

WATER SUPPLY STUDY

**MULBERRY POINT, TUTTLES POINT
AND INDIAN COVE**

FEASIBILITY REPORT

PREPARED FOR:

TOWN OF GUILFORD, CONNECTICUT



DECEMBER 2011

PREPARED BY:



MERIDEN, CT

**WATER SUPPLY STUDY
MULBERRY POINT, TUTTLES POINT
AND INDIAN COVE**

FEASIBILITY STUDY

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EXECUTIVE SUMMARY

The Mulberry Point, Tuttle Point and Indian Cove waterfront communities of Guilford currently use individual wells for their water supply but have experienced chronic drinking water quality and quantity problems. The Town commissioned an Engineering Study to investigate possible improvements to the Water Supply in this area focusing on 3 possible alternatives:

- Option A - Community Well System
- Option B - Point of Use Well Treatment
- Option C - Public Water System Extension

It was determined that the Public Water System Extension option of connecting to the Connecticut Water Company's nearby water system and extending water mains to and throughout the Project Area was feasible, cost-effective and constructible in a short time frame. This option also provides the most complete water supply system for all of the Project Area residents with a safe, professionally managed and regulated drinking water supply. Therefore, the Public Water System Extension was selected as the Recommended Plan of Action. State-assisted grants and low-interest financing are available to help property owners pay for the construction costs associated with the Public Water System Extension.

This Option addresses both water quality and quantity problems and has the added benefit of providing improved fire protection to the Project Area with hydrants making water availability easier for the Fire Department.

Section 1. INTRODUCTION

1.1 Overview

The Town of Guilford, Connecticut commissioned a study to determine the feasibility of improving the supply of safe drinking water to a section of Town along the shoreline known as the Mulberry Point, Tuttle Point and Indian Cove neighborhoods (See Figure 1). This is a desirable coastal area along Long Island Sound of approximately 350 homes that has undergone initial development on typically small lots as a summer community with conversion to year-round occupancy of many residences over the years. Increased water usage and wastewater disposal in this densely developed area has resulted in water quality and quantity problems including chlorides, nitrates, bacteria and low well yield, thus necessitating this Study to investigate possible options to improve the Water Supply for the residents. The Town applied for and received a Planning Grant from the State of Connecticut Department of Energy and Environmental Protection (DEEP) and retained Luchs Consulting Engineers, LLC (Luchs) of Meriden, Connecticut to perform this Engineering Study.

1.2 Purpose

The difficult hydrogeologic conditions and occurrence of problems with water quality and quantity have been well documented in previous investigations by the Town. The purpose of this Report is to determine the Feasibility of improving the water supply to the Project Area from an engineering perspective by focusing on three (3) alternatives:

- 1) Development of a Community Well Water Supply System
- 2) Installation of Point-of-Use Water Treatment on Individual Wells.
- 3) Extension of the adjacent Public Water System

Each alternative comes with its own attributes and difficulties related to the physical constraints of a shallow soil/bedrock-laden, densely developed waterfront community. In this context, "feasibility" also must be measured in terms of cost-effectiveness and affordability to the individual property owner in providing a long term solution. This Report also serves as an update on previous investigations by the Connecticut Water Company (CWC) which operates the adjacent Public Water Supply System in Guilford. Previous analyses of the cost to extend water mains to the Project Area have been provided and rejected as too expensive – but conditions have changed to the extent a review is warranted.

1.3 Background

The Indian Cove, Mulberry Point and Tuttle Point shoreline areas are densely developed summer and year round residential neighborhoods located on the Long Island Sound shoreline in Guilford, Connecticut. Many of the homes in these densely developed areas were built in the early 1900's as seasonal cottages, utilizing private water supply wells and on-site sewage disposal methods which have experienced problems over the years. Septic system issues within the communities have been addressed, but private well quality and quantity issues remain. Residential structures vary from the small Connecticut shoreline summer cottage to new year-round residences. There are approximately 350 homes in the 126 acre area. The Town of Guilford has worked with residents of the area who have experienced private well and septic system problems for many years.

The Guilford Health Department has collected water data and performed extensive testing of drinking water wells in the project area over the past 10 years. In one survey of well water quality 70% of wells exceeded recommended secondary contaminant levels and 40% exceeded primary MCL for nitrates. Neighborhoods adjacent to the study area showed concentration of contaminants below recommended action levels.

2000 Initiative: In 2000, residents of the area approached the Town for assistance with correcting persistent water quality and quantity issues that affect many of the residents in the area. Elevated nitrates, sodium, and saltwater intrusion impact the water quality of some private wells in the area. The financial obligation associated with the Public Water System Extension proposal in 2000 was too great to establish firm consensus among the area residents.

