TOWN OF WESTERLY, RHODE ISLAND
WATER SUPPLY SYSTEM MANAGEMENT PLAN

EXECUTIVE SUMMARY

MAY 2013

Prepared for:

Town of Westerly, Rhode Island
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C&E Project No. J1230

EXECUTIVE SUMMARY

1.0 INTRODUCTION

The goal of this Plan is to comply with the provisions of the Water Supply System Management Planning Act referenced previously, by developing a comprehensive Water Supply System Management Plan for the Westerly Water Supply System. It is also intended to apply the components of the plan to successful execution for the purpose of achieving the effective and efficient conservation, development, utilization, and protection of the water system's resources in ways that satisfy the present and future needs of the Town of Westerly, and the Pawcatuck section of the Town of Stonington, Connecticut.

The goals of the Westerly Comprehensive Plan and Southeastern Connecticut Council of Governments Regional Development Plan to maintain the high quality of residential life within the subject service area while controlling the future rate of growth are recognized herein and their contents are referenced in the development of future water demand projections. Additionally, the region has opportunities for economic development through areas in and around the Business Districts in Westerly and Pawcatuck, as well as within other industrial and commercial zoned portions of the Water Supply System service area.

The goal of this plan is, furthermore, consistent with the overall goal of the RI State Guide Plan No. 721 and the CT Plan for Public Water Supply System Coordination, which is to develop a long range program to improve the quantity and quality of water required by the citizens within the service area of both states in the most cost effective and environmentally sound manner.

2.0 BACKGROUND

The Town of Westerly located in Washington County, Rhode Island owns and operates a public water supply and distribution system serving the Town and the nearby Pawcatuck section of Stonington, Connecticut. The system is operated as a Division of the Department of Public Works and is subject to the governing authority of the Westerly Town Council. The Town of Westerly purchased the original portions of the water system from private owners in 1898. Prior to that, the system functioned under the ownership of the Westerly Water Works, since its development during the 1870's.

Figure 1: Organizational Chart depicts the structure of the Town's Water Division and personnel responsible for the day-to-day operation of the water supply system. The Water Division currently employs 31 persons to operate and maintain the water distribution system, and the staff is of adequate qualifications, number and experience to effectively and efficiently perform such duties.

The Rules, Regulations and Rate Schedule for the Town of Westerly provides the legal basis for all water distribution related issues within the water supply system enacted by Town ordinance. In this format, the ordinances have the same effectiveness of local laws and can only be changed by a majority vote of the Town Council after two separate duly advertised public readings of the section(s) in question. While the ordinances thus establish the framework for the Water Division's operations, the Town may periodically develop policies (typically adopted by Town Council resolution) for implementing specific water system goals and programs.

3.0 SYSTEM DESCRIPTION

The sole source of raw water supply for the Westerly water system is groundwater. An overview of the water supply system is presented in Figure 2: Water Distribution System. A system of well fields distributed throughout the system service area accommodates 100% of the service area demand. Water is supplied directly into the distribution system for consumption, or serves to augment storage volumes within the storage facilities.

The present configuration of the system, as of June 30, 2012, consists of approximately 206 miles of water main ranging in size from 1 ¼-inches to 20-inches in diameter, six (6) storage facilities with combined storage of 5.0 million gallons, eleven (11) active groundwater supply wells and one (1) inactive groundwater well and seven (7) well stations, 870 hydrants, meters and appurtenances that serve a total of 14,442 customer accounts. Pipe material consists of cast iron, ductile iron, asbestos-cement, and polyvinyl chloride (PVC). The system is currently operating as one complete pressure zone. Generally, the distribution system services the majority of the Town including, in part or whole, the villages of Watch Hill, Weekapaug, Misquamicut, Bradford, Dunn's Comers, and Shelter Harbor, as well as the majority of the Pawcatuck and a portion of the Wequetequock regions of Stonington, Connecticut.

Overall, the operation and productive capabilities of the system to meet the needs of the water service community have been relatively efficient and capable. The ability of the system to supply potable water of good to superior quality to the service population has been readily maintained.

