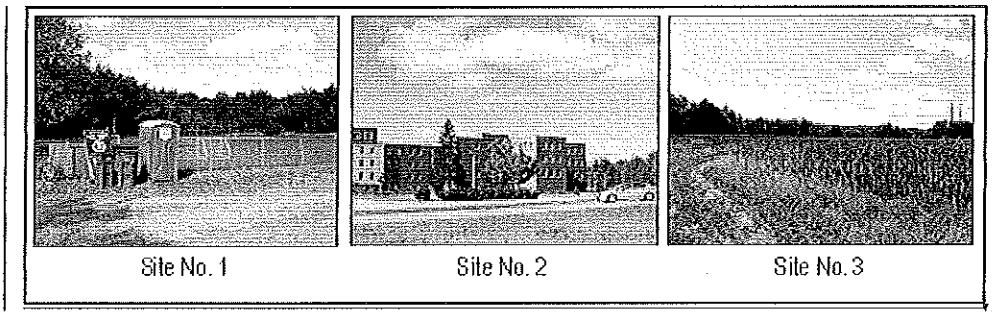
The file review data gathered and presented in Figure 1 demonstrates problem areas within the Town identified by contaminated wells and violations of sewage discharge from septic systems. These problem areas and associated chronic issues are clustered within specific areas. The most significant clusters evaluated in accordance with the data and interviews are described as follows (as shown in Figure 8):

- Aljen Heights: The northwest corner of Ledyard from Windward Lane and Avery Hill Road extending to Preston.
- Avery Hill Trailer Park: The westerly side of Avery Hill Road across from Oak Hills Trail, including Tucker's Run.

Figure 8: Study Areas

- Christy Hill: Christy Hill Road and Long Cove Road neighborhoods
- Gales Ferry: Along Route 12 and westerly toward the Thames River extending from Long Cove to Clark Cove

The Alternatives Analysis subsequently involved a field investigation of town owned vacant parcels to determine the feasibility for a septic or treatment system. A summary of all the parcels visited on October 8, 2009 with accompanying photos is provided within the Appendix of this report. These sites are shown in photos presented in Figures 9 through 12. As highlighted in Figures 13 and 14, the sites investigated are within close proximity to problem areas and may be suitable for a septic or treatment system.



Deleted:

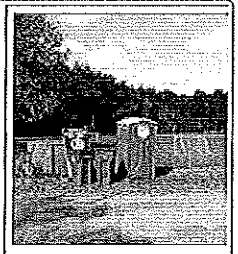


Figure 9: Sites investigated for septic or treatment system to service Aljen Heights

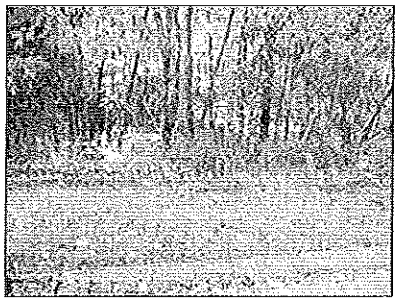


Figure 10: Site investigated for septic or treatment system to service Avery Hill Trailer Park

Figure 11: Sites investigated for septic or treatment system to service Christy Hill.

Figure 12: Site investigated for septic or treatment system to service Gales Ferry.

The Needs Analysis Mapping was then cross-referenced to the town owned parcels as part of the Alternatives Analysis. The town owned vacant parcels investigated that had no wetlands, no steep slopes (> 15%), no flood plains and no municipal well limitations were considered as potentially suitable for a septic or treatment system and are summarized in Table 1.