The Connecticut Water Company: The Connecticut Water Company (CWC) is the public water supplier in the study area. The CWC has been assigned exclusive service area responsibilities through the Connecticut Department of Public Health's Water Utility Coordinating Committee (WUCC) process. The CWC supported efforts by the Town and area residents during the 2000 to 2002 timeframe when a water main extension to the area was considered, and remains in support of this new initiative.

Section 2. ANALYSIS OF WATER SUPPLY ALTERNATIVES

Each of the three alternatives was analyzed individually to determine the feasibility, cost and effectiveness of the proposed solution in meeting the long-term water supply needs of the Project Area.

2.1 Community Well Water Supply System:

A hydrogeologic investigation was conducted to determine if a site existed within or near the Project Area where a well could be drilled and a treatment system installed sufficient to provide the estimated 130,000 gallons per day of potable water needed. This investigation conducted for Luchs by a subconsultant, is contained in Appendix A. The findings were that no water-bearing geologic formation exists within or near the Project Area, with the closest site miles away beyond the existing CWC public water system anyway. Furthermore, State Department of Public Health (DPH) regulations to create and operate a new small water system would make it very difficult to gain approval of this alternative.

In summary, the Development of a Community Well Water Supply System is not physically feasible in a cost-effective manner, burdened with state regulation difficulties and has been rejected as a possible solution.

2.2 Point-of-Use Treatment of Individual Wells:

This alternative involves the installation by each property owner of a whole-house treatment system in each home to improve the water quality coming from their well. This process is already in use in some homes in the Project Area to some degree and typically involves the mechanical and/or chemical treatment of the well water using a water softener for pretreatment and then Reverse Osmosis or Ultraviolet Radiation for filtration or destruction of the contaminants of concern (chlorides, bacteria and nitrates). A schematic of the Point-of-Use Well Treatment System is shown on Figure 2. This alternative involves the initial capital costs to purchase and install the Treatment System and also the yearly maintenance and replacement costs to operate the system by the homeowner. Based on experience with homes in similar settings, the initial purchase and installation costs for a typical multi-component, whole house treatment system runs from \$10,000 to \$20,000 with an average of \$15,000. Annual operating costs are estimated at \$300.

An obvious limitation of the Point-of-Use Water Treatment option is that it does not address water quantity issues resulting from low-yielding wells that currently affect some homes in the Project Area. Other issues with well treatment using these methods exist relative to removing all particulates in the water stream leaving the finished product corrosive to

plumbing and devoid of the beneficial minerals in normal drinking water. These side effects can be addressed in other ways, however, and not deemed to be cause for rejection. The Point-of-Use Water Treatment option also does not address the physical setting of the well remaining in the setback of the septic system and thus in non-conformance with State Health regulations.

In summary, the Installation of Point-of-Use Water Treatment on Individual Wells was determined to be feasible for more widespread use in the Project Area with an initial cost estimated to be \$15,000 and annual operating costs of \$300.

2.3 Public Water System Extension

The Connecticut Water Company (CWC) currently operates a public water supply system surrounding the Project Area. They have determined that they have the available water quantity and pressure within their existing system capacity to serve the Project Area and have submitted a letter to the Town expressing their desire to do so. The mechanism to tap into this existing public water system would be to connect to the existing water main at its terminus and extend new water mains into the Project Area.

Recent improvements to CWC's overall system and extension of the water main on West Lane adjacent to Indian Cove have boosted water pressure and flow capacity as well as bringing the water main closer to the Project Area. This enables public water service availability with a 600 foot water main extension on West Lane instead of the 2,900 foot Vineyard Point or 5,200 foot Mulberry Point Supply Routes prescribed in the earlier study done by the CWC. This yields significant cost reduction and corresponding lower possible assessments on the order of \$2,000-\$3,000 savings for each property owner.

In addition, a possible supply route with water fed from the Guilford Point area under the sea floor to Tuttle Point using horizontal directional drilling was investigated. This relatively expensive technology is used to avoid impacts to sensitive areas such as coastal environments. This 3,400 foot path would add significantly to the project cost resulting in an additional \$12,000 assessment for each property owner if this supply route was selected.