Town of Westerly ~ Utilities Division

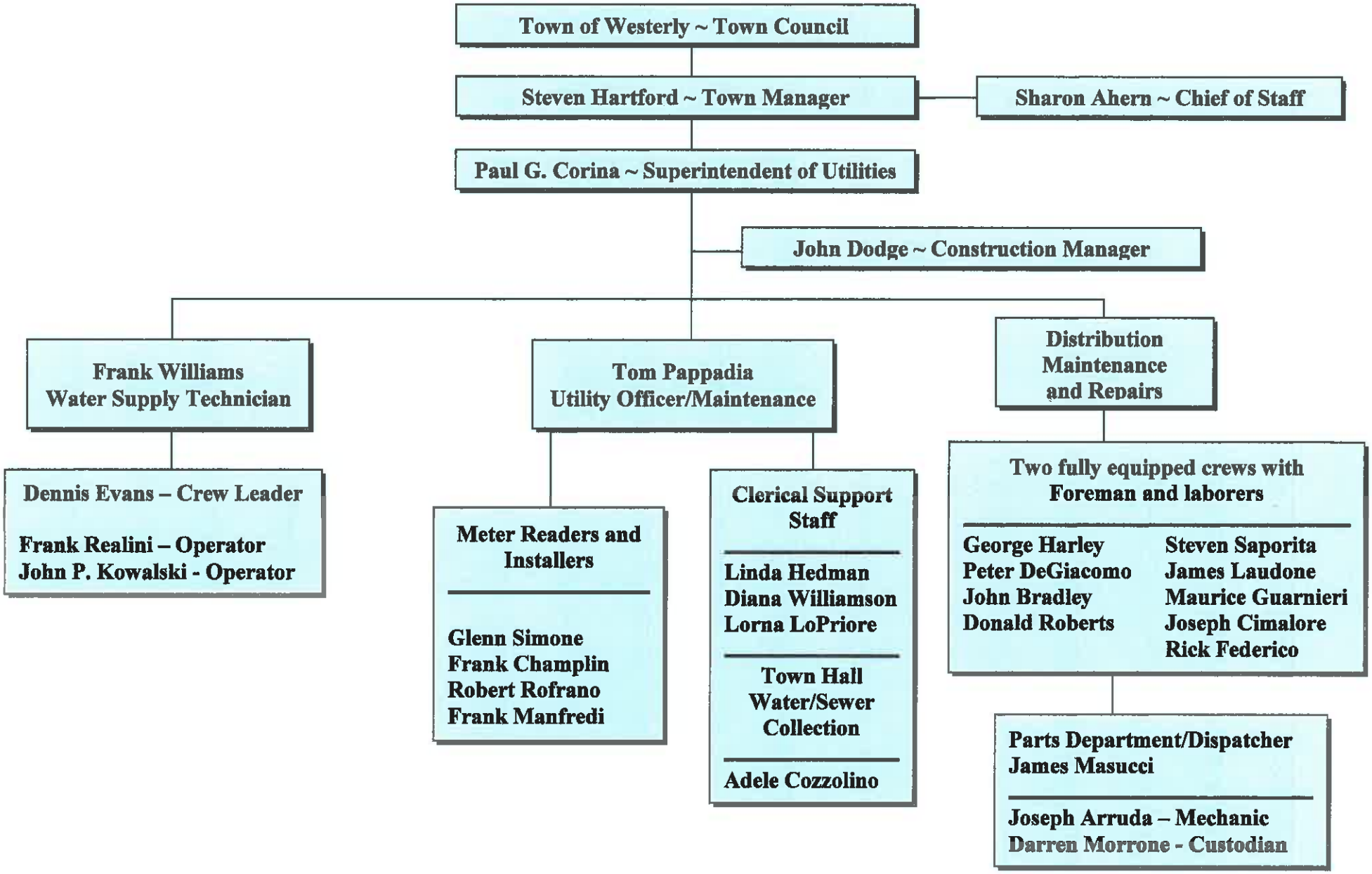

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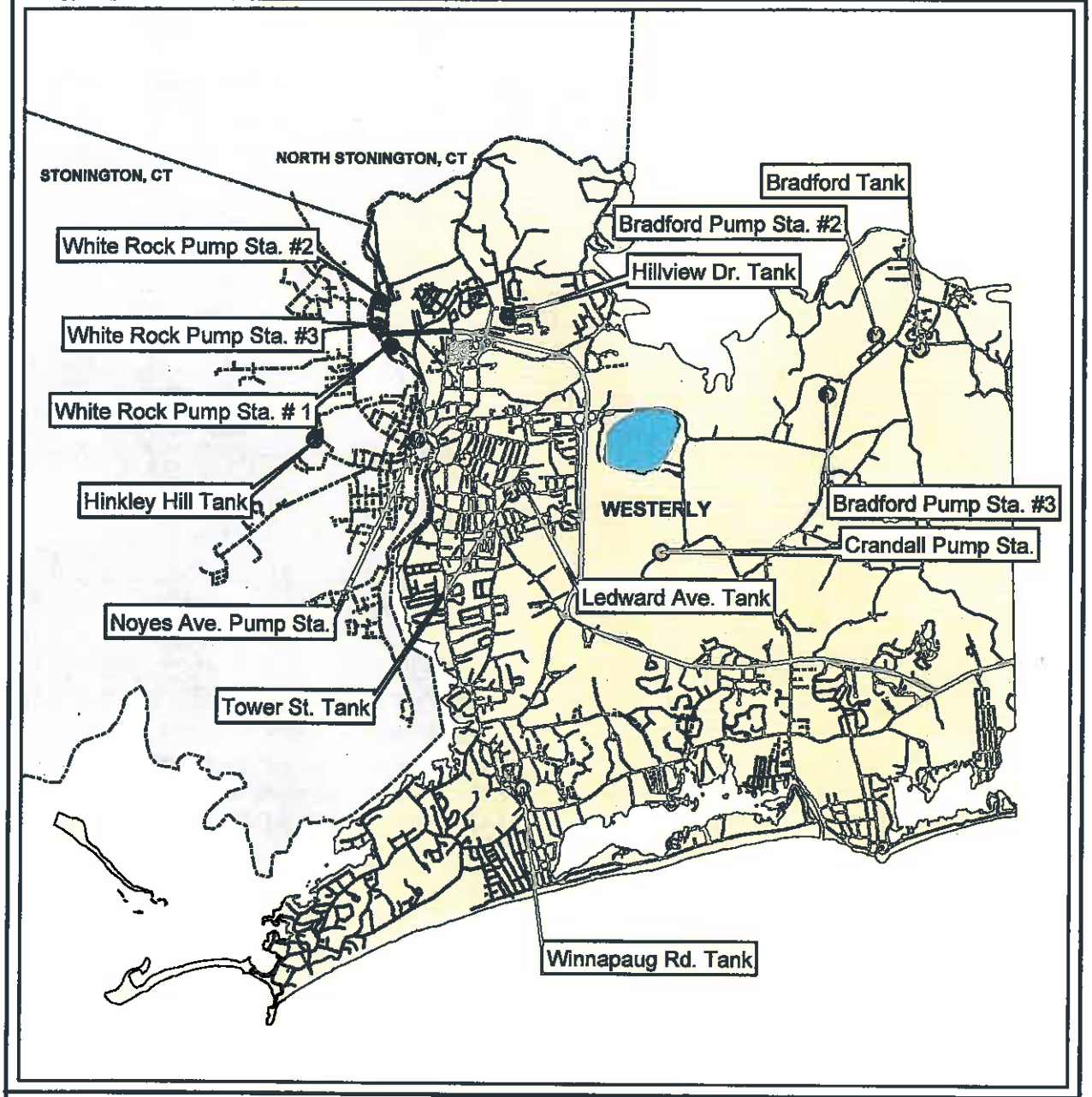
Figure 2:
Water Distribution System
Town of Westerly
Rhode Island



Legend

- Wells/ Tanks
- Water Distribution
- Roads
- Lakes
- Westerly

1:90,000

0 2,850 5,700 11,400 17,100 22,800 Feet

RIGIS

NOTE: INFORMATION AVAILABLE FROM RIGIS.

