# Capital Efficiency Plan™
# Aquarion Water Company
# Hingham/Hull Water System

Prepared by:

TATA & HOWARD
Water and Wastewater Consultants

March 2011

Prepared by or under the supervision of: Robert L. Roland

TATA & HOWARD
Water and Wastewater Consultants

March 31, 2011

Mr. Robert Roland
Director of Operations
Aquarion Water Company
900 Main Street
Hingham, MA 02043

Subject: Capital Efficiency Plan™
T&H Project No. 2061

Dear Mr. Roland:

In accordance with our agreement, Tata & Howard is pleased to present you with the Capital Efficiency Plan™ for the Hingham/Hull Water System. The analysis and improvements in this report are based on the Three Circle Approach for capital efficiency, which combines hydraulic and critical component considerations with an asset management rating system to evaluate the condition of the water mains in the distribution system.

In the 2007 Water Supply and Distribution System Study, Tata & Howard used a hydraulic model to evaluate the Hingham/Hull water distribution system. Hydraulic recommendations were developed as part of this study and included in the Capital Efficiency Plan™. Additionally, the model was updated to include improvements to the system since 2007. The system was surveyed for critical areas and tested on the hydraulic model for redundancy. Finally, each water main was evaluated based on age, material, diameter, break history, water quality and soil conditions to determine its asset management score. The results were combined to determine the water mains most in need of replacement and establish a prioritized set of improvements in the system. A detailed description of the improvements and their estimated costs is presented in Section 7.

During the course of this project, Ms. Karen Gracey, P.E. served as Project Manager, Ms. Justine Evans, P.E. served as Project Engineer, Ms. Victoria Zabierek served as Engineer, and the undersigned provided technical reviews and served as Project Officer.

At this time, we wish to express our appreciation to the Aquarion Water Company for their participation in this study and for their help in collecting information and data. We also appreciate the opportunity to assist the Aquarion Water Company on this important project.

Sincerely,

TATA & HOWARD, INC.

Donald J. Tata, P.E.
President

Enclosures

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# SECTION 1 – Executive Summary

## 1.1 General

Tata & Howard, Inc. was retained by the Aquarion Water Company (Aquarion) to complete a Capital Efficiency Plan™ for the Hingham/Hull water system. The purpose of the plan is to identify areas of the water distribution system in need of rehabilitation, repair or replacement and prioritize improvements to make the most efficient use of the System's capital budget. In addition, water supply and storage needs are evaluated and prioritized. The conditions of the systems above ground facilities, including water supply and chemical feed facilities and water storage tanks, were not evaluated as part of this study.

## 1.2 The Three Circle Approach

The Capital Efficiency Plan™ evaluated the water distribution system using the Three Circle Approach. The Three Circle Approach includes the following evaluation criteria:

- System hydraulic evaluation,
- Critical component assessment,
- Asset management considerations.

Each circle represents a unique set of evaluation criteria for each water system component. From each set of criteria, system deficiencies are identified. System deficiencies from each circle are then compared. Any deficiency that falls into more than one circle is given higher priority than one that does not. Using the Three Circle Approach, recommended improvements are identified that will result in the most benefit to the system. In addition, the Three Circle Approach allows us to identify any situations where an improvement of a deficiency in one circle will eliminate a deficiency in another circle. By integrating all three sets of criteria, the infrastructure improvement decision making process and overall capital efficiency is optimized.

Tasks in this study included the following:

- Using data presented in the Water Supply and Distribution System Study, include an evaluation of water supply and storage needs based upon existing and future demands and fire flow requirements.
- Conduct a one day workshop with the operations and management staff to review operations and maintenance practices, break history and other pertinent information.
- Review previously completed reports and available data pertaining to the condition of the existing system.
- Incorporate applicable pipe information into the hydraulic model.
- Review recommended hydraulic improvements from the Water Supply and Distribution System Study, as well as potential improvements resulting from asset management and critical component considerations.

- Create a pipe rating system to identify areas needing rehabilitation or replacement. Use the rating system to create a prioritized plan of recommended improvements. The study will consider buried infrastructure only.

Based on the Three Circle Approach, a prioritized list of improvements was compiled. Improvements were separated into three phases. Phase I represents the most needed improvements based on hydraulic needs, location in the distribution system and the condition of the water main. In general, these include water mains that fall into two or three of the three circles strengthening the transmission grid, eliminating potential asset management concerns, and/or providing redundancy.

Phase I improvements include replacement of water mains on Pleasant Street and Liberty Pole Road in Hingham, and Atlantic Avenue, Summit Avenue, Edgewater Road, and the north end of Beach Avenue in Hull.

Phase II improvements generally include areas that fall into two circles, but are located on side streets or dead ends, as well as areas that are hydraulically deficient or have high asset management ratings. These improvements generally will benefit a localized area, while Phase I improvements benefit the transmission grid. Phase III improvements include water mains that are a concern due to either hydraulic deficiencies or asset management concerns only.

# SECTION 2 – Existing Water System

## 2.1 Distribution System

Aquarion Water Company's Hingham/Hull distribution system consists of approximately 186 miles of water mains ranging in diameter from two to twenty inches. Figure No. 2-1 shows a breakdown of the water main size distribution of the existing water system. Approximately six percent of the system is 14-inch diameter or larger pipe, approximately 15 percent is 10 or 12-inch diameter pipe, approximately 38 percent of the system is 8-inch diameter pipe, approximately 31 percent is 6-inch diameter pipe, and approximately 10 percent is 4-inch diameter or smaller pipe. These mains are constructed of various materials including cement lined ductile iron (CLDI), cast iron (CI), galvanized steel, precast concrete, and asbestos cement (AC). Figure No. 2-2 shows the breakdown of material distribution of the existing water system. The existing system has seven active supply sources, one emergency supply source (Free Street Well No. 2), two water storage facilities and a water treatment facility. A map of the existing water distribution system is included in Appendix A.

The water distribution system is divided into two service areas. The main service area consists of the Town of Hingham, north of the water treatment facility, the Town of Hull and a portion of North Cohasset. The high service area includes the southern portion of Hingham. The distribution system services elevations range from approximately 0 to 131 feet above mean sea level (MSL) in the main service area and approximately 49 to 180 feet above MSL in the high service area. The Hingham/Hull District Water Treatment Facility provides water to both service areas.

## 2.2 Water Supply Sources

The Hingham/Hull water system includes seven water supply sources and one emergency source. The supply system is comprised of six groundwater sources and one surface water source. The Accord Pond is the sole surface water source within the system and Free Street Well Nos. 2A, 4, 3/5, Downing Street Well, Prospect Street Well, Scotland Street Well and Fulling Mill Station are groundwater supply sources. Free Street Well No. 2 is currently listed as an emergency supply source.

### Downing Street Well

Downing Street Well is a gravel packed well located off Downing Street (Lat 42° 13' 25", Long 70° 52' 50"). It was constructed in 1965 to a depth of approximately 66.5 feet. The well was cleaned and rehabilitated in March 2002. The Massachusetts Department of Environmental Protection (MassDEP) approved pumping rate for this well is 284 gallons per minute (gpm) or 0.41 million gallons per day (mgd). The Downing Street

**Figure No. 2-1**
**Water Main Diameter Distribution**

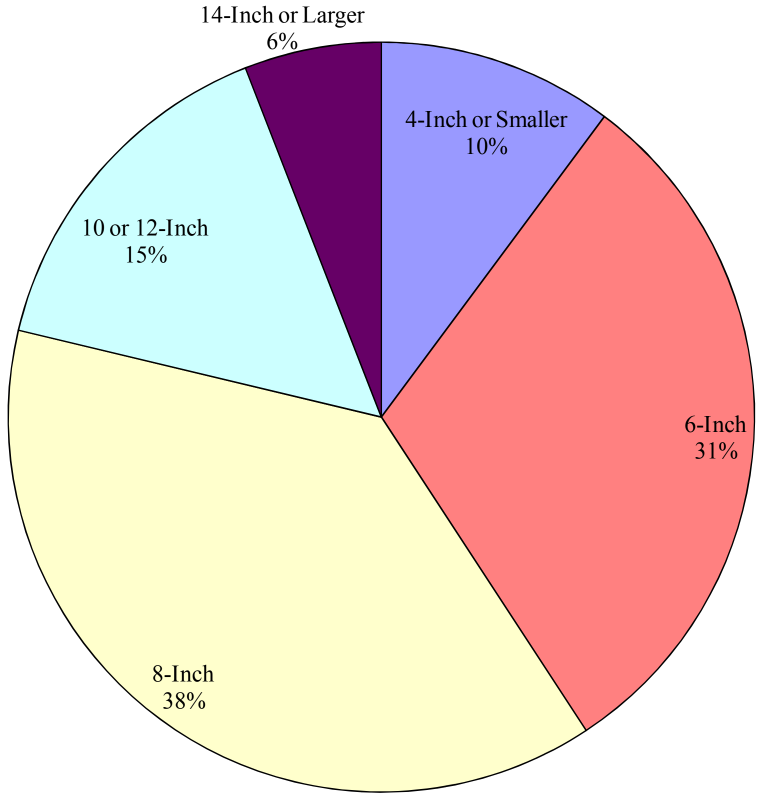
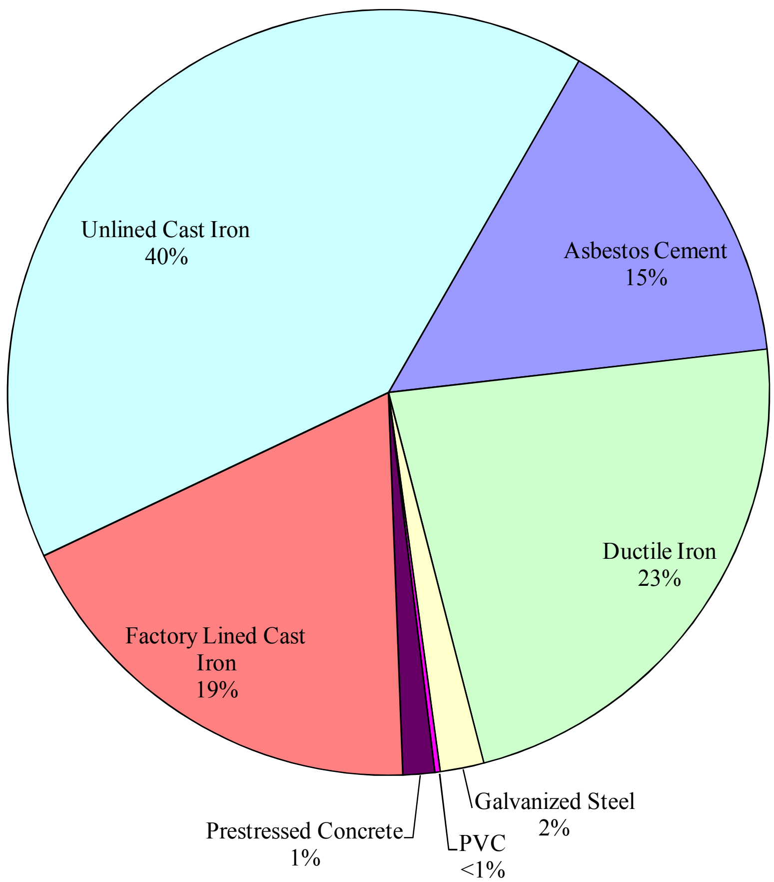


**Figure No. 2-2**
**Water Main Material Distribution**



Well is the only supply source that pumps directly into the finished water system. All other sources are treated at the Hingham/Hull District Water Treatment Facility.

### Free Street Well Nos. 2, 2A and 4

Free Street Well No. 2 is a gravel packed well located off Free Street (Lat 42$^{o}$ 13' 05", Long 70$^{o}$ 52' 40"). It was constructed in 1952 to a depth of approximately 73 feet. The well was cleaned and rehabilitated in March 2002. Free Street Well No. 2A is a replacement well that was installed in 2007 to a depth of approximately 79.5 feet. Free Street Well No. 4 is a gravel packed well located off Free Street (Lat 42$^{o}$ 13' 10", Long 70$^{o}$ 52' 45"). It was constructed in 1983 to a depth of approximately 86 feet. In November 2008, the MassDEP approved a status change of Free Street Well No. 2 and 4. Free Street Well No. 2 was changed from an active source to an emergency source while Free Street Well No. 4 was changed to an active source. MassDEP has limited the total maximum daily withdrawal from Free Street Well No. 4 to 0.81 mgd. The total combined volume to be withdrawn from Free Street Well No. 2 and 4 cannot exceed 1.80 mgd.

### Free Street Well No. 3/5

Free Street Well No. 3/5 are gravel packed wells located off Free Street (Lat 42$^{o}$ 13' 05", Long 70$^{o}$ 52' 52"). Free Street Well No. 3 was constructed in 1967 to a depth of approximately 88.5 feet. Free Street Well No. 5 was constructed as a satellite well to supplement lost capacity of Free Street Well No. 3. The satellite well pumps to Well No. 3 and is then pumped to the system. The wells were cleaned and rehabilitated in 1998. The MassDEP approved pumping rate for these wells is 351 gpm or 0.51 mgd.

### Prospect Street Well

The Prospect Street Well is a gravel packed well located off Elaine Road (Lat 42$^{o}$ 11' 30", Long 70$^{o}$ 52' 30"). It was constructed in 1971 to a depth of approximately 58 feet. The MassDEP approved pumping rate for this well is 269 gpm or 0.39 mgd.

### Scotland Street Wells

The Scotland Street Well is a gravel packed well located off Scotland Street (Lat 42$^{o}$ 11' 25", Long 70$^{o}$ 52' 20"). It was constructed in 1956 to a depth of approximately 45 feet. A replacement well was installed in 2008 to a depth of 57 feet. The original well was cleaned and rehabilitated in March 2002. The MassDEP approved pumping rate for this well site is 1,078 gpm or 1.55 mgd.

### Fulling Mill Station

The original Fulling Mill Station is a dug well fed by infiltration basins located at 93 South Pleasant Street (Lat 42$^{o}$ 12' 10", Long 70$^{o}$ 52' 30"). It was constructed in 1903 to a depth of approximately 21.5 feet. Two replacement wells were installed at the Fulling Mill Well site in 2008. The Fulling Mill Replacement Wells No. 1 and 2 have a capacity of 430 gpm and 265 gpm, respectively. The MassDEP approved pumping rate for this well site is 941 gpm or 1.36 mgd.

### Accord Pond

Accord Pond is 100 acre pond located off Whiting Street (Lat 42° 10' 30", Long 70° 53' 30"). The total storage capacity of the pond is approximately 523 million gallons with a drainage basin area of 1.01 square miles. The intake pipe is a gravity feed line to the treatment plant. The estimated safe yield of the pond is approximately 0.69 mgd.

## 2.3 Hull Booster Pump Station

The Hull Booster Pump Station services the northern portion of Hull. The booster pump station provides domestic pressure only when high demands in Hull reduce pressures in the area.

## 2.4 Water Storage Facilities

There are two water storage facilities located within the Hingham/Hull system. The Turkey Hill Tank is located on Turkey Hill Lane in Hingham. The welded steel standpipe is 70 feet in diameter, 70 feet tall and has a reported capacity of 2.01 million gallons (mg). It has an overflow elevation of 240 feet and is connected to the system with a 20-inch diameter water main. The Accord Tank is located on Whiting Street in Hingham. The elevated welded steel tank is 58 feet in diameter, 112 feet tall and has a reported capacity of 0.75 mg. Accord Tank has an overflow elevation of 282 feet and is connected to the system through a 16-inch diameter water main.

## 2.5 Hingham/Hull District Water Treatment Facility

Aquarion operates a 7.7 mgd water treatment facility located in Hingham. The treatment facility, in operation since April 1996, receives water from all water supply sources except the Downing Street Well and satisfies the treatment requirements set forth by the United States Environmental Protection Agency (US EPA). The Hingham/Hull District Water Treatment Facility treats raw water via rapid mix, Superpulsator clarifiers, deep-bed GAC filters and post-filtration disinfection, pH adjustment and fluoridation. The facility also has a large holding tank for treated water to improve water pressure in the system during high demand periods.

## 2.6 Previous System Studies

A Water Supply and Distribution System Study was completed by Tata & Howard in 2007. The System Study provided recommended storage, supply and distribution system improvements to meet the existing and future needs of the system. Using the hydraulic model, capital improvements were evaluated and prioritized. Distribution system improvements were primarily recommended based on the hydraulic characteristics of the system to eliminate hydraulic restrictions and fire flow deficiencies.

# SECTION 3 – Water Supply and Storage Evaluation

## 3.1 General

In accordance with MassDEP, the supply sources of a water system must be capable of meeting existing and projected maximum day demand (MDD) conditions and existing and projected summer average day demand (SADD) conditions with the largest source out of service. In this section, safe yields of the supplies and permitted withdrawals of the existing supply sources were compared to current and future demand conditions.

## 3.2 Adequacy of Existing Water Supply Sources

In 1987, the Water Management Act (WMA) program was implemented by MassDEP to regulate withdrawal of water from the state's watershed basins. Under this program, all new and existing sources withdrawing more than 100,000 gallons per day (gpd) are required to obtain a withdrawal permit under the WMA. When first implemented, the registered withdrawal volume for a public water system was based on that system's historical pumping rate of the water supply source(s) between 1981 and 1985. However, permits can be renewed and amended as system demands increase and additional supply sources are utilized. The WMA program considers the need for the withdrawal, the impact of the withdrawal on other hydraulically connected water suppliers, the environmental impacts of the withdrawal and the water available in the river basin or subbasin (the basin safe yield) prior to issuing a permit. It is important to note that the basin safe yield is different from the safe yield of a supply. In accordance with the WMA permit application instructions, the basin safe yield is the total water available to be withdrawn from a river basin or subbasin, whereas the safe yield of a well is the volume of water the well is capable of pumping under the most severe pumping and recharge conditions that can be realistically anticipated.

The current Hingham/Hull system is comprised of seven supply sources and one emergency source. Table No. 3-1 provides the current withdrawal rates from each well and a summary of the MassDEP approved withdrawal rates for each of Aquarion's supply sources presented in Section 2. The total allowable withdrawal rate from existing sources is approximately 6.71 mgd without the emergency source Free Street Well No. 2. The ADD and MDD in 2009 were 3.13 mgd and 4.95 mgd, respectively. The projected ADD and MDD for the year 2025 are 4.12 mgd and 7.25 mgd, respectively.

MassDEP guidelines recommend that a system have adequate supply to meet (1) the projected MDD and (2) the projected SADD with the largest source offline. The current SADD is estimated by averaging the three maximum demand months for the past five years. The SADD peaking factor is determined by dividing the SADD by the average ADD for each of the past five years. These peaking factors are averaged to estimate the future summer peaking factor. Based on 2005 through 2009 monthly demand data, the summer peaking factor is 1.30. Based on a projected ADD of 4.12 mgd, the estimated future SADD is 5.36 mgd.

**Table No. 3-1**
**Estimated Yield of Existing Sources**

| Source Name | Current Estimated Yield (mgd) | MassDEP Approved Withdrawal Rate (mgd) |
|---|---|---|
| Downing Street | 0.32 | 0.41 |
| Free Street No. 2A and 4* | 1.80 | 1.80 |
| Free Street No. 3/5 | 0.37 | 0.51 |
| Fulling Mill Station | 1.36 | 1.36 |
| Prospect Street Well | 0.24 | 0.39 |
| Scotland Street Well | 1.55 | 1.55 |
| Accord Pond | 0.69 | 0.69 |
| **Total** | **6.33** | **6.71** |

*Free Street No. 4 has a maximum withdrawal rate of 0.81 mgd. The total combined withdrawal rate from Free Street No. 2A and 4 is 1.80 mgd.

The system's total combined yield of the active supply sources is approximately 6.33 mgd. Compared to the projected MDD in 2025, a deficit of 0.92 mgd is estimated. The total combined allowable withdrawal volume from Free Street Wells No 2A and 4 is 1.80 mgd. However, MassDEP has limited the maximum withdrawal volume from Free Street Well No. 4 to 0.81 mgd, while Free Street No. 2A is allowed to pump up to 1.80 mgd. Therefore, Free Street Well No. 2A is the largest source based on sustainable yield; therefore the available pumping rate while the largest source is off-line is 5.34 mgd including 0.81 mgd from Free Street No. 4. Compared to the projected SADD, a deficit of 0.02 mgd is estimated.

In order to eliminate this predicted deficit, the 2007 Water Supply and Distribution System Study recommended a phased approach to maximize production of existing supply sources and augment the current supply with new sources or water purchase. The first and second phases, to maximize production at several wells to satisfy current demands and improve source management, have been completed. The third phase will augment the current supply through potential new source development and water purchase.

### Phase I

Several higher capacity supply wells within the system had experienced a gradual reduction in pumping capacity over the years. In an effort to restore capacity to these wells, Aquarion recently installed replacement wells at the Scotland Street Well, Free Street Well No. 2, and the Fulling Mill Well Site. As a result, each well site capacity was restored to the MassDEP approved withdrawal rate. Therefore, the current total available yield was increased to 6.33 mgd.

## Phase II

Following the maximization of existing sources, additional supply must be obtained to satisfy the projected demands in 2025. Phase II consisted of exchanging production between Free Street No. 2 and Free Street No. 4.

Free Street No. 4 had an approved safe yield of 0.81 mgd for emergency production only. Historical records indicate better water quality at Free Street No. 4 than Free Street No. 2. This may be due to Free Street No. 4 being constructed to a greater depth than Free Street No. 2. Aquarion has invested considerable time and money into permitting Free Street No. 4 as a permanent source and increasing the available yield to 1.3 mgd. However, increases in yield are uncertain primarily due to environmental concerns for the Weir River and the limitations of the Interbasin Transfer Act. Based on this information, Aquarion was approved to utilize Free Street No. 4 and the new Free Street No. 2A as the permanent sources and make the existing Free Street No. 2 an emergency source. This approach did not increase the withdrawal rate from the sub-basin, only changes the point of withdrawal to Free Street No. 4 and 2A, rather than Free Street No. 2 and 2A.

## Phase III

Phase III incorporates longer term alternatives to supplement current system capacity. The following alternatives include the development of a new source and water purchase from adjacent and nearby water wholesale sellers. Each water purchase alternative would require an agreement between the Aquarion Water Company and another utility or private entity to meet the projected system demands. Further, new infrastructure and potentially water treatment would be required to transport and treat purchased water to the Hingham-Hull system.

## New Source Development

In accordance with MassDEP guidelines, the development of a new source consists of four stages. The exploratory stage is for review of existing available information, evaluation of potential sites and installation of test wells. The second stage includes preparation and submittal of the request for site exam, alternatives analysis, land use survey and pumping test proposal. After approval by the MassDEP, the third stage is to complete a minimum five-day pump test and accompanying pump test report to be submitted to the MassDEP for review. The final stage consists of the design of the pump station and associated water main from the source well to the system. A Water Management Act permit is required when the total withdrawal volume is greater than 100,000 gpd. In addition, all new sources will require the completion of an Environmental Notification Form (ENF) to be submitted to the Massachusetts Environmental Policy Act Office for review and public comment.

Permitting for new source development is a time consuming and costly process depending on the location and potential impact on the environment. In addition, the process does not guarantee that sufficient yield and quality will be found or that Aquarion can obtain ownership of the Zone I radius. In general, the permitting and development process could take up to five years to complete. In addition, water treatment may be required, which will increase the time and cost of the project.

The United States Geological Survey (USGS) potential aquifer yield potential maps were reviewed to identify potential well site locations within town boundaries. The areas of reasonable yield currently host one or more active supply wells. Additional gravel packed wells in these subbasins could strain these areas. Therefore, a fracture trace analysis was conducted to identify potential bedrock well locations. This type of well would withdraw water from a deeper aquifer, not immediately connected to the shallower aquifer supplying current gravel packed wells. A new bedrock supply well is permitted in the same manner as sand and gravel sources, and is constrained by the results of pump testing and MassDEP approval.

Several sites were identified during the fracture trace analysis as potential supply well locations, however, a pumping test would be required to determine the yield. The sites are located within the South Coastal Basin and the property is owned by the Massachusetts Department of Conservation and Recreation (DCR). Obtaining access to these areas may prove extremely difficult as DCR does not favor development on agency owned land. Additional evaluation will be conducted on potential sand and gravel sources and bedrock wells at existing well sites as well as appropriate locations within the service area.

## Interconnection to Cohasset

All current supply sources should be maximized and potential sites investigated prior to seeking water sources across town boundaries. The Town of Cohasset currently operates and maintains the Aaron Reservoir as a water supply source. Currently, system demands only require the Town to utilize a portion of the permitted withdrawal rate. In addition, preliminary estimates indicate that a surplus of approximately 1.0 mgd may exist through 2025 based on projected demands in Cohasset. The current cost for purchasing water is approximately $4.50 per 1,000 gallons for finished water. The Aquarion Water Company currently wheels up to 0.3 mgd of finished water from Cohasset to the Linden Pond development. Additional finished water may be available through this connection with the completion of a Water Management Act Permit and infrastructure upgrades. Additional analysis on the estimated cost for purchasing finished water from Cohasset is needed.

Although it may be cost effective at current prices, from an operation and maintenance standpoint for Aquarion to purchase raw water and treat it at the existing Hingham/Hull District Water Treatment Facility, the capital costs associated with constructing approximately four miles of raw water main from Aaron Reservoir to the treatment facility would be considerable.

## MWRA Connection

The MWRA currently provides wholesale water to approximately 50 communities throughout Massachusetts. The closest area for Aquarion to connect to the MWRA system is the City of Quincy, Massachusetts. This would require the construction of approximately two miles of water main along Route 3A and a new pump station. Reportedly, the current cost for MWRA is approximately $3,400 per 1.0 million gallons with a $5,500,000 participation fee.

### Desalination Facility

Currently, the Town of Hull is conducting a feasibility study regarding the construction and operation of a desalination plant. This improvement would reduce the demands on Aquarion system and offer a potential long-term option for supplement supply. However, this option is still in the planning and discussion phase. The estimated cost for this improvement is on the order of $20,000,000 for a plant with a capacity of approximately 2.5 mgd.

A desalination plant has been constructed by Aquaria Corporation and Bluestone Energy Services in the Town of Dighton, Massachusetts, to satisfy water demands in Brockton, Massachusetts. In order for Aquarion to obtain water from this plant, approximately one mile of new 20-inch diameter water main would need to be constructed from Dighton to Brockton. Brockton would then transmit the water through existing infrastructure to Hingham and charge a wheeling fee to Aquarion. Based on information presented in previous reports, the minimum contract amount for purchasing water from Dighton would be $176,000 per year per 100,000 gallons and the current water charge of approximately $1.23 per 1,000 gallons will be assessed in addition to the annual fee.

## 3.3 Adequacy of Existing Water Storage Facilities

Distribution storage is provided to meet peak consumer demands such as peak hour demands and additionally, to provide a reserve for fire fighting. Storage may also serve to provide an emergency supply in case of temporary breakdown of pumping facilities, or for pressure regulating during periods of fluctuating demand.

There are three components that must be considered when evaluating storage requirements. These components include equalization, fire flow requirements, and emergency storage.

Equalization storage provides water from the tanks during peak hourly demands in the system. Typically, this quantity is a percentage of the maximum day demands. The percentages can range from fifteen to twenty-five percent, with fifteen percent used for a large system, twenty percent for a medium sized system and twenty five percent used for a small system. A system is considered small if it has less than 3,300 customers, while a system is considered large if it has more than 50,000 customers. The Hingham/Hull system would be considered a medium system. As a result, twenty percent of maximum day demand was used for the equalization storage calculations.

1. Equalization

- Medium sized system = 20 percent of the Maximum Day Demand
- Maximum Day Demand in year 2008 = 5.98 mgd

- Estimated Maximum Day Demand in year 2025 = 7.25 mgd

- Equalization (2009) = 0.20 x 4.95 = 0.99 mg
- Equalization (2025) = 0.20 x 7.25 = 1.45 mg

The fire flow storage component is based on the basic fire flow requirement multiplied by the required duration of the flow. This basic fire flow is defined as a fire flow indicative of the quantities needed for handling fires in important districts, and usually serves to mitigate some of the higher specific fire flows. Within the Hingham/Hull system, a basic fire flow of 2,000 gpm for a duration of two hours was used for the storage evaluation.

2. Basic Fire Flow Requirement
- Representative fire flow = 2,000 gpm
- Duration of 2 hours or 120 minutes

- Basic Fire Flow Requirement = 2,000 x 120 = 0.24 mg

The emergency storage component is typically equivalent to one ADD. However, if there is emergency power available at the source(s) and the supply is sufficient to meet the ADD or there are emergency connections with surrounding communities, the emergency storage component can be waived. Therefore, the emergency storage component was not included in the storage capacity calculations.

3. Emergency - Waived

The total required storage for any given year is the equalization component plus the basic fire flow requirement. Therefore, the current (year 2004) and projected (year 2025) total required storage is as follows:

- Total Required Storage (2009) = 0.99 + 0.24 = 1.23 mg.
- Total Required Storage (2025) = 1.45 + 0.24 = 1.69 mg.

Under existing and projected ADD, MDD and peak hour demands, a minimum pressure of 20 psi should be maintained throughout the distribution system. In the Hingham/Hull system, the highest customer is at an elevation of approximately 131 feet in the main service area and 180 feet in the high service area, and in order to maintain a pressure of 20 pounds per square inch (psi) at these elevations, the tank levels can drop to approximately 177 feet and 226 feet, respectively. Based on this scenario, the entire Accord Tank (0.75 mg), at a base elevation of 244 feet, is usable. However, the Turkey Hill (2.0 mg) has a base elevation of 170 feet. Therefore, in order to maintain 20 psi throughout the system the Turkey Hill Tank level cannot drop below 63 feet. This reduces the usable storage in the Turkey Hill Tank to 1.81 mg.

The total usable storage in the Hingham/Hull water distribution system is approximately 2.56 mg. The projected required storage for the design year is approximately 1.69 mg. Therefore, the system has approximately 0.87 mg of surplus storage.