With this information, meetings were held with the Town Health, Engineering and Fire Departments to determine the standards required to meet public health and safety. The result is that any extension of the public water system would be required to provide a minimum of 500 gallons per minute for fire flow with hydrants within 1,000 feet of homes, in addition to providing potable drinking water to the residents. An

investigation of subsurface conditions was conducted to determine soil depths and the presence and type of rock that would be encountered when constructing the water main. The full findings of the subsurface geologic investigation are contained in Appendix B. Rock was variable over the Project Area but on average was estimated at a depth of 3.5 feet below grade, consisting of a hard gneiss bedrock. Removal of this rock to enable construction of the water lines can be accomplished in close proximity to houses using controlled blasting technologies and a "hoe-ram" backhoe device as needed. Typically a pre-blast survey is conducted of each house prior to construction.

These factors were used to estimate the cost of extending the water mains to the Project Area. A detailed analysis of these costs is contained in Section 4 of this report, including a cost contribution from CWC in anticipation of gaining new customers in the amount of \$3,000+/- per house. Due to narrow existing roadways and impacts from installing the water mains and house services during construction, it was assumed that all roadways would be reconstructed and repaved to their full width in the cost analysis as shown on Figure 5.

In summary, the estimated cost per property owner to provide the extension of the CWC public water system to the Project Area is \$10,000. It is anticipated that it will cost an average additional \$1,500 to connect the water service for each home from the street to the house plumbing system. Yearly water usage charges payable to CWC for an average home are estimated to be \$500. These annual costs may be partially offset by savings in Homeowners Insurance from having houses better protected from fire with the public water system and hydrants. Insurance savings range from an estimated \$250 per year for a house in the \$300,000 range to \$2,200 per year for house valued at \$1,000,000.

The Public Water System Extension option will eliminate the issue of drinking water wells being too close to septic systems as currently exists on many properties not in conformance with State Health regulations. As part of this Study, an analysis was conducted to assess the possible negative impact that having unlimited water supply might have on existing septic systems. This analysis is contained in Appendix D. Findings from this study were that continued use of proper land use controls, public education and periodic Town inspection should minimize concerns regarding septic system impacts.

Section 3 RECOMMENDATIONS AND PLAN OF ACTION

3.1 Recommended Alternative

Of the alternatives available to improve the water supply to the Project Area, the Public Water System Extension is the clear choice in meeting all of the project goals. The Public Water System Extension provides water quality and quantity solutions to all property owners, is less expensive than a whole house Point-of-Use Well Treatment system, has State grant and financing options, offers improved fire protection and supplies reliable drinking water by a professionally managed, state regulated public utility company.

3.2 Plan of Action

As requested by a significant representation of the affected residents and supported herein, the Recommended Plan of Action is to extend the CWC's water mains from the present terminus on West Lane onto Indian Cove Road and throughout the Project Area as shown on Figure 3. Water mains will be constructed of 8 and 12 inch diameter cement lined ductile iron pipe laid in a trench in the roadways. Water services with meters will then be run to each house and connected to the interior plumbing according to CWC and Department of Public Health standards. All lines will then be disinfected and flushed ready for potable use.

Specifically, the Plan of Action includes the following tasks:

1. Complete the design of contract drawings and specifications by the Town engineering consultant, Luchs Consulting Engineers, for the extension of water mains in the street and also the individual water service construction to each house. Advertise this project for bids and award a construction contract for this work.
2. Interface between the CWC, Town and Engineer for the water main construction project and the individual water service construction to effect the new provision of potable public water supply to the properties in the Project Area affected by the contamination. Upon connection, restore properties and roadway pavement. Per CWC guidelines, a petition for connection to the water main must be filed, fees paid and the water main tapped by CWC personnel for each house water service. A typical water service extension will consist of a corporation stop at the main, a 1" diameter water service, a curb box shut-off and 5/8" meter setting as shown on Figure 4. The CWC will then be responsible for providing potable water to its customers, maintaining facilities and billing for water use.

The Public Water System Extension has been found to entirely feasible using conventional construction methods, capable of being performed in a timely manner without any major permit obstacles and cost-effective on a per unit basis with majority participation from the Project Area.

Extension of the CWC Public Water System in the Project Area roadways would be exempt from Town permit regulations as utility construction. The State Department of Public Health would need to approve the CWC extension but this approval is anticipated without opposition. The Town of Guilford Board of Selectman would need to approve the appropriation of funds for the project to be recovered fully through assessments resulting in no Town budget expense. If approved, the following Project Schedule would be feasible:

Project Design	January 2012 – April 2012
Town Approval	April 2012
Advertise for Construction	May 2012
Project Water Main Construction	June 2012 – November 2012
Completion of Work and Paving	Spring 2013

Section 4. COST ESTIMATE

4.1 Cost Estimate Details

An estimate of Costs to extend the Connecticut Water Company water main from West Lane to the Indian Cove, Mulberry Point and Tuttle Point sections of Guilford is summarized below and shown in more detail in Tables 1 and 2. Work includes trench excavation of earth and rock, installation of water main, trench backfill, extension of house services from the water main to the property line and full-width reconstruction of the roadway pavement from edge to edge. It is anticipated that all construction costs will be borne by the Project Area property owners minus any grants or contributions from other sources, with no costs paid by the Town.