3.1 Water Supply Sources

The Westerly Water Division draws its water from 3 major sand and gravel groundwater reservoirs (or aquifers), all of which are located in the Lower Pawcatuck subbasin. The Lower Pawcatuck subbasin is part of the Pawcatuck Basin which was designated in 1988 as a sole-source aquifer by the U.S. Environmental Protection Agency. The Lower Pawcatuck Subbasin is in the southwestern section of the Pawcatuck Basin in Rhode Island and Connecticut. The Subbasin includes the towns of Charlestown, Hopkinton, and Westerly in Rhode Island, and North Stonington, Stonington, and Voluntown in Connecticut. The Green Fall River, Wyassup Brook, and Shunook River flow southeasternly into the Pawcatuck River, which flows southwesterly into Long Island Sound.

The Town currently utilizes both the Westerly and Bradford reservoirs to supply its municipal wells. The Bradford groundwater reservoir and the majority of the Westerly reservoir are classified as GAA groundwater sources, and are thus suitable for public drinking water use without treatment. The remaining portion of the Westerly reservoir is classified as GB which defines it as a source which may not be suitable for public or private drinking without treatment, due to known or presumed degradation. The Groundwater Division of the RIDEM has delineated the critical portions of the groundwater recharge areas to these reservoirs.

There are, at present, a total of eleven (11) gravel-packed and gravel-developed wells, and seven (7) well stations that comprise the source water supply portion of the Westerly Water system. Overall, the operation and production capabilities of the system to meet the needs of the water service community have been relatively efficient and capable. The ability of the system to supply potable water of good quality to the service population has been readily maintained, though system disinfection has had some impacts on water quality in some areas of Town.

A summary of the total productive capacity of each well and pump station, as well as the total pumping capacity of each well field currently serving the system is depicted in Table 1: Well Fields and Pumping Stations.

Table 1: Well Fields and Pumping Stations

Well and Well Field Site	Well Number	Pump Capacity GPM (Each Well)	Combined Pumping Capacity (GPM) (Well Field)
White Rock No. 1[1]	1A 1B 1D	500 GPM 500 GPM 500 GPM	1,500 GPM (2.16 MGD)
White Rock No. 2	2A 2B 2C 2D	750 GPM 750 GPM 750 GPM 750 GPM	3,000 GPM[2] (4.32 MGD)
White Rock No. 3	3	750 GPM	750 GPM (1.08 MGD)
Bradford Well II	II	520 GPM	520 GPM (0.7488 MGD)
Bradford Well III	III	750 GPM	750 GPM (1.08 MGD)
Crandall Well	-	700 GPM	700 GPM (1.008 MGD)
Noyes Avenue[3]	-	700 GPM	700 GPM (1.008 MGD)
TOTAL			**7,220 GPM[4]** **(10.3968)**

Note: (1) Well 1C has been replaced by Well 1D.
(2) Supply from this well field is limited to 2.0 MGD.
(3) The Noyes Avenue Well was taken offline and removed from the distribution system.
(4) Noyes Avenue Well not included.

3.2 Water Treatment Facilities

The raw water from each of the well fields is treated prior to being pumped into the distribution system. Each of the treatment systems is operated on a flow-proportional basis. Treatment consists of the following:

Potassium Hydroxide (KOH): Potassium Hydroxide is injected into the raw water for adjustment of pH for corrosion control at each well station. The water system utilizes KOH with a trade percentage of 45%, which is mixed with carry-off water and injected into the discharge main via chemical feed pumps at the chemical injection vault. This system serves to reduce the corrosiveness of the raw water that has an initial pH of approximately 6.0 and which is adjusted to the range of 7.5-8.0.

Corrosion Inhibitor: A corrosion inhibitor, which consists of a blended polyphosphate based compound, is injected into the raw water at each well station. The product is injected with chemical

metering pumps, which is mixed with carry-off water and introduced at the chemical metering vault. This product is added as an aid to the pH adjustment and is designed for additional corrosion control of distribution piping and home plumbing system materials. The intended use of the inhibitor is to optimize corrosion control strategies for compliance with the USEPA Lead and Copper Rule.

Miox: Mixed Oxidant is generated at the well stations with a Miox system utilizing salt and raw water. It is then injected into the raw water to maintain a disinfectant residual throughout the water distribution system. It is intended that the chlorine residual leaving the well station will maintain a minimum chlorine residual in the distribution system to protect the distribution system from bacterial contamination. The Miox system utilizes a Mixed Oxidant that is generated at a constant concentration of 0.4 mg/l that is then injected into the raw water at a concentration of 0.67 mg/l. A residual of 0.4 mg/l is maintained at the ends of the distribution system.

3.3 Storage Facilities

The water system maintains six (6) distribution storage facilities located throughout the service area. These facilities are described as follows:

Bradford Tank – a 0.5 MG steel spheroid tank:

- This tank was cleaned and inspected in the fall of 2008
- In 2008 the interior and exterior of this tank were recoated by Amstar
- This tank was cleaned and inspected in June of 2010

Hillview Drive Tank – a 1.5 MG concrete reservoir:

- In 2004 the interior of this tank was cleaned and inspected
- This tank was cleaned and inspected in the fall of 2009
- This tank was cleaned and inspected in June of 2010
- A Tideflex mixing system is scheduled to be installed in this tank in 2013-14

Ledward Avenue Tank – a 0.66 MG concrete standpipe:

- In 2004 the interior of this tank was cleaned and inspected
- This tank was cleaned and inspected in June of 2010
- A Tideflex mixing system is scheduled to be installed in this tank in 2013-14

Tower Street Tank – a 0.36 MG steel standpipe:

- In 2004 the interior of this tank was cleaned and inspected

- In 2007 rehabilitation, interior and exterior painting and the installation of a Tideflex mixing system occurred
- This tank was cleaned and inspected in June of 2010

Winnapaug Road Tank – a 1.0 MG steel spheroid tank:

- This tank replaced the old 0.5 MG elevated storage tank in 2007
- In June of 2010 the exterior of this tank was power washed
- This tank was cleaned and inspected in June of 2010

Hinkley Hill Tank – a 1.0 MG concrete reservoir:

- In 2004 the interior of this tank was cleaned and inspected
- This tank was cleaned and inspected in June of 2010
- A Tideflex mixing system is scheduled to be installed in this tank in 2013-14

All tanks are equipped with altitude valves, which preclude overfilling the tank. In addition, the status (i.e. water elevation) including high and low water level alarms, are continuously transmitted via telemetry to the pump control room of the Division of Public Works at White Rock Station No. 1. This remote transmission permits a continuous monitoring of the tank system via the SCADA system. Water system operators at the pump control room have the ability to activate or deactivate well pump stations based on the varying levels in the water storage tanks.