Table 1: Town-owned parcels feasible of septic or treatment system

Study Area	Lot Size (acres)	CW[1]	SWV[2]	SPV[3]	Soils	C & D Plan	Comment
Aljen Heights (Site No. 1)	5.2	17	4	7	Thick Till	Existing Preserved Open Space	Play Area at Aljen Avenue.
Aljen Heights (Site No. 2)		17	4	7	Sand & Gravel	Growth Area	Hospital site in Preston. Approximately 2-miles to a site on the property.
Aljen Heights (Site No. 3)	42.8	17	4	7	Sand & Gravel	Existing Preserved Open Space	Open field off Route 117 with power lines that traverse site. Requires cross-country sewer line.
Avery Hill Trailer Park	1.87	2	2	1	Till	Neighborhood Conservation	Oak Hills Trail cul-de-sac in close proximity to Trailer Park. Adjacent property has ledge outcroppings.
Christy Hill	6.29	2	4	4	Till	Existing Preserved Open Space	Wooded area behind homes on Washington Drive and Long Cove Road
Gales Ferry	.79	6	10	21	Sand & Gravel	Existing Preserved Open Space	Play Area at Winthrop Road.

[1] CW=Contaminated Wells; [2] SWV=Sewage Violations; [3] SPV=Septic Variances

The use of the above described sites for a septic or treatment system may require the Town and State C&D mapping to be updated.

Figure 13: Aljen Heights and Avery Hill Trailer Park Study Areas

Figure 14: Gales Ferry and Christy Hill Study Areas

Feasibility of Solving Problem Areas

The Data Gathering, Mapping and Field Investigation provided invaluable information and a better understanding on how to move forward in terms of alternatives for solving the above described problem areas. The following tables summarize alternatives that appear viable from an engineering perspective without taking economic considerations into account.

Aljen Heights

The Aljen Heights Study Area is scheduled is to receive a water main in the future according to the "Draft Sewer Service Area Map for Inclusion in the Plan of Conservation & Development" dated September 12, 2008 (Figure 6). The use of a new sewer collection and treatment system is feasible and could most likely be accomplished through use of the three sites investigated; Aljen Play Area within neighborhood, Preston Hospital Site which would involve and inter-municipal agreement between Ledyard and Preston, and the open field located off Route 117 which contains sand and gravels.

Table 2: Alternatives for Aljen Heights

Alternatives	Engineer's Opinion	Comment
No Action Required (lot sizes suitable for use in replacement systems)		Lots are too small combined with till soils (slow perc rate)
Septic System Management Planning	X	Repairing on-site systems
Sewering to surrounding Town(s)	X	Interconnection with Preston at Hospital Site would require approximately 2-miles of force main.
Sewering to an upgraded/expanded Town of Ledyard treatment facility		Approximately 8-miles away
A new collection / treatment system	X	Vacant parcel off Route 117 or Aljen Play Area
Providing public water	X	Already planned as future WPCA water mains

Avery Hill Trailer Park

The Avery Hill Trailer Park already has a water main installed in recent years, so contamination of wells is not an issue at this time. Should there be an increase in the number of failed septic systems, the use of a vacant parcel on Oak Hills Trail may provide a suitable SWAS for some of this area. The use of a new sewage collection and treatment system is feasible, but there do not appear to be sufficient failures to warrant at this time.

Table 3: Alternatives for Avery Hill Trailer Park

Alternatives	Engineer's Opinion	Comment
No Action Required (lot sizes suitable for use in replacement systems)		Lots are too small combined with till soils (slow perc rate)
Septic System Management Planning	X	Repairing on-site systems
Sewering to surrounding Town(s)	X	Interconnection with Preston at Hospital Site would require approximately 2 miles of force main to this

Alternatives	Engineer's Opinion	Comment
		location approximately 3 miles away.
Sewering to an upgraded/expanded Town of Ledyard treatment facility		Approximately 7-miles away
A new collection / treatment system	X	Vacant parcel off Oak Hills Trail or combine with Allen Heights alternative
Providing public water	X	Already has water main installed, but it should be expanded to include the rest of the Study Area as part of future planning.