# SECTION 4 – Hydraulic Evaluation

## 4.1 General

In the 2007 Water Supply and Distribution System Study, Tata & Howard, Inc. used a hydraulic model to evaluate the Hingham/Hull water distribution system and as a basis for recommending water distribution system improvements. At the time of the study, a hydraulic computer model was created using WaterGEMS modeling software, allowing the user to conduct hydraulic simulations. The computer model is represented by the node, pipe and tank information provided in Appendix B. A color-coded junction map of the water distribution system model can be found in Appendix B. The node map provides information on storage facilities, water supply sources, sizes of water mains, and a general layout of the distribution system. The hydraulic input data in Appendix B provides data on system demands, length and diameter of water mains, roughness coefficient or "c-value" of water mains, elevations, pumping rates of water supply sources, and overflow elevations at storage facilities

As part of the system study, the hydraulic model was verified based on fire flow testing and information pertaining to the sources and storage facilities. Verification of the computer model was completed under steady state conditions. It should be noted that verification of the model for extended period simulations was outside the scope of this study. Once the model was verified, recommendations set forth by the Insurance Services Office (ISO) for water storage necessary for fire protection, fire flows, and peak demands were utilized in the analysis of the distribution system under steady state conditions. As part of this Capital Efficiency Plan™, the model was updated to include improvements to the system since 2007.

## 4.2 Evaluation Criteria

The Hydraulic Evaluation facet of the Three Circle Approach evaluates the system's ability to meet varying demand conditions. In general, a minimum pressure of 35 pounds per square inch (psi) at ground level is required during average day, maximum day, and peak hour demand conditions. During MDD with a coincident fire flow, a minimum pressure of 20 psi is required at ground level throughout the system. In order to evaluate the system's ability to meet these criteria, the following hydraulic simulations were run in the model:

### Insurance Services Office (ISO) Fire Flow Recommendations

The recommended fire flow in any community is established by the ISO. The ISO determines a theoretical flow rate recommended to combat a major fire at a specific location; taking into account the building structure, floor area, the building contents, and the availability of fire suppression systems. In general, the flows recommended for proper fire protection are based on maintaining a residual pressure of 20 psi. This residual pressure is considered necessary to maintain a positive pressure in the system to allow continued service to the customers and avoid negative pressures that could introduce groundwater into the system.

The estimated recommended fire flows, as determined by the ISO, were simulated on the computer model. Areas where the available fire flow did not meet the ISO recommended fire flow were considered hydraulically deficient. As part of the Water Distribution System Study, recommended improvements were developed to alleviate these deficiencies.

### Additional Fire Flows Requirements

According to American Water Works Association (AWWA), the minimum recommended fire flow in residential areas where homes are between 31 feet and 100 feet apart is approximately 750 gpm. Based on the 2007 study, certain areas of the system could not meet the minimum recommended fire flow. The recommended improvements to achieve 750 gpm in these areas are also included as hydraulic improvements in the Capital Efficiency Plan™.

## 4.3 Hydraulically Deficient Areas

In general, the recommendations presented in the 2007 study were broken down into three components. The first presented general recommendations that could be completed on an as-needed basis. The second and third components were the Priority I and II recommendations for system improvements relative to the water supply and distribution system. Priority I Hydraulic Improvements were intended to meet water supply needs and mitigate ISO fire flow deficiencies. Priority II Hydraulic Improvements identified improvements required at or near system extremities for fire flow deficiencies, as well as system looping in certain areas. A map of the recommended hydraulic improvements is included in Appendix C.

The following list provides a summary of the Priority I and II Hydraulic Improvements that will need to be completed. It should be noted that this Capital Efficiency Plan™ focused only on buried infrastructure. Therefore, previous recommendations for storage, supply and pump stations were not included. General recommendations are discussed in Section 7 of this study.

### Priority I Hydraulic Improvements

1. In order to provide a nominal capacity of 2,000 gpm at the end of Nantasket Avenue in Hull, it is recommended that the existing Hull Booster Pump Station be upgraded to include fire pumps. The fire pumps would provide additional fire flow to all services north of the pump station.

2. In order to provide the inherent capacity for fire flow, it is recommended that the existing water main on Beach Avenue in Hull be replaced with 12-inch diameter cement lined ductile iron water main. The proposed water main will be installed along an existing utility easement adjacent to Beach Avenue.

3. In order to provide the ISO recommended fire flow of 3,500 gpm on Beal Street in Hingham, it is recommended that the existing 8-inch diameter water main that runs

along Beal Street be replaced with 12-inch diameter cement lined ductile iron water main.

4. In order to provide the ISO recommended fire flow of 3,000 gpm on Atlantic Avenue in Hull, it is recommended that the existing 6-inch diameter water main that runs along Atlantic Avenue from Gunrock Avenue to Jerusalem Road should be replaced with 12-inch diameter cement lined ductile iron water main. This improvement accounts for the approximately 1,200 linear feet of 12-inch water main being installed on Atlantic Avenue between Stony Beach Road and Gunrock Avenue in the spring 2011. Additionally, the existing 6-inch diameter water main that runs along Summit Avenue should be replaced with 8-inch diameter cement lined ductile iron water main.

5. In order to provide the ISO recommended fire flow of 3,000 gpm on Keith Way in Hingham, it is recommended that the existing 8-inch diameter water main that runs along Recreation Park Drive from Derby Street to Keith Way and along Keith Way be replaced with 16-inch diameter cement lined ductile iron water main.

6. In order to provide the ISO recommended fire flow of 3,500 gpm on George Washington Boulevard in Hingham, it is recommended that the existing 8-inch diameter water main that runs along George Washington Boulevard be replaced with 12-inch diameter cement lined ductile iron water main.

7. In order to provide the ISO recommended fire flow of 3,000 gpm on East Gate Lane in Hingham, it is recommended that the existing 8-inch diameter water main that runs along East Gate Lane be replaced with 12-inch diameter cement lined ductile iron water main.

8. In order to provide the ISO recommended fire flow of 3,000 gpm on Pleasant Street in Hingham, it is recommended that the existing 6-inch diameter water main that runs along Pleasant Street from Main Street to Middle Street be replaced with 8-inch diameter cement lined ductile iron water main.

9. In order to provide the ISO recommended fire flow of 3,000 gpm on Rockway Avenue in Hull, it is recommended that the existing 6-inch diameter water main that runs along Rockway Avenue from Wyola Road to Rock View Road be replaced with 8-inch diameter cement lined ductile iron water main. Additionally, the existing 6-inch diameter water mains that run along Wyola Road from Rock View Road to Logan Avenue and Delawanda Road from Rock View Road to Logan Avenue should be replaced with 8-inch diameter cement lined ductile iron water main.

10. In order to provide the ISO recommended fire flow of 3,000 gpm on Downer Avenue in Hingham, it is recommended that the existing 8-inch diameter water main that runs along Downer Avenue from Otis Street to Planters Field Lane be replaced with 12-inch diameter cement lined ductile iron water main.

11. In order to provide the ISO recommended fire flow of 3,000 gpm on Pinegrove Road in Hingham, it is recommended that the existing 8-inch diameter water main that runs along Main Street from Pinegrove Road to Gardner Road and along Pinegrove Road be replaced with 12-inch diameter cement lined ductile iron water main.

12. In order to provide the ISO recommended fire flow of 1,000 gpm on Mayflower Avenue in Hull, it is recommended that the existing 4-inch diameter water main that runs along Mayflower Avenue be replaced with 8-inch diameter cement lined ductile iron water main. Additionally, the existing 6-inch diameter water main that runs along Hampton Circle from Moreland Avenue to Mayflower Avenue should be replaced with 8-inch diameter cement lined ductile iron water main.

## Priority II Hydraulic Improvements

13. In order to provide the inherent capacity for fire flow, an 8-inch diameter cement lined ductile iron water main is recommended on Rockwood Road from East Street to Ledgewood Circle and on Ledgewood Circle in Hingham.

14. In order to provide the inherent capacity for fire flow, it is recommended that the existing water mains on Grist Mill Lane, Howland Lane from Grist Mill Lane to Whitcomb Avenue and Whitcomb Avenue from High Street to Howland Lane in Hingham be replaced with an 8-inch diameter cement lined ductile iron water main.

15. In order to provide the inherent capacity for fire flow, it is recommended that the existing water mains on Nutty Hill Road and Whitehorse Road from High Street to Nutty Hill Road in Hingham be replaced with an 8-inch diameter cement lined ductile iron water main.

16. In order to provide the inherent capacity for fire flow, it is recommended that the existing 4-inch diameter water main on Electric Avenue (also known as Edgewater Road) in Hull be replaced with an 8-inch diameter cement lined ductile iron water main.

17. In order to provide the inherent capacity for fire flow, it is recommended that the existing water main on Simmons Road in Hingham be replaced with an 8-inch diameter cement lined ductile iron water main.

18. In order to provide the inherent capacity for fire flow, it is recommended that the existing water mains on Smith Road and Hobart Street from New Bridge Road to Smith Road in Hingham be replaced with an 8-inch diameter cement lined ductile iron water main.

19. In order to provide the inherent capacity for fire flow, it is recommended that the existing water mains on Summit Drive and Harbor View Drive from Thaxter Street to Summit Drive in Hingham be replaced with an 8-inch diameter cement lined ductile iron water main.

20. In order to provide the inherent capacity for fire flow, it is recommended that the existing water main on Dighton Street in Hull be replaced with an 8-inch diameter cement lined ductile iron water main.

21. In order to provide the inherent capacity for fire flow, it is recommended that the existing water main on Howe Street from Marsh Street to Jarvis Avenue be replaced with an 8-inch diameter cement lined ductile iron water main.

22. In order to provide the inherent capacity for fire flow, it is recommended that the existing water main on Spruce Street and Hull Street from Canterbury Street to Spruce Street in Hingham be replaced with an 8-inch diameter cement lined ductile iron water main.

23. In order to provide the inherent capacity for fire flow, it is recommended that the existing water main on Carleton Road in Hingham be extended to High Street with 8-inch diameter water main.

# SECTION 5 – Critical Component Assessment

## 5.1 General

A critical component assessment was performed for the water distribution system in order to evaluate the impact of potential water main failures on the water distribution system. The critical component assessment includes identification of critical areas served, critical water mains and the need for redundant mains.

## 5.2 Evaluation Criteria

Critical areas served are locations in the distribution system that require continual water supply for public health, welfare or financial reasons. Examples of critical service areas include hospitals, nursing homes, schools, and business districts. All water mains within 1,000 feet of a critical area are considered a critical component. Because water storage tanks and sources provide water and maintain pressure to critical service areas, tanks and primary sources are also considered critical areas. Therefore, any water main within 1,000 feet of a water storage tank or primary source is considered a critical component.

Critical water mains are those mains that are the sole transmission main from a source or tank are considered critical components. In addition, main transmission lines that do not have a redundant main are considered critical. The evaluation included a visual review of the water mains leading into and out of the critical areas and the transmission grid.

## 5.3 Critical Components

Critical areas served, critical supply mains and redundant mains were evaluated in the Hingham/Hull Water System based on the criteria described above. The following provides a listing of the areas that are considered critical components.

### Critical Areas Served

A system-wide review of critical areas served such as hospitals, health care facilities, and schools was completed. Other critical services such as the Coast Guard Station located in Hull and Russelectric, Inc, a 24-hour facility, were identified during the workshop with Aquarion staff. Twenty nine critical services were identified. Table No. 5-1 presents all critical areas served including critical services and critical components of the distribution system.

### Critical Water Mains

Critical water mains include primary transmission lines as well as mains connecting water storage tanks and sources to the system. Critical mains are highlighted on Critical Components Map found in Appendix D.

**Table No. 5-1**
**Critical Service Areas**

| Critical Area | Location |
|---|---|
| 1. Coast Guard Station at Allerton Point | 93 Main Street, Hull |
| 2. Lillian Jacobs School | 180 Harborview Road, Hull |
| 3. Memorial Middle School | 81 Central Avenue, Hull |
| 4. Hull High School | 180 Main Street, Hull |
| 5. Hingham High School | 17 Union Street, Hingham |
| 6. Hingham Middle School | 1103 Main Street, Hingham |
| 7. Foster Elementary School | 55 Downer Avenue, Hingham |
| 8. Plymouth River Elementary School | 200 High Street, Hingham |
| 9. South Elementary School | 831 Main Street, Hingham |
| 10. Derby Academy | 56 Burditt Avenue, Hingham |
| 11. Notre Dame Academy | 1073 Main Street, Hingham |
| 12. St. Paul's School | 18 Fearing Road, Hingham |
| 13. South Shore Medical Center | 35 Pond Park Road, Hingham |
| 14. Harbor House Nursing & Rehabilitation | 11 Condito Road, Hingham |
| 15. Queen Anne's Nursing Home | 50 Recreation Park Drive, Hingham |
| 16. Welch Healthcare | 15 Condito Road, Hingham |
| 17. Cohasset Knoll Nursing & Rehabilitation Facility | 1 Chief Justice Cushing Highway, Cohasset |
| 18. Deerfield Senior Services | 20 Pond Park Road, Hingham |
| 19. Russ Electric, Inc. | 99 Industrial Park Road, Hingham |
| 20. Turkey Hill Tank | Turkey Hill Lane, Hingham |
| 21. Accord Tank | Whiting Street, Hingham |
| 22. Hingham/Hull District Water Treatment Facility | 900 Main Street, Hingham |
| 23. Downing Street Well | Downing Street, Hingham |
| 24. Central Fire – Hingham | 339 Main Street, Hingham |
| 25. Town Hall – Hingham | 210 Central Street, Hingham |
| 26. Town Hall – Hull | 253 Atlantic Avenue, Hull |
| 27. East Elementary School | 2 Collins Street, Hingham |
| 28. Linden Ponds | 203 Linden Ponds Way, Hingham |
| 29. Peddocks Island | Peddocks Island, Hull |

The system was also evaluated for areas where additional mains could be added to create redundancy and strengthen the transmission grid. One area where redundant mains could be installed is from the existing 20-inch diameter water main on South Pleasant Street east along South Pleasant Street and on Lazell Street to the 20-inch main on Union Street. This route will provide redundancy to the existing 24-inch diameter main on Main Street, and strengthen the transmission grid from the Treatment Facility to North Hingham and Hull.

# SECTION 6 – Asset Management Considerations

## 6.1 General

The Hingham/Hull water distribution system has been in operation since 1882. The existing system includes approximately 186 miles of water main varying in size and material. A number of factors including age, material, break history, soil conditions, pressure, and water quality affect the decision to replace or rehabilitate a water main. Using an Asset Management approach, each water main in the system was assigned a grade based on these factors. The grades were then used to establish a prioritized schedule for water main replacement or rehabilitation.

## 6.2 Data Collection

Information regarding the water main diameters was obtained from existing water distribution system maps. Information regarding pipe age, material and break history was obtained from workshops with system managers and operators and Aquarion records. Because record drawings do not exist for much of the system, water main age, material and break history are based on the operators' field experience and best estimates.

## 6.3 Evaluation Criteria

In order to prioritize water main replacement or rehabilitation, a water main grading system has been established. The grading system uses the water main characteristics such as age, material, break history, water quality, diameter size and soil characteristics to assign point values to each pipe in the system. Each category is assigned a rating between zero and 100 with zero being the most favorable and 100 being the worst case within the category. Each category is then given a weighted percentage, which represents priorities within the system. It is at the Owner's discretion to adjust the weight based on system performance and condition. Our recommendation is to assign a maximum of 30 percent to any one category. The rating is then multiplied by the weight. The weighted rating for each performance criteria will be utilized to determine the overall rating per pipe. Those pipes with the highest grade are most in need of replacement or rehabilitation.

In order to establish a rating system specific to the Hingham/Hull water system, a workshop was held with the system management and operators. During the discussion, it was determined that water main diameter is a priority for the Hingham/Hull system. Aquarion has experienced a substantial number of breaks in 2¼-inch mains that service multiple homes. Therefore, small diameter mains were given more points within the category and the diameter category was given a larger percentage of the total weighted rating. Aquarion is also concerned with external corrosion of water mains due to bog areas as well as tidal influenced areas. Therefore, the corrosive soil category was given additional weight in the overall rating scale. In addition, material of water main was noted as a priority for Aquarion. Therefore, material was given a higher percent of the overall weighted rating. Table No. 6-1 presents the Asset Management grading system including the ratings and category weights that resulted from discussions with Aquarion.

## Age/Material

The water industry in the United States followed certain trends over the last century. The installation date of a water main correlates with a specific pipe material that was used during that time as shown on Table No. 6-2. For example, up until about the year 1958, unlined cast iron water mains were the predominant pipe material installed in water systems. Factory cement lined cast iron mains were manufactured from the late 1950's to about the mid 1970's, when pipe manufactures switched primarily to factory cement lined ductile iron pipe.

Cast iron water mains consist of two types; pit cast and sand spun. Pit cast mains were generally manufactured up to the year 1930 while sand spun mains were generally manufactured between 1930 and 1970. Pit cast mains with diameters between 4-inch and 12-inch do not have a uniform wall thickness and may have "air inclusions" as a result of the manufacturing process. This reduces the overall strength of the main, which makes it more prone to leaks and breaks. Although sand spun mains have a uniform wall thickness, the overall wall thickness was thinner than the pit cast mains. The uniformity provided added strength, however, the thin wall thickness made it more susceptible to corrosion breaks. Pit cast mains 16-inch diameter and larger have very thick pipe walls and are generally stronger than the thinner walled sand spun cast mains.

While the transition to factory cement lined cast iron mains had begun in the early 1950's, prior to the year 1958, most cast iron water mains that were manufactured were still unlined. Unlined cast iron mains increased the potential for internal corrosion. By 1958 the majority of cast iron mains manufactured had a factory cement lining. The year 1958 is also when rubber gasket joints were introduced. Prior to this date, joint material was jute (rope type material) packed in place with lead or a lead-sulfur compound, also known as "leadite" or "hydrotite". Leadite type joint materials expand at a different rate than iron due to temperature changes. This can result in longitudinal split main breaks at the pipe bell. Sulfur in the leadite can promote bacteriological corrosion that can lead to circumferential breaks of the spigot end of the pipe.

The rating score is higher for water mains manufactured before 1958 as opposed to water mains manufactured after this time. After 1958, factory lined cast iron was manufactured and installed up until 1970. This material provided increased protection against internal corrosion. Unlined cast iron water mains make up approximately 60 percent of the Hingham/Hull water system. It was assumed that cast iron water main installed after 1960 was factory lined. Factory lined cast iron makes up approximately 20 percent of the system.

Prestressed concrete cylinder pipe (PCCP) was first produced in 1942 and most widely used in the early 1970s. There are two types of PCCP, embedded-cylinder pipe (ECP) and lined-cylinder pipe (LCP). LCP typically ranges from 16-inch to 48-inche in diameter and ECP is 48-inch and larger diameter pipe. Both types are a thin cement lined

| Table No. 6-1<br>Asset Management Grading System | | | |
|---|---|---|---|
| **Weight** | **Performance Criteria** | **Rating** | **Weighted Rating** |
| **20%** | Breaks per 1,000 Feet | | |
| | Greater than 10.0 | 100 | 25 |
| | 5.0 to 10.0 | 75 | 18.75 |
| | 2.0 to 5.0 | 50 | 12.5 |
| | Less than 2.0 | 25 | 6.25 |
| | No History of Breaks | 0 | 0 |
| **25%** | Material | | |
| | Asbestos Cement | 100 | 25 |
| | Galvanized Steel | 80 | 20 |
| | Unlined Cast Iron | 70 | 17.5 |
| | Prestressed Concrete | 10 | 2.5 |
| | Factory Lined Cast Iron | 10 | 2.5 |
| | PVC | 0 | 0 |
| | Ductile Iron | 0 | 0 |
| **20%** | Installation Date | | |
| | Pre 1930 | 100 | 20 |
| | 1930-1957 | 80 | 16 |
| | 1958-1969 | 20 | 4 |
| | 1970-1979 | 10 | 2 |
| | 1980-1989 | 5 | 1 |
| | 1990-1999 | 2 | 0.4 |
| | 2000-2007 | 0 | 0 |
| **25%** | Diameter | | |
| | 4-inch water main or smaller | 100 | 20 |
| | 6-inch water main | 80 | 16 |
| | 8-inch water main | 40 | 8 |
| | 10-inch water main | 20 | 4 |
| | 12-inch water main | 10 | 2 |
| | 14-inch water main or larger | 0 | 0 |
| **5%** | Soil | | |
| | Clay, Tidal Influence | 100 | 5 |
| | Gravel, Sand | 0 | 0 |
| **5%** | Water Quality | | |
| | History of water quality problems | 100 | 5 |
| | No history of water quality problems | 0 | 0 |

**Table No. 6-2**
**Pipe Material by Installation Year**

| Installation Year | Asbestos Cement | Ductile Iron | Galvanized Steel | PVC | Prestressed Concrete | Factory Lined Cast Iron | Unlined Cast Iron | Total |
|---|---|---|---|---|---|---|---|---|
| 1880-1889 | | | | | | | 3,876 | 3,876 |
| 1890-1899 | | | 227 | | | | 51,678 | 51,905 |
| 1900-1909 | | | 1,365 | | | | 53,539 | 54,904 |
| 1910-1919 | | | 2,486 | | | | 120,201 | 122,687 |
| 1920-1929 | | | 8,632 | | | | 62,684 | 71,316 |
| 1930-1939 | | | 1,984 | | | | 25,940 | 27,924 |
| 1940-1949 | 22,238 | | 486 | | | | 34,780 | 57,504 |
| 1950-1959 | 118,973 | | 1,814 | | 9,660 | | 47,031 | 177,478 |
| 1960-1969 | 5,983 | 1,048 | | | 3,642 | 149,879 | | 160,552 |
| 1970-1979 | | 29,892 | 1,415 | 942 | | 29,832 | | 62,081 |
| 1980-1989 | | 72,096 | | | | 4,407 | | 76,503 |
| 1990-1999 | | 79,431 | | 1,069 | | | | 80,500 |
| 2000-2008 | | 34,937 | | 232 | | | | 35,169 |
| Grand Total | 147,194 | 217,404 | 18,409 | 2,243 | 13,302 | 184,118 | 399,729 | 982,399 |

steel cylinder wrapped with prestressed wire. The ECP also has a second layer of concrete between the steel cylinder and the wire. The steel cylinder and wires are susceptible to corrosion. Approximately one percent of the system consists of PCCP water mains. These water mains are all 20-inch diameter water mains and make up a portion of the transmission grid of the system.

Between 1958 and 1970, the water industry also utilized asbestos cement (AC) pipe for their expanding water systems. An advantage of AC pipe is that it resists tuberculation build up, resulting in less system head loss. However, based on external influences such as soil type and high groundwater, the structural integrity of AC mains can deteriorate over time, thereby becoming sensitive to pressure fluctuations and/or nearby construction activities. Approximately 15 percent of the system consists of AC water mains.

Polyvinyl Chloride (PVC) pipe was first used in the United States in the early 1960s. Due to its resistance to both chemical and electrochemical corrosion, PVC pipe is not damaged by aggressive water or corrosive soils. In addition, the smooth interior of PVC pipe is resistant to tuberculation. The 1994 "Evaluation of Polyvinyl Chloride (PVC) Pipe Performance" by the AWWA Research Foundation, found that utilities have experienced minimal long term problems with PVC pipe. Generally, problems with PVC occurred when the area surrounding the pipe was disturbed after installation of the pipe, indicating that PVC pipe is not as strong as ductile iron when hit by excavation equipment after installation. It should be noted that PVC is a permeable material. Low molecular weight petroleum products and organic solvents can permeate PVC pipe if the contaminants are found in high concentrations in the soil surrounding the pipe. Less than one percent of the system is PVC pipe.

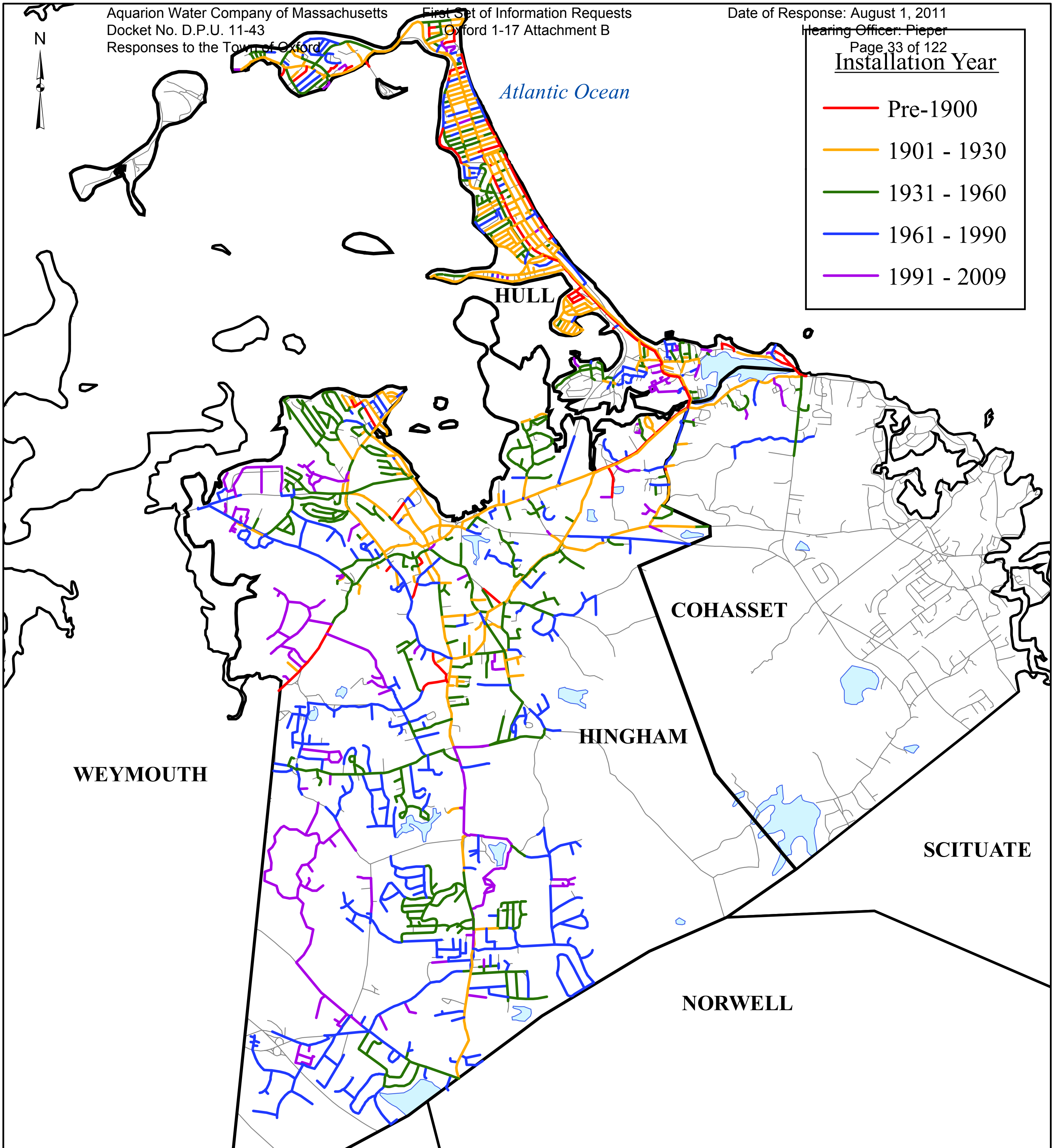
Approximately 23 percent of the system is cement lined ductile iron water main. This material was introduced in the United States in 1950's, however, was not widely used until the 1970's. According to the Ductile Iron Pipe Research Association (DIPRA), ductile iron pipe retains all of cast iron's qualities such as machinability and corrosion resistance, but also provides additional strength, toughness, and ductility.

In general, the oldest water mains in the system received a high rating of 100, while the newest received a rating of zero. A significant rating decrease occurs around 1958, which represents the timeframe when factory lining was introduced. Figures No. 6-1 and 6-2 present the installation year of the water mains and the materials, respectively.

## Diameter

The Hingham/Hull water distribution system consists of water main ranging in diameter from two to twenty-four inches. Approximately 38 percent of the system is comprised of 8-inch diameter pipes and approximately 31 percent is 6-inch diameter pipes.