3.4 Pumping Stations

In 2003/2004, a new booster pump station was designed and constructed on the dedicated 12-inch water main in Beach Street that supplies the southern portion of the Town. This booster pump station is designed to effectively transfer water to the south portion of the Town and specifically to replenish the Winnapaug tank during periods of peak demand.

3.5 Transmission and Distribution Facilities

The water system's transmission mains are primarily dedicated for the conveyance of potable water between the well pumping stations, and the service territory and the system storage facilities. The waster system maintains a well dispersed and strong grid layout in an effort to provide and maintain satisfactory reliability and redundancy. The entire distribution system is fully interconnected, with all storage facilities having an overflow elevation equal to 231.0 feet Mean Sea Level (MSL). This allows operations as a single pressure zone and permits all the sources to supply all parts of the distribution system.

The transmission and distribution system consists of approximately 206 miles of water main ranging in size from 1 ¼-inches to 20-inches in diameter. Installation dates range from circa 1870 to the present. The water mains prior to 1970 consist of unlined cast iron (CI) and a limited portion of asbestos cement (AC). Several sections of CI transmission mains have been cleaned and cement lined. The remainder of the distribution system, including replacements of older pipe sections, consists primarily of polyvinyl chloride (PVC) pipe and concrete lined ductile iron (DI) pipe materials.

The Water Division continues to employ an aggressive proactive Capital Improvement Program of water main replacement/rehabilitation and system development which has been in effect for several years, with the intent of replacing existing low capacity mains and water meters, upgrading and expanding system supply and storage facilities, and improving overall system reliability. This has lowered the hydraulic loss, improved the fire flow and reduced friction loss. Further improvements to the existing transmission system are being addressed through the operating budget. Focus is on loops, undersized mains and standardization of pipe, hydrants and meters.

3.6 Planned Extensions

There are presently no major planned extensions of the water distribution system.

3.7 Interconnections

The Westerly water system currently maintains no emergency connections with neighboring water utilities. Neighboring water supply systems consist of the Mystic Division of the Connecticut American Water Co. which supplies Mystic and a portion of Groton in Connecticut, and two small divisions of the South Eastern Connecticut Water Authority. Of these systems, it would appear that only the Mystic Division of the Connecticut American Water Company has the potential to be of use to the Westerly Water Division during an emergency event. The ability of the system in terms of quantity of surplus water available for such purposes is not known at this time. In any case, the Town of Westerly does not plan to develop an agreement between both utilities and nor to construct a system interconnection, but if they did it would have to proceed rapidly for this alternative to become a viable emergency source in the near future.

3.8 Populations Served and Projections

3.8.1 Geographic Area

The Town of Westerly occupies an area of approximately 29.7 square miles, which includes a various array of structures (i.e. residential, commercial, industrial, governmental), that are serviced by the

Water Division. In addition, the neighboring Pawcatuck area of Connecticut is also served by Westerly. All undeveloped areas within the water service area are eligible to be served as the demand requires and, depending upon the circumstances involved, the Town or the property developer may extend existing water main lines and associated appurtenances necessary for the adequate supply of water in those areas. Extension of water distribution lines outside of the present service area is contingent upon formal approval of the Westerly Water Division, and is subject to the hydraulic feasibility of the current system to accommodate any extensions.

Table 2: Present Population and Projected Populations Served

2012	2017	2032
33,397	34,673	39,865

3.9 Major Users

The Westerly Water Division supplies water to ten (10) large users with a demand greater than 3 million gallons per year. These major users are involved in a range of operations from Industrial/Manufacturing to Domestic and Health Services. Due to the current major user meter reading schedule (quarterly), a monthly breakdown is not available. Westerly Hospital and Ocean House Hotel Mgmt. are the two most significant major users in the system.

3.10 Metering

3.10.1 Master Meters

All of the water pumped from the Westerly groundwater supply system is metered at each source well field. These Master Meters provide for 100% source metering and are provided with remote transmitters which allow a continuous charting and digital display of well station production at the system's Pump Room at White Rock Station No. 2.

3.10.2 Distribution Meters

The Water Division owns, maintains and replaces all customer meters within the water system, which totals 13,960. Every residential, commercial, industrial and government customer serviced by the Town's water supply distribution system is metered, thus providing 100% distribution metering. These meters are read on either a quarterly, semi-annual, or seasonal/annual basis. The quarterly readings are taken during the first week of January, April, July and August. Semi-annual readings are performed over a five month period between January – June and July – December, in accordance with a defined meter reading cycle. Seasonal accounts are recorded annually during meter shutdown.

Meter testing and calibration is performed by Water Division employees on a request (from owner) basis. Additionally, random meter testing is performed by Water Division personnel as manpower requirements dictate. The current ongoing meter replacement program provides for a change in meters every ten years that reduces the concern for error.

3.11 Legal Agreements

In addition to the implied legal obligations associated with the Town of Westerly ordinances defining the responsibility of the Water Division to furnish potable water to its customers, Special Act 476 of the 1899 session on the State of Connecticut General Assembly authorized the Town of Westerly to serve the Pawcatuck Fire District portion of the Town of Stonington, Connecticut. No additional specific legal obligations or contract agreements exist regulating the Division's provision of water.

3.12 Non-Account Water

Unaccounted for water use consists of the difference in the sum of the volume of water metered at the point of supply and that recorded at all points of sale. This unaccounted for water typically consists of water consumed for both authorized and unauthorized uses. Authorized uses include water main/storm drain flushing, sewer/street cleaning, landscaping in public areas, construction sites, etc. It also includes water which is metered but not billed, and therefore is not reflected in the recorded volumes of water sold. Unauthorized uses typically include system leaks, malfunctioning meters, meter pit bypasses, water theft, other non-metered public use, etc.

The percentage of unaccounted water use for the Westerly Water Division has in the past (i.e. 1990's) occurred at levels typically above 20%. The Division was cognizant of this and has reduced these levels through various programs including leak detection, better methods of accounting for "lost" water which is unmetered, etc. Since fiscal year 2000, the unaccounted for water percentage has been below 20% and more recently since fiscal year 2004 has been below 10%. For the most recent year, the unaccounted for water was determined to be 9.53%.