Christy Hill

Christy Hill already has a water main installed in recent years, so contamination of wells is not an issue at this time. It would be beneficial to expand this water main to cover additional areas of Long Cove Road and Vinegar Hill Road. Should there be an increase in the number of failed septic systems, the use of an interconnection to Groton appears to be a viable solution, but there does not appear to be sufficient failures to warrant at this time.

Table 4: Alternatives for Christy Hill

Alternatives	Engineer's Opinion	Comment
No Action Required (lot sizes suitable for use in replacement systems)		Lots are too small combined with till soils (slow perc rate)
Septic System Management Planning	X	Repairing on-site systems
Sewering to surrounding Town(s)	X	Interconnection with Groton town line is approximately 2-miles from Christy Hill Road/Washington Street intersection
Sewering to an upgraded/expanded Town of Ledyard treatment facility		Approximately 7-miles away
A new collection / treatment system		Wooded area in neighborhood behind homes is too small
Providing public water		Already has water main installed for most of this area. Possibly expand the water main.

Gales Ferry

Gales Ferry already has a water main installed in recent years per the "Draft Sewer Service Area Map for Inclusion in the Plan of Conservation & Development" dated September 12, 2008 (Figure 6). It would be beneficial to expand this water main to cover additional homes within the Gales Ferry area. The use of the Gales Ferry Play Area may provide suitable leaching area for some of the area and it consists of sand and gravels. Providing future sewer service in accordance with the "Draft Sewer Service Area Map for Inclusion in the Plan of Conservation & Development" dated September 12, 2008 (Figure 6) is the most feasible alternative to provide sewer to this area.

Table 5: Alternatives for Gales Ferry

Alternatives	Engineer's Opinion	Comment
No Action Required (lot sizes suitable for use in replacement systems)		Lots are too small combined with till soils (slow perc rate)
Septic System Management Planning	X	Repairing on-site systems
Sewering to surrounding Town(s)	X	Interconnection with Groton town line is approximately 0.5-miles from Long Cove Road
Sewering to an upgraded/expanded Town of Ledyard treatment facility		Approximately 7-miles away
A new collection / treatment system	X	Gales Ferry Play Area may be of suitable size for some of area (sand and gravel soils)
Providing public water	X	Already has water main installed for most of this area. Expand the water main for entire area.

Also part of Gales Ferry and to the south towards the town boundary are the Route 12 commercial corridor and other areas of growth identified in the State C&D plan (refer to Figure 3). Preliminary talks with the Town of Groton indicate that they have spare capacity at their treatment plant and are open to discussions regarding a connection to its sewer system. The closest connection to the Groton system is at Ohio Avenue, which could be accessed via Route 12 (a state roadway) or Pleasant Valley Road North (a local roadway). It is a 10-inch sewer line, approximately 2,000 feet from the town line. It is shown in Figure 15. Discussions would consider how much volume the Town of Groton can receive, rates, maintenance, and capital costs associated with the construction of new infrastructure, among other issues.

Sewage Flows

The sewage flows at each of the problem areas have been estimated using the following assumptions:

- Average daily sewage flows equivalent to water consumption based upon 70 gallons per capita per day (gpcd)
- Estimate three occupants per lot/home
- Study Area boundaries as shown on Figure 8.

Table 6: Sewage flow estimates for each study area

Study Area	Approximate Number of Homes	Occupants	Average Daily Sewage Flow (GPD)
Aljen Heights	232	696	48,720
Avery Hill Trailer Park	94	282	17,740
Christy Hill	746	2,238	156,660
Gales Ferry	725	2,175	152,250

The above sewage flows are suitable for evaluating infrastructure and a wastewater treatment facility when combined with the appropriate peaking factors, with the exception of the subsurface wastewater absorption system (SWAS). Sewage design flow for the SWAS are 150 gallons per day (GPD) per bedroom for up to four bedrooms in a

single family home as required by the Connecticut Department of Public Health (CDPH).