In general, as the diameter of a pipe increases, the strength increases. In most cases, failure occurs in the form of ring cracks. This is primarily the result of bending forces on the pipe. Pipes that are 6-inch in diameter are more likely to deflect or bend than a larger diameter main. Pipes that are 8-inch in diameter r are less likely to break from bending

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Water Main Installation Years

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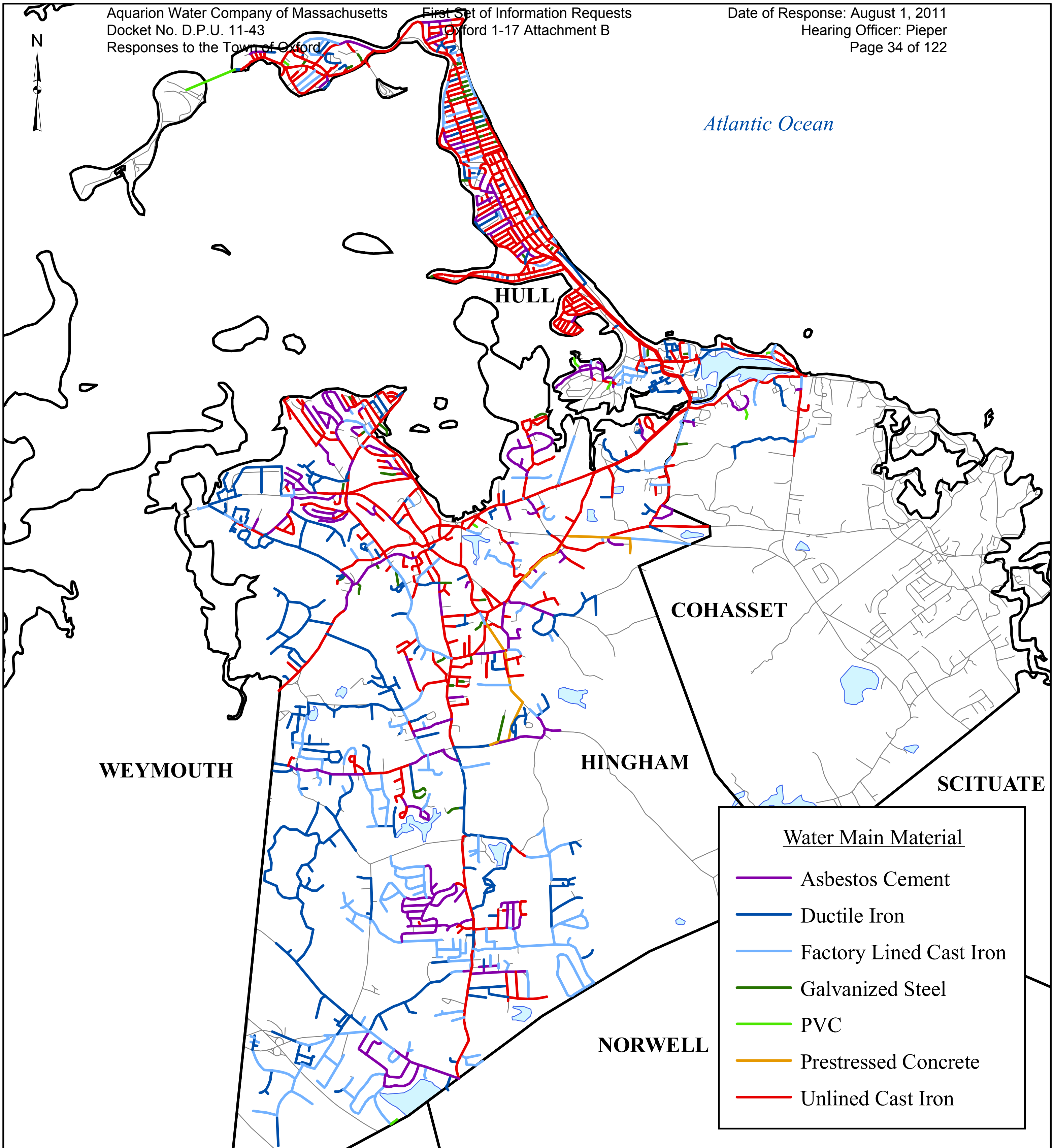
Figure No.

6-1

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Water Main Materials

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Figure No.

6-2

forces due to their increased diameter and resulting increased moment of inertia. In addition, the pipe wall thickness typically increases as the pipe diameter increases. Pipes that are 16-inches in diameter and larger have significantly thicker walls than 12-inch diameter pipe and smaller diameter mains, such that in addition to superior bending resistance, they also are much more resistant to failure from pipe wall corrosion.

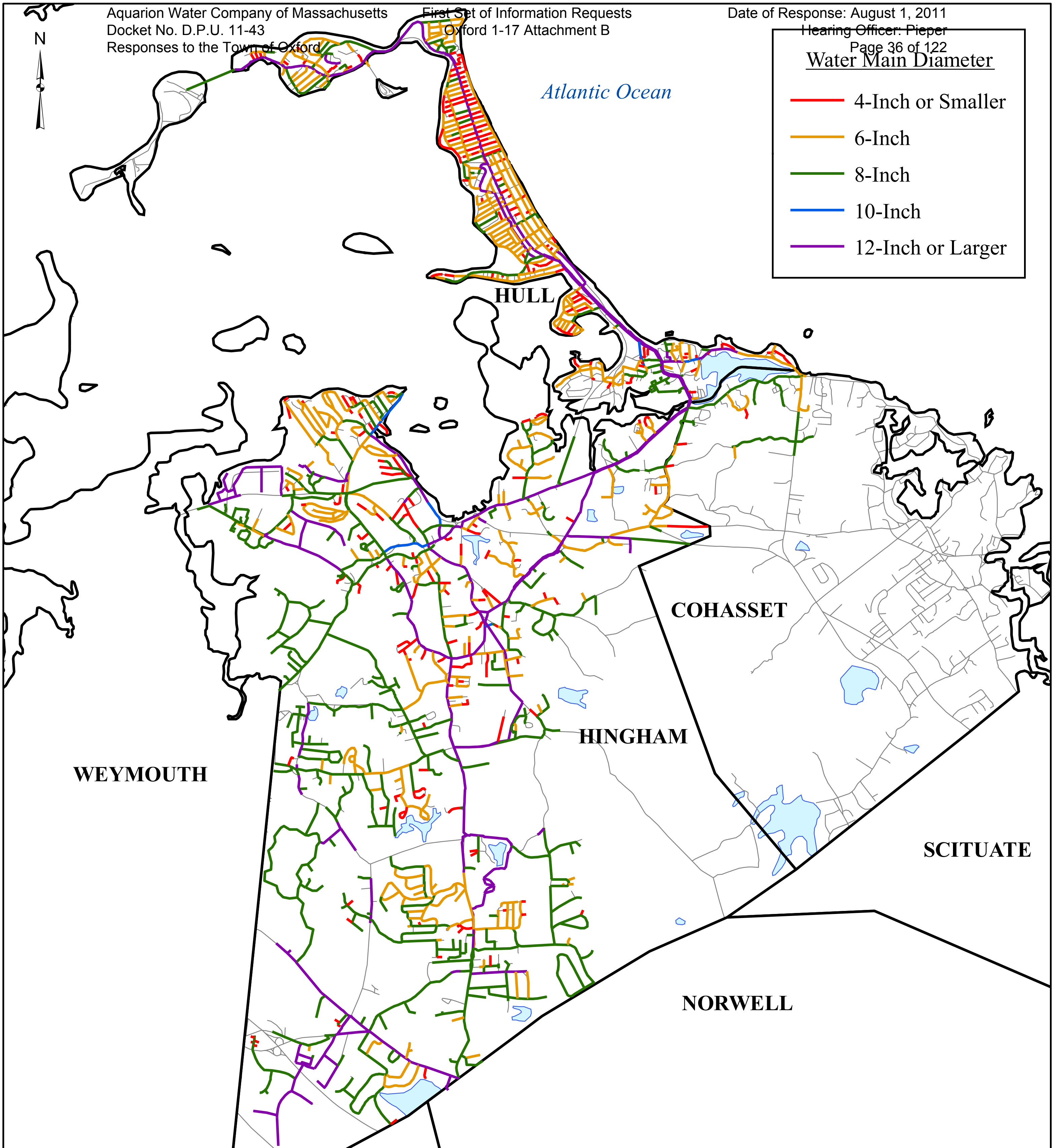
The rating system for the diameter of the water mains follows the concept that 4-inch diameter water mains are not as strong as 20-inch diameter water mains. Therefore, a rating of 100 was given to 4-inch diameter and smaller water mains and a rating of zero was given to the 14-inch diameter and larger water mains. Table No. 6-1 shows a significant drop in the rating score between a 6-inch diameter water main (80) and 8-inch diameter water main (40). This is due to wall thickness and field experience. An 8-inch diameter water main has proven to have nearly twice the bending strength of a 6-inch diameter water main. In general, 8-inch diameter water mains are stronger and less likely to break than 6-inch diameter pipes. Figure No. 6-3 presents the various diameter sizes throughout the distribution system.

## Break History

Based on conversations with company personnel, the Hingham/Hull water system experiences approximately 20 breaks per year on average. In relation to the total miles of water main in the system, this equates to approximately 11 breaks per 100 miles per year. In comparison to the national average of 25 breaks per 100 miles per year, the Hingham/Hull water system is in good condition. However, each water main break costs the system time and labor. They also cause disruption to the public and water consumers. At some point, it becomes more efficient to replace the main then to continue repairing it. Based on Aquarion water main break records, there are several areas in the system that have experienced frequent breaks. These areas are given a rating of 100 while areas with no known breaks received a rating of zero. Areas that have a history of breaks are highlighted on Figure No. 6-4.

## Water Quality

In general, the water quality in the Hingham/Hull water system meets or exceeds state and federal water quality standards. However, the water quality in a few areas, including Main Street between South Pleasant Street and Pleasant Street, Fottler Road, and High Street, is a concern. In addition, the neighborhood extending from Volunteer Road to Old Colony Road, Clark Road, and the area near the intersection of High Street, Ward Street and French Street have experienced high color and turbidity during peak demand periods in the spring and summer. Reportedly, customers in these areas have complained of black water, due to high manganese concentrations. This is believed to be due to their proximity to the ground water sources. Prior to construction of the Hingham/Hull District Water Treatment Facility, well water was distributed to the distribution system with minimal treatment. The areas surrounding the wells received the bulk of deposits from the water causing tuberculation of the water main. As demands increase in the summer months, the water main experiences scouring of the pipes, causing the manganese deposits in the pipes to release into the water. Areas where water quality is of concern are highlighted on Figure No. 6-5.

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Water Main Diameter

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Figure No.
6-3

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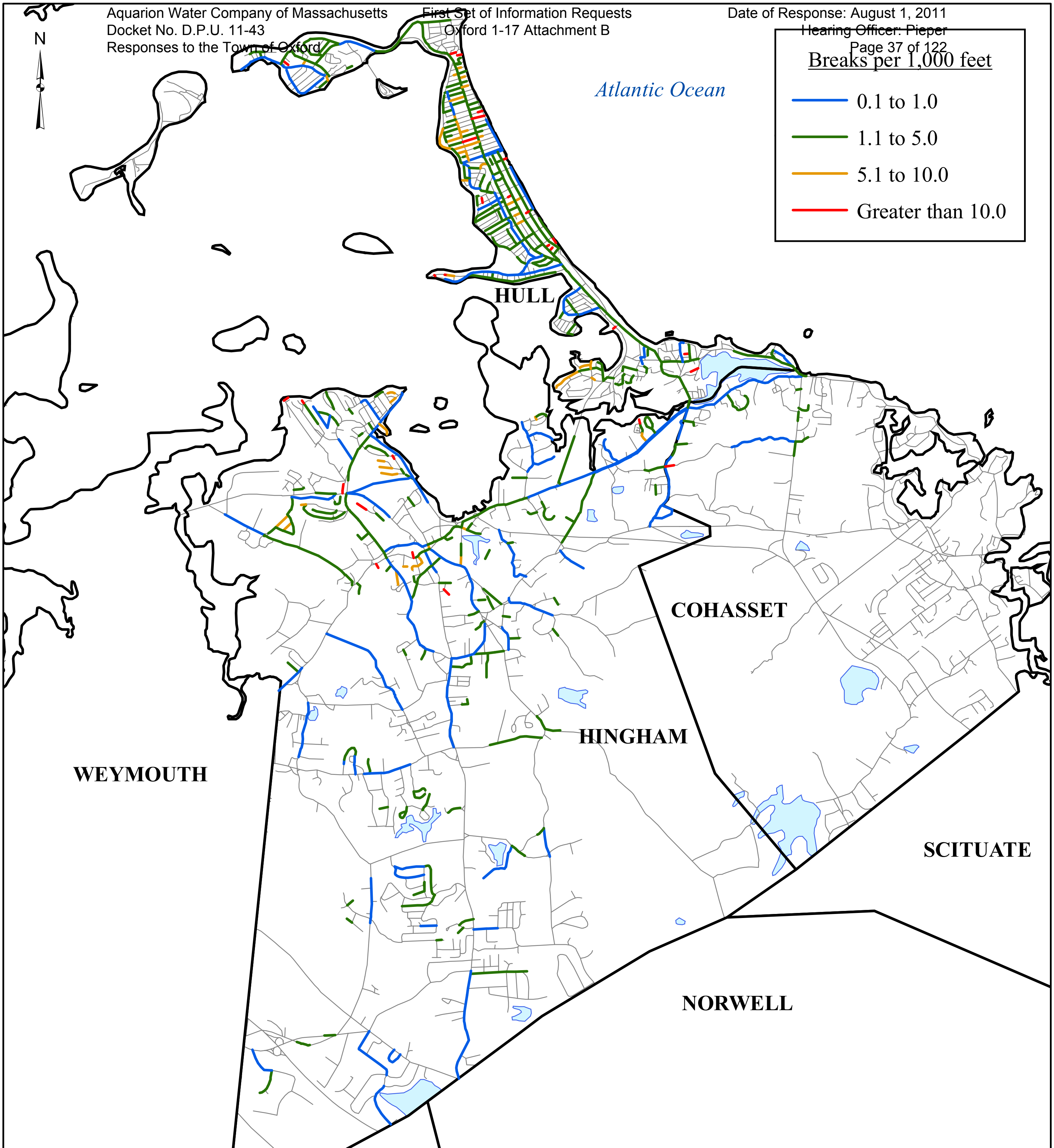


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Areas with History of Breaks

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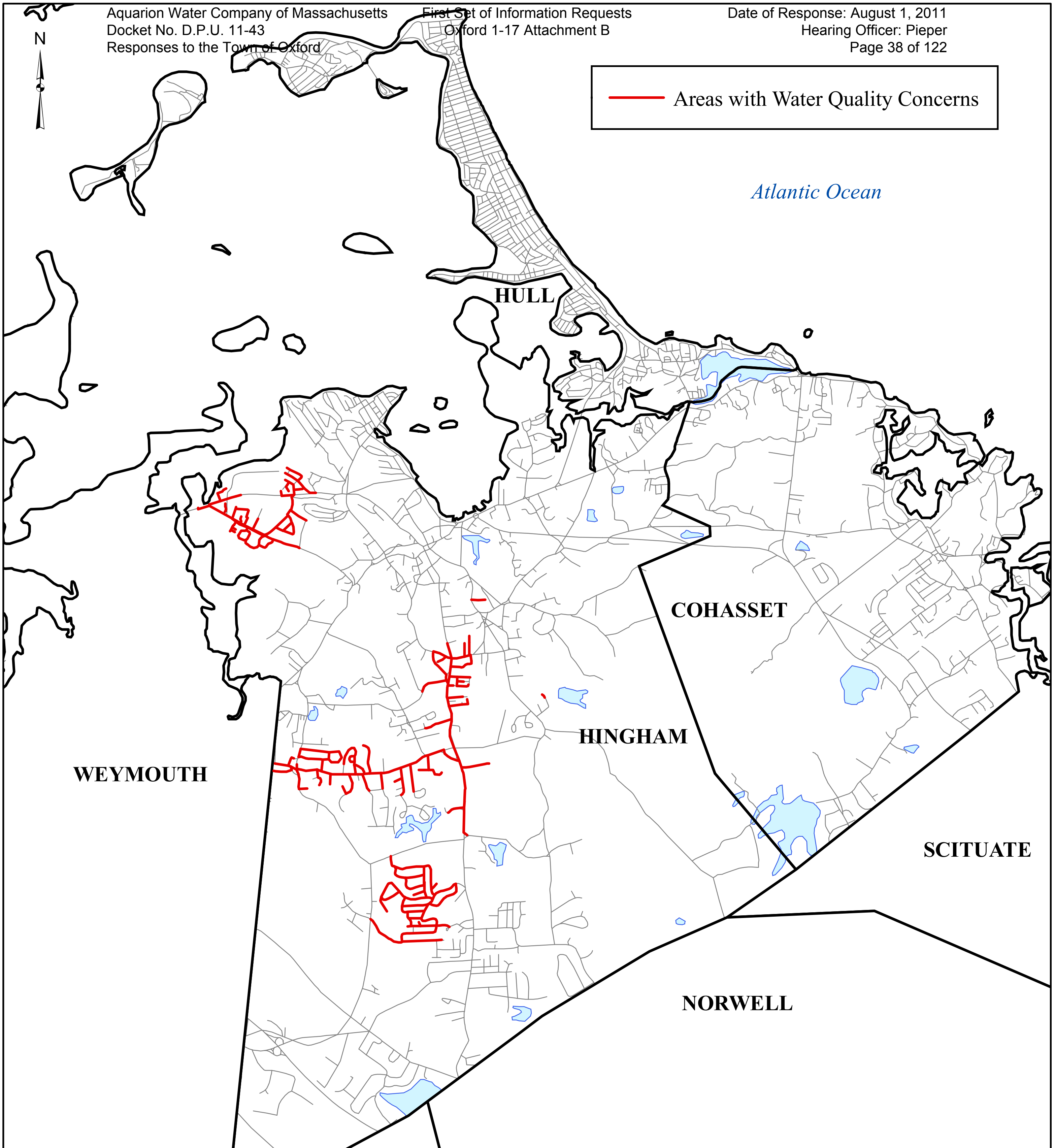
Figure No.
6-4

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Areas with Water Quality Concerns

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Figure No.

6-5

### Soils

Water main degradation can occur both internally and externally. Factors that increase the rate of external corrosion include high groundwater, soils with low calcium carbonate, or soils with high acidity or sulfate. Wetlands areas have greater potential to cause external corrosion of water mains than other soil conditions. Areas that are under the influence of ocean water also have increased corrosion potential due to the high salt content. Aquarion has experienced external corrosion in areas near the ocean as well as areas where the pipes are in clay which is a low permeable soil. As a result, groundwater will not drain away from the pipe as quickly. The additional contact with water can accelerate the rate of external corrosion of a pipe. Aquarion has identified several clay areas including Crow Point in Hingham, several hills in Hull and portions of Jerusalem Road in Cohasset.

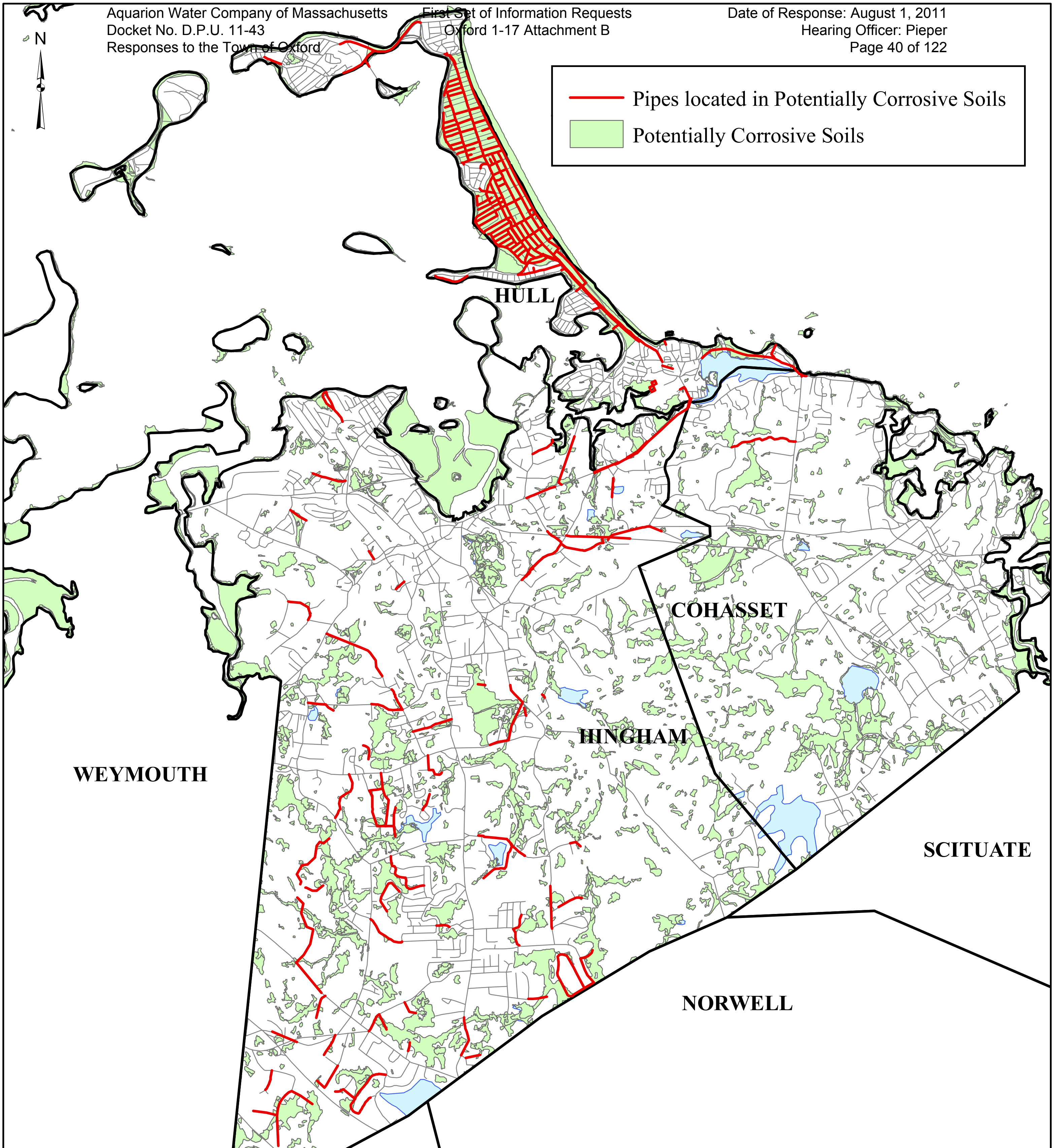
As shown on Figure No. 6-6, much of the Hingham/Hull area is made up of potentially corrosive soils. Areas where the water system and the potentially corrosive soils coincide are considered areas of potential exterior corrosion. Water mains located in potentially corrosive soil were assigned a rating of 100, while all other pipe was assigned a rating of zero.

## 6.4 Asset Management Areas of Concern

Based on the Asset Management ratings, there are several areas of concern in the system. Water mains with a total rating between zero and 30 are considered to be in good to excellent condition. Areas with a total rating between 31 and 60 are considered to be in fair to good condition, and areas with a total rating greater than 60 are considered to be in poor to fair condition. Asset Management ratings are presented graphically in Appendix E.

In addition, Aquarion has identified two operational concerns in the system: bleeders and broken valves. As indicated in Table No. 6-3, Aquarion operates 13 bleeders each winter due to shallow water mains. According to the 2008 Annual Statistical Report, an estimated 9.6 million gallons of water was lost to bleeders in 2008. Because bleeders waste water and increase operation and maintenance time for Aquarion staff, Aquarion has indicated that replacing shallow water mains that requires bleeders is a priority.

Table No. 6-4 includes the locations of the 21 known broken valves in the water distribution system. Broken valves increase the number of customers affected during shutdowns due to main breaks. In addition, one broken valve on a water line, may indicate that other valves on that main are in poor condition. Therefore, water mains with broken valves were given higher priority for replacement.

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Potentially Corrosive Soils

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Figure No.

6-6

**Table No. 6-3**
**Bleeder Inventory**

| **Location of Bleeder** | **Location of Shallow Main** |
|---|---|
| Hingham | |
| Pioneer Road | Liberty Pole Road |
| Brewster Road | Brewster Road and Liberty Pole Road |
| High Street | Intersection of High Street and Ward Street |
| Grove Avenue at Hayes Road | Hayes Road |
| Elmore Road | Elmore Road |
| East Street at Skating Club | East Street (2¼-inch main) |
| | |
| Hull | |
| Maple Way | Maple Way |
| Sunset Avenue | Sunset Avenue |
| S Street | Cadish Avenue – K Street to U Street |
| T Street at Beach Avenue | T Street |
| Beach Avenue | Beach Street – L Street to X Street |
| X Street at Beach Avenue | X Street at Beach Avenue |
| North Truro Street | Alsada Road and Logan Avenue |

**Table No. 6-4**
**Known Broken Valve Inventory**

| Location of Valve | Size |
|---|---|
| Hingham | |
| High Street | 8-Inch |
| Winthrop Road | 8-Inch |
| Brewster Road | 8-Inch |
| Bradford Road | 2-Inch |
| Green Street at Water Street | 4-Inch |
| Elm Street at Lafayette Avenue | 6-Inch |
| Bel Air Road at Westview Circle | 8-Inch |
| Rockland Street (Valve No. 458) | 8-Inch |
| Nantasket Avenue (Vale No. 460) | 8-Inch |
| | |
| Hull | |
| Point Allerton Avenue | 12-Inch |
| Nantasket Avenue at Carousel | 12-Inch |
| C Street at Cadish Avenue | 6-Inch |
| Crest Road | 1-Inch |
| Gunrock Avenue at Atlantic Avenue | 4-Inch |
| Manomet Avenue at Kenberma Street | 6-Inch |
| Beach Avenue at Coburn Street | 6-Inch |
| Beacon Road at Bluff Road | 6-Inch |
| Standish Avenue at Beacon Road | 6-Inch |
| Whitehead Avenue at Fifth Street | 8-Inch |
| Nantasket Road at Third Street | 4-Inch |
| Bay Street at Roosevelt Avenue | 6-Inch |
| Bay Street at Island View Road | 6-Inch |
| Edgewater Road at Tenth Street | 2-Inch |

# SECTION 7 – Capital Efficiency Recommendations

## 7.1 General

The following summarizes the findings of the study and presents a prioritized plan for recommended improvements and associated costs. The prioritization of improvements allows for constructing the necessary improvements over an extended period of time as funds allow.

Costs are based on the February 2011 Engineering News Record (ENR) construction cost index for Boston, MA of 11433.13 and include a 25 percent allowance for engineering and contingencies and costs associated with water services, hydrants and permanent and temporary trench pavement. Estimates do not include costs for land acquisition, easement, or legal fees.

The capital improvement projects considered by this study will provide a direct benefit to the overall level of service to the Hingham/Hull customers, reduce operation and maintenance cost by reducing the frequency of water main failures and the damage they cause, as well as improve fire protection to the homeowners and businesses.

The Water Research Association's (formerly the American Water Works Research Foundation) study on "Cost of Infrastructure Failure," which was completed in 2002, found that in addition to direct costs paid by water utility ratepayers for water main failures, there are also societal costs, which are paid by the public. Examples of the direct costs include outside contractor costs, engineering costs, police assistance, fire department assistance, electrical, telephone and gas utility damage costs, landscaping restoration costs and laboratory costs. Examples of societal costs included the cost of traffic impacts, business customer outage impacts, public health impacts (including loss of life), property damage not covered by direct costs, and the cost of reduced fire fighting capability during the failure event.

Replacement of one percent of a system each year (a 100 year replacement cycle) is a reasonable guideline based on industry experience and analysis. For the Hingham/Hull distribution system, this would equate to approximately 9,800 linear feet of water main replacement each year as a guideline. Regular rehabilitation of water mains reduces main failures, leakage and water quality issues. Water main rehabilitation can also provide socio-economic benefits by reducing operational costs associated with chemical and energy usage. Also, rehabilitation or replacement of water mains that are inadequately sized to provide needed fire protection will improve public safety.

## 7.2 General Recommendations

In order to establish a comprehensive database of the condition of the system, it is recommended that Aquarion create a water main failure database. The database should include the location of each break and the properties of the failed main such as diameter, material, joint type, and type of lining. In addition, Aquarion should record the type of failure such as ring crack, lateral split, hole in the pipe, "punky" AC pipe failure, or joint leak. If possible, Aquarion should include the apparent cause of the failure such as frost load, traffic load, direct contractor damage, settlement, water hammer, external soil corrosion or stray current. This data should then be inputted into the hydraulic model to create a Water Main Failure Map for identifying problem areas in the future. The water main failure database will aid Aquarion in making water main replacement decisions in the future.

In addition, it is recommended that Aquarion create a database of new or replacement water mains. The database should include water main diameter, material, lining, joint type, soil conditions, date of installation, and as-built drawings. This data can be added to the existing database, created for this study, to maintain a comprehensive water main database.

It is recommended that prior to installation of all new ductile iron water mains, Aquarion test the soils in the area of the new main to determine if the soil has high corrosion potential. If the soil is found to be potentially corrosive soil, Aquarion should consider wrapping the main to protect against external corrosion. Wrapping is a relatively inexpensive practice that may extend the life of new ductile iron pipe. In addition, wrapping helps to protect the pipe from stray currents that may develop near the main.

Based on proposed development within the High Service Area, a high service area build-out analysis is recommended. The analysis should consider existing and proposed storage and supply requirements and existing high service area infrastructure. Recommendations should be developed to alleviate and storage, supply or distribution system deficiencies.

## 7.3 Prioritization of Improvements

Based on the Three Circles Approach, a prioritized list of improvements was created. Improvements were separated into three phases. The Phase I Improvements are priority improvements based on hydraulic needs, location in the distribution system and the condition of the water main. In general, these include water mains that fall into two or more of the three circles strengthen the transmission grid, eliminate potential asset management concerns, as well as provide redundancy. The hydraulically deficient areas, critical component considerations and asset management ratings are combined on the Three Circle Integration map included in Appendix F.

It should be noted that due to the nature of this Capital Efficiency Plan™, the list of improvements is extensive. This results in a high associated cost if all of the suggested improvements were constructed. The intent of the prioritization, therefore, is to serve as a guide for implementation from the most needed to the least needed improvements based on the weighted criteria established jointly by Aquarion and Tata & Howard. These improvements would most logically be constructed over an extended period of time.

Table No. 7-1, at the end of this section, includes a prioritized list of Phase I Improvements and the hydraulic, critical component and asset management status of each improvement. Table No. 7-2 includes the linear footage and estimated cost of each Phase I Improvement. A Phase I and Phase II Improvements map is included in Appendix G. It should be noted that paving schedules were not evaluated as part of this study. Aquarion may reprioritize the recommendations if paving is scheduled on any of the roads recommended for improvement.

## Phase I Improvements

1. As a result of its age and material, the 6-inch diameter AC main on Pleasant Street from Main Street to Middle Street in Hingham has an asset management rating of 66. The main is located in a critical area near Hingham High School and the Downing Street Well. In addition, the main does not meet the ISO recommended fire flow of 3,000 gpm on Pleasant Street, making it a recommended hydraulic improvement. Due to these considerations, it is recommended that an 8-inch diameter water main replace the existing main from Main Street to Middle Street. This improvement will not only eliminate an asset management concern, but will also strengthen the hydraulics of the transmission grid. The estimated probable construction cost for approximately 1,500 feet of 8-inch diameter water main is $281,000.