3.13 Demand Management

Demand Management consists of those conservation measures which achieve long-term water savings by providing incentives and technical assistance to consumers as a means of improving efficiency of water use and reducing waste. Such water conservation measures, whereby suppliers and/or local water departments and government work to influence water consumption, is the most fundamental

approach to water conservation since the ability to conserve water lies primarily with the water user. Consequently, the success of these measures is high dependent upon consumer participation and cooperation.

With the adoption of the Water Management Plan (approved in 2008), the Town has undertaken measures to achieve permanent and long-term water savings by implementing the following demand management techniques.

- Installation of water conserving, low-flow plumbing devices (retrofit) and revision of plumbing code regulations.
- Promotion of water recycling and efficient use and reuse; provision of technical assistance to industrial, commercial and municipal users.
- Public education on water conservation and water supply issues.
- Appropriate use of fees, rates and charges.
- Water use regulations and restrictions.

3.14 Supply Management

As required by Chapter 46-15.3 of the General Laws of Rhode Island, the Town of Westerly has an approved Water Quality Protection Plan. The 1993 Water Quality Protection Plan included a determination of the boundaries of reservoirs, watersheds, identification of real or potential sources of contamination to each supply, identification of source protection measures, and a priority list of actions for implementing these protection measures. The Water Quality Protection Plan identified regulatory, structural and non-structural source protection measures, as well as land acquisition strategies.

3.14.1 Threats to Groundwater Quality – General

In general, the groundwater in Westerly is of high quality, as indicated through the Monitoring/Quality Program. Yet, because 100 percent of the water supply for Westerly residents is obtained from local groundwater reserves and easily polluted by local activities, it is of utmost importance that local interests recognize potential sources of pollution.

Sources of groundwater contamination can be defined as point source and non-point source pollution. Point source pollution is defined as contamination originating from a specific point on the landscape, such as a discharge pipe from a factory. Non-point source pollution originates from no single source

and includes stormwater runoff, leaking underground storage tanks, and agricultural fertilizers and pesticides. In Westerly, the majority of potential sources of contamination are non-point sources.

3.14.2 Inventory of Pollution Sites within Wellhead Protection Areas

As required by State legislation as a component of DEM's Wellhead Protection Program, the Town of Westerly was required to prepare an inventory of potential sources of pollution within wellhead protection areas. In 1994, the work was performed by a research assistant hired by the Town of Westerly Planning Department under an EPA Demonstration grant as part of a regional wellhead protection effort involving the Towns of Westerly, Hopkinton, Charlestown and Richmond. The research assistant then followed the suggested procedure for accumulating the required information within the limits of the mapped WHP areas by: performing a directory/file search of local tax records to identify and record land uses; completing a field survey along every road; and concluding an historical research of the current business at each address. Pollution threats were hand plotted on USGS Quad sheets for the region and on plat sheets for the Town of Westerly. In addition, a consultant was utilized to complete the mapping of the Wellhead Protection Areas as well as the High Threat Pollution Points on RIGIS.

The inventory of pollution sites was updated in January 2001 to include Point Source Pollutants, Underground Storage Tanks, Leaking Underground Storage Tanks, Hazardous Materials Spills, State list of known or potential hazardous waste sites, and the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) which addresses site remediation for more than 40,000 hazardous waste sites nationwide.

There are no known sites designated CERCLA within the wellhead protection areas.

3.14.3 Monitoring/Quality Program

The quality of water from Westerly's eleven municipal wells has historically been rated good to excellent. The federal Safe Drinking Water Act has established standards against which water quality is judged. The standards are set by the US ENVIRONMENTAL PROTECTION AGENCY and are referred to as maximum contaminant levels (MCLs), secondary MCLs, and non-mandatory maximum contaminant level goals (MCLGs). MCLs represent the upper limit of contaminants allowed in public drinking water supplies. Both the RI and CT Departments of Health require routine analysis at the Town wells which are compared to standard water quality criteria to assess the potability of public water supplies.

Water testing for bacteriological quality is carried out on a routine schedule. Testing for a broad spectrum of contaminants is conducted, at minimum, once per year, and more frequently, up to several samples per year for selected contaminants. Typically, this larger spectrum of testing includes sampling and analysis for the following: Inorganics, Metals, Pesticides and Herbicides, Volatile Organic Compounds (VOC's), Radiological, Polychlorinated Biphenyls (PCB's) and Petroleum Hydrocarbons. A review of available water quality testing results for fiscal year 2011 (last available year of test results) was conducted as part of this investigation.

3.15 Available Water

3.15.1 Aquifer

The U.S. Geological Survey, in cooperation with the Rhode Island Water Resources Board, developed a report *Estimated Water Use and Availability in the Pawcatuck Basin, Southern Rhode Island and Southeastern Connecticut, 1995-1999,* which presented an analysis of water use and availability for the Pawcatuck Basin. The report identifies the water-use components and assesses water use and availability in the Pawcatuck Basin and its six groundwater subbasins for periods of little or no recharge. The water availability in the subbasin for the gross yield, at the 50th percentile of the total base flow, ranged from 28.82 MGD in September to 75.58 MGD in June and by using the 7-day, 10-year flow (7Q10) criteria, ranged from 14.56 MGD in September to 61.31 MGD in June. The water availability in the subbasin for the gross yield, at the 75th percentile of the total base flow, ranged from 40.57 MGD in September to 96.53 MGD in June and by using the 7-day, 10-year flow (7Q10) criteria, ranged from 26.30 MGD in September to 82.27 MGD in June.

From the USGS report, the water availability in the subbasin from the sand and gravel deposits for the gross yield, at the 50th percentile of the total base flow, ranged from 16.36 MGD in September to 42.88 MGD in June and by using the 7Q10 criteria, ranged from 8.26 MGD in September to 34.79 MGD in June. The water availability in the subbasin from the sand and gravel deposits for the gross yield, at the 75th percentile of the total base flow, ranged from 23.02 MGD in September to 54.77 MGD in June and by using the 7Q10 criteria, ranged from 14.92 MGD in September to 46.68 MGD in June.