Figure 15: Closest location for an interconnection with the Town of Groton Sewer System

One way to reduce the problems with on-site systems is to reduce the volume of wastewater discharged. Low-flow bathroom fixtures and curtailing the use of on-site washing of clothes will reduce the total volume of wastewater discharged. Some of the new low flush toilets are now as low as 1.28 gallons per flush. Most of the older toilets discharged about 3 gallons per flush. Toilet flushing amounts to about 25% of daily water use. The new toilets now have a "flush" rating. Most are on a 10 point basis and at least one of these 1.28 gallons/flush toilets is rated at 10. In the early years of low flush toilets (about 1.6 gallons per flush) there were many complaints about having to double flush. This seems to have been solved (the writer can attest to the flushing ability of the 1.28 gallons per flush toilet having installed two of them recently).

Formatted: Font color: Auto

A future SWAS located on any of the town owned parcels will require review by the State of CT for design flows greater than 5,000 GPD. Determining the size and configuration of a future SWAS leaching field will require further analysis of various conditions that control such designs, including:

- Soil characteristics
- Seasonal high ground water table
- Long term acceptance rate (LTAR)
- Proximity of site constraints (e.g., wells)

Once soil and percolation testing have been completed to establish an LTAR value allowed by the CTDEP, the effective leaching area available versus the sewage flow needs can be determined and further evaluated.

Cost Estimates

A preliminary cost estimates for each alternative by Study Area have been developed with the following assumptions. Tables 7 through 10 summarize these preliminary costs.

- Unit pricing within table is all inclusive of labor and materials. For example, the sewer main unit price includes pipe work, manholes, all related appurtenances, and restoration of pavement/disturbed areas.
- Best guess regarding the linear footage of piping and number of pump stations.
- 20% for permits, studies and engineering
- 30% Contingency

Table 7: Aljen Heights alternatives analysis cost estimates

Item	Description	Unit	Unit $	Qty	Cost $
SEWER TO PRESTON HOSPITAL SITE					
1	Sewer Main: 8-inch	LF	$150	16,000	$2,400,000
2	Pump Station	EA	$200,000	2	$400,000
3	Force Main: 2-miles	LF	$100	10,560	$1,056,000
4	Wetlands at Route 2	LS	$250,000	1	$250,000
5	Treatment System/Leaching Field (sand)	GAL	$20	50,000	$1,000,000
	Subtotal				$5,106,000
6	Permits, Studies & Engineering	EA	20%		$1,021,200

Item	Description	Unit	Unit $	Qty	Cost $
	Subtotal				$6,127,200
7	Contingency	EA	30%		$1,838,160
	Project Construction Cost Estimate				**$7,965,360**
NEW COLLECTION/TREATMENT SYSTEM					
	ALJEN PLAY AREA				
1	Sewer Main: 8-inch	LF	$150	16,000	$2,400,000
2	Pump Station	EA	$200,000	2	$400,000
3	Treatment System/Leaching Field (till)	GAL	$30	50,000	$1,500,000
	Subtotal				$4,300,000
4	Permits, Studies & Engineering	EA	20%		$860,000
	Subtotal				$5,160,000
5	Contingency	EA	30%		$1,548,000
	Project Construction Cost Estimate				**$6,708,000**
NEW COLLECTION/TREATMENT SYSTEM					
	ROUTE 117 OPEN FIELD				
1	Sewer Main: 8-inch	LF	$150	16,000	$2,400,000
2	Pump Station	EA	$200,000	2	$400,000
3	Treatment System/Leaching Field (sand)	GAL	$20	50,000	$1,000,000
4	Cross-country Sewer Main	LF	$150	3,000	$450,000
	Subtotal				$4,250,000
5	Permits, Studies & Engineering	EA	20%		$850,000
	Subtotal				$5,100,000
6	Contingency	EA	30%		$1,530,000
	Project Construction Cost Estimate				**$6,630,000**
EXTEND PUBLIC WATER SUPPLY INFRASTRUCTURE					
1	Water Main	LF	$150	16,000	$2,400,000
	Subtotal				$2,400,000
2	Permits, Studies & Engineering	EA	20%		$480,000
	Subtotal				$2,880,000
3	Contingency	EA	30%		$864,000
	Project Construction Cost Estimate				**$3,744,000**