2. The existing 6-inch and 4-inch diameter water main on Beach Avenue in Hull has experienced frequent breaks and has required numerous repairs. The main was installed in corrosive soils, and also at a shallow depth, requiring the use of a bleeder. Several broken gate valves are located along the main, increasing the number of customers affected by a shutdown. In addition, its location within the sand dunes along the beach impedes repair costs and inhibits maintenance efforts. In order to provide the inherent capacity for fire flow, it is recommended that the existing water main on Beach Avenue be replaced with 12-inch diameter cement lined ductile iron water main. The proposed water main will be installed along an existing utility easement adjacent to Beach Avenue. In addition, the existing 2-inch main on X Street has an asset management rating of 73. The main was installed at a shallow depth, requiring the use of a bleeder. The main is also a dead end, impacting water quality. It is recommended that the main be replaced and extended to Y Street with 8-inch diameter cement lined ductile iron main. The estimated probable construction cost for installation of approximately 1,800 linear feet of 12-inch diameter water main and approximately 370 linear feet of 8-inch diameter water main, including design, coordination with gas and sewer utilities, construction and contingencies, is $439,000.

3. The existing 6-inch unlined cast iron water main on Downer Avenue in Hingham from Otis Street to Planters Field Lane has an asset management rating of 63. In addition, the main is located in a critical area, adjacent to the Foster Elementary School. In order to provide ISO needed fire flow of 3,000 gpm on Downer Avenue, it is recommended that the existing 6-inch diameter water main on Downer Avenue from Otis Street to Planters Field Lane be replaced with 8-inch diameter cement lined ductile iron water main. The estimated probable construction cost for

installation of approximately 1,450 linear feet of 8-inch diameter water main, including design, construction and contingencies is $271,000.

4. The existing 6-inch diameter cast iron main on Hull Street and Spruce Street in Hingham is considered a critical main due to its use as a transmission main for both the Hingham and Cohasset service areas. In addition, the existing main does not provide the inherent fire flow capacity for the area serviced by the main. The water main on Hull Street has an asset management rating of 63. It is recommended that the existing water main be replaced with 8-inch diameter cement lined ductile iron main. The estimated probable construction cost for installation of approximately 1,740 linear feet of 8-inch diameter water main, including design, construction and contingencies, is $304,000.

5. The existing 6-inch diameter unlined cast iron main on Atlantic Avenue in Hull does not meet the ISO needed fire flow of 3,000 gpm. In addition, the main has an asset management rating of 68, due to its material, age, and location in corrosive soils. It is recommended that the existing main that runs along Atlantic Avenue from Gunrock Avenue to Jerusalem Road be replaced with a 12-inch diameter cement lined ductile iron water main. Additionally, the existing 4-inch diameter water main that runs along Summit Avenue should be replaced with 8-inch diameter cement lined ductile iron water main. The estimated probable construction cost for the installation of approximately 3,500 linear feet of 12-inch diameter water main and approximately 1,200 linear feet of 8-inch diameter water main, including design, construction and contingencies is $950,000. This improvement accounts for the approximately 1,200 linear feet of 12-inch water main being installed on Atlantic Avenue between Stony Beach Road and Gunrock Avenue in the spring 2011.

6. The existing 4-inch diameter main on Edgewater Road in Hull is in a hydraulically deficient area with an asset management rating of 63. In addition, a broken valve exists at the connection with Nantasket Avenue. It is recommended that the 4-inch cast iron main be replaced with 8-inch diameter cement lined ductile iron main. The estimated probable construction cost for installation of approximately 480 linear feet of 8-inch diameter water main, including design, construction and contingencies, is $138,000.

7. In order to provide the inherent capacity for fire flow, it was recommended in Section 4 that the existing 6-inch unlined cast iron water mains on Nutty Hill Road and Whitehorse Road from High Street to Nutty Hill Road in Hingham be replaced with an 8-inch diameter cement lined ductile iron water main. The mains are also located in a critical area, due to the proximity of the Plymouth River School. However, while reviewing the asset management ratings of the water mains, the water main on Hemlock Road has an asset management rating of 64 and is considered fair to poor, and the water main on Whitehorse Road has an asset management rating of 59, which is considered good to fair. Replacing the water main on Hemlock Road from High Street to Nutty Hill Road will also provide the inherent capacity for fire flow. The estimated probable construction cost for

installation of approximately 1,500 linear feet of 8-inch diameter water main, including design, construction and contingencies, is $245,000.

8. Due to its age and material, the 6-inch and 8-inch diameter AC main on Liberty Pole Road in Hingham has an asset management rating of 66. The main is located in a critical area, near the South Elementary School. In addition, the main was installed at a shallow depth, requiring the use of a bleeder to prevent freezing. It is recommended that the existing main be replaced with 8-inch diameter cement lined ductile iron water main. The estimated probable construction cost for installation of approximately 2,100 linear feet of 8-inch diameter water main, including design, construction and contingencies, is $434,000.

## Phase II Improvements

Phase II Improvements generally include areas that fall into two circles, but are located on side streets or dead ends, as well as areas that are hydraulically deficient or have high asset management ratings. These improvements generally will benefit a localized area, while Phase I Improvements benefit the transmission grid. Phase II Improvements should be completed as funds become available and considered as when reviewing road paving schedules. Table No. 7-3 includes a prioritized list of Phase II Improvements and the hydraulic, critical component and asset management status of each improvement. Table No. 7-4 includes the linear footage and estimated cost of each Phase II Improvement.

9. In order to provide ISO recommended fire flow of 3,000 gpm on Rockaway Avenue in Hull and eliminate a hydraulically deficient area, it is recommended that the existing 6-inch diameter water main that runs along Rockway Avenue from Wyola Road to Alsada Road be replaced with 8-inch diameter cement lined ductile iron water main. Additionally, it is recommend that the existing 6-inch diameter water mains that run along Wyola Road from Rock View Road to Logan Avenue and Park Avenue from Wyola Road to Shore Garden Road be replaced with 8-inch diameter cement lined ductile iron water main. The water main on Park Avenue has an asset management rating of 68. The estimated probable construction cost for installation of approximately 1,350 linear feet of 8-inch diameter water main, including design, construction and contingencies is $277,000.

10. In order to provide ISO recommended fire flow of 1,000 gpm on Mayflower Avenue in Hull, it is recommended that the existing 4-inch diameter water main that runs along Mayflower Avenue be replaced with 8-inch diameter cement lined ductile iron water main. The main on Mayflower Avenue has an asset management rating of 67, due to its diameter, age and material. Additionally, the existing 6-inch diameter water main that runs along Hampton Circle from Moreland Avenue to Mayflower Avenue should be replaced with 8-inch diameter cement lined ductile iron water main. The estimated probable construction cost for installation of approximately 750 linear feet of 8-inch diameter water main, including design, construction and contingencies is $162,000.

11. In order to provide the inherent capacity for fire flow, it is recommended that the existing water mains on Grist Mill Lane, Howland Lane from Grist Mill Lane to Whitcomb Avenue and Whitcomb Avenue from High Street to Howland Lane in Hingham be replaced with an 8-inch diameter cement lined ductile iron water main. The mains have an asset management rating of 61. The estimated probable construction cost for installation of approximately 3,600 linear feet of 8-inch diameter water main, including design, construction and contingencies, is $586,000.

12. In order to provide the inherent capacity for fire flow, it is recommended that the existing 6-inch AC water main on Howe Street in Hingham be replaced with an 8-inch diameter cement lined ductile iron water main. The existing main has a poor asset management rating of 61; replacement of the main will eliminate this concern. The estimated probable construction cost for installation of approximately 1,970 linear feet of 8-inch diameter water main, including design, construction and contingencies, is $321,000.

13. To provide the ISO recommended fire flow of 3,000 gpm on Keith Way (at all locations), in Hingham, it is recommended that the existing 8-inch diameter water main that runs along Recreation Park Drive to Keith Way be replaced with a 16-inch diameter cement lined ductile iron water main. The 8-inch main on Recreation Park Drive should be extended to Derby Street with 16-inch diameter main to provide fire flow and to eliminate a dead end. It is also recommended that the existing 12-inch diameter main on Keith Way be replaced with 16-inch diameter cement lined ductile iron main. The water mains in this location are considered to be in a critical area due to the servicing of a medical facility. The estimated probable construction cost for installation of approximately 2,450 linear feet of 16-inch diameter water main, including design, construction and contingencies is $460,000.

14. Channel Street is located in a critical area, near Hull High School. The existing 6-inch AC main has experienced frequent breaks, and due to its age and material has an asset management rating of 71. Therefore, an 8-inch diameter cement lined ductile iron water main is recommended to replace the existing main. The estimated probable construction cost for installation of approximately 710 linear feet of 8-inch diameter water main, including design, construction and contingencies is $116,000.

15. O Street in Hull is located in a critical area near a public school. The existing 2-inch galvanized steel main from Central Avenue to Nantasket Avenue has an asset management rating of 75 due to its age, material, and break history. The main has experienced five breaks in the past decade, creating the need for frequent costly repairs. It is recommended that the main be replaced with 8-inch cement lined ductile iron water main. The estimated probable construction cost for installation of approximately 730 linear feet of 8-inch diameter water main, including design, construction and contingencies is $119,000.

16. The existing 6-inch water main on Beach Avenue from A Street to L in Hull has experienced frequent breaks and has required numerous repairs. The main was installed in corrosive soils, and also at a shallow depth, requiring the use of a bleeder. The main has an asset management rating of 68. The main is considered critical, due to its use as a primary transmission man to North Hull. In addition, its location within the sand dunes along the beach impedes repair cost and inhibits substantial maintenance efforts. In order to provide the inherent capacity for fire flow, it is recommended that the existing water main on Beach Avenue be replaced with 12-inch diameter cement lined ductile iron water main. The proposed water main will be installed along an existing utility easement adjacent to Beach Avenue. The estimated probable construction cost for installation of approximately 7,100 linear feet of 12-inch diameter water main, including design, coordination with gas and sewer utilities, construction and contingencies, is $1,332,000.

17. In order to eliminate a dead end, and provide the inherent capacity for fire flow, it is recommended that the existing 6-inch diameter water main on Carleton Road in Hingham be extended to High Street with an 8-inch ductile iron water main. The estimated probable construction cost for installation of approximately 500 linear feet of 8-inch diameter water main, including design, construction and contingencies is $166,000.

18. In order to provide ISO recommended fire flow of 3,000 gpm on Pinegrove Road in Hingham, it is recommended that the existing 8-inch diameter water main that runs along Main Street from Pinegrove Road to Gardner Road and along Pinegrove Road be replaced with 12-inch diameter cement lined ductile iron water main. The water mains are located in a critical area, due to the proximity of two schools. The water main on Main Street has an asset management rating of 53; replacement of the main will eliminate this concern. The estimated probable construction cost for the installation of approximately 3,270 linear feet of 12-inch diameter water main, including design, construction and contingencies is $614,000.

19. The water main on Simmons Road in Hingham is comprised of 2-inch galvanized steel and 4-inch unlined cast iron installed in 1924. Due to these factors, the main has an asset management rating of 63. In order to provide adequate fire flow, it is recommended that the existing main on Simmons Road be replaced with an 8-inch cement lined ductile iron main. The estimated probable construction cost for installation of approximately 1,060 linear feet of 8-inch diameter water main, including design, construction and contingencies is $173,000.

20. The unlined 4-inch cast iron main on N Street from Central Avenue to Nantasket Avenue was installed in 1922. Due to its age and material, the main has a poor asset management rating of 68. The main is also located in a critical area near the Hull Memorial School. In order to eliminate the asset management concern, and provide increased fire flow, it is recommended that the main be replaced with 8-inch diameter cement lined ductile iron water mains. The estimated probable

construction cost for installation of approximately 730 linear feet of 8-inch diameter water main, including design, construction and contingencies is $119,000.

21. The water mains on H Street, M Street and K Street from Central Avenue to Cadish Avenue in Hull are composed of 6-inch and 4-inch unlined cast iron water main, installed prior to 1922. These mains have high asset management ratings from 70 to 73 due to their high break rate and age. The K Street main is also located in corrosive soils. In addition, the mains are located in a critical area due to the proximity of a public school. It is recommended that all the mains are replaced with 8-inch cement lined ductile iron main. The estimated probable construction cost for installation of approximately 1,790 linear feet of 8-inch diameter water main, including design, construction and contingencies is $351,000.

22. The existing 6-inch diameter cast iron water main on Central Avenue in Hull has an asset management rating of 78. The aging main is located in corrosive soils, leading to frequent breaks. A portion of the main is also located in a critical area, near a school. It is recommended that the entire main from A Street to Q Street be replaced with 8-inch diameter cast iron water main to strengthen the transmission grid. The estimated probable construction cost for installation of approximately 3,340 linear feet of 8-inch diameter water main, including design, construction and contingencies is $543,000.

23. In order to provide the inherent capacity for fire flow, it is recommended that the existing water mains on Summit Drive and Harbor View Drive from Thaxter Street to Summit Drive in Hingham be replaced with an 8-inch diameter cement lined ductile iron water main. Due to their age and material, the existing 6-inch AC water mains have an asset management rating of 66 and 61, respectively. The estimated probable construction cost for installation of approximately 1,800 linear feet of 8-inch diameter water main, including design, construction and contingencies, is $294,000.

24. The existing 4-inch and 2¼-inch diameter cast iron main on Otis Hill Road in Hingham has an asset management rating of 78. In addition, the main is located in a critical area adjacent to a school. The main has also experienced several breaks due to its poor condition. Future breaks could potentially cause disruptions at the nearby school. It is recommended that the existing main be replaced with 8-inch diameter cement lined ductile iron water main. The estimated probable construction cost for installation of approximately 1,330 linear feet of 8-inch diameter water main, including design, construction and contingencies, is $217,000.

25. The existing 2¼-inch unlined cast iron main on Downing Street in Hingham was installed in 1937. Due to its age, material, and break history, the main has an asset management rating of 64. In addition, the main is located in a critical area due to its proximity to Hingham High School. In order to eliminate the asset management concern, and provide increased fire flow, it is recommended that the main be replaced with an 8-inch diameter cement lined ductile iron water main. The

estimated probable construction cost for installation of approximately 1,140 linear feet of 8-inch diameter water main, including design, construction and contingencies, is $186,000.

26. The main on Independence Lane in Hingham is composed of 6-inch diameter AC pipe. The main has a high asset management rating of 66 due to its age and material. It is recommended that the existing main from be replaced with 8-inch cement lined ductile iron water main. The estimated probable construction cost for the installation of approximately 1,900 linear feet of 8-inch diameter water main, including design, construction and contingencies, is $392,000.

27. The existing 6-inch and 2-inch diameter mains on Hull Street and Clark Drive in Hingham have asset management ratings of 64 and 65, respectively. The Hull Street main is considered critical because it is part of the transmission grid. In order to eliminate the asset management concern, and increase available fire flow on both streets, it is recommended that both mains are replaced with 8-inch diameter cement lined ductile iron main. The estimated probable construction cost for the installation of approximately 1,060 linear feet of 8-inch diameter water main, including design, construction and contingencies, is $187,000.

28. The existing main on High Street from Tower Road to Whitehorse Road in Hingham is a 6-inch diameter unlined cast iron water main. The water main has an asset management rating of 64. The main is considered critical as it services a public school. In addition, the main is choke point for the transmission grid as the majority of High Street is composed of 8-inch diameter main. In order to eliminate the hydraulic bottleneck, it is recommended the existing main be replaced with 8-inch diameter cement lined ductile iron water main. The estimated probable construction cost for the installation of approximately 2,210 linear feet of 8-inch diameter water main, including design, construction and contingencies, is $413,000.

29. In order to provide the inherent capacity for fire flow, it was recommended in Section 4 that the existing 2¼-inch and 6-inch diameter water mains on Smith Road and Hobart Street from New Bridge Road to Smith Road in Hingham be replaced with an 8-inch diameter cement lined ductile iron water main. The existing 6-inch diameter water main on Hobart Street from New Bridge Road to Smith Road has an asset management rating of 27 and is considered to be in good to excellent condition. The existing water main on Hobart Street from Smith Road to Main Street has an asset management rating of 63 and is considered to be in fair to poor condition. This water main should be replaced instead of the portion from New Bridge Road to Smith Road. This will also provide the inherit capacity for fire flow in the area and it will all Aquarion to leave in a good main and replace a poor main.

    Also, a 14-inch gate valve was reportedly installed on the 20-inch diameter water main on Main Street at Hobart Street in Hingham. The smaller diameter valve creates additional headlosses in the 20-inch diameter main, which reduces the available fire flow and the efficiency of the distribution system. In addition, Aquarion generally requires butterfly valves on mains 16-inches in diameter and larger. Therefore, while work is being completed on Hobart Street from Smith Road to Main Street, it is recommended that the 14-inch gate valve be replaced with a 20-inch butterfly valve. The estimated probable construction cost of approximately 3,460 linear feet of 8-inch diameter ductile iron main and a 20-inch butterfly valve, including engineering, construction, and contingencies, is $571,000.

## Phase III Improvements

Phase III Improvements generally include areas that fall into one circle. Phase III-Priority 1 Improvements include areas that are hydraulically deficient, and do not meet ISO recommended fire flow. Phase III-Priority 2 Improvements encompass mains that have high asset management ratings as well as broken valves or minimal ground cover. Phase III-Priority 3 Improvements only include mains with high asset management ratings. Phase III Improvements should be completed as funds become available and considered as when reviewing road paving schedules. Table No. 7-5 includes an unordered list of Phase III Improvements for Priority 1 and 2 Improvements, and the hydraulic, critical component and asset management status of each improvement. Table No. 7-6 includes the linear footage and estimated cost of each Phase II-Priority 1 and 2 Improvement. The Phase III-Priority 3 Improvements with the highest asset management ratings for Hingham and Hull are included in Table No. 7-7. The remaining Phase III-Priority 3 Improvements are displayed graphically on the Phase III Improvements Map, located in Appendix G.

### Phase III-Priority 1

30. In order to provide ISO needed fire flow of 3,500 gpm on George Washington Boulevard in Hingham, it is recommended that the existing 8-inch diameter water main that runs along George Washington Boulevard be replaced with 12-inch diameter cement lined ductile iron water main. The estimated probable construction cost for installation of approximately 2,360 linear feet of 12-inch diameter water main, including design, construction and contingencies is $531,000.

31. In order to provide ISO needed fire flow of 3,000 gpm on East Gate Lane in Hingham, it is recommended that the existing 8-inch diameter water main that runs along East Gate Lane be replaced with 12-inch diameter cement lined ductile iron water main. The estimated probable construction cost for installation of approximately 1,380 linear feet of 12-inch diameter water main, including design, construction and contingencies is $259,000.

32. In order to provide ISO needed fire flow of 3,500 gpm on Beal Street in Hingham, it is recommended that the existing 8-inch diameter water main that runs along Beal Street be replaced with 12-inch diameter cement lined ductile iron water main. The estimated probable construction cost for installation of approximately 2,500 linear feet of 12-inch diameter water main, including design, construction and contingencies is $540,000.

33. In order to provide the inherent capacity for fire flow, an 8-inch diameter cement lined ductile iron water main is recommended on Rockwood Road from East Street to Ledgewood Circle and on Ledgewood Circle in Hingham. Replacement of the main will also eliminate an asset management concern, as the main has a rating of 56. The estimated probable construction cost for installation of approximately 3,380 linear feet of 8-inch diameter water main, including design, construction and contingencies, is $601,000.

34. In order to provide the inherent capacity for fire flow, it is recommended that the existing 2-inch diameter PVC and 6-inch diameter cast iron mains on Dighton Street in Hull be replaced with an 8-inch diameter cement lined ductile iron water main. The estimated probable construction cost for installation of approximately 700 linear feet of 8-inch diameter water main, including design, construction and contingencies, is $114,000.

### Phase III – Priority 2

35. The existing 2-inch galvanized steel main on Bradford Road in Hingham was installed in 1927. Due to its age the main has a poor asset management rating of 70. In addition, there is an inoperable gate valve at the connection with the water main on Central Street. Due to these factors, it is recommended that the main be replaced with new 8-inch diameter cement lined ductile iron main. The estimated probable construction cost for installation of approximately 540 linear feet of 8-inch diameter water main, including design, construction and contingencies, is $88,000.

36. The existing 6-inch cast iron main on Eldridge Court in Hingham has an asset management rating of 78 due to age and frequent break history. In addition, there is a broken gate valve at the connection with the water main on Water Street. Due to these factors, it is recommended that the main be replaced with new 8-inch diameter cement lined ductile iron main. Replacement of the main will also eliminate a choke point in the system. The estimated probable construction cost for installation of approximately 300 linear feet of 8-inch diameter water main, including design, construction and contingencies, is $87,000.

37. The existing 4-inch cast iron main on Elm Street in Hingham between Hershey Street and Emerald Street has asset management ratings of 68. In addition, there is an inoperable gate valve at the connection with the water main on Hersey Street. Due to these factors, it is recommended that the main be replaced with new 8-inch diameter cement lined ductile iron main. The estimated probable construction cost for installation of approximately 800 linear feet of 8-inch diameter water main, including design, construction and contingencies, is $130,000.

38. A 6-inch and 8-inch diameter AC main currently runs along Brewster Road in Hingham. The main has experience frequent breaks, leading to its asset management rating of 61. In addition, the main was installed at a shallow depth, requiring the use of bleeder to prevent main freezing. It is recommended that the main be replaced with 8-inch cement lined ductile iron water main, to eliminate the bleeder and asset management issues. The estimated probable construction cost for

installation of approximately 2,500 linear feet of 8-inch diameter water main, including design, construction and contingencies, is $516,000.

39. The existing 2¼-inch diameter unlined cast iron main on East Street in Hingham near the Cohasset Town Line has an asset management rating of 74 due its age. In addition, the main was installed to a shallow depth, requiring the use of a bleeder. In order to eliminate the bleeder to conserve water, as well as strengthen the interconnection to the Cohasset water system, it is recommended that the main be replaced with 8-inch diameter cement lined ductile iron water main. The estimated probable construction cost for installation of approximately 650 linear feet of 8-inch diameter water main, including design, construction and contingencies, is $155,000.

40. The existing 1-inch and 2-inch diameter galvanized steel main on Elmore Road in Hingham was installed to a shallow depth, requiring the use of a bleeder. In addition, the 1-inch and 2-inch mains are dead ended, preventing proper turnover. The mains have an asset management rating of 65 due to their age and break history. It is recommended that the main is replaced with 8-inch diameter cement lined ductile iron water main along the entire length of Elmore Road to eliminate these concerns. The estimated probable construction cost for installation of approximately 730 linear feet of 8-inch diameter water main, including design, construction and contingencies, is $151,000.

41. A 2¼-inch and 2-inch diameter cast iron and galvanized steel main currently runs along Hayes Road in Hingham. The main has an asset management rating of 69 due to its age. In addition, the main was installed at a shallow depth, requiring the use of bleeder to prevent main freezing. It is recommended that the main be replaced with 8-inch cement lined ductile iron water main, to eliminate the bleeder and asset management issues. The estimated probable construction cost for installation of approximately 420 linear feet of 8-inch diameter water main, including design, construction and contingencies, is $121,000.

42. The existing 6-inch diameter main on the majority of Manomet Avenue in Hull has an asset management rating of 68 due to its age, material, break history, and that it is located in corrosive soil. In addition, the gate valve at Kenberma Street is inoperable. Due to these factors, it is recommended that the main be replaced with 8-inch diameter cement lined ductile iron main. The estimated probable construction cost for installation of approximately 5,400 linear feet of 8-inch diameter water main, including design, construction and contingencies, is $878,000.

43. The existing 6-inch diameter main on Whitehead Avenue from Nantasket Avenue to Nantasket Road in Hull has an asset management rating of 68 due to its age, material, break history, and that it is located in corrosive soil. In addition, the gate valve at 5th Street is inoperable. Due to these factors, it is recommended that the main be replaced with 8-inch diameter cement lined ductile iron main. The estimated probable construction cost for installation of approximately 2,070 linear

feet of 8-inch diameter water main, including design, construction and contingencies, is $337,000.

44. The existing 4-inch diameter main on Sunset Avenue in Hull has an asset management rating of 78. The main was installed in 1893 at a shallow depth, requiring the use of a bleeder. It is recommended that the main be replaced with 8-inch diameter cement lined ductile iron main. The estimated probable construction cost for installation of approximately 1,400 linear feet of 8-inch diameter water main, including design, construction and contingencies, is $228,000.

45. The existing 4-inch diameter and 2-inch diameter water mains on T Street in Hull have an asset management rating of 75. The mains were installed circa 1900 at a shallow depth, requiring the use of a bleeder. It is recommended that the mains be replaced with 8-inch diameter cement lined ductile iron main. The estimated probable construction cost for installation of approximately 840 linear feet of 8-inch diameter water main, including design, construction and contingencies, is $137,000.

**Table No. 7-1**
**Prioritization of Improvements - Phase I**

| Item No. | Location | From | To | Town | Hydraulically Deficient? | Critical Area? | Asset Management Rating |
|---|---|---|---|---|---|---|---|
| 1 | Pleasant Street | Main Street | Middle Street | Hingham | Yes | Yes | 66 |
| 2 | Beach Avenue | L Street | X Street | Hull | Yes | Yes | 63 |
| | X Street | | | Hull | No | No | 73 |
| 3 | Downer Avenue | Otis Street | Planters Field Lane | Hingham | Yes | Yes | 63 |
| 4 | Hull Street | Canterbury Street | Spruce Street | Hingham | Yes | Yes | 63 |
| | Spruce Street | | | Hingham | Yes | No | 27 |
| 5 | Atlantic Avenue | Gunrock Avenue | Jerusalem Road | Hull | Yes | No | 73 |
| | Summit Avenue | | | Hull | Yes | No | 68 |
| 6 | Edgewater Road | Nantasket Avenue | Existing 6-inch | Hull | Yes | No | 63 |
| 7 | Nutty Hill Road | | | Hingham | Yes | Yes | 64 |
| | Hemlock Road | High Street | Nutty Hill Road | Hingham | Yes | Yes | 64 |
| 8 | Liberty Pole Road | Main Street | Colonial Road | Hingham | No | Yes | 66 |

**Table No. 7-2**
**Estimated Improvement Costs - Phase I**

| Item No. | Location | From | To | Town | Water Main Diameter (in.) | Length (LF) | Estimated Cost |
|---|---|---|---|---|---|---|---|
| 1 | Pleasant Street | Main Street | Middle Street | Hingham | 8 | 1,500 | $281,000 |
| 2 | Beach Avenue | L Street | X Street | Hull | 12 | 1,770 | $332,000 |
| | X Street | | | Hull | 8 | 370 | $107,000 |
| 3 | Downer Avenue | Otis Street | Planters Field Lane | Hingham | 8 | 1,450 | $271,000 |
| 4 | Hull Street | Canterbury Street | Spruce Street | Hingham | 8 | 860 | $161,000 |
| | Spruce Street | | | Hingham | 8 | 880 | $143,000 |
| 5 | Atlantic Ave | Gunrock Avenue | Jerusalem Road | Hull | 12 | 3,500 | $755,000 |
| | Summit Avenue | | | Hull | 8 | 1,200 | $195,000 |
| 6 | Edgewater Road | Nantasket Avenue | Existing 6-inch | Hull | 8 | 480 | $138,000 |
| 7 | Nutty Hill Road | | | Hingham | 8 | 650 | $106,000 |
| | Hemlock Road | High Street | Nutty Hill Road | Hingham | 8 | 850 | $139,000 |
| 8 | Liberty Pole Road | Main Street | Colonial Road | Hingham | 8 | 2,100 | $434,000 |
| **Total Estimated Phase I Cost:** | | | | | | | **$3,062,000** |

**Table No. 7-3**
**Prioritization of Improvements - Phase II**

| Item No. | Location | From | To | Town | Hydraulically Deficient? | Critical Area? | Asset Management |
|---|---|---|---|---|---|---|---|
| 9 | Park Avenue | Wyola Road | Shore Garden Road | Hull | Yes | No | 68 |
| | Wyola Road | Rock View Road | Logan Avenue | Hull | Yes | No | 32 |
| | Rockaway Avenue | Wyola Road | Alsada Road | Hull | Yes | No | - |
| 10 | Mayflower Avenue | | | Hull | Yes | No | 68 |
| | Hampton Circle | Moreland Avenue | Mayflower Avenue | Hull | Yes | No | 58 |
| 11 | Grist Mill Lane | | | Hingham | Yes | No | 40 |
| | Howland Lane | Whitcomb Avenue | Grist Mill Lane | Hingham | Yes | No | 61 |
| | Whitcomb Avenue | High Street | Howland Lane | Hingham | Yes | No | 61 |
| 12 | Howe Street | | | Hingham | Yes | No | 61 |
| 13 | Keith Way | | | Hingham | Yes | Yes | 9 |
| | Recreation Park Drive | Derby St. | Keith Way | Hingham | Yes | Yes | 12 |
| 14 | Channel Street | Helen Street | Town Way | Hull | No | Yes | 71 |
| 15 | O Street | Central Avenue | Nantasket Avenue | Hull | No | Yes | 75 |
| 16 | Beach Avenue | A Street | L Street | Hull | No | Yes | 68 |
| 17 | Carleton Road | | High Street | Hingham | Yes | Yes | - |
| 18 | Pinegrove Road | | | Hingham | Yes | Yes | 17 |
| | Main Street | Pinegrove Road | Gardner Road | Hingham | Yes | Yes | 53 |
| 19 | Simmons Road | | | Hingham | No | No | 63 |

| Table No. 7-3 (Continued)<br>Prioritization of Improvements - Phase II | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Item No.** | **Location** | **From** | **To** | **Town** | **Hydraulically Deficient?** | **Critical Area?** | **Asset Management** |
| **20** | N Street | Central Avenue | Nantasket Avenue | Hull | No | Yes | 68 |
| **21** | M Street | Central Avenue | Cadish Avenue | Hull | No | Yes | 73 |
| | K Street | Central Avenue | Cadish Avenue | Hull | No | Yes | 78 |
| | H Street | Central Avenue | Cadish Avenue | Hull | No | Yes | 73 |
| **22** | Central Avenue | A Street | Q Street | Hull | No | Yes | 78 |
| **23** | Summit Drive | | | Hingham | Yes | No | 66 |
| | Harborview Drive | Thaxter Street | Summit Drive | Hingham | Yes | No | 61 |
| **24** | Otis Hill Road | Broad Cover Road | Gov. Long Road | Hingham | No | Yes | 79 |
| **25** | Downing Street | | | Hingham | No | Yes | 64 |
| **26** | Independence Lane | Liberty Pole Road | Colonial Road | Hingham | No | Yes | 66 |
| **27** | Hull Street | Clark Drive | Existing 8-inch | Hingham | No | Yes | 64 |
| | Clark Drive | | | Hingham | No | Yes | 65 |
| **28** | High Street | Tower Road | Whitehorse Rd | Hingham | No | Yes | 64 |
| **29** | Smith Road | | | Hingham | Yes | No | 61 |
| | Hobart Street | Main Street | Smith Road | Hingham | Yes | No | 63 |