The State of Rhode Island A. D. Little Report – Water Supply Analysis for the State of Rhode Island, October 1990, presented an analysis of the Lower Pawcatuck River Basin which includes the Ashaway, Westerly and Bradford aquifers. In the report analysis, all three groundwater reservoirs were grouped together and treated as a single Aquifer. The drainage of the Aquifer group in Rhode Island was estimated

to be 47.0 square miles. The total runoff was approximated to average 1.27 MGD/sq. mile, based on the USGS Pawcatuck River gauge located in Westerly. The groundwater runoff was estimated to be between 65 and 75 percent of total runoff, based on the Aquifer's similarity with other Aquifers analyzed in the study. The suggested, from this report, combined Safe Yield of this reservoir group lies between 6.0 and 9.0 MGD. The average annual yield of the group was estimated to fall between 9.5 and 18.5 MGD.

3.16 Safe Yield

3.16.1 Well Fields

The State of Rhode Island, Division of Water Supply Management does not define Safe Yield for groundwater sources. Instead, the capacity of the well or well field is evaluated to determine if adequate supply is available. In accordance with the Division guidelines, 90% of the well/well field capacity can be utilized towards determination of the system's available water.

In March 1990, the State of Connecticut, Department of Health, developed an *Interim Safe Yield Methodology for Groundwater Sources in Unconsolidated Aquifers, for Water Supply System Planning Purposes.* This methodology defines the Safe Yield of such sources as "the calculated well yield, determined from a minimum 72 hour pumping test, delivered in an 18 hour period and expressed in gallons per day". Where 72 hour pump test data is not available, alternative yield calculations such as those derived from historic production records may be accepted, depending on the nature of the supply situation.

The State of Rhode Island A.D. Little Report – Water Supply Analysis for the State of Rhode Island, October 1990, also estimated the Safe Yield of the Westerly water supply system, a figure of 6.6 MGD was suggested. Table 3: System Safe Yield provides a source breakdown of the system Safe Yield as developed from recorded pumping tests and historical production data.

Table 3: System Safe Yield

Well Field Site	Well No.	Well Yield	RI Methodology (MGD)		CT Methodology (MGD)	
			Well	Well Field	Well	Well Field
Well Field No. 1	1A 1B 1D	500 gpm[1] 500 gpm[2] 500 gpm[3]	0.65 0.65 0.65	1.95	0.54 0.54 0.54	1.62
Well Field No. 2	2A 2B 2C 2D	694 gpm 694 gpm 694 gpm[4] 694 gpm	0.91 0.91 0.91 0.91	2.0[7]	0.76 0.76 0.76 0.76	2.0[7]
Well Field No. 3	3	600 gpm	0.78	0.78	0.65	0.65
Bradford II	II	520 gpm[5]	0.67	0.67	0.56	0.56
Bradford III	III	657 gpm[6]	0.85	0.85	0.71	0.71
Crandall	-	700 gpm	0.91	0.91	0.76	0.76
Noyes Avenue[8]	-	700 gpm[9]	0.91	0.91	0.76	0.76
Bradford IV[11]	IV	350 gpm	0.45	0.45	0.38	0.38
TOTALS				6.93[10]		6.30[10]

Note: (1) Well Yield was recorded as 750 GPM during the pump test, but existing pump is rated at 500 GPM.
(2) Well Yield was recorded as 754 GPM during the pump test, but existing pump is rated at 500 GPM.
(3) Well Yield was recorded as 754 GPM during the pump test, but existing pump is rated at 500 GPM.
(4) Pump test duration equaled 48 hours.
(5) Well Yield was recorded at 600 GPM during the pump test, but existing pump is rated at 520 GPM.
(6) Pump test information not available.
(7) Well Field Safe Yield limited to 2.0 MGD.
(8) Well Field Safe Yield not included in System Safe Yield calculations.
(9) Pumping rate varied between 615 & 1,002 GPM during pump test duration; existing pump is rated at 700 GPM.
(10) Combined hydraulic limitation of Well Field Nos. 1, 2 and 3 is 4.5 MGD and used in calculations.
(11) Well Field completed February 2013. Activation upon final land purchase for 400' radius.

As indicated in Table 3: System Safe Yield, the current estimated total combined safe yield of the Westerly groundwater supply sources is estimated at 6.30-6.93 MGD. The combined current pumping capacity of the active supply wells totals 9.29 MGD (6,451 GPM).

Available data regarding existing water supply limitations indicates that White Rock Well Field No. 2 should be relied upon for a combined safe yield of 2.0 MGD, even though it is provided with three separate wells capable of pumping 750 GPM each. In addition it was noted in the Individual Water

Supply System Plan prepared by the Town in 1989 and 1995 that the existence of two 12-inch transmission mains from the White Rock area, an 8-inch main crossing the river to Pawcatuck, and a 6-inch main in the area, limited transmission of the total rated production from the White Rock Well Fields to 4.5 MGD. The Division installed a new 20-inch transmission main in 2008 to eliminate the previous hydraulic restriction. In light of the Safe Yield (RI Methodology) calculations presented in Table 4: Available Water Summary, this hydraulic limitation limits current output from these well fields by 0.23 MGD.

It should also be noted that some local small community and non-community water supply systems in neighboring Towns of Hopkinton, Charlestown, and North Stonington, Connecticut also utilize the Ashaway, Westerly and Bradford groundwater reservoirs for water supply.

3.17 Anticipated Future Demands

The following Table 4 details the total water supply in relation to the existing supply and proposed average and maximum day system demands. It should be noted that the development of future projections assumed reasonable estimates for unaccounted-for water and would therefore, reflect the total amount of water supply needed (i.e. total pumping supply) to meet overall system demands.

Table 4: Available Water Summary

	Condition		
	2012 Existing	**2017 5 Yr. Projection**	**2032 20 Yr. Projection**
Total Available Water Capacity	6.30 6.93	7.72 9.02	8.48 9.93
Average Day Demand (MGD)	3.30	3.33	3.83
Maximum Day Demand (MGD)	6.24	6.29	7.24

It would appear, from a review of the information presented above, that the Westerly water system supplies will remain adequate to meet existing and future demands for the 5 and 20 year planning horizons.

3.18 Capital Improvement

It is the intent of the Westerly Water Division to eliminate major identifiable deficiencies present in the water distribution system. The system's program for replacement and upgrade of distribution

meters, and the ongoing maintenance and replacement programs for major system components (i.e. well station equipment, storage facilities, piping, hydrants) reinforce the Division's commitment to improving the system's overall reliability and operating efficiency.