Table 8: Avery Hill Trailer Park alternatives analysis cost estimates

Item	Description	Unit	Unit $	Qty	Cost $
SEWER TO PRESTON HOSPITAL SITE [1]					
1	Sewer Main: 8-inch	LF	$150	9,250	$1,387,500
2	Pump Station	EA	$200,000	3	$600,000
3	Force Main: 2-miles	LF	$100	10,560	$1,056,000
4	Wetlands at Route 2	LS	$250,000	1	$250,000
5	Treatment System/Leaching Field (sand)	GAL	$20	20,000	$400,000
	Subtotal				$3,693,500
6	Permits, Studies & Engineering	EA	20%		$738,700
	Subtotal				$4,432,200
7	Contingency	EA	30%		$1,329,660
	Project Construction Cost Estimate				**$5,761,860**

NEW COLLECTION/TREATMENT SYSTEM OAK HILLS TRAIL					
1	Sewer Main: 8-inch	LF	$150	9,250	$1,387,500
2	Treatment System/Leaching Field (till)	GAL	$30	20,000	$600,000
	Subtotal				$1,987,500
3	Permits, Studies & Engineering	EA	20%		$397,500
	Subtotal				$2,385,000
4	Contingency	EA	30%		$715,500
	Project Construction Cost Estimate				**$3,100,500**
EXTEND PUBLIC WATER SUPPLY INFRASTRUCTURE					
1	Water Main (portions only) [2]	LF	$150	3,500	$525,000
	Subtotal				$525,000
2	Permits, Studies & Engineering	EA	20%		$105,000
	Subtotal				$630,000
3	Contingency	EA	30%		$189,000
	Project Construction Cost Estimate				**$819,000**

[1] The appropriate deductions to the cost estimate should be applied if combined with Aljen Heights project.
[2] The Trailer Park itself already has a public water supply main installed.

Table 9: Christy Hill alternatives analysis cost estimates

Item	Description	Unit	Unit $	Qty	Cost $
SEWER TO GROTON					
1	Sewer Main: 8-inch	LF	$150	61,050	$9,157,500
2	Pump Station	EA	$200,000	4	$800,000
3	Tie-In to Groton with sewer main: 2-miles	LF	$200	10,560	$2,112,000
	Subtotal				$12,069,500
4	Permits, Studies & Engineering	EA	20%		$2,413,900
	Subtotal				$14,483,400
5	Contingency	EA	30%		$4,345,020
	Project Construction Cost Estimate				**$18,828,420**

Table 10: Gales Ferry alternatives analysis cost estimates

Item	Description	Unit	Unit $	Qty	Cost $
SEWER TO GROTON					
1	Sewer Main: 8-inch	LF	$150	103,600	$15,540,000
2	Pump Station	EA	$200,000	5	$1,000,000
3	Wetlands	LS	$500,000	1	$500,000
	Subtotal				$17,040,000
4	Permits, Studies & Engineering	EA	20%		$3,408,000
	Subtotal				$20,448,000
5	Contingency	EA	30%		$6,134,400
	Project Construction Cost Estimate				**$26,582,400**
NEW COLLECTION/TREATMENT SYSTEM GALES FERRY PLAY AREA					
1	Sewer Main: 8-inch	LF	$150	103,600	$15,540,000
2	Pump Station	EA	$200,000	5	$1,000,000
3	Wetlands	LS	$500,000	1	$500,000

4	Treatment System/Leaching Field (sand)	GAL	$20	155,000	$3,100,000
	Subtotal				$20,140,000
5	Permits, Studies & Engineering	EA	20%		$4,028,000
	Subtotal				$24,168,000
6	Contingency	EA	30%		$7,250,400
	Project Construction Cost Estimate				**$31,418,400**
EXTEND PUBLIC WATER SUPPLY INFRASTRUCTURE					
1	Water Main (portions only) [1]	LF	$150	22,000	$3,300,000
	Subtotal				$3,300,000
2	Permits, Studies & Engineering	EA	20%		$660,000
	Subtotal				$3,960,000
3	Contingency	EA	30%		$1,188,000
	Project Construction Cost Estimate				**$5,148,000**

[1] A large portion of Gales Ferry already has a public water supply main installed.