**Table No. 7-4**
**Estimated Improvement Costs - Phase II**

| Item No. | Location | From | To | Town | Water Main Diameter (in.) | Length (LF) | Estimated Cost |
|---|---|---|---|---|---|---|---|
| 9 | Park Avenue | Wyola Road | Shore Garden Road | Hull | 8 | 200 | $58,000 |
| | Wyola Road | Rock View Road | Logan Avenue | Hull | 8 | 900 | $147,000 |
| | Rockaway Avenue | Wyola Road | Alsada Road | Hull | 8 | 250 | $72,000 |
| 10 | Mayflower Avenue | | | Hull | 8 | 550 | $104,000 |
| | Hampton Circle | Moreland Avenue | Mayflower Avenue | Hull | 8 | 200 | $58,000 |
| 11 | Grist Mill Lane | | | Hingham | 8 | 850 | $139,000 |
| | Howland Lane | Whitcomb Avenue | Grist Mill Lane | Hingham | 8 | 800 | $130,000 |
| | Whitcomb Avenue | High Street | Howland Lane | Hingham | 8 | 1,950 | $317,000 |
| 12 | Howe Street | | | Hingham | 8 | 1,970 | $321,000 |
| 13 | Keith Way | | | Hingham | 16 | 850 | $160,000 |
| | Recreation Park Drive | Derby St. | Keith Way | Hingham | 16 | 1,600 | $300,000 |
| 14 | Channel Street | Helen Street | Town Way | Hull | 8 | 710 | $116,000 |
| 15 | O Street | Central Avenue | Nantasket Avenue | Hull | 8 | 730 | $119,000 |
| 16 | Beach Avenue | A Street | L Street | Hull | 12 | 7,100 | $1,332,000 |
| 17 | Carleton Road | | High Street | Hingham | 8 | 500 | $166,000 |
| 18 | Pinegrove Road | | | Hingham | 12 | 1,370 | $257,000 |
| | Main Street | Pinegrove Road | Gardner Road | Hingham | 12 | 1,900 | $357,000 |
| 19 | Simmons Road | | | Hingham | 8 | 1,060 | $173,000 |

**Table No. 7-4 (Continued)**
**Estimated Improvement Costs - Phase II**

| Item No. | Location | From | To | Town | Water Main Diameter (in.) | Length (LF) | Estimated Cost |
|---|---|---|---|---|---|---|---|
| 20 | N Street | Central Avenue | Nantasket Avenue | Hull | 8 | 730 | $119,000 |
| 21 | M Street | Central Avenue | Cadish Avenue | Hull | 8 | 470 | $136,000 |
| | K Street | Central Avenue | Cadish Avenue | Hull | 8 | 600 | $98,000 |
| | H Street | Central Avenue | Cadish Avenue | Hull | 8 | 720 | $117,000 |
| 22 | Central Avenue | A Street | Q Street | Hull | 8 | 3,340 | $543,000 |
| 23 | Summit Drive | | | Hingham | 8 | 1,190 | $194,000 |
| | Harborview Drive | Thaxter Street | Summit Drive | Hingham | 8 | 610 | $100,000 |
| 24 | Otis Hill Road | Broad Cover Road | Gov. Long Road | Hingham | 8 | 1,330 | $217,000 |
| 25 | Downing Street | | | Hingham | 8 | 1,140 | $186,000 |
| 26 | Independence Lane | Liberty Pole Road | Colonial Road | Hingham | 8 | 1,900 | $392,000 |
| 27 | Hull Street | Clark Drive | Existing 8-inch | Hingham | 8 | 530 | $100,000 |
| | Clark Drive | | | Hingham | 8 | 530 | $87,000 |
| 28 | High Street | Tower Road | Whitehorse Rd | Hingham | 8 | 2,210 | $413,000 |
| 29 | Smith Road | | | Hingham | 8 | 1,960 | $319,000 |
| | Hobart Street | Main Street | Smith Road | Hingham | 8 | 1,500 | $252,000 |
| | | | | | | **Total Estimated Phase II Cost:** | **$7,599,000** |

**Table No. 7-5**
**Prioritization of Improvements - Phase III**
**Priority 1**

| Item No. | Location | From | To | Town | Hydraulically Deficient? | Critical Area? | Asset Management |
|---|---|---|---|---|---|---|---|
| **30** | George Washington Boulevard | | | Hingham | Yes | No | 25 |
| **31** | East Gate Lane | | | Hingham | Yes | No | 37 |
| **32** | Beal Street | Lincoln Street | Tuckers Lane | Hingham | Yes | No | 25 |
| **33** | Rockwood Road | East Street | Ledgewood Circle | Hingham | Yes | No | 59 |
| | Ledgewood Circle | | | Hingham | Yes | No | 59 |
| **34** | Dighton Street | | | Hull | Yes | No | 20 |

## Table No. 7-5 (Continued)
## Prioritization of Improvements - Phase III

### Priority 2

| Item No. | Location | From | To | Town | Hydraulically Deficient? | Critical Area? | Asset Management |
|---|---|---|---|---|---|---|---|
| **35** | Bradford Road | | | Hingham | No | No | 70 |
| **36** | Eldridge Court | Green Street | Water Street | Hingham | No | No | 78 |
| **37** | Elm Street | Hershey Street | Emerald Street | Hingham | No | No | 68 |
| **38** | Brewster Road | | | Hingham | No | No | 61 |
| **39** | East Street | Near Cohasset Town Line | | Hingham | No | No | 74 |
| **40** | Elmore Road | | | Hingham | No | No | 65 |
| **41** | Hayes Road | | | Hingham | No | No | 69 |
| **42** | Manomet Avenue | | | Hull | No | No | 68 |
| **43** | Whitehead Avenue | Nantasket Road | Nantasket Avenue | Hull | No | No | 68 |
| **44** | Sunset Avenue | | | Hull | No | No | 78 |
| **45** | T Street | | | Hull | No | No | 75 |

**Table No. 7-6**
**Estimated Improvement Costs - Phase III**

**Priority 1**

| Item No. | Location | From | To | Town | Water Main Diameter (in.) | Length (LF) | Estimated Cost |
|---|---|---|---|---|---|---|---|
| **30** | George Washington Boulevard | | | Hingham | 12 | 2,360 | $531,000 |
| **31** | East Gate Lane | | | Hingham | 12 | 1,380 | $259,000 |
| **32** | Beal Street | Lincoln Street | Tuckers Lane | Hingham | 12 | 2,500 | $540,000 |
| **33** | Rockwood Road | East Street | Ledgewood Circle | Hingham | 8 | 2,970 | $483,000 |
| | Ledgewood Circle | | | Hingham | 8 | 410 | $118,000 |
| **34** | Dighton Street | | | Hull | 8 | 700 | $114,000 |

| Table No. 7-6 (Continued)<br>Estimated Improvement Costs - Phase III<br>Priority 2 | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Item No.** | **Location** | **From** | **To** | **Town** | **Water Main Diameter (in.)** | **Length (LF)** | **Estimated Cost** |
| **35** | Bradford Road | | | Hingham | 8 | 540 | $88,000 |
| **36** | Eldridge Court | Green Street | Water Street | Hingham | 8 | 300 | $87,000 |
| **37** | Elm Street | Hershey Street | Emerald Street | Hingham | 8 | 800 | $130,000 |
| **38** | Brewster Road | | | Hingham | 8 | 2,500 | $516,000 |
| **39** | East Street | Cohasset Town Line | | Hingham | 8 | 650 | $155,000 |
| **40** | Elmore Road | | | Hingham | 8 | 730 | $151,000 |
| **41** | Hayes Road | | | Hingham | 8 | 420 | $121,000 |
| **42** | Manomet Avenue | | | Hull | 8 | 5,400 | $878,000 |
| **43** | Whitehead Avenue | Nantasket Road | Nantasket Avenue | Hull | 8 | 2,070 | $337,000 |
| **44** | Sunset Avenue | | | Hull | 8 | 1,400 | $228,000 |
| **45** | T Street | | | Hull | 8 | 840 | $137,000 |
| **Total Estimated Phase III – Priority 1 and 2 Cost:** | | | | | | | **$4,873,000** |

**Table No. 7-7**
**Prioritization of Improvements and Estimated Improvement Costs-Phase III – Priority 3**

**Hingham**

| Item No. | Location | From | To | Asset Management Rating | Water Main Diameter (in) | Length (LF) | Estimated Cost |
|---|---|---|---|---|---|---|---|
| 1 | Off South Street | Opposite Cresswell Lane | | 80 | 8 | 200 | $ 58,000 |
| 2 | Crow Point Lane | Lincoln Street | End | 80 | 8 | 425 | $123,000 |
| 3 | Downer Avenue | Lincoln Street | Crow Point Lane | 78 | 8 | 1,000 | $163,000 |
| 4 | Bayberry Road | Bradley Woods Drive | Sycamore Lane | 76 | 8 | 500 | $144,000 |
| 5 | Meadow Road | Rockland Street | Cliff Road | 76 | 8 | 500 | $144,000 |
| | Cliff Road | Meadow Road | End | 74 | 8 | 700 | $114,000 |
| 6 | Causeway Road | Downer Avenue | End | 75 | 8 | 650 | $106,000 |
| 7 | Crowes Lane | Hershey Street | End | 75 | 8 | 700 | $114,000 |
| 8 | Beach Road | Wompatuck Road | End | 74 | 8 | 700 | $114,000 |
| | Beach Lane | Wompatuck Road | End | 74 | 8 | 250 | $ 72,000 |
| 9 | Rhodes Place | | | 74 | 8 | 550 | $159,000 |
| 10 | Forget Me Not Lane | | | 74 | 8 | 300 | $ 87,000 |
| 11 | Alden Road | | | 74 | 8 | 330 | $ 95,000 |
| 12 | Bradley Hill Road | | | 61-74 | 8 | 1050 | $171,000 |

| Table No. 7-7 (Continued)<br>Prioritization of Improvements and Estimated Improvement Costs-Phase III – Priority 3 | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Hull** | | | | | | | |
| **Item No.** | **Location** | **From** | **To** | **Asset Management Rating** | **Water Main Diameter (in)** | **Length (LF)** | **Estimated Cost** |
| 1 | Wharf Avenue | 8-inch DI main | End | 83 | 8 | 125 | $ 36,000 |
| 2 | Newport Road | Nantasket Road | Warfield Avenue | 83 | 8 | 2,350 | $382,000 |
| 3 | C Street | Central Avenue | End of 4-inch | 83 | 8 | 1,150 | $187,000 |
| 4 | B Street | | | 83 | 8 | 1,800 | $293,000 |
| 5 | D Street | | | 81 | 8 | 2,050 | $334,000 |
| 6 | G Street | Central Avenue | Unlined Cast Iron | 81 | 8 | 350 | $101,000 |
| | G Street | Cadish Avenue | Ductile Iron | 76 | 8 | 350 | $101,000 |
| | G Street | Nantasket Avenue | Beach Avenue | 70 | 8 | 650 | $106,000 |
| 7 | Harold Place | | | 80 | 8 | 215 | $ 62,000 |
| 8 | Alden Street | | | 80 | 8 | 400 | $115,000 |
| 9 | Nantasket Road | 8-inch | Clifton Avenue | 78 | 8 | 550 | $ 90,000 |
| 10 | Warren Street | Nantasket Avenue | Manomet Avenue | 78 | 8 | 800 | $130,000 |
| 11 | Lewis Street | Nantasket Avenue | Beach Avenue | 63-78 | 8 | 900 | $147,000 |


N
Legend
Service Area Boundary
Water Main Diameter
4-Inch or Smaller
6-Inch
8-Inch
10-Inch
12-Inch
14-Inch
16-Inch
18-Inch
20-Inch
24-Inch
Hull Booster Pump Station
Atlantic Ocean
Hingham Harbor
HULL
Straits Pond
Interconnection with Cohasset
Turkey Hill Standpipe
Capacity: 2.0 mg
Overflow Elevation: 240 feet
Downing Street Well
Accord Brook
Triphammer Pond
HINGHAM
COHASSET
Lily Pond
Interconnection with Weymouth
WEYMOUTH
Free Street Well No. 4
Free Street Well No. 2
Free Street Well No. 3
Free Street Well No. 5
Crooked Meadow River
Fulling Mill Brook
Fulling Mill Well
Hingham Water Treatment Facility
Capacity: 7.7 mgd
Prospect Street Well
Scotland Street Well
Aaron Reservoir
SCITUATE
NORWELL
Accord Brook Pond
Accord Pond
Accord Tank
Capacity: 0.75 mg
Overflow Elevation: 282 feet
Water Distribution System
Hingham/Hull, Massachusetts
Aquarion Water Company
TATA & HOWARD
Water and Wastewater Consultants
MARCH 2011
Approximate Scale: 1" = 1,500'

# Asset Management Pipe Input Data
## Capital Efficiency Study
## Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 1390 | P-207 | 8 | Ductile Iron | 1990 | 0 | 0 | FALSE |
| 1392 | P-238 | 24 | Ductile Iron | 1995 | 0 | 0 | FALSE |
| 1393 | P-239 | 12 | Factory Lined Cast Iron | 1973 | 2.2 | 0 | FALSE |
| 1394 | P-240 | 8 | Factory Lined Cast Iron | 1973 | 0 | 0 | FALSE |
| 1395 | P-242 | 8 | Ductile Iron | 1984 | 0 | 0 | FALSE |
| 1396 | P-249 | 12 | Unlined Cast Iron | 1910 | 0 | 0 | FALSE |
| 1397 | P-251 | 8 | Factory Lined Cast Iron | 1965 | 0 | 0 | TRUE |
| 1398 | P-252 | 8 | Ductile Iron | 1987 | 0 | 1 | FALSE |
| 1399 | Charles St | 8 | Factory Lined Cast Iron | 1973 | 0.7 | 0 | FALSE |
| 1400 | P-254 | 8 | Factory Lined Cast Iron | 1973 | 0.7 | 0 | FALSE |
| 1401 | P-255 | 8 | Factory Lined Cast Iron | 1981 | 0 | 0 | FALSE |
| 1402 | South Pleasant St | 24 | Ductile Iron | 1995 | 0 | 1 | FALSE |
| 1403 | P-259 | 8 | Factory Lined Cast Iron | 1962 | 0 | 0 | FALSE |
| 1405 | P-262 | 8 | Asbestos Cement | 1951 | 0 | 0 | TRUE |
| 1406 | P-263 | 8 | Asbestos Cement | 1951 | 0 | 0 | TRUE |
| 1407 | P-264 | 8 | Asbestos Cement | 1951 | 0 | 0 | TRUE |
| 1408 | P-265 | 8 | Factory Lined Cast Iron | 1961 | 0 | 0 | FALSE |
| 1409 | P-266 | 8 | Ductile Iron | 1978 | 0 | 0 | FALSE |
| 1411 | P-268 | 8 | Ductile Iron | 1973 | 0 | 0 | TRUE |
| 1412 | P-269 | 6 | Unlined Cast Iron | 1951 | 0.9 | 0 | TRUE |
| 1413 | P-270 | 6 | Unlined Cast Iron | 1939 | 0 | 0 | TRUE |
| 1414 | P-271 | 6 | Unlined Cast Iron | 1939 | 0 | 0 | TRUE |
| 1415 | P-273 | 6 | Asbestos Cement | 1950 | 0 | 0 | FALSE |
| 1416 | P-274 | 6 | Asbestos Cement | 1950 | 0 | 0 | FALSE |
| 1418 | P-277 | 24 | Ductile Iron | 1995 | 0 | 0 | TRUE |
| 1419 | P-278 | 8 | Asbestos Cement | 1951 | 0 | 0 | TRUE |
| 1420 | P-279 | 24 | Ductile Iron | 1995 | 0 | 0 | TRUE |
| 1421 | P-281 | 20 | Unlined Cast Iron | 1910 | 0.6 | 0 | TRUE |
| 1423 | P-283 | 8 | Asbestos Cement | 1956 | 0 | 0 | FALSE |
| 1424 | P-284 | 8 | Unlined Cast Iron | 1957 | 0 | 0 | FALSE |
| 1425 | P-285 | 8 | Factory Lined Cast Iron | 1962 | 0 | 0 | FALSE |
| 1426 | P-288 | 6 | Factory Lined Cast Iron | 1963 | 0 | 0 | FALSE |
| 1427 | P-289 | 8 | Ductile Iron | 1987 | 0 | 0 | FALSE |
| 1428 | P-290 | 8 | Factory Lined Cast Iron | 1962 | 0 | 0 | FALSE |
| 1429 | P-291 | 8 | Factory Lined Cast Iron | 1976 | 0 | 0 | FALSE |
| 1430 | P-292 | 6 | Unlined Cast Iron | 1951 | 0.9 | 0 | TRUE |
| 1431 | P-293 | 6 | Unlined Cast Iron | 1951 | 0.9 | 0 | TRUE |
| 1432 | P-294 | 6 | Unlined Cast Iron | 1951 | 0.9 | 0 | TRUE |
| 1433 | P-295 | 8 | Asbestos Cement | 1951 | 0 | 0 | FALSE |
| 1434 | P-296 | 8 | Asbestos Cement | 1951 | 0 | 0 | TRUE |
| 1435 | P-297 | 8 | Asbestos Cement | 1951 | 0 | 0 | TRUE |

# Asset Management Pipe Input Data
## Capital Efficiency Study
## Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 1436 | P-299 | 8 | Ductile Iron | 1987 | 1.5 | 0 | TRUE |
| 1437 | P-300 | 8 | Ductile Iron | 1987 | 0 | 1 | TRUE |
| 1438 | P-301 | 6 | Unlined Cast Iron | 1955 | 0 | 0 | TRUE |
| 1439 | P-302 | 6 | Unlined Cast Iron | 1955 | 0.9 | 0 | TRUE |
| 1440 | P-303 | 6 | Unlined Cast Iron | 1955 | 0.9 | 0 | TRUE |
| 1441 | P-304 | 6 | Unlined Cast Iron | 1955 | 0.9 | 0 | TRUE |
| 1442 | P-305 | 6 | Factory Lined Cast Iron | 1962 | 1.7 | 0 | TRUE |
| 1443 | P-306 | 6 | Unlined Cast Iron | 1955 | 1.55 | 0 | TRUE |
| 1444 | Berkley Rd | 8 | Ductile Iron | 1974 | 0 | 1 | TRUE |
| 1445 | P-308 | 8 | Factory Lined Cast Iron | 1974 | 0 | 0 | TRUE |
| 1446 | P-309 | 8 | Ductile Iron | 1974 | 0 | 1 | FALSE |
| 1447 | P-310 | 8 | Ductile Iron | 1974 | 0 | 0 | FALSE |
| 1448 | P-311 | 8 | Ductile Iron | 1974 | 0 | 0 | FALSE |
| 1449 | P-313 | 8 | Asbestos Cement | 1951 | 0 | 0 | TRUE |
| 1450 | P-314 | 8 | Factory Lined Cast Iron | 1960 | 0 | 0 | TRUE |
| 1451 | P-316 | 8 | Factory Lined Cast Iron | 1960 | 0 | 0 | TRUE |
| 1452 | P-318 | 6 | Factory Lined Cast Iron | 1963 | 0 | 0 | TRUE |
| 1453 | P-319 | 8 | Factory Lined Cast Iron | 1963 | 0 | 0 | TRUE |
| 1454 | High St | 8 | Asbestos Cement | 1951 | 0 | 0 | TRUE |
| 1455 | P-321 | 12 | Ductile Iron | 1987 | 0 | 0 | TRUE |
| 1456 | P-322 | 8 | Asbestos Cement | 1952 | 0 | 0 | TRUE |
| 1457 | P-323 | 8 | Ductile Iron | 1983 | 0 | 0 | TRUE |
| 1458 | P-324 | 8 | Asbestos Cement | 1952 | 0 | 0 | TRUE |
| 1459 | P-325 | 8 | Asbestos Cement | 1951 | 0 | 0 | FALSE |
| 1461 | P-327 | 8 | Factory Lined Cast Iron | 1964 | 0 | 0 | TRUE |
| 1462 | P-330 | 8 | Factory Lined Cast Iron | 1974 | 0 | 0 | FALSE |
| 1463 | P-331 | 8 | Ductile Iron | 1975 | 0 | 0 | FALSE |
| 1464 | P-332 | 12 | Factory Lined Cast Iron | 1970 | 0 | 0 | FALSE |
| 1466 | P-334 | 8 | Ductile Iron | 1976 | 0 | 0 | FALSE |
| 1467 | French St | 12 | Factory Lined Cast Iron | 1970 | 0.4 | 0 | FALSE |
| 1468 | P-337 | 8 | Ductile Iron | 1976 | 0 | 0 | FALSE |
| 1469 | P-338 | 8 | Ductile Iron | 1976 | 0 | 0 | FALSE |
| 1470 | P-339 | 8 | Ductile Iron | 1976 | 0 | 0 | FALSE |
| 1471 | P-340 | 8 | Ductile Iron | 1976 | 0 | 0 | FALSE |
| 1472 | P-341 | 8 | Ductile Iron | 1989 | 0 | 0 | FALSE |
| 1473 | P-342 | 8 | Ductile Iron | 1989 | 0 | 0 | FALSE |
| 1474 | P-343 | 8 | Ductile Iron | 1989 | 0 | 0 | FALSE |
| 1475 | P-344 | 12 | Ductile Iron | 1981 | 0.4 | 0 | FALSE |
| 1476 | P-345 | 8 | Ductile Iron | 1983 | 0 | 1 | FALSE |
| 1477 | P-346 | 8 | Ductile Iron | 1985 | 0 | 0 | FALSE |
| 1478 | P-347 | 8 | Ductile Iron | 1985 | 0 | 0 | FALSE |

# Asset Management Pipe Input Data
## Capital Efficiency Study
## Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 1479 | P-348 | 8 | Ductile Iron | 1976 | 0 | 0 | FALSE |
| 1480 | Hobart St | 8 | Ductile Iron | 1976 | 0 | 1 | FALSE |
| 1481 | P-350 | 8 | Factory Lined Cast Iron | 1975 | 0 | 0 | FALSE |
| 1482 | P-351 | 8 | Factory Lined Cast Iron | 1975 | 0 | 0 | FALSE |
| 1483 | P-352 | 6 | Factory Lined Cast Iron | 1962 | 0 | 0 | FALSE |
| 1484 | P-353 | 8 | Factory Lined Cast Iron | 1967 | 0 | 0 | TRUE |
| 1485 | P-354 | 8 | Factory Lined Cast Iron | 1967 | 0 | 1 | FALSE |
| 1486 | P-355 | 8 | Factory Lined Cast Iron | 1967 | 0 | 0 | FALSE |
| 1487 | P-356 | 8 | Ductile Iron | 1977 | 0 | 1 | FALSE |
| 1489 | P-358 | 8 | Factory Lined Cast Iron | 1969 | 0 | 1 | TRUE |
| 1490 | P-359 | 6 | Factory Lined Cast Iron | 1970 | 0 | 1 | FALSE |
| 1491 | P-360 | 8 | Ductile Iron | 1977 | 0 | 1 | FALSE |
| 1492 | P-361 | 8 | Ductile Iron | 1977 | 0 | 1 | FALSE |
| 1493 | P-362 | 8 | Ductile Iron | 1977 | 0 | 1 | FALSE |
| 1494 | P-363 | 20 | Ductile Iron | 1995 | 0 | 0 | FALSE |
| 1496 | Free St | 8 | Asbestos Cement | 1960 | 3.7 | 0 | FALSE |
| 1498 | Union St | 8 | Asbestos Cement | 1965 | 2.8 | 0 | FALSE |
| 1499 | P-368 | 8 | Ductile Iron | 1981 | 0 | 0 | FALSE |
| 1500 | P-369 | 6 | Ductile Iron | 1981 | 0 | 0 | FALSE |
| 1501 | P-370 | 8 | Ductile Iron | 1981 | 0 | 0 | FALSE |
| 1502 | P-371 | 8 | Ductile Iron | 1981 | 0 | 0 | FALSE |
| 1503 | P-372 | 8 | Ductile Iron | 1981 | 0 | 0 | FALSE |
| 1504 | P-373 | 8 | Ductile Iron | 1981 | 0 | 1 | FALSE |
| 1505 | P-374 | 8 | Asbestos Cement | 1965 | 2.8 | 0 | FALSE |
| 1506 | P-375 | 8 | Ductile Iron | 1965 | 0 | 0 | FALSE |
| 1507 | P-378 | 8 | Factory Lined Cast Iron | 1966 | 0 | 1 | FALSE |
| 1508 | P-379 | 8 | Factory Lined Cast Iron | 1966 | 0 | 0 | FALSE |
| 1509 | Union Street | 20 | Prestressed Concrete | 1952 | 0 | 0 | FALSE |
| 1510 | P-381 | 6 | Unlined Cast Iron | 1923 | 0 | 0 | FALSE |
| 1511 | P-386 | 8 | Factory Lined Cast Iron | 1966 | 0 | 0 | FALSE |
| 1512 | Middle St | 20 | Prestressed Concrete | 1952 | 0 | 0 | FALSE |
| 1513 | P-387 | 20 | Prestressed Concrete | 1952 | 0 | 0 | FALSE |
| 1514 | P-390 | 6 | Unlined Cast Iron | 1916 | 0 | 0 | FALSE |
| 1515 | P-391 | 6 | Unlined Cast Iron | 1923 | 0 | 0 | FALSE |
| 1517 | P-393 | 8 | Asbestos Cement | 1956 | 0.9 | 0 | FALSE |
| 1518 | P-395 | 6 | Asbestos Cement | 1953 | 2 | 0 | FALSE |
| 1519 | P-397 | 6 | Asbestos Cement | 1953 | 0 | 0 | FALSE |
| 1520 | P-399 | 8 | Asbestos Cement | 1956 | 0.9 | 0 | FALSE |
| 1522 | Main Str | 20 | Unlined Cast Iron | 1910 | 0.6 | 0 | FALSE |
| 1523 | P-403 | 10 | Unlined Cast Iron | 1918 | 0 | 0 | FALSE |
| 1524 | P-406 | 20 | Unlined Cast Iron | 1910 | 0.6 | 0 | FALSE |



Prepared by or under the supervision of: Robert L. Roland

**Asset Management Pipe Input Data**
**Capital Efficiency Study**
**Aquarion Water Company - Hingham/Hull Water System**

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 1525 | P-407 | 20 | Unlined Cast Iron | 1910 | 0 | 0 | FALSE |
| 1527 | Short Street | 20 | Unlined Cast Iron | 1910 | 0 | 0 | FALSE |
| 1528 | P-410 | 12 | Unlined Cast Iron | 1948 | 0 | 0 | FALSE |
| 1529 | P-412 | 8 | Ductile Iron | 1985 | 0 | 0 | FALSE |
| 1530 | P-413 | 8 | Ductile Iron | 1985 | 0 | 0 | FALSE |
| 1531 | P-414 | 6 | Unlined Cast Iron | 1913 | 0 | 0 | FALSE |
| 1532 | P-415 | 6 | Unlined Cast Iron | 1913 | 0 | 0 | FALSE |
| 1533 | P-417 | 8 | Unlined Cast Iron | 1927 | 0 | 0 | FALSE |
| 1534 | P-418 | 6 | Unlined Cast Iron | 1937 | 0 | 0 | FALSE |
| 1535 | P-419 | 8 | Ductile Iron | 1985 | 0 | 0 | FALSE |
| 1536 | P-421 | 20 | Unlined Cast Iron | 1910 | 0.6 | 0 | TRUE |
| 1537 | P-422 | 6 | Unlined Cast Iron | 1939 | 0 | 0 | TRUE |
| 1541 | Hersey Street | 6 | Unlined Cast Iron | 1899 | 0 | 0 | TRUE |
| 1542 | P-427 | 6 | Unlined Cast Iron | 1899 | 0 | 0 | TRUE |
| 1543 | P-428 | 20 | Unlined Cast Iron | 1910 | 0.6 | 0 | TRUE |
| 1544 | P-429 | 6 | Unlined Cast Iron | 1927 | 0 | 0 | TRUE |
| 1545 | P-430 | 6 | Unlined Cast Iron | 1931 | 0 | 0 | TRUE |
| 1547 | P-432 | 8 | Ductile Iron | 1983 | 0 | 0 | FALSE |
| 1548 | P-433 | 6 | Unlined Cast Iron | 1899 | 0 | 0 | TRUE |
| 1549 | P-435 | 6 | Unlined Cast Iron | 1937 | 0 | 0 | FALSE |
| 1552 | P-438 | 6 | Asbestos Cement | 1955 | 0 | 0 | TRUE |
| 1553 | P-439 | 20 | Unlined Cast Iron | 1910 | 0.6 | 0 | TRUE |
| 1554 | P-440 | 6 | Unlined Cast Iron | 1939 | 0 | 0 | TRUE |
| 1555 | P-441 | 20 | Unlined Cast Iron | 1910 | 0.6 | 0 | TRUE |
| 1556 | P-442 | 20 | Unlined Cast Iron | 1910 | 0 | 0 | FALSE |
| 1558 | P-444 | 6 | Unlined Cast Iron | 1957 | 1.6 | 0 | FALSE |
| 1559 | East St. | 20 | Unlined Cast Iron | 1910 | 0 | 0 | FALSE |
| 1560 | Leavitt St | 8 | Asbestos Cement | 1956 | 0.4 | 0 | FALSE |
| 1561 | P-447 | 8 | Factory Lined Cast Iron | 1968 | 0 | 0 | FALSE |
| 1562 | P-448 | 8 | Asbestos Cement | 1956 | 0.4 | 0 | FALSE |
| 1563 | P-449 | 8 | Asbestos Cement | 1956 | 0.4 | 0 | FALSE |
| 1564 | P-450 | 8 | Ductile Iron | 1986 | 0 | 0 | FALSE |
| 1565 | P-451 | 8 | Factory Lined Cast Iron | 1986 | 0 | 0 | FALSE |
| 1567 | P-453 | 8 | Ductile Iron | 1986 | 0 | 0 | FALSE |
| 1568 | P-454 | 8 | Ductile Iron | 1986 | 0 | 0 | FALSE |
| 1570 | P-458 | 8 | Ductile Iron | 1980 | 0 | 0 | FALSE |
| 1571 | P-459 | 8 | Ductile Iron | 1975 | 0.4 | 1 | FALSE |
| 1572 | P-460 | 8 | Ductile Iron | 1996 | 0 | 0 | FALSE |
| 1573 | P-461 | 8 | Ductile Iron | 1985 | 0.4 | 0 | FALSE |
| 1574 | P-462 | 8 | Ductile Iron | 1975 | 0 | 0 | FALSE |
| 1575 | P-463 | 8 | Ductile Iron | 1975 | 0 | 0 | FALSE |