Estimated Project Costs:

Construction Cost	\$2,780,000
Contingency Factor (15%)	\$417,000
Engineering and Inspection (12%)	<u>\$333,600</u>
Subtotal	\$3,530,600
CT. Water Company Contribution (Assuming 215 houses are connected =75%)	-\$665,500
Net Cost to Be Recovered Through Assessments	\$2,865,100
Assessable Units (Houses and Lots)	287
Estimated Cost per Unit (rounded)	\$10,000
Approximate Yearly Costs (if financed at 2%, 20 years) For Principal and Interest	\$600

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**WATER SUPPLY STUDY
MULBERRY POINT, TUTTLES POINT
AND INDIAN COVE**

FEASIBILITY STUDY

**Table 1 – Public Water System Extension Cost
Summary**

TABLE 1 - PUBLIC WATER SYSTEM EXTENSION COST SUMMARY

Luchs Consulting Engineers, L.L.C. MULBERRY POINT, TUTTLES POINT AND INDIAN COVE WATER SUPPLY STUDY TOWN OF GUILFORD, CONNECTICUT EXTENSION OF PUBLIC WATER SYSTEM PROPOSAL COST ESTIMATE December 2011					
ITEM No.	ITEM DESCRIPTION	UNITS	QUANTITY	UNIT PRICE	AMOUNT
	Trench Excavation	C.Y.	7,678	\$20.00	\$153,560
	Rock Excavation	C.Y.	4,080	\$70.00	\$285,600
	8" DIP Water Main	L.F.	15,730	\$40.00	\$629,200
	12" DIP Water Main	L.F.	5,030	\$60.00	\$301,800
	Domestic Service	EA.	287	\$1,000.00	\$287,000
	Hydrant	EA.	34	\$2,500.00	\$85,000
	SUBTOTAL - Water Main				\$1,742,160
	Process Aggregate Base	C.Y.	5,854	\$30.00	\$175,620
	Bituminous Concrete Class 1	TON	6,130	\$115.00	\$704,950
	SUBTOTAL - Road				\$880,570
	SUBTOTAL - Construction				\$2,622,730
	Maintenance and Protection of Traffic (3%+/-)	LS	1	\$78,682	\$78,682
	Mobilization (3%+/-)	LS	1	\$78,682	\$78,682
	SUBTOTAL - Miscellaneous				\$157,364
	SUBTOTAL CONTRACT ITEMS				\$2,780,000
	TOTAL PROJECT CONSTRUCTION COST				\$2,780,000