Findings

This Needs Analysis has examined alternatives for areas within the Town of Ledyard which contain contaminated wells and septic violations. Following data gathering, Study Areas having clustered problem areas were further evaluated with an Alternatives Analysis. The major findings of this Study are the following:

- Aljen Heights:
  - The water main should be extended to address the cluster of contaminated wells.
  - New sewage collection and treatment options involving the use of vacant town owned land within the Town of Ledyard are viable from an engineering perspective, but it is much more economically feasible to complete on-site repairs of systems; say $100,000 for four systems versus $6-million plus for a sewage collection and treatment option.
  - An interconnection with the Preston Hospital site for a new sewage collection and treatment option appears feasible, but a sewage agreement with Preston will be needed. Preliminary discussion with the Town Selectman suggests that the Town of Preston would be open to negotiating opportunities to work with Ledyard in providing wastewater treatment. Preston is considering a wastewater treatment facility south of the Pequot Bridge to accommodate the redevelopment of the State Hospital. Again it is more economically feasible to complete on-site repairs of the systems.

- Avery Hills Trailer Park
  - The water main should be extended to cover a larger area should the number of contaminated wells increase.
  - A new sewage collection and treatment option involving the use of vacant town owned land at Oak Hills Trail appears viable from an engineering perspective, but it is much more economically feasible to complete on-site repairs of systems; say $50,000 for two systems versus $3-million plus for a sewage collection and treatment option.

  - Extending the Aljen Heights sewage connection is not economically feasible.

- Christy Hill
  - A new sewer connection with Groton appears feasible. Need to determine if the Groton system has sufficient capacity, and if Groton is able to allocate wastewater flows to Ledyard. Preliminary meetings suggest that there are opportunities to make a connection to the Groton system at Ohio Avenue. Further talks would focus on service area, flows, infrastructure, maintenance, and usage fees, among other issues.

- Gales Ferry
  - The water main should be extended to cover a larger area.
  - A new sewer collection and treatment option involving the use of a Play Area may be a viable solution for some of the wastewater generated in this area.
  - A new sewer connection with Groton appears feasible. Groton is able to allocate wastewater flows to Ledyard. Preliminary meetings suggest that there are opportunities to make a connection to the Groton system at Ohio Avenue. Further talks would focus on service area, flows, infrastructure, maintenance, and usage fees, among other issues.

- The municipal wastewater treatment facility at Town Farm Road is too far away from the problem areas to be a viable solution. It should be noted that the plant and its leaching beds have sufficient space for expansion.

- The size of the Study Areas and assumptions significantly impact the cost estimate provided. As the next phase of the project moves forward, a more detailed analysis with specific budget constraints should be identified.

- Based upon interviews and limited records from 1984 to 2005, it appears that data collection efforts provided insight to problem areas, but clearly do not represent all of the issues related to contaminated wells and failing septic systems over the past 25-years. It is believed that the last 4-years of data within the Ledge Light Health District files are accurate.

- The C&D Mapping at the southwest corner of Ledyard is not consistent with future plans for the Baldwin Hill Industrial Park.

- The Town of Ledyard should consider a program to implement low flow fixtures to reduce water consumption/sewage flows. Low flow toilets (1.28 gallons per flush) have been proven to flush effectively compared with earlier design at 1.6 gallons per flush.

Formatted: Font color: Auto

- Pursue inter-municipal agreements with Preston and Groton.