# Asset Management Pipe Input Data
# Capital Efficiency Study
# Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 1576 | P-464 | 8 | Ductile Iron | 1975 | 0 | 0 | FALSE |
| 1577 | P-465 | 8 | Ductile Iron | 1991 | 0 | 0 | FALSE |
| 1578 | P-466 | 8 | Ductile Iron | 1991 | 0.4 | 0 | FALSE |
| 1579 | P-467 | 8 | Ductile Iron | 1991 | 0 | 0 | FALSE |
| 1580 | P-468 | 8 | Ductile Iron | 1985 | 0.4 | 0 | FALSE |
| 1581 | New Bridge St | 8 | Ductile Iron | 1991 | 0.4 | 1 | FALSE |
| 1582 | P-470 | 8 | Unlined Cast Iron | 1899 | 0 | 0 | FALSE |
| 1583 | Fort Hill St | 8 | Unlined Cast Iron | 1899 | 0 | 0 | FALSE |
| 1584 | Fresh River Ave | 8 | Unlined Cast Iron | 1899 | 0.7 | 0 | FALSE |
| 1586 | P-474 | 8 | Unlined Cast Iron | 1917 | 1.5 | 0 | FALSE |
| 1587 | P-475 | 8 | Ductile Iron | 1995 | 0 | 0 | FALSE |
| 1588 | P-476 | 8 | Ductile Iron | 1992 | 0 | 0 | FALSE |
| 1589 | P-477 | 8 | Ductile Iron | 1992 | 0 | 0 | FALSE |
| 1590 | P-478 | 8 | Ductile Iron | 1992 | 0 | 0 | FALSE |
| 1591 | P-479 | 8 | Ductile Iron | 1992 | 0 | 0 | FALSE |
| 1592 | P-480 | 8 | Ductile Iron | 1992 | 0 | 0 | FALSE |
| 1593 | P-481 | 8 | Ductile Iron | 1992 | 0 | 0 | FALSE |
| 1594 | P-483 | 8 | Ductile Iron | 1992 | 0 | 0 | FALSE |
| 1595 | P-484 | 8 | Ductile Iron | 1992 | 0 | 0 | FALSE |
| 1596 | P-485 | 8 | Ductile Iron | 1992 | 0 | 0 | FALSE |
| 1597 | P-486 | 8 | Ductile Iron | 1992 | 0 | 1 | FALSE |
| 1598 | P-487 | 8 | Ductile Iron | 1992 | 0 | 1 | FALSE |
| 1599 | P-488 | 8 | Ductile Iron | 1992 | 0 | 0 | FALSE |
| 1600 | P-489 | 8 | Ductile Iron | 1992 | 0 | 0 | FALSE |
| 1601 | P-490 | 8 | Ductile Iron | 1992 | 0 | 0 | FALSE |
| 1602 | P-491 | 8 | Unlined Cast Iron | 1899 | 0 | 0 | FALSE |
| 1604 | P-494 | 8 | Ductile Iron | 1985 | 0 | 0 | FALSE |
| 1608 | P-500 | 8 | Ductile Iron | 1985 | 0 | 1 | FALSE |
| 1609 | P-501 | 8 | Ductile Iron | 1985 | 0 | 0 | FALSE |
| 1610 | P-502 | 12 | Factory Lined Cast Iron | 1962 | 0.2 | 0 | FALSE |
| 1612 | P-505 | 6 | Ductile Iron | 1983 | 0 | 0 | FALSE |
| 1613 | P-506 | 8 | Unlined Cast Iron | 1917 | 2.1 | 0 | FALSE |
| 1614 | P-507 | 8 | Unlined Cast Iron | 1917 | 2.1 | 0 | FALSE |
| 1615 | P-509 | 8 | Factory Lined Cast Iron | 1965 | 0 | 0 | FALSE |
| 1616 | P-510 | 8 | Ductile Iron | 1985 | 0 | 0 | FALSE |
| 1617 | P-511 | 8 | Ductile Iron | 1985 | 0 | 0 | FALSE |
| 1618 | P-512 | 6 | Factory Lined Cast Iron | 1962 | 0 | 1 | FALSE |
| 1619 | P-513 | 8 | Ductile Iron | 1985 | 0 | 0 | FALSE |
| 1620 | P-514 | 8 | Unlined Cast Iron | 1950 | 1.26 | 0 | FALSE |
| 1621 | South Street | 8 | Asbestos Cement | 1956 | 0 | 0 | FALSE |
| 1622 | P-516 | 6 | Unlined Cast Iron | 1933 | 0 | 0 | FALSE |

# Asset Management Pipe Input Data
## Capital Efficiency Study
## Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 1623 | P-518 | 8 | Unlined Cast Iron | 1939 | 7.5 | 0 | FALSE |
| 1625 | P-521 | 6 | Unlined Cast Iron | 1895 | 6.5 | 0 | FALSE |
| 1626 | P-522 | 8 | Unlined Cast Iron | 1933 | 5 | 0 | FALSE |
| 1627 | North Street | 10 | Unlined Cast Iron | 1917 | 0.5 | 0 | FALSE |
| 1628 | P-524 | 10 | Unlined Cast Iron | 1917 | 0.5 | 0 | FALSE |
| 1629 | P-525 | 8 | Unlined Cast Iron | 1917 | 0 | 0 | FALSE |
| 1630 | P-526 | 8 | Ductile Iron | 1985 | 0 | 0 | FALSE |
| 1631 | P-527 | 8 | Unlined Cast Iron | 1933 | 5 | 0 | FALSE |
| 1632 | P-528 | 12 | Unlined Cast Iron | 1923 | 9.2 | 0 | FALSE |
| 1633 | P-529 | 6 | Unlined Cast Iron | 1901 | 0.9 | 0 | FALSE |
| 1634 | P-530 | 8 | Unlined Cast Iron | 1921 | 0 | 0 | FALSE |
| 1635 | P-531 | 8 | Unlined Cast Iron | 1921 | 0 | 0 | FALSE |
| 1638 | P-535 | 12 | Ductile Iron | 1985 | 1.4 | 0 | TRUE |
| 1641 | Beal St | 6 | Unlined Cast Iron | 1916 | 0 | 0 | TRUE |
| 1642 | P-540 | 6 | Asbestos Cement | 1953 | 0 | 0 | TRUE |
| 1643 | P-542 | 12 | Ductile Iron | 1986 | 1.4 | 0 | TRUE |
| 1644 | P-543 | 8 | Asbestos Cement | 1954 | 4.2 | 0 | TRUE |
| 1645 | P-544 | 12 | Ductile Iron | 1986 | 0 | 0 | TRUE |
| 1646 | P-546 | 8 | Factory Lined Cast Iron | 1971 | 0.8 | 0 | TRUE |
| 1647 | P-547 | 8 | Factory Lined Cast Iron | 1971 | 0.8 | 0 | TRUE |
| 1648 | P-548 | 6 | Unlined Cast Iron | 1916 | 0 | 0 | TRUE |
| 1649 | P-549 | 6 | Unlined Cast Iron | 1916 | 0 | 0 | TRUE |
| 1650 | P-550 | 8 | Ductile Iron | 1978 | 0 | 0 | TRUE |
| 1651 | P-551 | 8 | Ductile Iron | 1978 | 0 | 0 | TRUE |
| 1652 | P-552 | 8 | Ductile Iron | 1978 | 0 | 0 | TRUE |
| 1653 | P-553 | 12 | Factory Lined Cast Iron | 1971 | 0 | 0 | TRUE |
| 1654 | P-554 | 8 | Ductile Iron | 1991 | 0 | 0 | TRUE |
| 1655 | P-556 | 8 | Ductile Iron | 1991 | 0 | 0 | TRUE |
| 1656 | P-557 | 8 | Ductile Iron | 1991 | 0 | 0 | TRUE |
| 1657 | P-558 | 8 | Ductile Iron | 1991 | 0 | 0 | TRUE |
| 1659 | P-561 | 8 | Ductile Iron | 1991 | 0 | 0 | TRUE |
| 1660 | P-562 | 8 | Ductile Iron | 1991 | 0 | 0 | FALSE |
| 1661 | P-563 | 8 | Ductile Iron | 1991 | 0 | 0 | TRUE |
| 1662 | P-564 | 8 | Ductile Iron | 1975 | 34.8 | 0 | TRUE |
| 1663 | P-566 | 12 | Ductile Iron | 1986 | 0 | 0 | TRUE |
| 1664 | P-569 | 8 | Factory Lined Cast Iron | 1975 | 0 | 0 | TRUE |
| 1667 | P-573 | 8 | Ductile Iron | 1978 | 0 | 0 | TRUE |
| 1668 | P-574 | 8 | Ductile Iron | 1978 | 0 | 0 | TRUE |
| 1670 | P-576 | 8 | Ductile Iron | 1979 | 0 | 0 | TRUE |
| 1674 | P-580 | 8 | Ductile Iron | 1985 | 0 | 0 | TRUE |
| 1676 | P-582 | 8 | Asbestos Cement | 1952 | 9.4 | 0 | TRUE |



Prepared by or under the supervision of: Robert L. Roland

# Asset Management Pipe Input Data
## Capital Efficiency Study
## Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 1678 | P-586 | 6 | Unlined Cast Iron | 1939 | 0 | 0 | FALSE |
| 1679 | P-587 | 6 | Unlined Cast Iron | 1939 | 1.6 | 0 | FALSE |
| 1680 | P-589 | 8 | Unlined Cast Iron | 1917 | 1.8 | 0 | FALSE |
| 1681 | P-590 | 6 | Unlined Cast Iron | 1939 | 0 | 0 | FALSE |
| 1682 | P-591 | 6 | Unlined Cast Iron | 1939 | 0 | 0 | FALSE |
| 1683 | P-592 | 8 | Asbestos Cement | 1956 | 0 | 0 | FALSE |
| 1684 | P-593 | 6 | Asbestos Cement | 1950 | 0 | 0 | FALSE |
| 1685 | P-594 | 6 | Asbestos Cement | 1949 | 1.7 | 0 | FALSE |
| 1686 | P-595 | 6 | Asbestos Cement | 1949 | 1.7 | 0 | FALSE |
| 1687 | P-596 | 6 | Asbestos Cement | 1956 | 0 | 0 | FALSE |
| 1688 | P-597 | 6 | Asbestos Cement | 1956 | 0 | 0 | FALSE |
| 1689 | P-598 | 6 | Unlined Cast Iron | 1940 | 0 | 0 | FALSE |
| 1690 | P-599 | 6 | Asbestos Cement | 1950 | 2.2 | 0 | FALSE |
| 1691 | P-602 | 8 | Unlined Cast Iron | 1917 | 0 | 0 | FALSE |
| 1692 | P-604 | 8 | Asbestos Cement | 1956 | 0 | 0 | FALSE |
| 1693 | Lincoln Street | 6 | Unlined Cast Iron | 1910 | 0.4 | 0 | FALSE |
| 1694 | P-607 | 6 | Asbestos Cement | 1948 | 0 | 0 | FALSE |
| 1695 | P-608 | 6 | Asbestos Cement | 1948 | 0 | 0 | FALSE |
| 1696 | P-609 | 6 | Unlined Cast Iron | 1910 | 0.4 | 0 | FALSE |
| 1697 | P-610 | 8 | Unlined Cast Iron | 1921 | 0 | 0 | FALSE |
| 1698 | P-611 | 12 | Unlined Cast Iron | 1922 | 0 | 0 | FALSE |
| 1700 | P-613 | 8 | Unlined Cast Iron | 1921 | 0 | 0 | FALSE |
| 1702 | P-615 | 6 | Unlined Cast Iron | 1917 | 0 | 0 | FALSE |
| 1704 | P-617 | 6 | Factory Lined Cast Iron | 1961 | 1.7 | 0 | FALSE |
| 1705 | P-618 | 6 | Factory Lined Cast Iron | 1961 | 1.7 | 0 | FALSE |
| 1707 | P-620 | 12 | Unlined Cast Iron | 1948 | 1 | 0 | FALSE |
| 1708 | P-621 | 6 | Factory Lined Cast Iron | 1961 | 1.7 | 0 | FALSE |
| 1709 | P-623 | 6 | Unlined Cast Iron | 1909 | 0.9 | 0 | FALSE |
| 1710 | P-624 | 8 | Unlined Cast Iron | 1928 | 0 | 0 | FALSE |
| 1711 | P-625 | 12 | Unlined Cast Iron | 1948 | 1 | 0 | FALSE |
| 1712 | P-626 | 6 | Unlined Cast Iron | 1941 | 6.1 | 0 | FALSE |
| 1713 | P-627 | 12 | Unlined Cast Iron | 1948 | 1 | 0 | FALSE |
| 1714 | P-628 | 8 | Ductile Iron | 1993 | 0 | 0 | FALSE |
| 1715 | P-629 | 12 | Unlined Cast Iron | 1948 | 1 | 0 | FALSE |
| 1716 | P-630 | 6 | Asbestos Cement | 1951 | 0 | 0 | FALSE |
| 1717 | P-631 | 12 | Unlined Cast Iron | 1948 | 1 | 0 | FALSE |
| 1718 | P-633 | 12 | Unlined Cast Iron | 1948 | 1 | 0 | FALSE |
| 1719 | P-634 | 12 | Unlined Cast Iron | 1917 | 1.4 | 0 | FALSE |
| 1720 | P-635 | 12 | Unlined Cast Iron | 1917 | 1.4 | 0 | FALSE |
| 1721 | P-637 | 6 | Unlined Cast Iron | 1916 | 0 | 0 | FALSE |
| 1722 | P-638 | 6 | Unlined Cast Iron | 1917 | 10 | 0 | FALSE |


Prepared by or under the supervision of: Robert L. Roland

# Asset Management Pipe Input Data
## Capital Efficiency Study
## Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 1724 | P-640 | 12 | Unlined Cast Iron | 1959 | 0 | 0 | FALSE |
| 1725 | Summer Street | 12 | Unlined Cast Iron | 1917 | 1.4 | 0 | FALSE |
| 1726 | P-642 | 8 | Ductile Iron | 1980 | 0 | 0 | FALSE |
| 1728 | P-644 | 12 | Unlined Cast Iron | 1917 | 1.4 | 0 | FALSE |
| 1729 | P-645 | 6 | Ductile Iron | 1976 | 0 | 0 | FALSE |
| 1730 | P-646 | 6 | Asbestos Cement | 1957 | 0 | 0 | FALSE |
| 1731 | P-647 | 20 | Unlined Cast Iron | 1910 | 0 | 0 | FALSE |
| 1732 | P-648 | 20 | Unlined Cast Iron | 1910 | 0 | 0 | FALSE |
| 1733 | P-649 | 8 | Factory Lined Cast Iron | 1972 | 0 | 0 | FALSE |
| 1735 | P-651 | 14 | Unlined Cast Iron | 1903 | 0 | 0 | FALSE |
| 1736 | P-652 | 6 | Unlined Cast Iron | 1941 | 0.3 | 0 | FALSE |
| 1737 | P-653 | 6 | Factory Lined Cast Iron | 1960 | 0 | 0 | FALSE |
| 1738 | P-654 | 14 | Unlined Cast Iron | 1903 | 0 | 1 | FALSE |
| 1739 | P-655 | 20 | Unlined Cast Iron | 1910 | 0 | 0 | FALSE |
| 1740 | P-656 | 20 | Unlined Cast Iron | 1910 | 1.1 | 0 | FALSE |
| 1741 | Kilby St | 20 | Prestressed Concrete | 1954 | 0 | 0 | FALSE |
| 1742 | P-659 | 6 | Unlined Cast Iron | 1941 | 0.3 | 0 | FALSE |
| 1743 | Andrews Isle | 6 | Factory Lined Cast Iron | 1969 | 0 | 0 | FALSE |
| 1748 | P-667 | 12 | Unlined Cast Iron | 1917 | 1.4 | 0 | FALSE |
| 1749 | P-669 | 6 | Asbestos Cement | 1949 | 0 | 0 | FALSE |
| 1750 | P-670 | 6 | Unlined Cast Iron | 1957 | 0 | 0 | FALSE |
| 1751 | P-671 | 8 | Factory Lined Cast Iron | 1963 | 1.5 | 0 | FALSE |
| 1752 | P-672 | 8 | Factory Lined Cast Iron | 1963 | 1.5 | 0 | FALSE |
| 1753 | P-673 | 6 | Asbestos Cement | 1950 | 2.2 | 0 | FALSE |
| 1754 | P-674 | 6 | Unlined Cast Iron | 1957 | 0 | 0 | FALSE |
| 1755 | P-675 | 8 | Ductile Iron | 1991 | 0 | 0 | FALSE |
| 1757 | P-680 | 12 | Asbestos Cement | 1957 | 0 | 0 | FALSE |
| 1758 | P-681 | 8 | Asbestos Cement | 1957 | 1 | 0 | FALSE |
| 1759 | P-682 | 8 | Unlined Cast Iron | 1959 | 1 | 0 | FALSE |
| 1760 | East Street | 6 | Unlined Cast Iron | 1903 | 0 | 1 | FALSE |
| 1761 | P-684 | 20 | Prestressed Concrete | 1963 | 0 | 1 | FALSE |
| 1762 | P-685 | 8 | Factory Lined Cast Iron | 1963 | 0 | 1 | FALSE |
| 1763 | Summer St | 6 | Unlined Cast Iron | 1903 | 0 | 1 | FALSE |
| 1764 | P-687 | 8 | Ductile Iron | 1991 | 0 | 1 | FALSE |
| 1765 | P-689 | 20 | Prestressed Concrete | 1963 | 0 | 1 | FALSE |
| 1766 | P-690 | 6 | Asbestos Cement | 1951 | 0 | 1 | FALSE |
| 1767 | P-691 | 6 | Asbestos Cement | 1951 | 0 | 0 | FALSE |
| 1768 | P-692 | 20 | Prestressed Concrete | 1963 | 0 | 1 | FALSE |
| 1769 | Chief Justice Cushing Hwy | 8 | Factory Lined Cast Iron | 1967 | 0 | 0 | FALSE |
| 1771 | East Str | 6 | Unlined Cast Iron | 1908 | 0 | 1 | FALSE |
| 1772 | P-696 | 6 | Unlined Cast Iron | 1908 | 0 | 0 | FALSE |

# Asset Management Pipe Input Data
## Capital Efficiency Study
## Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 1773 | P-697 | 6 | Unlined Cast Iron | 1908 | 0.2 | 0 | FALSE |
| 1776 | P-704 | 8 | Factory Lined Cast Iron | 1972 | 0 | 0 | TRUE |
| 1777 | P-705 | 8 | Factory Lined Cast Iron | 1971 | 5.7 | 0 | TRUE |
| 1778 | P-706 | 8 | Factory Lined Cast Iron | 1972 | 0 | 0 | TRUE |
| 1779 | P-707 | 6 | Asbestos Cement | 1945 | 0 | 0 | TRUE |
| 1780 | P-708 | 6 | Asbestos Cement | 1945 | 0 | 0 | TRUE |
| 1781 | P-709 | 6 | Asbestos Cement | 1945 | 0 | 0 | TRUE |
| 1782 | P-710 | 6 | Asbestos Cement | 1945 | 2.2 | 0 | TRUE |
| 1783 | P-711 | 8 | Asbestos Cement | 1945 | 0 | 0 | TRUE |
| 1784 | P-712 | 6 | Asbestos Cement | 1945 | 0 | 0 | TRUE |
| 1785 | P-713 | 8 | Asbestos Cement | 1945 | 0 | 0 | TRUE |
| 1786 | P-714 | 8 | Asbestos Cement | 1945 | 0 | 0 | TRUE |
| 1787 | Lincoln Str | 8 | Unlined Cast Iron | 1941 | 2.15 | 0 | FALSE |
| 1788 | P-716 | 8 | Ductile Iron | 1994 | 0 | 0 | FALSE |
| 1789 | P-717 | 8 | Ductile Iron | 1994 | 0 | 0 | FALSE |
| 1790 | P-718 | 8 | Ductile Iron | 1994 | 0 | 0 | FALSE |
| 1791 | P-719 | 8 | Ductile Iron | 1994 | 0 | 0 | FALSE |
| 1793 | P-721 | 8 | Ductile Iron | 1994 | 0 | 0 | FALSE |
| 1794 | P-722 | 12 | Ductile Iron | 1994 | 0 | 1 | FALSE |
| 1795 | P-723 | 12 | Ductile Iron | 1994 | 0 | 0 | FALSE |
| 1796 | P-724 | 12 | Ductile Iron | 1994 | 0 | 0 | FALSE |
| 1797 | P-725 | 6 | Unlined Cast Iron | 1910 | 1.2 | 0 | FALSE |
| 1798 | P-726 | 6 | Unlined Cast Iron | 1910 | 11.7 | 0 | FALSE |
| 1799 | P-727 | 8 | Unlined Cast Iron | 1941 | 0 | 0 | FALSE |
| 1801 | P-729 | 12 | Unlined Cast Iron | 1921 | 0.7 | 0 | FALSE |
| 1802 | P-730 | 12 | Unlined Cast Iron | 1916 | 0.7 | 0 | FALSE |
| 1803 | P-732 | 8 | Unlined Cast Iron | 1922 | 0 | 0 | FALSE |
| 1804 | P-733 | 12 | Ductile Iron | 1985 | 0 | 0 | FALSE |
| 1805 | P-736 | 8 | Asbestos Cement | 1952 | 0 | 0 | FALSE |
| 1806 | P-738 | 8 | Asbestos Cement | 1952 | 0 | 0 | FALSE |
| 1807 | P-739 | 12 | Unlined Cast Iron | 1921 | 0.7 | 0 | FALSE |
| 1809 | Otis Str | 12 | Unlined Cast Iron | 1921 | 0.7 | 0 | FALSE |
| 1810 | P-742 | 6 | Unlined Cast Iron | 1935 | 0 | 0 | FALSE |
| 1811 | P-743 | 6 | Asbestos Cement | 1947 | 1.6 | 0 | FALSE |
| 1812 | P-744 | 6 | Factory Lined Cast Iron | 1960 | 0 | 0 | FALSE |
| 1813 | Downer Ave | 6 | Unlined Cast Iron | 1910 | 1.2 | 0 | FALSE |
| 1814 | P-746 | 8 | Asbestos Cement | 1957 | 1.7 | 0 | FALSE |
| 1815 | P-747 | 6 | Unlined Cast Iron | 1910 | 1.2 | 0 | FALSE |
| 1816 | P-748 | 8 | Unlined Cast Iron | 1925 | 0.9 | 0 | FALSE |
| 1817 | P-749 | 8 | Unlined Cast Iron | 1932 | 0 | 0 | FALSE |
| 1818 | P-750 | 8 | Unlined Cast Iron | 1932 | 0 | 0 | FALSE |



Prepared by or under the supervision of: Robert L. Roland

# Asset Management Pipe Input Data
## Capital Efficiency Study
## Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 1819 | P-751 | 8 | Unlined Cast Iron | 1932 | 0 | 0 | FALSE |
| 1820 | P-752 | 6 | Asbestos Cement | 1955 | 0 | 0 | FALSE |
| 1821 | P-753 | 8 | Unlined Cast Iron | 1932 | 0 | 0 | FALSE |
| 1823 | P-755 | 6 | Unlined Cast Iron | 1937 | 0 | 0 | FALSE |
| 1824 | P-756 | 6 | Unlined Cast Iron | 1937 | 0 | 0 | FALSE |
| 1825 | P-757 | 6 | Unlined Cast Iron | 1937 | 0 | 0 | FALSE |
| 1826 | P-758 | 6 | Unlined Cast Iron | 1937 | 0 | 0 | FALSE |
| 1828 | P-761 | 6 | Asbestos Cement | 1953 | 1.7 | 0 | FALSE |
| 1829 | P-762 | 6 | Asbestos Cement | 1955 | 1.7 | 0 | FALSE |
| 1830 | P-764 | 6 | Asbestos Cement | 1955 | 0.6 | 0 | FALSE |
| 1831 | P-765 | 6 | Asbestos Cement | 1953 | 0 | 0 | FALSE |
| 1832 | P-766 | 8 | Factory Lined Cast Iron | 1971 | 0 | 0 | FALSE |
| 1833 | P-767 | 6 | Asbestos Cement | 1952 | 0 | 0 | FALSE |
| 1835 | P-769 | 6 | Asbestos Cement | 1955 | 0 | 1 | FALSE |
| 1836 | P-770 | 6 | Asbestos Cement | 1955 | 0 | 1 | FALSE |
| 1837 | P-771 | 6 | Asbestos Cement | 1955 | 1.1 | 1 | FALSE |
| 1838 | P-772 | 6 | Asbestos Cement | 1952 | 0 | 0 | FALSE |
| 1841 | P-775 | 8 | Unlined Cast Iron | 1905 | 0 | 0 | FALSE |
| 1843 | P-778 | 8 | Factory Lined Cast Iron | 1968 | 0 | 0 | FALSE |
| 1844 | P-779 | 6 | Asbestos Cement | 1946 | 0 | 0 | FALSE |
| 1845 | P-780 | 8 | Unlined Cast Iron | 1898 | 0 | 0 | FALSE |
| 1848 | P-783 | 6 | Unlined Cast Iron | 1922 | 0 | 0 | FALSE |
| 1849 | P-784 | 6 | Unlined Cast Iron | 1922 | 0.8 | 0 | FALSE |
| 1850 | P-785 | 6 | Unlined Cast Iron | 1922 | 0.8 | 0 | FALSE |
| 1851 | P-787 | 8 | Ductile Iron | 1989 | 0 | 0 | FALSE |
| 1852 | P-789 | 8 | Ductile Iron | 1989 | 0 | 0 | FALSE |
| 1853 | P-790 | 10 | Unlined Cast Iron | 1917 | 0.4 | 0 | FALSE |
| 1854 | Downer Avenue | 10 | Unlined Cast Iron | 1921 | 0.4 | 0 | FALSE |
| 1855 | P-792 | 8 | Ductile Iron | 1985 | 0 | 0 | FALSE |
| 1856 | P-793 | 6 | Unlined Cast Iron | 1917 | 2.3 | 0 | FALSE |
| 1858 | P-795 | 8 | Unlined Cast Iron | 1916 | 0 | 0 | FALSE |
| 1861 | P-799 | 6 | Factory Lined Cast Iron | 1960 | 0 | 0 | FALSE |
| 1862 | George Washington Blvd | 8 | Factory Lined Cast Iron | 1973 | 1.2 | 1 | FALSE |
| 1863 | P-802 | 8 | Asbestos Cement | 1953 | 0 | 0 | FALSE |
| 1864 | P-803 | 8 | Unlined Cast Iron | 1957 | 0.4 | 0 | FALSE |
| 1865 | P-804 | 6 | Unlined Cast Iron | 1958 | 0.9 | 0 | FALSE |
| 1866 | P-805 | 6 | Asbestos Cement | 1947 | 0 | 0 | FALSE |
| 1867 | P-806 | 6 | Asbestos Cement | 1947 | 0 | 0 | FALSE |
| 1868 | P-807 | 6 | Asbestos Cement | 1947 | 0 | 0 | FALSE |
| 1869 | P-808 | 6 | Asbestos Cement | 1947 | 0 | 0 | FALSE |
| 1870 | P-809 | 6 | Asbestos Cement | 1947 | 0 | 0 | FALSE |