**WATER SUPPLY STUDY
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AND INDIAN COVE**

FEASIBILITY STUDY

**Table 2 – Public Water System Detailed Estimate
Sheet**

TABLE 2 - PUBLIC WATER SYSTEM EXTENSION DETAILED ESTIMATE SHEET

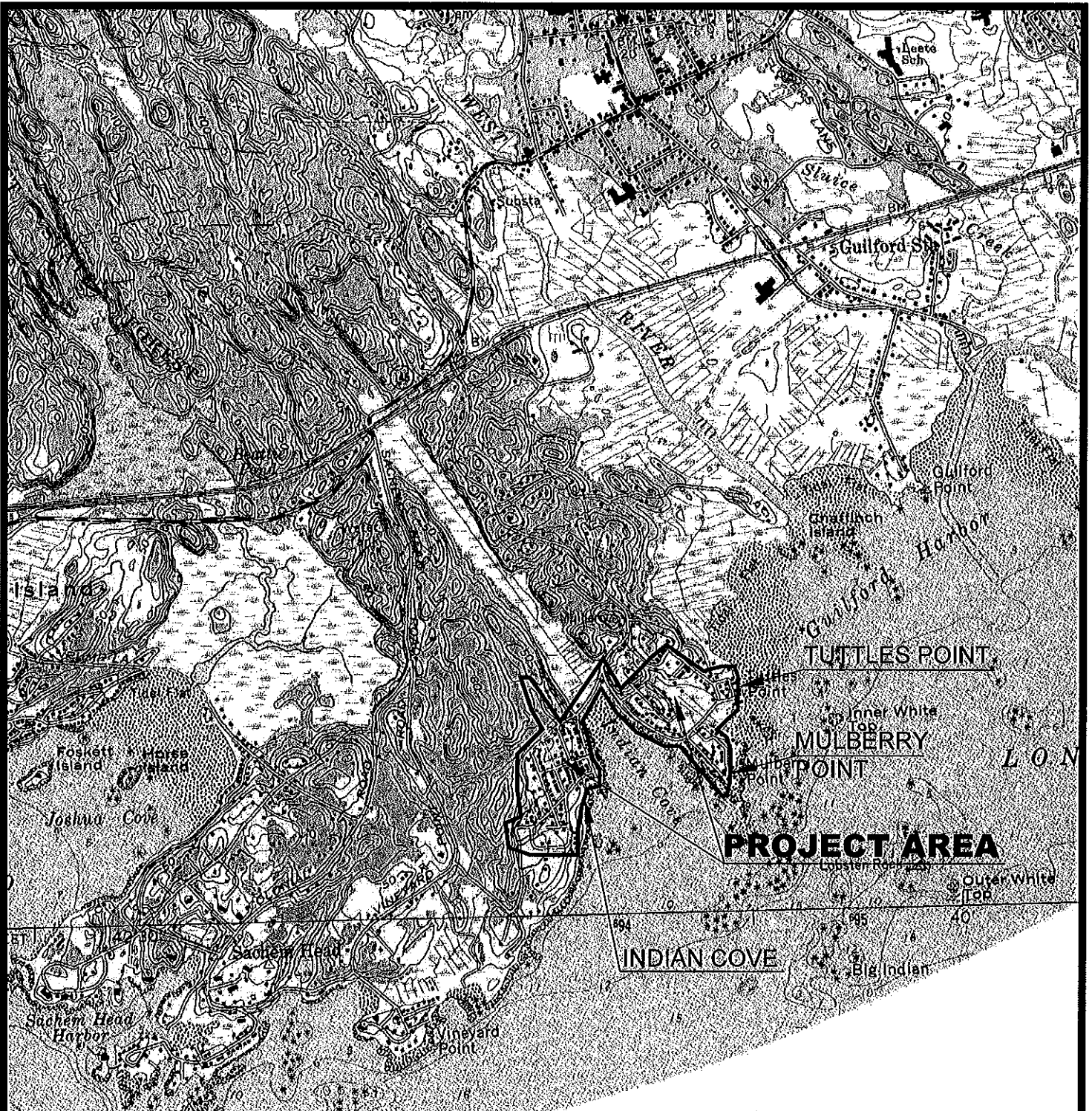
Lucas Consulting Engineers, L.L.C. MULBERRY POINT, TUTTLES POINT AND INDIAN COVE WATER SUPPLY STUDY TOWN OF GUILFORD, CONNECTICUT EXTENSION OF PUBLIC WATER SYSTEM QUANTITY SUMMARY BY ROAD December 2011											
STREET NAME	TRENCH EXCAVATION C.Y.	ROCK EXCAVATION C.Y.	8" DIP WATER MAIN L.F.	12" DIP WATER MAIN L.F.	PROCESS AGGREGATE BASE C.Y.	BITUMINOUS CONCRETE CLASS 1 TON	DOMESTIC SERVICE EA.	HYDRANT EA.			
Oak Avenue	118	130	450	0	100	104	7	1			
Highland Avenue	264	231	900	0	200	207	19	2			
Spencer Avenue Section 2	206	273	870	0	194	200	19	2			
Reeves Avenue Section 1	330	137	850	0	188	196	18	1			
Prout Road 1	432	70	830	0	216	223	18	1			
Prout Road 2	96	119	390	0	102	105	5	0			
Spencer Avenue	125	111	430	0	112	115	4	1			
Arch Street Section 1	185	393	1050	0	272	282	14	2			
Indian Cove Section 2	92	47	0	230	68	71	4	1			
Indian Cove Section 1	116	60	0	290	86	89	2	0			
West Lane Section 4	83	69	0	250	74	77	2	1			
West Lane Section 3	41	116	0	260	68	70	4	0			
West Lane Section 2	22	62	0	140	36	38	1	1			
West Lane	77	286	0	600	156	161	3	1			
Ruth Lane	227	0	420	0	94	97	4	1			
Charles Street	322	52	680	0	176	182	8	1			
Decatur Avenue-Marshall Avenue	642	161	1460	0	378	392	15	2			
Highland Avenue-Meriden Street-Spring Street	366	35	730	0	162	168	14	0			
Faulkner Drive	323	73	720	0	186	193	10	2			
Tuttles Road	162	124	520	0	116	120	9	1			
Sabore Street-Rock lane-White Top Lane	126	259	700	0	156	161	13	1			
Marshall Avenue - Section 1 (Loop)	703	337	1890	0	700	725	38	2			
Tuttles Point Road	318	244	0	930	344	357	5	1			
Mulberry Point Road - Section 1	622	328	0	1570	698	722	20	3			
Daniel Avenue	421	39	0	760	338	350	1	2			
West Lane & Reeves Avenue North	404	0	700	0	156	161	8	1			
Lower Road	359	120	870	0	226	223	10	1			
Lower Road Extension	248	83	600	0	78	161	8	1			
Bay Street	129	97	410	0	106	110	0	0			
Bay Street	119	24	260	0	68	70	4	1			
TOTALS	7678	4080	15730	5030	5854	6130	287	34			