While Westerly's water system is judged by the Town to be adequate, transmission from the main production facilities in White Rock had been restricted due to the capacity of two 12-inch and two 8-inch mains. These mains were limiting the pumping yield and preventing the realization of the potential six million gallons per day. In 2008, approximately 13,000 feet of a new 20-inch ductile iron transmission water main was installed between White Rock Pump Station No. 2 and the 12-inch water mains at the intersection of Granite Street and Summer Street. The installation of this new transmission main has addressed the issue of restricted capacity of the production facilities in White Rock.

Certain parts of the Town, especially the Hillview area, experience low water pressure. According to the Town Engineer, many areas may have levels which are not adequate for fire service (20 pounds per square inch). The Town currently uses computer software to model the distribution system for the whole Town and determine what areas are deficient and what can be done to correct them. Work would include improvement of the transmission system and possibly individual booster pumps in certain residences. This hydraulic model is also used on all proposed additions to the water systems to determine the capabilities of supplying additional growth.

The Division maintains a 5-year Capital Improvement plan outlining targeted system improvements for fiscal years 2011 through 2015 as well as a 20-year Capital Improvement plan. This plan addresses current deficiencies within the system as well as seeking to remain in line with the ever increasing regulatory and management responsibilities of the Division.

3.19 Rate Structure

Conservation oriented pricing is usually regarded as an essential element of a broad municipal water conservation program and is considered critical to the effective implementation of regulations and devices aimed at outdoor water use, sanitary devices, cooling systems, recycling, etc. Reported experience and effectiveness of pricing programs have been widely varied in part because of the different environments in which they have been implemented, plus the fact that they have usually been initiated simultaneously with other conservation programs. However, when combined with information on how to reduce peak or excess use with retrofitted sanitary devices, process changes, modernization,

etc., changes in price structures can have a significant impact on the actions and water using practices of major users.

Finally, it should be noted that pricing will likely be a strong reinforcement tool for the Demand management initiatives discussed herein, but without good user understanding of the rate structure and implications for consumer costs, results could be minimal.

3.19.1 Current Rate Structure

The current Water Rate Schedule for fiscal year 2012 as established by Town Council Ordinance is included in Appendix C of the Water Supply System Management Plan (2013). This schedule provides a separate rate structure for assessing charges to single unit residential users, commercial and industrial users, and fire hydrant rentals. Single unit residential (per meter) and commercial/industrial users are appraised on either a seasonal, semi-annual, or quarterly basis, consistent with their meter reading frequency. The rate structure consists of a combination of a Customer Service Charge (Flat Rate) plus a Consumption Charge (Excess Use Charge). The Customer Service Charge is applied up to a specific volume of water used depending on the billing frequency, with the Consumption Charge added when the consumer exceeds this defined level of consumption.

The current rate structure (Customer Service Charge plus Consumption Charge) has been in effect since fiscal year 1987-1988 and represents a Demand Management initiative by maintaining the Customer Service Charge while replacing the previously existing Declining Block rate structure. Declining Block rate structures do not promote the conservation of water as the unit price of water becomes cheaper as use increases.

3.19.2 Alternative Rate Structure

Revisions to the current water use rate structure, if properly designed, may earn extra revenues even as consumption drops. This approach is most effective for addressing long-term, low percentage, average and peak goals when all users are metered. To date, water rate revision in other water supply systems has been shown to be most effective in encouraging reduction of residential peak use and of non-residential average use. The response to a rate revision usually diminishes as users become accustomed to paying more. As price levels increase for water, however, user's response is likely to increase. The percent of reduction in use will vary, but it can be expected to produce more of a reduction in peak use than average use.

The cost of implementing an alternate rate structure program is primarily a one time cost. It may be necessary to perform a cost of service study and to set up a revised billing system. However, revisions to the current rate structure should prove cost-effective, and when implemented with other programs and in conjunction with upgrading of the water distribution system, can be expected to contribute significantly to conservation of water by residential and non-residential users.

Appendix O includes a discussion on alternative Rate Structures as presented in the State of Connecticut publication – *Conserving Water – Plan on it, CTDOHS, Water Supplies Section, 1987.*

The following presents a brief discussion of some of these alternatives as they may apply to the Westerly water supply system:

1. Seasonal Adjustments: Seasonal increased rate structures are generally used to encourage conservation during the period of greatest outdoor use. In such circumstances, Summer rates are higher than non-Summer rates. Based on the desirability of Westerly and Pawcatuck as a recreational resort, a large number of seasonal and day trippers not permanently residing within the service area frequent the locale and consume water. This accounts for the high seasonal use of water during the summer months. It would appear worthwhile, therefore, that the Water Division investigate use of a seasonal adjustment factor as part of its rate structure.

2. Metered Inclining Block Structure: Inclining block rates are based on the assumption that heavy users are responsible for increasing the need for expansion of a system and should, therefore, pay a higher unit price. Water is priced on blocks of consumption with the unit price increasing as the use enters increasing volume blocks. Although large consumers of water (such as commercial, industrial, nurseries and residences with large lawns) will likely resist an increasing rate structure, such a structure will promote conservation of water if rates are high enough in the higher priced blocks. It would seem appropriate to consider the effectiveness of applying an inclining block rate structure to the Westerly system, based on the potential for restricting overall average daily and peak demand, and curtailing the outside water use common during the summer months.

3. Uniform Metered Rate for Each Class: Uniform rate for each class is equivalent to the existing Consumption Charge applied to each class of customer.

4. Metered Inclining Block Structure for Each Class: As previously defined, inclining block rates are based on the assumption that heavy users are responsible for increasing the need for expansion of a system and should, therefore, pay a higher unit price. In this case, the system users are divided into different classes and a separate block rate structure is applied to each. In the Westerly water supply system, the existing user classification (residential, commercial/industrial) would be maintained or expanded, with an increasing block rate structure applied to each class of user. This rate structure may present the most desirable alternative for consideration by the Division, as it rewards consumer efforts in conserving water, while applying a fair pricing structure to each user class.