# Asset Management Pipe Input Data
## Capital Efficiency Study
## Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 1871 | P-810 | 8 | Unlined Cast Iron | 1957 | 0.4 | 0 | FALSE |
| 1872 | P-811 | 8 | Unlined Cast Iron | 1957 | 0.4 | 0 | FALSE |
| 1873 | P-813 | 8 | Asbestos Cement | 1955 | 0 | 1 | FALSE |
| 1874 | P-814 | 6 | Asbestos Cement | 1955 | 0.8 | 0 | FALSE |
| 1875 | P-815 | 8 | Unlined Cast Iron | 1957 | 0.4 | 0 | FALSE |
| 1876 | P-816 | 8 | Unlined Cast Iron | 1957 | 0.4 | 0 | FALSE |
| 1877 | P-817 | 8 | Unlined Cast Iron | 1957 | 0 | 0 | FALSE |
| 1878 | P-818 | 8 | Unlined Cast Iron | 1957 | 0 | 0 | FALSE |
| 1879 | P-821 | 8 | Unlined Cast Iron | 1957 | 0.4 | 0 | FALSE |
| 1882 | P-824 | 20 | Unlined Cast Iron | 1910 | 0 | 0 | FALSE |
| 1883 | P-825 | 16 | Unlined Cast Iron | 1917 | 0.4 | 1 | FALSE |
| 1884 | P-826 | 12 | Unlined Cast Iron | 1891 | 0.3 | 1 | FALSE |
| 1885 | P-827 | 6 | Unlined Cast Iron | 1899 | 0 | 0 | FALSE |
| 1886 | P-828 | 8 | Ductile Iron | 1985 | 0.7 | 0 | FALSE |
| 1887 | P-829 | 12 | Unlined Cast Iron | 1891 | 0.3 | 0 | FALSE |
| 1888 | P-830 | 8 | Ductile Iron | 1985 | 0 | 0 | FALSE |
| 1889 | Rockland Street | 12 | Unlined Cast Iron | 1891 | 0.3 | 1 | FALSE |
| 1890 | P-833 | 6 | Asbestos Cement | 1947 | 8.6 | 0 | FALSE |
| 1891 | P-834 | 6 | Ductile Iron | 1996 | 0 | 0 | FALSE |
| 1892 | P-835 | 6 | Ductile Iron | 1996 | 0 | 0 | FALSE |
| 1893 | P-836 | 6 | Ductile Iron | 1996 | 0 | 0 | FALSE |
| 1894 | P-837 | 6 | Asbestos Cement | 1947 | 2 | 0 | FALSE |
| 1895 | P-838 | 6 | Ductile Iron | 1992 | 0 | 0 | FALSE |
| 1896 | P-839 | 12 | Unlined Cast Iron | 1891 | 0.3 | 0 | FALSE |
| 1898 | P-841 | 6 | Unlined Cast Iron | 1908 | 0.2 | 0 | FALSE |
| 1900 | P-844 | 8 | Factory Lined Cast Iron | 1965 | 1.3 | 0 | FALSE |
| 1903 | P-851 | 6 | Ductile Iron | 1981 | 0 | 0 | FALSE |
| 1904 | P-853 | 8 | Ductile Iron | 1981 | 0.3 | 1 | FALSE |
| 1905 | Surry Dr | 8 | Ductile Iron | 1981 | 0.3 | 1 | FALSE |
| 1907 | P-858 | 6 | Unlined Cast Iron | 1958 | 3 | 0 | FALSE |
| 1908 | P-860 | 6 | Asbestos Cement | 1956 | 4.4 | 0 | FALSE |
| 1909 | P-861 | 6 | Factory Lined Cast Iron | 1960 | 0 | 0 | FALSE |
| 1910 | P-863 | 8 | Factory Lined Cast Iron | 1962 | 0 | 0 | FALSE |
| 1911 | P-865 | 8 | Factory Lined Cast Iron | 1960 | 0 | 1 | FALSE |
| 1912 | P-866 | 6 | Unlined Cast Iron | 1882 | 2.5 | 1 | FALSE |
| 1918 | P-874 | 12 | Ductile Iron | 2010 | 0 | 0 | FALSE |
| 1919 | P-875 | 10 | Unlined Cast Iron | 1923 | 1.2 | 0 | FALSE |
| 1920 | P-876 | 6 | Unlined Cast Iron | 1921 | 0 | 0 | FALSE |
| 1921 | P-877 | 12 | Unlined Cast Iron | 1923 | 1 | 0 | FALSE |
| 1923 | P-879 | 12 | Unlined Cast Iron | 1923 | 2.2 | 0 | FALSE |
| 1924 | P-880 | 6 | Unlined Cast Iron | 1959 | 0 | 0 | FALSE |

# Asset Management Pipe Input Data
## Capital Efficiency Study
## Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 1926 | P-882 | 6 | Ductile Iron | 1986 | 0 | 0 | FALSE |
| 1927 | P-883 | 12 | Unlined Cast Iron | 1923 | 2.2 | 0 | FALSE |
| 1928 | P-884 | 12 | Ductile Iron | 1986 | 0 | 0 | FALSE |
| 1929 | P-885 | 8 | Ductile Iron | 1994 | 0 | 0 | FALSE |
| 1930 | P-886 | 8 | Ductile Iron | 1986 | 0 | 0 | FALSE |
| 1931 | P-887 | 8 | Ductile Iron | 1986 | 0 | 0 | FALSE |
| 1932 | P-888 | 8 | Ductile Iron | 1986 | 0 | 1 | FALSE |
| 1933 | P-889 | 12 | Unlined Cast Iron | 1923 | 2.2 | 0 | FALSE |
| 1935 | P-891 | 6 | Factory Lined Cast Iron | 1960 | 0 | 0 | FALSE |
| 1937 | P-893 | 20 | Unlined Cast Iron | 1924 | 0 | 1 | FALSE |
| 1938 | P-894 | 6 | Factory Lined Cast Iron | 1960 | 0 | 0 | FALSE |
| 1940 | P-896 | 20 | Unlined Cast Iron | 1924 | 0 | 0 | FALSE |
| 1941 | P-897 | 8 | Ductile Iron | 1987 | 0 | 0 | FALSE |
| 1942 | P-899 | 8 | Ductile Iron | 1989 | 0 | 0 | FALSE |
| 1943 | P-900 | 8 | Ductile Iron | 1989 | 0 | 0 | FALSE |
| 1944 | P-901 | 8 | Ductile Iron | 1989 | 0 | 1 | FALSE |
| 1945 | P-902 | 8 | Ductile Iron | 1989 | 0 | 0 | FALSE |
| 1946 | P-903 | 8 | Ductile Iron | 1989 | 0 | 0 | FALSE |
| 1947 | P-905 | 20 | Unlined Cast Iron | 1924 | 0 | 0 | FALSE |
| 1948 | P-906 | 20 | Unlined Cast Iron | 1924 | 0 | 0 | FALSE |
| 1949 | P-907 | 6 | Unlined Cast Iron | 1923 | 0 | 1 | FALSE |
| 1950 | P-908 | 8 | Unlined Cast Iron | 1925 | 0 | 0 | FALSE |
| 1953 | P-916 | 8 | Ductile Iron | 1985 | 0 | 0 | FALSE |
| 1956 | P-920 | 6 | Asbestos Cement | 1958 | 0 | 0 | FALSE |
| 1957 | P-921 | 6 | Asbestos Cement | 1958 | 1.8 | 0 | FALSE |
| 1958 | P-922 | 6 | Asbestos Cement | 1955 | 3 | 0 | FALSE |
| 1959 | P-923 | 6 | Asbestos Cement | 1955 | 3 | 0 | FALSE |
| 1960 | P-924 | 6 | Asbestos Cement | 1954 | 2 | 0 | FALSE |
| 1962 | P-926 | 6 | Asbestos Cement | 1954 | 2 | 0 | FALSE |
| 1963 | P-927 | 6 | Asbestos Cement | 1954 | 5.9 | 0 | FALSE |
| 1966 | P-932 | 12 | Unlined Cast Iron | 1894 | 1.3 | 1 | FALSE |
| 1967 | P-933 | 8 | Unlined Cast Iron | 1906 | 0.9 | 1 | FALSE |
| 1969 | P-935 | 8 | Unlined Cast Iron | 1906 | 0.9 | 0 | FALSE |
| 1971 | P-937 | 8 | Unlined Cast Iron | 1906 | 0 | 0 | FALSE |
| 1972 | P-938 | 8 | Asbestos Cement | 1963 | 0 | 0 | FALSE |
| 1973 | P-940 | 6 | Unlined Cast Iron | 1907 | 0 | 0 | FALSE |
| 1974 | P-941 | 6 | Unlined Cast Iron | 1915 | 0 | 0 | FALSE |
| 1975 | P-942 | 6 | Unlined Cast Iron | 1907 | 0 | 0 | FALSE |
| 1976 | P-943 | 6 | Unlined Cast Iron | 1918 | 0 | 0 | FALSE |
| 1977 | P-944 | 6 | Unlined Cast Iron | 1907 | 0 | 0 | FALSE |
| 1978 | P-945 | 6 | Unlined Cast Iron | 1922 | 0 | 0 | FALSE |

# Asset Management Pipe Input Data
## Capital Efficiency Study
## Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 1979 | P-946 | 6 | Unlined Cast Iron | 1907 | 0 | 0 | FALSE |
| 1980 | P-947 | 6 | Unlined Cast Iron | 1950 | 0 | 0 | FALSE |
| 1981 | P-948 | 6 | Unlined Cast Iron | 1907 | 0 | 0 | FALSE |
| 1982 | P-949 | 6 | Unlined Cast Iron | 1907 | 0 | 0 | FALSE |
| 1984 | P-951 | 6 | Unlined Cast Iron | 1915 | 2.6 | 0 | FALSE |
| 1985 | P-952 | 6 | Unlined Cast Iron | 1908 | 0.9 | 0 | FALSE |
| 1986 | P-953 | 6 | Unlined Cast Iron | 1908 | 0.9 | 0 | FALSE |
| 1987 | P-954 | 6 | Unlined Cast Iron | 1915 | 0 | 0 | FALSE |
| 1988 | P-955 | 6 | Unlined Cast Iron | 1915 | 1.1 | 0 | FALSE |
| 1989 | P-956 | 6 | Unlined Cast Iron | 1908 | 0.9 | 0 | FALSE |
| 1991 | P-958 | 6 | Unlined Cast Iron | 1906 | 0 | 0 | FALSE |
| 1992 | P-959 | 6 | Unlined Cast Iron | 1906 | 1.1 | 0 | FALSE |
| 1993 | P-960 | 6 | Unlined Cast Iron | 1893 | 0.9 | 0 | FALSE |
| 1995 | P-962 | 6 | Unlined Cast Iron | 1893 | 0.9 | 1 | FALSE |
| 1996 | P-963 | 12 | Unlined Cast Iron | 1894 | 1.3 | 1 | FALSE |
| 1997 | P-964 | 12 | Ductile Iron | 1975 | 0 | 1 | FALSE |
| 1998 | Nantasket Avenue | 12 | Unlined Cast Iron | 1894 | 1.3 | 1 | FALSE |
| 1999 | P-966 | 8 | Unlined Cast Iron | 1924 | 0 | 0 | FALSE |
| 2000 | Hull Shore Drive | 12 | Ductile Iron | 1975 | 0 | 1 | FALSE |
| 2001 | P-968 | 6 | Unlined Cast Iron | 1923 | 0 | 1 | FALSE |
| 2002 | P-969 | 6 | Unlined Cast Iron | 1915 | 4.8 | 1 | FALSE |
| 2003 | P-970 | 6 | Unlined Cast Iron | 1923 | 2.5 | 1 | FALSE |
| 2004 | P-971 | 4 | Unlined Cast Iron | 1916 | 0 | 1 | FALSE |
| 2005 | P-972 | 6 | Unlined Cast Iron | 1916 | 1.2 | 0 | FALSE |
| 2006 | P-973 | 6 | Unlined Cast Iron | 1916 | 1.2 | 0 | FALSE |
| 2007 | P-974 | 6 | Unlined Cast Iron | 1916 | 1.2 | 0 | FALSE |
| 2010 | P-978 | 6 | Ductile Iron | 1992 | 0 | 0 | FALSE |
| 2012 | P-980 | 8 | Unlined Cast Iron | 1901 | 0.4 | 0 | FALSE |
| 2013 | P-981 | 6 | Ductile Iron | 1992 | 0 | 0 | FALSE |
| 2014 | P-982 | 6 | Unlined Cast Iron | 1916 | 0 | 0 | FALSE |
| 2016 | P-984 | 12 | Unlined Cast Iron | 1894 | 1.3 | 1 | FALSE |
| 2019 | P-988 | 8 | Unlined Cast Iron | 1901 | 0 | 1 | FALSE |
| 2020 | P-989 | 8 | Unlined Cast Iron | 1901 | 0.4 | 1 | FALSE |
| 2021 | P-990 | 6 | Unlined Cast Iron | 1915 | 1.4 | 1 | FALSE |
| 2023 | P-992 | 6 | Unlined Cast Iron | 1915 | 1.4 | 1 | FALSE |
| 2025 | P-995 | 12 | Asbestos Cement | 1956 | 0 | 1 | FALSE |
| 2026 | P-996 | 12 | Asbestos Cement | 1956 | 0.3 | 1 | FALSE |
| 2027 | P-997 | 6 | Unlined Cast Iron | 1922 | 0 | 1 | FALSE |
| 2028 | P-998 | 12 | Asbestos Cement | 1956 | 0.3 | 1 | FALSE |
| 2029 | P-999 | 6 | Unlined Cast Iron | 1915 | 17 | 1 | FALSE |
| 2030 | P-1000 | 6 | Unlined Cast Iron | 1924 | 0 | 1 | FALSE |



Prepared by or under the supervision of: Robert L. Roland

# Asset Management Pipe Input Data
## Capital Efficiency Study
## Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 2031 | P-1001 | 6 | Unlined Cast Iron | 1915 | 17 | 1 | FALSE |
| 2032 | P-1002 | 6 | Unlined Cast Iron | 1923 | 3.7 | 1 | FALSE |
| 2033 | P-1003 | 6 | Unlined Cast Iron | 1923 | 3.7 | 1 | FALSE |
| 2034 | P-1004 | 12 | Asbestos Cement | 1956 | 0.3 | 1 | FALSE |
| 2035 | P-1005 | 6 | Unlined Cast Iron | 1923 | 0 | 1 | FALSE |
| 2036 | P-1006 | 6 | Unlined Cast Iron | 1922 | 0 | 1 | FALSE |
| 2037 | P-1007 | 12 | Asbestos Cement | 1956 | 0.3 | 1 | FALSE |
| 2038 | P-1008 | 6 | Unlined Cast Iron | 1923 | 3.7 | 1 | FALSE |
| 2039 | P-1009 | 6 | Unlined Cast Iron | 1922 | 2.4 | 1 | FALSE |
| 2040 | P-1010 | 6 | Unlined Cast Iron | 1915 | 0 | 1 | FALSE |
| 2041 | P-1011 | 6 | Unlined Cast Iron | 1915 | 1.4 | 1 | FALSE |
| 2042 | P-1012 | 6 | Unlined Cast Iron | 1922 | 2.4 | 1 | FALSE |
| 2043 | P-1013 | 6 | Unlined Cast Iron | 1928 | 0 | 1 | FALSE |
| 2044 | P-1014 | 6 | Unlined Cast Iron | 1915 | 1.4 | 1 | FALSE |
| 2045 | P-1015 | 6 | Unlined Cast Iron | 1922 | 2.4 | 1 | FALSE |
| 2046 | P-1016 | 6 | Unlined Cast Iron | 1922 | 0 | 1 | FALSE |
| 2047 | P-1017 | 6 | Unlined Cast Iron | 1915 | 1.4 | 1 | FALSE |
| 2048 | P-1018 | 6 | Unlined Cast Iron | 1922 | 2.4 | 1 | FALSE |
| 2049 | P-1019 | 6 | Unlined Cast Iron | 1915 | 0 | 1 | FALSE |
| 2050 | P-1020 | 6 | Unlined Cast Iron | 1915 | 1.4 | 1 | FALSE |
| 2051 | P-1021 | 6 | Asbestos Cement | 1950 | 0 | 1 | FALSE |
| 2052 | P-1022 | 6 | Asbestos Cement | 1950 | 1.7 | 1 | FALSE |
| 2053 | P-1023 | 6 | Unlined Cast Iron | 1922 | 0 | 1 | FALSE |
| 2054 | P-1024 | 6 | Unlined Cast Iron | 1915 | 0 | 1 | FALSE |
| 2055 | P-1025 | 6 | Asbestos Cement | 1957 | 1.7 | 1 | FALSE |
| 2056 | P-1026 | 6 | Unlined Cast Iron | 1922 | 0 | 1 | FALSE |
| 2058 | P-1028 | 8 | Ductile Iron | 1987 | 0 | 1 | FALSE |
| 2059 | P-1029 | 8 | Ductile Iron | 1987 | 0 | 1 | FALSE |
| 2060 | P-1030 | 8 | Ductile Iron | 1987 | 0 | 1 | FALSE |
| 2061 | P-1031 | 8 | Ductile Iron | 1987 | 0 | 1 | FALSE |
| 2062 | P-1032 | 6 | Asbestos Cement | 1949 | 2.1 | 1 | FALSE |
| 2063 | P-1033 | 8 | Ductile Iron | 1987 | 0 | 1 | FALSE |
| 2064 | P-1034 | 6 | Asbestos Cement | 1949 | 3.5 | 1 | FALSE |
| 2065 | P-1035 | 6 | Unlined Cast Iron | 1928 | 0 | 1 | FALSE |
| 2066 | P-1036 | 6 | Asbestos Cement | 1965 | 2.1 | 1 | FALSE |
| 2067 | P-1037 | 6 | Unlined Cast Iron | 1923 | 1.4 | 1 | FALSE |
| 2068 | P-1038 | 6 | Unlined Cast Iron | 1923 | 0.8 | 1 | FALSE |
| 2069 | P-1039 | 6 | Asbestos Cement | 1953 | 0 | 1 | FALSE |
| 2071 | P-1041 | 6 | Asbestos Cement | 1953 | 0 | 1 | FALSE |
| 2072 | P-1044 | 6 | Asbestos Cement | 1954 | 2 | 1 | FALSE |
| 2073 | P-1045 | 6 | Asbestos Cement | 1954 | 2 | 1 | FALSE |

# Asset Management Pipe Input Data
## Capital Efficiency Study
## Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 2074 | P-1046 | 20 | Unlined Cast Iron | 1924 | 0 | 1 | FALSE |
| 2076 | P-1048 | 6 | Unlined Cast Iron | 1915 | 4.1 | 1 | FALSE |
| 2077 | P-1049 | 6 | Unlined Cast Iron | 1915 | 4.1 | 1 | FALSE |
| 2078 | P-1050 | 12 | Unlined Cast Iron | 1894 | 1.3 | 1 | FALSE |
| 2079 | P-1051 | 12 | Unlined Cast Iron | 1894 | 1.3 | 1 | FALSE |
| 2082 | P-1054 | 6 | Unlined Cast Iron | 1916 | 0 | 1 | FALSE |
| 2083 | P-1055 | 6 | Unlined Cast Iron | 1916 | 3.7 | 1 | FALSE |
| 2084 | P-1056 | 6 | Unlined Cast Iron | 1915 | 4.8 | 1 | FALSE |
| 2085 | P-1057 | 6 | Unlined Cast Iron | 1916 | 3.7 | 1 | FALSE |
| 2086 | P-1058 | 6 | Unlined Cast Iron | 1915 | 0 | 1 | FALSE |
| 2087 | P-1059 | 12 | Unlined Cast Iron | 1894 | 1.3 | 1 | FALSE |
| 2088 | P-1060 | 6 | Unlined Cast Iron | 1922 | 0 | 1 | FALSE |
| 2089 | P-1061 | 8 | Unlined Cast Iron | 1911 | 6.5 | 1 | FALSE |
| 2090 | P-1062 | 8 | Unlined Cast Iron | 1911 | 6.5 | 1 | FALSE |
| 2091 | P-1063 | 6 | Unlined Cast Iron | 1915 | 4.8 | 1 | FALSE |
| 2092 | P-1064 | 6 | Unlined Cast Iron | 1904 | 1.3 | 1 | FALSE |
| 2093 | P-1065 | 6 | Ductile Iron | 1996 | 0 | 1 | FALSE |
| 2095 | P-1067 | 6 | Ductile Iron | 1996 | 0 | 1 | FALSE |
| 2096 | P-1068 | 8 | Factory Lined Cast Iron | 1964 | 0 | 1 | FALSE |
| 2097 | P-1069 | 8 | Factory Lined Cast Iron | 1964 | 0 | 1 | FALSE |
| 2098 | P-1070 | 6 | Unlined Cast Iron | 1904 | 1.3 | 1 | FALSE |
| 2099 | P-1072 | 12 | Unlined Cast Iron | 1894 | 1.3 | 1 | FALSE |
| 2100 | P-1073 | 6 | Unlined Cast Iron | 1923 | 3.6 | 1 | FALSE |
| 2102 | P-1075 | 6 | Unlined Cast Iron | 1916 | 0 | 1 | FALSE |
| 2103 | P-1077 | 6 | Unlined Cast Iron | 1896 | 1.9 | 1 | FALSE |
| 2104 | P-1078 | 8 | Ductile Iron | 1986 | 0 | 1 | FALSE |
| 2105 | P-1079 | 6 | Factory Lined Cast Iron | 1964 | 0 | 1 | FALSE |
| 2106 | P-1080 | 6 | Unlined Cast Iron | 1911 | 1.3 | 1 | FALSE |
| 2107 | P-1081 | 6 | Unlined Cast Iron | 1957 | 4.3 | 1 | FALSE |
| 2108 | P-1082 | 6 | Unlined Cast Iron | 1911 | 1.3 | 1 | FALSE |
| 2110 | P-1084 | 6 | Unlined Cast Iron | 1915 | 5.1 | 1 | FALSE |
| 2111 | P-1085 | 6 | Unlined Cast Iron | 1915 | 5.1 | 1 | FALSE |
| 2112 | P-1086 | 12 | Unlined Cast Iron | 1894 | 1.3 | 1 | FALSE |
| 2113 | P-1087 | 6 | Unlined Cast Iron | 1923 | 0.8 | 1 | FALSE |
| 2116 | P-1092 | 8 | Ductile Iron | 1990 | 0 | 1 | FALSE |
| 2118 | P-1094 | 6 | Unlined Cast Iron | 1957 | 0 | 1 | FALSE |
| 2119 | P-1096 | 6 | Unlined Cast Iron | 1916 | 2.6 | 1 | FALSE |
| 2120 | P-1097 | 12 | Unlined Cast Iron | 1909 | 1.3 | 1 | FALSE |
| 2122 | P-1100 | 6 | Unlined Cast Iron | 1922 | 0 | 1 | FALSE |
| 2123 | P-1101 | 6 | Asbestos Cement | 1949 | 0 | 1 | FALSE |
| 2124 | P-1102 | 12 | Asbestos Cement | 1956 | 1.4 | 1 | FALSE |



Prepared by or under the supervision of: Robert L. Roland

# Asset Management Pipe Input Data
## Capital Efficiency Study
## Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 2126 | P-1105 | 12 | Asbestos Cement | 1955 | 1.4 | 0 | FALSE |
| 2127 | P-1106 | 6 | Factory Lined Cast Iron | 1964 | 0 | 0 | FALSE |
| 2128 | P-1107 | 6 | Unlined Cast Iron | 1915 | 0.6 | 0 | FALSE |
| 2129 | P-1108 | 8 | Ductile Iron | 1986 | 0 | 0 | FALSE |
| 2130 | P-1109 | 12 | Unlined Cast Iron | 1933 | 0 | 0 | FALSE |
| 2131 | P-1110 | 6 | Factory Lined Cast Iron | 1965 | 1.9 | 0 | FALSE |
| 2132 | P-1111 | 6 | Unlined Cast Iron | 1915 | 0.6 | 0 | FALSE |
| 2133 | P-1112 | 6 | Unlined Cast Iron | 1915 | 0.6 | 0 | FALSE |
| 2134 | P-1113 | 8 | Ductile Iron | 1990 | 2.4 | 0 | FALSE |
| 2135 | P-1114 | 8 | Ductile Iron | 1990 | 0 | 1 | FALSE |
| 2136 | P-1115 | 8 | Factory Lined Cast Iron | 1964 | 0.5 | 1 | FALSE |
| 2137 | P-1116 | 8 | Factory Lined Cast Iron | 1964 | 0.5 | 1 | FALSE |
| 2139 | P-1118 | 12 | Unlined Cast Iron | 1909 | 1.3 | 1 | FALSE |
| 2140 | P-1119 | 6 | Unlined Cast Iron | 1897 | 0 | 1 | FALSE |
| 2142 | P-1121 | 6 | Unlined Cast Iron | 1915 | 0 | 1 | FALSE |
| 2143 | P-1122 | 12 | Unlined Cast Iron | 1909 | 1.3 | 1 | FALSE |
| 2145 | P-1124 | 8 | Ductile Iron | 1983 | 0 | 0 | FALSE |
| 2147 | P-1126 | 8 | Unlined Cast Iron | 1911 | 0.5 | 1 | FALSE |
| 2148 | P-1127 | 6 | Unlined Cast Iron | 1915 | 4.8 | 1 | FALSE |
| 2149 | P-1128 | 6 | Unlined Cast Iron | 1915 | 4.8 | 1 | FALSE |
| 2151 | P-1130 | 6 | Unlined Cast Iron | 1957 | 5 | 1 | FALSE |
| 2153 | P-1132 | 8 | Unlined Cast Iron | 1911 | 0.5 | 1 | FALSE |
| 2154 | P-1133 | 8 | Unlined Cast Iron | 1959 | 0.5 | 1 | FALSE |
| 2157 | P-1136 | 6 | Unlined Cast Iron | 1897 | 0 | 1 | FALSE |
| 2160 | P-1139 | 6 | Asbestos Cement | 1950 | 6.3 | 1 | FALSE |
| 2162 | P-1141 | 6 | Factory Lined Cast Iron | 1960 | 5.8 | 1 | FALSE |
| 2163 | P-1142 | 6 | Factory Lined Cast Iron | 1960 | 0 | 1 | FALSE |
| 2166 | P-1148 | 6 | Factory Lined Cast Iron | 1960 | 0 | 1 | FALSE |
| 2167 | P-1149 | 6 | Asbestos Cement | 1947 | 4.6 | 1 | FALSE |
| 2168 | P-1150 | 6 | Unlined Cast Iron | 1931 | 0 | 1 | FALSE |
| 2171 | P-1155 | 6 | Ductile Iron | 1982 | 0 | 1 | FALSE |
| 2172 | P-1156 | 12 | Unlined Cast Iron | 1909 | 1.3 | 1 | FALSE |
| 2173 | P-1157 | 12 | Unlined Cast Iron | 1909 | 1.3 | 1 | FALSE |
| 2176 | P-1160 | 12 | Unlined Cast Iron | 1909 | 1.3 | 1 | FALSE |
| 2177 | P-1161 | 12 | Unlined Cast Iron | 1909 | 1.3 | 1 | FALSE |
| 2178 | P-1162 | 12 | Unlined Cast Iron | 1909 | 1.3 | 1 | FALSE |
| 2179 | P-1163 | 6 | Asbestos Cement | 1950 | 4.6 | 1 | FALSE |
| 2180 | P-1164 | 6 | Unlined Cast Iron | 1950 | 0 | 1 | FALSE |
| 2181 | P-1165 | 6 | Factory Lined Cast Iron | 1964 | 0 | 1 | FALSE |
| 2182 | P-1166 | 6 | Factory Lined Cast Iron | 1964 | 0 | 1 | FALSE |
| 2183 | P-1167 | 6 | Unlined Cast Iron | 1916 | 9.2 | 1 | FALSE |

# Asset Management Pipe Input Data
## Capital Efficiency Study
## Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 2184 | P-1168 | 6 | Unlined Cast Iron | 1916 | 9.2 | 1 | FALSE |
| 2185 | P-1169 | 6 | Unlined Cast Iron | 1916 | 9.2 | 1 | FALSE |
| 2186 | P-1170 | 6 | Unlined Cast Iron | 1908 | 8.3 | 1 | FALSE |
| 2188 | P-1172 | 6 | Unlined Cast Iron | 1922 | 0.9 | 1 | FALSE |
| 2189 | P-1173 | 8 | Ductile Iron | 1989 | 0 | 1 | FALSE |
| 2190 | P-1174 | 6 | Asbestos Cement | 1950 | 3 | 1 | FALSE |
| 2191 | P-1175 | 6 | Unlined Cast Iron | 1916 | 2.8 | 1 | FALSE |
| 2192 | P-1176 | 6 | Factory Lined Cast Iron | 1972 | 1.4 | 1 | FALSE |
| 2193 | P-1177 | 8 | Ductile Iron | 1993 | 0 | 1 | FALSE |
| 2195 | P-1179 | 8 | Factory Lined Cast Iron | 1964 | 0 | 1 | FALSE |
| 2197 | P-1181 | 6 | Factory Lined Cast Iron | 1964 | 1.9 | 1 | FALSE |
| 2199 | P-1183 | 6 | Unlined Cast Iron | 1922 | 2.7 | 1 | FALSE |
| 2200 | P-1184 | 6 | Unlined Cast Iron | 1901 | 2.4 | 1 | FALSE |
| 2201 | P-1185 | 6 | Unlined Cast Iron | 1916 | 1.5 | 1 | FALSE |
| 2203 | P-1187 | 6 | Factory Lined Cast Iron | 1960 | 0 | 1 | FALSE |
| 2204 | P-1188 | 6 | Factory Lined Cast Iron | 1964 | 0 | 1 | FALSE |
| 2205 | P-1189 | 6 | Unlined Cast Iron | 1901 | 2.4 | 1 | FALSE |
| 2207 | P-1198 | 8 | Ductile Iron | 1980 | 0 | 0 | FALSE |
| 2208 | P-1199 | 12 | Unlined Cast Iron | 1909 | 1.1 | 0 | FALSE |
| 2209 | P-1200 | 8 | Unlined Cast Iron | 1917 | 0 | 0 | FALSE |
| 2210 | P-1202 | 8 | Unlined Cast Iron | 1917 | 0 | 0 | FALSE |
| 2211 | P-1203 | 8 | Ductile Iron | 1998 | 0 | 0 | FALSE |
| 2212 | P-1204 | 8 | Ductile Iron | 1998 | 0 | 0 | FALSE |
| 2213 | P-1205 | 8 | Ductile Iron | 1980 | 0 | 0 | FALSE |
| 2214 | P-1207 | 6 | Unlined Cast Iron | 1896 | 0 | 0 | FALSE |
| 2215 | P-1208 | 6 | Unlined Cast Iron | 1919 | 0 | 0 | FALSE |
| 2216 | P-1209 | 6 | Unlined Cast Iron | 1914 | 0 | 0 | FALSE |
| 2218 | P-1212 | 8 | Asbestos Cement | 1956 | 2.2 | 0 | FALSE |
| 2219 | P-1213 | 6 | Unlined Cast Iron | 1913 | 0 | 0 | FALSE |
| 2220 | P-1214 | 6 | Asbestos Cement | 1956 | 0 | 0 | FALSE |
| 2221 | P-1215 | 6 | Asbestos Cement | 1956 | 0 | 0 | FALSE |
| 2222 | P-1216 | 6 | Asbestos Cement | 1956 | 0 | 0 | FALSE |
| 2223 | P-1217 | 6 | Unlined Cast Iron | 1898 | 0 | 0 | FALSE |
| 2224 | P-1218 | 6 | Unlined Cast Iron | 1917 | 0 | 0 | FALSE |
| 2225 | P-1219 | 6 | Unlined Cast Iron | 1898 | 0 | 0 | FALSE |
| 2226 | P-1220 | 6 | Asbestos Cement | 1956 | 0 | 0 | FALSE |
| 2228 | P-1222 | 8 | Asbestos Cement | 1956 | 2.2 | 0 | FALSE |
| 2229 | P-1223 | 12 | Unlined Cast Iron | 1909 | 1.1 | 0 | FALSE |
| 2230 | P-1224 | 6 | Asbestos Cement | 1956 | 0 | 0 | FALSE |
| 2231 | P-1226 | 12 | Unlined Cast Iron | 1909 | 1.1 | 0 | FALSE |
| 2232 | P-1227 | 12 | Unlined Cast Iron | 1909 | 1.1 | 1 | FALSE |