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**WATER SUPPLY STUDY
MULBERRY POINT, TUTTLES POINT
AND INDIAN COVE**

FEASIBILITY STUDY

Figure 1 - Location Map



**WATER SUPPLY STUDY
MULBERRY POINT, TUTTLES POINT
AND INDIAN COVE**

LOCATION MAP

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DECEMBER 2011

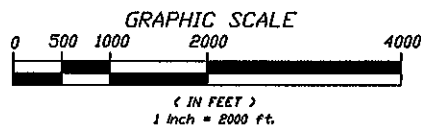
PREPARED BY:



LUCHS CONSULTING ENGINEERS, LLC
MERIDEN, CT

FIGURE NO.

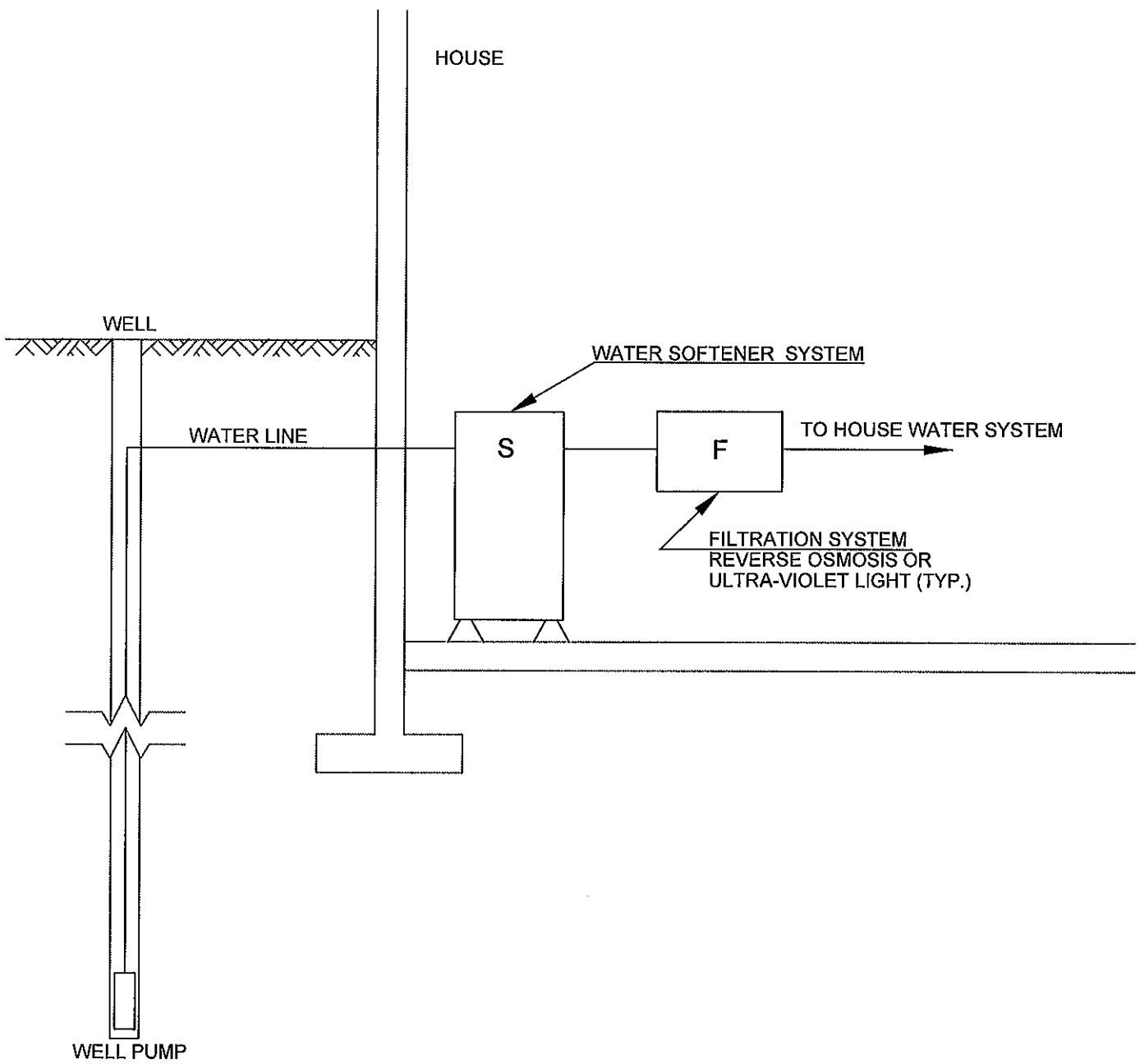
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**WATER SUPPLY STUDY
MULBERRY POINT, TUTTLES POINT
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Figure 2 - Point of Use Well Treatment Schematic