- Complete a detailed evaluation and develop a Comprehensive Wastewater Management Plan (CWMP).

Preliminary Treatment Plant Review

The Town's existing wastewater treatment plant services the Highland residential area. Overall the treatment plant has been operated very well, headed by Superintendent Stephen Banks. The Town has initiated some infiltration/inflow (I/I) repairs within the past few years that have reduced the peak hour flows from about 1.0 million gallons per day (MGD) to 0.7 MGD. The Town is on the CT DEP Priority List for conducting additional repairs to leaky sewers including relining. The estimated project cost is approximately $500,000. There may be other grants/loans that the town may be eligible for. Identification of these resources will be explored along with other options to help reduce the Town's cost for this work.

Flows

The facility has a design capacity of 0.26 MGD. The average daily flows were recorded as follows:

- 2003 through 2004: 0.10 to 0.19 MGD at 56% capacity
- 2005 through 2007: 0.10 to 0.23 MGD at 62% of capacity
- 2009 through September: 0.13 to 0.26 MGD at 70% of capacity

Except for a few high flow days when heavy rain events occurred and flow got as high as 0.316 MGD, the flows were within design capacity.

The very low average daily flows during the summer months (0.10 to 0.13 MGD) compared with peak hour flows of up to 0.70 MGD during heavy rains indicates the need to do additional I/I removal. For a plant this size the typical ratio of peak hour flows to average daily flows tend to be about 4.6 to 1. The ratio of 0.70 to 0.10 is 7.0 to 1. This is higher than normal and indicates further action should be done by the Town to investigate the higher than normal peak flows. This can occur from two sources. One is clean water **inflow**, which can be introduced into the system from sump pumps in basements of homes connected to the sewer, house gutter down spouts, area storm drains, and combined sewers. Inflow usually occurs over a short time with a high flow. The second clean water source entering the sewer system is **infiltration**. High groundwater tables that rise above the level of the sewer pipe in the ground that have cracks or other joint leakage are the usual source of infiltration. The difference between infiltration and inflow is that the infiltration typically lasts over a longer period, sometimes weeks or months. When the groundwater is below the bottom of the pipe, such as from June to October, infiltration drops off. Consequently, the low flow values of 0.10 to 0.13 MGD will almost always occur during this period. Typically, metering programs to determine the sewered areas with high infiltration is done in the spring. This is followed by further studies to pinpoint the sections of sewers that need repair, associated costs, and a plan to prioritize repair work. It is recommended that the Town conduct a metering program in the near future.

Effluent

The plant has had an excellent record regarding meeting effluent requirements for biological oxygen demand (BOD), total suspended solids (TSS), total nitrogen and coli form kill. There have been times during extreme high flows that certain processes needed to be by passed. This has occurred infrequently; but when the peak flows reached 0.50 to 0.70 MGD, a portion of the flow had to bypass processes, such as the effluent filters, ultraviolet (UV) disinfection and the seepage beds. The permit allows for high storm flows to bypass to the brook instead of the seepage beds if conditions do not allow the beds to accept more flow. However, all the permit levels were met.

Review of Plant Processes

Even if the flow did not exceed the present design average daily flow of 0.26 MGD, there are some unit processes that should be upgraded.