3.20 Financial Management

3.20.1 Enterprise Fund

The Town of Westerly Water Division has operated as an Enterprise Fund Agency within the municipal corporation of the Town of Westerly since fiscal year 1985-1986. The Town has established enterprise funds for operations that are organized to be self-supporting through user charges; i.e. the intent of the governing body is that the costs (expenses, including depreciation) of providing the services to the general public on a continuing basis be financed or recovered fully through user charges.

The Water Division accounting consists of the following four (4) funds:

- Operating Fund: Normal expenditures and revenue
- Sinking Fund: Established to offset the financial impact to capital from new additions to the system. Includes a Water Application Fee Fund.
- Bond Fund: To replace and improve the Capital Assets of the water system
- Water Rates

All operations of the Water Division are financed from water revenues in the form of user fees. The budget for the Water Division is prepared in a manner to incorporate all the costs of operating the

Division and the water rates are established so that the users pay for all of the activities of the Division. User fees and charges levied by the Water Division are established by the Town Council as an Ordinance of the Town of Westerly.

The annual Town financial audit includes an audit of the financial accounts of the Water Division. The Water Division is audited separately as an enterprise fund. The enterprise fund audits are combined with the complete Town audit, but are shown separately in the Town's Annual Comprehensive Financial Report.

3.20.2 Sources of Funds for Implementation of Plans

Westerly seeks to provide funding for the implementation of this Plan as well as for the development of any capital needs through the most cost effective financing available. In general, the Water Division will utilize the Town's capacity to issue General Obligation Bonds to finance major projects. Westerly will conduct an evaluation of the capability, capacity and cost-effectiveness of various methods of financing for all capital needs of the water system, including implementation of this plan. These methods may include, but are not limited to borrowing funds under:

- Town General Obligation Bonds;
- Water System Revenue Bonds;
- RI Clean Water Protection Financing Agency loans;
- RI Water Resource Board loans;
- Other state or federal loan programs; or
  seeking grants under:
- RI Water Resource Board programs;
- Other state or federal grant programs; and/or developing reserve funds from water rates/fees and/or other water system related charges.

The amount of money involved, the availability of grants, the timing of the needs and the cost of the financing will all play a part in the determination of the best financing method for the Town.

3.21 Emergency Management

The Town of Westerly has an approved Emergency Management Plan. The plan establishes the responsibility and authority within the Westerly Water Division organization for responding to the

most probable emergencies and outlines specific tasks for carrying out functional and constructive solutions based on a review of potential emergencies and risks.

3.22 Water Supply Source Protection

Effective strategies for groundwater protection currently exist in the Town of Westerly. A variety of programs and regulations are in effect at the Federal, State and local levels. The following discussion is designed to acknowledge those programs already in place and to identify the key components of each that pertain to groundwater protection. As such, the inventory of existing strategies serves two purposes: it helps to identify weaknesses in groundwater legislation and programs and thus assists in developing recommendations that will strengthen yet not duplicate current efforts.

As is the case with the Wellhead Protection Program, the Federal Government oftentimes takes the lead in developing legislative policy relating to groundwater protection. Congress has the authority to establish programs to be adopted by the fifty states. In turn, state governments transform federal policies into rules and regulations applicable both to state residents and to the municipal governments. State legislation can take the form of enabling legislation, which requires local governments to conform to state standards.

3.22.1 Federal Regulations

Federal laws passed by the United States Congress during the past several decades have addressed the need to protect groundwater. However, no single law protects groundwater supplies. Rather, a variety of laws contain components that can be applied to groundwater protection efforts.

The following section lists these Federal laws. Some laws are preventive in nature, others are remedial. However, none are comprehensive.

1. Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), (more commonly referred to as "Superfund") 42 USC 9601 1980: Substantial modification by Superfund Amendment and Reauthorization Act of 1986 (SARA).

2. Federal Insecticide, Fungicide, and Rodenticide Act 7 USC 136h 1947: Substantial amendments 1972 with the Federal Environmental Pesticide Control Act and the FIFRA amendments of 1975, 1978, 1980 and 1988.

3. Federal Water Pollution Control Act (The Clean Water Act) 33 USC 1251 1972: Amended in 1977 and again in 1987 as the Water Quality Act.

4. Hazardous Materials Transportation Act 49 USC 1801.

5. National Environmental Policy Act (NEPA) 42 USC 4321 1969.

6. Resource Conservation and Recovery Act (RCRA) 42 USC 6901 1976, Amended in 1984 with the Hazardous and Solid Waste Amendments (HSWA)

7. Safe Drinking Water Act (SDWA) 42 USC 300f – 300j – 11 1974: Amended in 1986.

8. Toxic Substances Control Act 15 USC 2601 1976.

3.22.2 State Regulations and Programs

The State of Rhode Island, primarily through various divisions and offices within the Department of Environmental Management, has established a variety of programs to address groundwater issues at the local level. DEM is the primary entity charged with overseeing groundwater protection, primarily through the Divisions of Groundwater and ISDS, Agriculture, Waste Management, and Site Remediation. Another State agency with an essential role is the Department of Health.

As at the Federal level, many laws pertaining to groundwater have been passed, and a variety of programs designed to prevent groundwater pollution, in addition to the Wellhead Protection Program, exist. This section is intended to provide a list of some of the programs at the State level that pertain most specifically to wellhead protection in Westerly. The Water Supply Management Plan (2013) details the programs further.

1. ISDS Permitting Regulations

2. Pesticide Control Act of 1976 (RIGL 23-25-1)

3. Public Drinking Water Act

4. Rhode Island Water Pollution Act (RIGL 46-12)

5. Rhode Island Groundwater Protection Act of 1985 (RIGL 46-13.1)

6. Underground Injection Control

7. Underground Storage Tanks

8. Hazardous Waste Collection

3.22.3 Town Regulatory Measures

A variety of strategies for wellhead protection at the local level have been identified. Common techniques center around regulatory measures such as overlay districts and subdivision regulations. Such strategies are oftentimes granted to local governments through adoption of laws at the Federal and State levels, as is apparent in the overlap between State and local regulations.

Non-regulatory measures can involve such techniques as land donation, tax incentives, and public education. Such approaches to protection require municipalities to develop strategies with local conservation groups and water suppliers, and to incorporate other key players within the region.

1. Subdivision Regulations

2. Waste Water Management Program

3. Aquifer Protection Overlay District