WATER SUPPLY STUDY
 MULBERRY POINT, TUTTLES POINT
 AND INDIAN COVE


**WHOLE HOUSE POINT-OF-USE
 WELL TREATMENT SCHEMATIC**

PREPARED FOR:



TOWN OF GUILFORD, CONNECTICUT

DECEMBER 2011

PREPARED BY:  Luchs <small>CONSULTING ENGINEERS</small>	FIGURE NO. 2
<small>LUCHS CONSULTING ENGINEERS, LLC MERIDEN, CT</small>	

**WATER SUPPLY STUDY
MULBERRY POINT, TUTTLES POINT
AND INDIAN COVE**

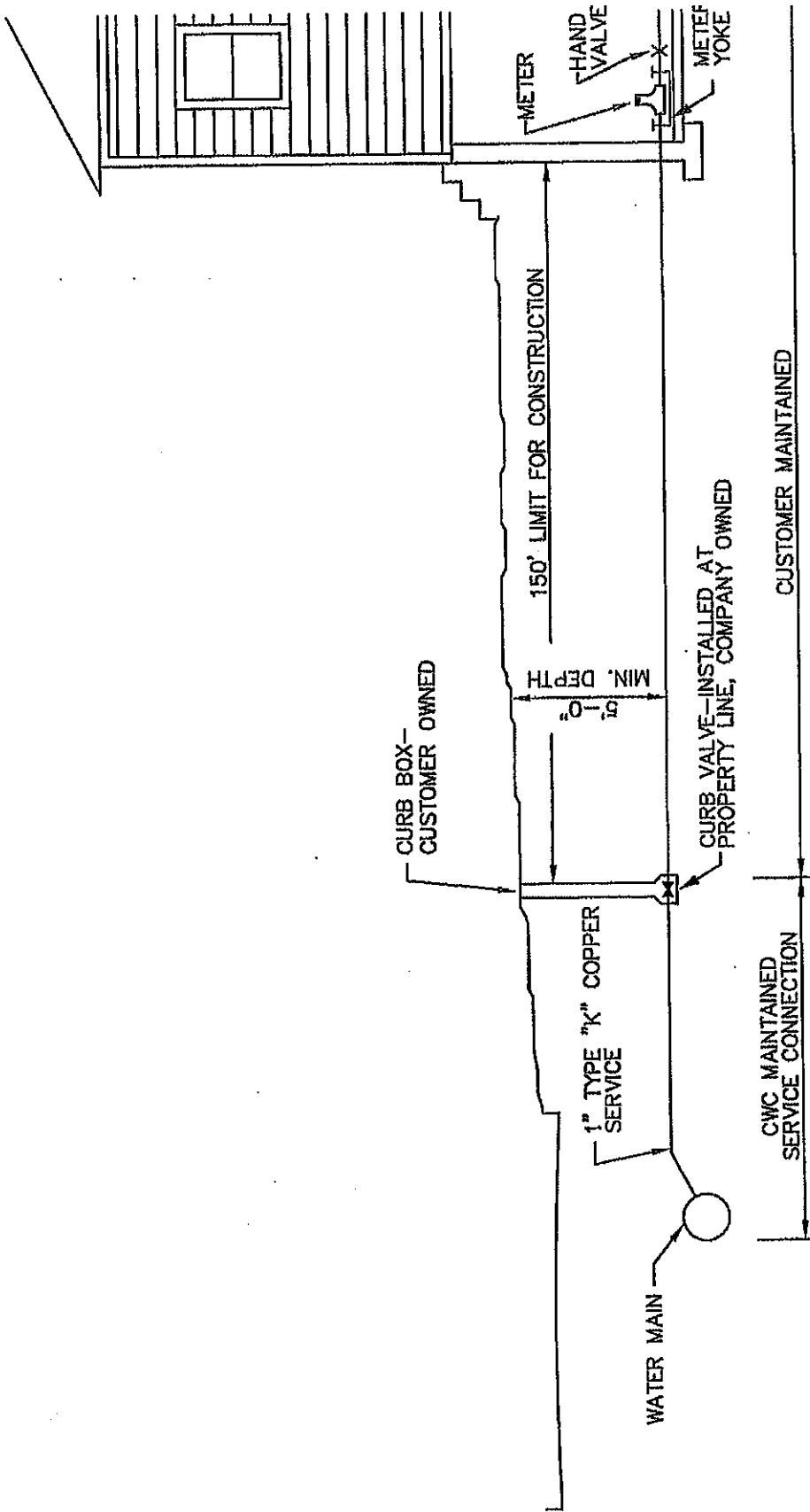
FEASIBILITY STUDY

Figure 3 – Public Water Main Extension Plan

**WATER SUPPLY STUDY
MULBERRY POINT, TUTTLES POINT
AND INDIAN COVE**

FEASIBILITY STUDY

Figure 4 – Individual Water Service Schematic




TYPICAL WATER SERVICE INSTALLATION

WATER SUPPLY STUDY
 MULBERRY POINT, TUTTLES POINT
 AND INDIAN COVE


**INDIVIDUAL WATER SERVICE
 SCHEMATIC**