Effluent Sand Filters, Effluent Pumps and UV System

There are two effluent sand filters and effluent pumps each with a design capacity of almost 0.50 MGD and one UV system with a capacity of approximately 0.50 MGD. Since the flow to the filters and the UV is equalized, the limit of flow to these processes is the design capacity of the effluent pumps that feed these systems. There are two pumps each with a capacity of about 0.5 MGD. With the equalization tank and the SBR system being able to minimize the effect of peak hour flow, the instantaneous flow is not as critical. However, there have been periods when the flows have reached 0.5 to 0.7 MGD. The general rule is that each system must have the capacity to pass the peak flow-in this case the pump capacity that feeds them. Design for the pump must be capable of handling the peak flow with a second pump, a spare, of equal capacity. Similarly, one filter is operating and the other is a spare. In the case of the UV system there is **no spare unit.** In some cases the flows get too high and "spare" equipment must be put into use. Consequently, the higher flows will initiate two effluent pumps running, which can pump about 1 MGD. In order to keep the filters and UV systems from exceeding there capacities or overflowing, bypasses of the systems can occur, although it is infrequent. Since there is only one UV system, there is no "spare". The seepage beds provide a "backup" to the filters and the UV system in that the seepage beds also provide for effluent filtration and coliform bacterial kill in a manner similar to a septic leaching field.

At some point in the future the equipment should be upgraded. The effluent pumps, sand filter and UV system must be designed for the peak flow and have a spare such that any one unit out of service will still pass the peak flow. In the case of a three pump scenario, two pumps need to be designed to pass the peak flow with the third pump the same size of the other two pumps as a spare. Additional equipment needs would include:

- A new bar screen
- Add another effluent pump
- Add another sand filter or go to a different type of filter such as a rotary filter
- Add another UV bank to have a spare

When the full Facility Plan is prepared as part of Phase II, this sizing will again be evaluated, since the flow coming to the plant over the next 20-year planning period could increase.

The seepage beds need to be investigated further. Previous studies have shown that this could also be a limiting design flow issue in the future. The beds have been shown to work very well except in times of high groundwater-such as in the spring months. When this occurs, the beds cannot accept all of the high influent flows. Although the present permit allows for conveying treated flow to the brook, it is a very small brook with limited capacity as well.

Influent Bar Screen and Aerated Grit Systems

The influent bar screen and aerated grit systems appear to be capable of passing the peak flows. The bar screen, however, is 15 years old and is nearing its useful life. Ideally, the bar screen should be replaced soon and placed in a building or enclosure to minimize damage from freeze conditions. Today's bar screens are equipped with washing and compacting mechanisms and some even have grinders to make the screenings unrecognizable.

The Town built up the sides of the aerated grit removal system so that high flows would not overtop the sides of the tank. The waste sludge pumps and thickener and waste sludge storage also appear to be adequate.

The SBR system, including tank size, blowers and decanters, appear to have sufficient capacity for present flow and BOD, TSS and nitrogen. Even with the past high flows, permit levels have been met. The ultimate capacity of the SBR system appears to have sufficient BOD capacity for additional loading in the future but not for a significant additional flow (hydraulic loading).

Preliminary Recommendations for Plant

The key areas to keep the plant operating well in the near-term future will be to have a spare effluent pump on hand at the site, to obtain spare bulbs and perhaps a controller for the UV system-best to coordinate spare parts inventory with the manufacturer of the UV system, and to keep two filters operational. Since the filters have to be taken down periodically for maintenance (painting and media replacement), it is imperative that they only be taken out of service during the low flow summer/fall months and only one filter at a time. Once again, the manufacturer should be consulted for the spare parts to keep on hand to minimize the down time of the filters.

Phase II Facility Plan

Details of the need for expansion of unit processes both for today's flow and 20-year planning horizon will be prepared in the next phase of the project which will cover the entire Town. The Phase I study was limited to a needs assessment of the outlying areas and available options. It appears that none of the areas studied on the western side of the Town will have an impact on the present treatment plant. The costs to transport the flows

all the way to the existing plant would be too costly. The discussion above provides insight as to potential existing problems.

Should there be any significant development in the Ledyard Center area in the future, this would have an impact on the treatment plant if such development does occur and the flows are conveyed to the plant. This will be investigated further in Phase II of the Facility Plan. The fact that the plant has treated flows very well even during high flow conditions and that for most of the year the flow is conveyed to seepage beds-these provide for filtration and bacterial kill, there is not a high priority right now for adding additional new equipment at the plant. Key is to have spare parts available on site to keep the identified unit process that are "short" on capacity operational.