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TOWN OF GUILFORD, CONNECTICUT
 DECEMBER 2011

PREPARED BY:



Luchs
 CONSULTING ENGINEERS

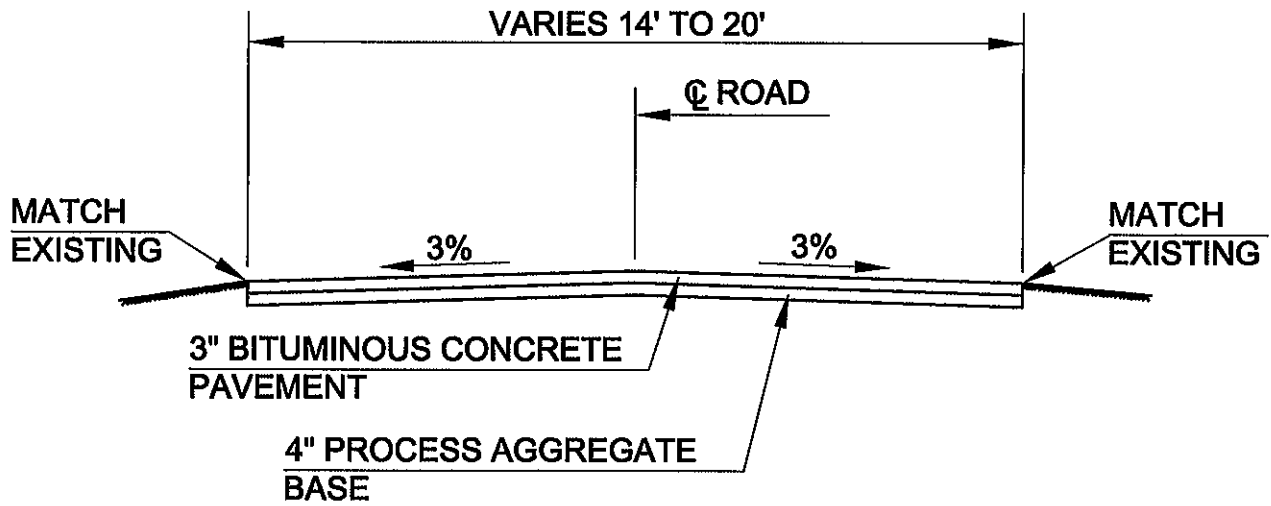
LUCHS CONSULTING ENGINEERS, LLC
 MERIDEN, CT

FIGURE NO.
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**WATER SUPPLY STUDY
MULBERRY POINT, TUTTLES POINT
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FEASIBILITY STUDY


Figure 5 – Typical Roadway Section




WATER SUPPLY STUDY
 MULBERRY POINT, TUTTLES POINT
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TYPICAL ROADWAY SECTION

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PREPARED BY:  <small>LUCHS CONSULTING ENGINEERS, LLC MERIDEN, CT</small>	FIGURE NO. 5
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Appendix A – Community Well Investigation