## Asset Management Pipe Input Data
## Capital Efficiency Study
## Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 2233 | P-1228 | 8 | Asbestos Cement | 1956 | 2.2 | 0 | FALSE |
| 2235 | P-1230 | 6 | Factory Lined Cast Iron | 1966 | 1.4 | 0 | FALSE |
| 2236 | P-1231 | 6 | Factory Lined Cast Iron | 1966 | 1.4 | 0 | FALSE |
| 2237 | P-1232 | 6 | Factory Lined Cast Iron | 1966 | 1.4 | 0 | FALSE |
| 2238 | P-1233 | 6 | Factory Lined Cast Iron | 1966 | 0 | 0 | FALSE |
| 2239 | P-1234 | 8 | Ductile Iron | 1985 | 0 | 0 | FALSE |
| 2240 | P-1235 | 8 | Ductile Iron | 1985 | 0 | 0 | FALSE |
| 2241 | P-1236 | 8 | Ductile Iron | 1985 | 0 | 0 | FALSE |
| 2242 | P-1237 | 8 | Ductile Iron | 1985 | 1.3 | 0 | FALSE |
| 2243 | P-1238 | 8 | Unlined Cast Iron | 1957 | 1.1 | 0 | FALSE |
| 2244 | P-1239 | 8 | Unlined Cast Iron | 1957 | 1.8 | 0 | FALSE |
| 2245 | P-1240 | 12 | Ductile Iron | 1985 | 0 | 0 | FALSE |
| 2246 | P-1241 | 8 | Ductile Iron | 1985 | 0 | 0 | FALSE |
| 2247 | P-1242 | 12 | Ductile Iron | 1985 | 0 | 0 | FALSE |
| 2248 | P-1244 | 8 | Unlined Cast Iron | 1957 | 1.8 | 0 | FALSE |
| 2249 | P-1245 | 6 | Unlined Cast Iron | 1942 | 2.5 | 0 | FALSE |
| 2250 | P-1246 | 8 | Unlined Cast Iron | 1942 | 0 | 0 | FALSE |
| 2252 | P-1248 | 6 | Unlined Cast Iron | 1896 | 0 | 1 | FALSE |
| 2254 | P-1251 | 6 | Unlined Cast Iron | 1894 | 0 | 0 | FALSE |
| 2256 | P-1253 | 12 | Unlined Cast Iron | 1909 | 0 | 0 | FALSE |
| 2258 | P-1256 | 12 | Unlined Cast Iron | 1909 | 0.7 | 0 | FALSE |
| 2259 | P-1257 | 12 | Unlined Cast Iron | 1913 | 0.7 | 0 | FALSE |
| 2262 | P-1260 | 12 | Unlined Cast Iron | 1913 | 0.7 | 0 | FALSE |
| 2263 | P-1261 | 6 | Factory Lined Cast Iron | 1964 | 0 | 0 | FALSE |
| 2264 | P-1262 | 8 | Unlined Cast Iron | 1957 | 0.8 | 0 | FALSE |
| 2265 | P-1263 | 6 | Factory Lined Cast Iron | 1964 | 0 | 0 | FALSE |
| 2266 | P-1264 | 12 | Unlined Cast Iron | 1913 | 0.7 | 0 | FALSE |
| 2267 | P-1265 | 12 | Unlined Cast Iron | 1913 | 0.7 | 0 | FALSE |
| 2268 | P-1266 | 8 | Unlined Cast Iron | 1957 | 0.8 | 0 | FALSE |
| 2269 | P-1267 | 6 | Unlined Cast Iron | 1898 | 0 | 0 | FALSE |
| 2270 | P-1268 | 12 | Unlined Cast Iron | 1913 | 0.7 | 0 | FALSE |
| 2271 | P-1269 | 12 | Unlined Cast Iron | 1913 | 0.7 | 0 | FALSE |
| 2272 | P-1271 | 12 | Unlined Cast Iron | 1913 | 0.7 | 0 | FALSE |
| 2273 | P-1272 | 6 | Unlined Cast Iron | 1896 | 0 | 0 | FALSE |
| 2274 | P-1273 | 12 | Unlined Cast Iron | 1913 | 0.7 | 0 | FALSE |
| 2276 | P-1275 | 6 | Unlined Cast Iron | 1921 | 0 | 0 | FALSE |
| 2278 | P-1277 | 12 | Unlined Cast Iron | 1913 | 0.7 | 1 | FALSE |
| 2279 | P-1278 | 6 | Unlined Cast Iron | 1958 | 0 | 0 | FALSE |
| 2280 | P-1279 | 8 | Ductile Iron | 1985 | 0 | 0 | FALSE |
| 2282 | Central St | 8 | Asbestos Cement | 1956 | 0 | 0 | FALSE |
| 2284 | P-1284 | 8 | Asbestos Cement | 1956 | 0 | 0 | FALSE |



Prepared by or under the supervision of: Robert L. Roland

# Asset Management Pipe Input Data
## Capital Efficiency Study
## Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 2285 | P-1285 | 6 | Unlined Cast Iron | 1914 | 2.6 | 0 | FALSE |
| 2286 | P-1291 | 24 | Ductile Iron | 1996 | 0 | 0 | FALSE |
| 2287 | P-1293 | 12 | Unlined Cast Iron | 1910 | 0 | 0 | FALSE |
| 2288 | P-1294 | 24 | Ductile Iron | 1995 | 0.9 | 1 | FALSE |
| 2289 | P-1296 | 24 | Ductile Iron | 1996 | 0 | 0 | FALSE |
| 2290 | P-1297 | 24 | Ductile Iron | 1996 | 0 | 0 | FALSE |
| 2291 | P-1300 | 8 | Unlined Cast Iron | 1998 | 0 | 0 | FALSE |
| 2292 | P-1301 | 12 | Unlined Cast Iron | 1909 | 1.3 | 1 | FALSE |
| 2294 | P-1304 | 12 | Unlined Cast Iron | 1909 | 1.1 | 0 | FALSE |
| 2295 | P-1305 | 12 | Unlined Cast Iron | 1909 | 1.1 | 0 | FALSE |
| 2296 | P-1308 | 8 | Factory Lined Cast Iron | 1971 | 0 | 0 | FALSE |
| 2297 | P-1309 | 8 | Ductile Iron | 1992 | 0 | 0 | FALSE |
| 2298 | P-1310 | 8 | Ductile Iron | 1992 | 0 | 0 | FALSE |
| 2299 | P-1311 | 8 | Ductile Iron | 1992 | 0 | 0 | FALSE |
| 2302 | P-1315 | 6 | Unlined Cast Iron | 1915 | 0 | 1 | FALSE |
| 2304 | P-1321 | 6 | Asbestos Cement | 1947 | 0 | 0 | FALSE |
| 2306 | P-1323 | 8 | Unlined Cast Iron | 1955 | 0 | 0 | FALSE |
| 2307 | P-1324 | 8 | Asbestos Cement | 1955 | 0 | 0 | FALSE |
| 2308 | P-1325 | 8 | Unlined Cast Iron | 1950 | 1.26 | 0 | FALSE |
| 2309 | P-1326 | 8 | Unlined Cast Iron | 1950 | 1.26 | 0 | FALSE |
| 2310 | P-1327 | 12 | Unlined Cast Iron | 1916 | 0.7 | 0 | FALSE |
| 2311 | P-1328 | 10 | Unlined Cast Iron | 1916 | 0 | 0 | FALSE |
| 2312 | P-1329 | 12 | Unlined Cast Iron | 1917 | 1.7 | 0 | FALSE |
| 2313 | P-1330 | 12 | Unlined Cast Iron | 1917 | 1.7 | 0 | FALSE |
| 2314 | P-1331 | 6 | Asbestos Cement | 1953 | 1.7 | 0 | FALSE |
| 2315 | P-1332 | 6 | Unlined Cast Iron | 1959 | 0 | 0 | FALSE |
| 2316 | P-1333 | 8 | Unlined Cast Iron | 1949 | 0 | 0 | FALSE |
| 2318 | P-1335 | 6 | Unlined Cast Iron | 1908 | 0 | 0 | FALSE |
| 2320 | P-1337 | 10 | Unlined Cast Iron | 1922 | 0 | 0 | FALSE |
| 2322 | P-1339 | 6 | Factory Lined Cast Iron | 1971 | 4.8 | 0 | FALSE |
| 2324 | P-1341 | 8 | Ductile Iron | 1986 | 0 | 1 | FALSE |
| 2325 | P-1342 | 6 | Unlined Cast Iron | 1887 | 32.8 | 1 | FALSE |
| 2327 | P-1344 | 6 | Unlined Cast Iron | 1902 | 0 | 1 | FALSE |
| 2328 | P-1345 | 6 | Unlined Cast Iron | 1949 | 0 | 1 | FALSE |
| 2329 | P-1346 | 6 | Asbestos Cement | 1949 | 4.3 | 1 | FALSE |
| 2331 | P-1348 | 6 | Unlined Cast Iron | 1948 | 0 | 1 | FALSE |
| 2332 | P-1349 | 6 | Asbestos Cement | 1948 | 8.5 | 1 | FALSE |
| 2333 | P-1350 | 6 | Asbestos Cement | 1955 | 0 | 0 | FALSE |
| 2334 | P-1351 | 6 | Unlined Cast Iron | 1955 | 0 | 0 | FALSE |
| 2335 | P-1361 | 12 | Ductile Iron | 1986 | 0 | 0 | TRUE |
| 2336 | P-1362 | 12 | Ductile Iron | 1986 | 0 | 0 | TRUE |

## Asset Management Pipe Input Data
## Capital Efficiency Study
## Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 2337 | P-1363 | 6 | Unlined Cast Iron | 1949 | 0 | 0 | FALSE |
| 2338 | P-1365 | 8 | Unlined Cast Iron | 1917 | 0.2 | 0 | FALSE |
| 2339 | P-1366 | 8 | Unlined Cast Iron | 1917 | 0.2 | 0 | FALSE |
| 2340 | P-1367 | 6 | Asbestos Cement | 1953 | 0 | 0 | FALSE |
| 2341 | P-1368 | 6 | Asbestos Cement | 1953 | 0 | 0 | FALSE |
| 2342 | P-1370 | 8 | Unlined Cast Iron | 1917 | 2.1 | 0 | FALSE |
| 2343 | P-1372 | 12 | Ductile Iron | 1985 | 1.4 | 0 | TRUE |
| 2344 | P-1043 | 8 | Unlined Cast Iron | 1917 | 0.2 | 0 | FALSE |
| 2345 | P-1066 | 6 | Unlined Cast Iron | 1949 | 0 | 0 | FALSE |
| 2346 | P-1071 | 6 | Unlined Cast Iron | 1949 | 0 | 0 | FALSE |
| 2347 | P-1088 | 6 | Asbestos Cement | 1953 | 0 | 0 | FALSE |
| 2348 | P-1095 | 6 | Asbestos Cement | 1953 | 0 | 0 | FALSE |
| 2351 | P-1145 | 12 | Ductile Iron | 1985 | 1.4 | 0 | FALSE |
| 2352 | P-1147 | 12 | Ductile Iron | 1985 | 1.4 | 0 | FALSE |
| 2356 | P-1191 | 8 | Factory Lined Cast Iron | 1964 | 0.33 | 0 | FALSE |
| 2362 | P-1210 | 8 | Factory Lined Cast Iron | 1964 | 0.33 | 0 | FALSE |
| 2363 | P-1290 | 8 | Asbestos Cement | 1952 | 1.6 | 0 | FALSE |
| 2366 | P-1299 | 12 | Factory Lined Cast Iron | 1970 | 0.4 | 0 | TRUE |
| 2367 | P-1303 | 12 | Factory Lined Cast Iron | 1970 | 0.4 | 0 | FALSE |
| 2368 | P-1306 | 8 | Ductile Iron | 1996 | 0 | 0 | TRUE |
| 2369 | P-1316 | 8 | Ductile Iron | 1996 | 0 | 0 | TRUE |
| 2370 | P-1317 | 8 | Ductile Iron | 1996 | 0 | 0 | TRUE |
| 2371 | P-1318 | 8 | Ductile Iron | 1996 | 0 | 0 | TRUE |
| 2372 | P-1319 | 12 | Unlined Cast Iron | 1913 | 0.7 | 0 | FALSE |
| 2373 | HP-77 | 6 | Factory Lined Cast Iron | 1965 | 0 | 0 | FALSE |
| 2374 | HP-63 | 12 | Ductile Iron | 1997 | 0 | 0 | FALSE |
| 2375 | HP-61 | 8 | Factory Lined Cast Iron | 1964 | 0 | 0 | FALSE |
| 2376 | HP-57 | 12 | Ductile Iron | 1986 | 0 | 0 | FALSE |
| 2377 | HP-46 | 6 | Asbestos Cement | 1955 | 0 | 0 | FALSE |
| 2378 | HP-43 | 6 | Factory Lined Cast Iron | 1971 | 0 | 1 | FALSE |
| 2379 | HP-42 | 6 | Asbestos Cement | 1955 | 0 | 0 | FALSE |
| 2380 | HP-40 | 12 | Asbestos Cement | 1953 | 0 | 0 | FALSE |
| 2381 | HP-33 | 6 | Asbestos Cement | 1953 | 0 | 0 | FALSE |
| 2382 | HP-39 | 12 | Asbestos Cement | 1961 | 0 | 0 | FALSE |
| 2384 | P-1316a | 8 | Ductile Iron | 1979 | 0 | 1 | FALSE |
| 2385 | HP-237 | 12 | Ductile Iron | 1995 | 0 | 0 | FALSE |
| 2386 | HP-235 | 8 | Factory Lined Cast Iron | 1962 | 3.9 | 0 | FALSE |
| 2387 | HP-234 | 8 | Factory Lined Cast Iron | 1962 | 3.9 | 0 | FALSE |
| 2388 | HP-70 | 12 | Factory Lined Cast Iron | 1963 | 0 | 0 | FALSE |
| 2389 | HP-69 | 12 | Factory Lined Cast Iron | 1963 | 0 | 0 | FALSE |
| 2390 | HP-67 | 12 | Factory Lined Cast Iron | 1961 | 0 | 0 | FALSE |



Prepared by or under the supervision of: Robert L. Roland

## Asset Management Pipe Input Data
## Capital Efficiency Study
## Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 2391 | HP-66 | 12 | Factory Lined Cast Iron | 1961 | 0 | 0 | FALSE |
| 2392 | HP-65 | 8 | Asbestos Cement | 1954 | 0.7 | 0 | FALSE |
| 2393 | HP-56 | 12 | Factory Lined Cast Iron | 1961 | 0 | 0 | FALSE |
| 2394 | HP-41 | 8 | Factory Lined Cast Iron | 1967 | 0.8 | 0 | FALSE |
| 2395 | HP-38 | 12 | Asbestos Cement | 1961 | 0 | 0 | FALSE |
| 2396 | HP-37 | 12 | Factory Lined Cast Iron | 1961 | 0 | 0 | FALSE |
| 2397 | HP-36 | 6 | Asbestos Cement | 1955 | 0 | 0 | FALSE |
| 2398 | HP-35 | 8 | Asbestos Cement | 1954 | 0 | 0 | FALSE |
| 2399 | HP-34 | 8 | Asbestos Cement | 1954 | 0.7 | 0 | FALSE |
| 2400 | HP-32 | 6 | Asbestos Cement | 1953 | 0 | 0 | FALSE |
| 2401 | HP-31 | 8 | Factory Lined Cast Iron | 1966 | 0 | 1 | FALSE |
| 2402 | HP-30 | 8 | Factory Lined Cast Iron | 1969 | 0 | 0 | FALSE |
| 2403 | HP-29 | 8 | Ductile Iron | 1981 | 0 | 1 | FALSE |
| 2404 | HP-28 | 8 | Factory Lined Cast Iron | 1969 | 0 | 1 | FALSE |
| 2405 | HP-26 | 8 | Factory Lined Cast Iron | 1963 | 0.9 | 0 | FALSE |
| 2406 | HP-25 | 8 | Factory Lined Cast Iron | 1966 | 0.9 | 0 | FALSE |
| 2407 | HP-24 | 12 | Factory Lined Cast Iron | 1961 | 0 | 1 | FALSE |
| 2408 | HP-23 | 12 | Factory Lined Cast Iron | 1971 | 0 | 1 | FALSE |
| 2409 | HP-22 | 8 | Factory Lined Cast Iron | 1972 | 0 | 0 | FALSE |
| 2410 | HP-21 | 12 | Factory Lined Cast Iron | 1969 | 0 | 0 | FALSE |
| 2414 | HP-17 | 12 | Ductile Iron | 1995 | 0 | 0 | FALSE |
| 2415 | HP-16 | 12 | Ductile Iron | 1995 | 0 | 0 | FALSE |
| 2417 | HP-13 | 12 | Factory Lined Cast Iron | 1961 | 0 | 0 | FALSE |
| 2418 | HP-12 | 12 | Factory Lined Cast Iron | 1965 | 0 | 1 | FALSE |
| 2419 | HP-11 | 12 | Factory Lined Cast Iron | 1965 | 0 | 1 | FALSE |
| 2420 | HP-10 | 12 | Factory Lined Cast Iron | 1965 | 0 | 0 | FALSE |
| 2422 | HP-8 | 8 | Factory Lined Cast Iron | 1963 | 0.4 | 0 | FALSE |
| 2423 | HP-7 | 8 | Factory Lined Cast Iron | 1963 | 0.86 | 0 | FALSE |
| 2424 | HP-5 | 8 | Ductile Iron | 1977 | 1.6 | 1 | FALSE |
| 2425 | HP-4 | 8 | Ductile Iron | 1977 | 0 | 0 | FALSE |
| 2426 | HP-3 | 8 | Ductile Iron | 1977 | 1.6 | 0 | FALSE |
| 2427 | HP-2 | 12 | Factory Lined Cast Iron | 1965 | 0 | 1 | FALSE |
| 2428 | HP-1 | 12 | Factory Lined Cast Iron | 1967 | 0 | 1 | FALSE |
| 2429 | HP-200 | 16 | Ductile Iron | 1967 | 0 | 0 | FALSE |
| 2430 | P-199 | 24 | Asbestos Cement | 1953 | 0 | 0 | FALSE |
| 2432 | Main Street | 8 | Unlined Cast Iron | 1912 | 0.6 | 1 | FALSE |
| 2433 | HP-53 | 8 | Factory Lined Cast Iron | 1964 | 0 | 0 | FALSE |
| 2434 | HP-52 | 6 | Factory Lined Cast Iron | 1962 | 0 | 1 | FALSE |
| 2435 | HP-51 | 8 | Factory Lined Cast Iron | 1962 | 0 | 0 | FALSE |
| 2436 | HP-50 | 8 | Unlined Cast Iron | 1912 | 0.6 | 0 | FALSE |
| 2437 | HP-49 | 8 | Unlined Cast Iron | 1912 | 0.6 | 0 | FALSE |



Prepared by or under the supervision of: Robert L. Roland

# Asset Management Pipe Input Data
## Capital Efficiency Study
## Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 2438 | HP-48 | 8 | Ductile Iron | 1985 | 0 | 0 | FALSE |
| 2439 | HP-45 | 12 | Asbestos Cement | 1953 | 0 | 0 | FALSE |
| 2440 | HP-44 | 6 | Factory Lined Cast Iron | 1972 | 0 | 0 | FALSE |
| 2441 | Pioneer Road | 8 | Factory Lined Cast Iron | 1963 | 0.7 | 0 | TRUE |
| 2442 | HP-185 | 6 | Factory Lined Cast Iron | 1966 | 0 | 1 | TRUE |
| 2443 | HP-171 | 8 | Asbestos Cement | 1951 | 1.1 | 0 | TRUE |
| 2444 | HP-170 | 8 | Asbestos Cement | 1952 | 0 | 0 | TRUE |
| 2445 | Winthrop Rd | 8 | Asbestos Cement | 1956 | 0 | 0 | TRUE |
| 2446 | HP-145 | 8 | Factory Lined Cast Iron | 1966 | 0 | 0 | TRUE |
| 2447 | HP-194 | 6 | Factory Lined Cast Iron | 1968 | 0 | 0 | TRUE |
| 2448 | HP-179 | 6 | Asbestos Cement | 1954 | 0 | 0 | TRUE |
| 2449 | HP-197 | 8 | Factory Lined Cast Iron | 1968 | 0 | 1 | TRUE |
| 2450 | HP-196 | 6 | Factory Lined Cast Iron | 1968 | 0 | 1 | TRUE |
| 2451 | HP-195 | 6 | Factory Lined Cast Iron | 1968 | 0 | 0 | TRUE |
| 2452 | HP-187 | 8 | Factory Lined Cast Iron | 1963 | 0 | 1 | TRUE |
| 2453 | HP-186 | 6 | Factory Lined Cast Iron | 1964 | 0.6 | 1 | TRUE |
| 2454 | HP-164 | 8 | Ductile Iron | 1989 | 0 | 0 | FALSE |
| 2455 | HP-163 | 12 | Ductile Iron | 1989 | 0.5 | 0 | FALSE |
| 2456 | Cushing Street | 12 | Ductile Iron | 1991 | 0.5 | 0 | FALSE |
| 2457 | HP-155 | 8 | Factory Lined Cast Iron | 1966 | 0 | 0 | FALSE |
| 2458 | HP-154 | 8 | Factory Lined Cast Iron | 1964 | 0 | 0 | FALSE |
| 2459 | HP-153 | 8 | Factory Lined Cast Iron | 1964 | 0 | 0 | FALSE |
| 2460 | HP-152 | 8 | Ductile Iron | 1992 | 0 | 0 | FALSE |
| 2461 | HP-150 | 8 | Factory Lined Cast Iron | 1969 | 0 | 0 | FALSE |
| 2462 | HP-149 | 8 | Factory Lined Cast Iron | 1965 | 0 | 0 | FALSE |
| 2463 | HP-147 | 8 | Factory Lined Cast Iron | 1963 | 0 | 1 | TRUE |
| 2464 | HP-146 | 12 | Factory Lined Cast Iron | 1967 | 0.5 | 0 | FALSE |
| 2465 | HP-306 | 8 | Ductile Iron | 2007 | 0 | 0 | FALSE |
| 2467 | HP-305 | 8 | Ductile Iron | 2007 | 0 | 1 | FALSE |
| 2468 | HP-303 | 8 | Ductile Iron | 2007 | 0 | 0 | FALSE |
| 2469 | HP-300 | 8 | Ductile Iron | 2007 | 0 | 0 | FALSE |
| 2471 | HP-301 | 8 | Ductile Iron | 2007 | 0 | 0 | FALSE |
| 2473 | P-4 | 8 | Factory Lined Cast Iron | 1963 | 0 | 0 | FALSE |
| 2474 | P-3 | 8 | Factory Lined Cast Iron | 1963 | 0 | 0 | FALSE |
| 2475 | HP-60 | 12 | Ductile Iron | 1996 | 0 | 0 | FALSE |
| 2476 | HP-64 | 12 | Ductile Iron | 1986 | 0 | 0 | FALSE |
| 2477 | HP-62 | 12 | Ductile Iron | 1986 | 0 | 0 | FALSE |
| 2478 | HP-59 | 8 | Ductile Iron | 1996 | 0 | 1 | FALSE |
| 2480 | Upland Dr | 8 | Factory Lined Cast Iron | 1968 | 0 | 1 | FALSE |
| 2481 | Wanders Dr | 8 | Factory Lined Cast Iron | 1967 | 0 | 1 | FALSE |
| 2482 | HP-139 | 8 | Factory Lined Cast Iron | 1965 | 0 | 0 | FALSE |

# Asset Management Pipe Input Data
## Capital Efficiency Study
## Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 2483 | HP-138 | 6 | Factory Lined Cast Iron | 1969 | 0 | 0 | FALSE |
| 2484 | HP-1358 | 8 | Ductile Iron | 1981 | 0 | 1 | FALSE |
| 2486 | HP-204 | 6 | Asbestos Cement | 1950 | 0 | 0 | FALSE |
| 2487 | HP-203 | 6 | Unlined Cast Iron | 1942 | 0 | 0 | FALSE |
| 2488 | HP-202 | 6 | Unlined Cast Iron | 1942 | 0 | 0 | FALSE |
| 2489 | HP-201 | 8 | Factory Lined Cast Iron | 1965 | 0 | 0 | TRUE |
| 2490 | HP-193 | 6 | Asbestos Cement | 1950 | 1.2 | 0 | TRUE |
| 2491 | HP-192 | 6 | Asbestos Cement | 1950 | 0 | 0 | TRUE |
| 2492 | Pioneer Rd | 6 | Asbestos Cement | 1955 | 1.2 | 0 | TRUE |
| 2493 | HP-190 | 6 | Factory Lined Cast Iron | 1964 | 0.6 | 0 | TRUE |
| 2494 | HP-189 | 8 | Factory Lined Cast Iron | 1965 | 0 | 0 | TRUE |
| 2495 | HP-184 | 8 | Factory Lined Cast Iron | 1965 | 1.8 | 0 | TRUE |
| 2496 | HP-183 | 6 | Factory Lined Cast Iron | 1966 | 3.9 | 0 | TRUE |
| 2497 | HP-182 | 8 | Factory Lined Cast Iron | 1964 | 0 | 0 | TRUE |
| 2498 | HP-181 | 6 | Asbestos Cement | 1954 | 0 | 0 | TRUE |
| 2499 | HP-180 | 6 | Asbestos Cement | 1954 | 0 | 0 | TRUE |
| 2500 | HP-178 | 6 | Asbestos Cement | 1954 | 0 | 0 | TRUE |
| 2501 | HP-177 | 8 | Asbestos Cement | 1951 | 1.1 | 0 | TRUE |
| 2502 | HP-176 | 8 | Asbestos Cement | 1951 | 1.1 | 0 | TRUE |
| 2503 | HP-175 | 6 | Asbestos Cement | 1948 | 0 | 0 | TRUE |
| 2504 | HP-174 | 6 | Asbestos Cement | 1954 | 0 | 0 | TRUE |
| 2505 | HP-173 | 8 | Asbestos Cement | 1951 | 0 | 0 | TRUE |
| 2506 | Pilgrim Rd | 6 | Asbestos Cement | 1952 | 0 | 0 | TRUE |
| 2507 | HP-169 | 6 | Asbestos Cement | 1954 | 0 | 0 | TRUE |
| 2508 | Puritan Rd | 6 | Asbestos Cement | 1952 | 0 | 0 | TRUE |
| 2509 | HP-167 | 6 | Asbestos Cement | 1952 | 0 | 0 | TRUE |
| 2510 | HP-166 | 8 | Asbestos Cement | 1954 | 0 | 0 | TRUE |
| 2511 | HP-165 | 8 | Asbestos Cement | 1954 | 0 | 0 | TRUE |
| 2512 | HP-161 | 6 | Asbestos Cement | 1954 | 0 | 0 | TRUE |
| 2514 | HP-159 | 6 | Asbestos Cement | 1951 | 0 | 0 | FALSE |
| 2515 | HP-158 | 8 | Asbestos Cement | 1956 | 0 | 1 | TRUE |
| 2516 | HP-157 | 8 | Asbestos Cement | 1954 | 0 | 0 | TRUE |
| 2517 | HP-137 | 8 | Factory Lined Cast Iron | 1965 | 0 | 0 | FALSE |
| 2518 | Prospect St | 8 | Factory Lined Cast Iron | 1963 | 0 | 0 | FALSE |
| 2519 | HP-135 | 8 | Factory Lined Cast Iron | 1965 | 0 | 0 | FALSE |
| 2520 | Meadow Rd | 8 | Factory Lined Cast Iron | 1963 | 0 | 0 | FALSE |
| 2521 | HP-133 | 8 | Factory Lined Cast Iron | 1963 | 0 | 0 | FALSE |
| 2522 | HP-129_2 | 8 | Unlined Cast Iron | 1912 | 0 | 0 | FALSE |
| 2523 | HP-127_1 | 8 | Factory Lined Cast Iron | 1971 | 0 | 0 | FALSE |
| 2524 | HP-126 | 8 | Ductile Iron | 1996 | 0 | 0 | FALSE |
| 2525 | HP-125 | 8 | Factory Lined Cast Iron | 1970 | 0 | 0 | FALSE |

# Asset Management Pipe Input Data
## Capital Efficiency Study
## Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 2528 | HP-122 | 8 | Factory Lined Cast Iron | 1966 | 0 | 0 | FALSE |
| 2529 | HP-121 | 8 | Factory Lined Cast Iron | 1970 | 0 | 0 | FALSE |
| 2531 | HP-119 | 8 | Ductile Iron | 1992 | 0 | 0 | FALSE |
| 2532 | HP-118_2 | 8 | Unlined Cast Iron | 1912 | 0 | 0 | FALSE |
| 2533 | HP-117_3 | 8 | Factory Lined Cast Iron | 1971 | 0 | 0 | FALSE |
| 2534 | HP-116 | 8 | Factory Lined Cast Iron | 1966 | 0 | 0 | FALSE |
| 2537 | HP-113 | 8 | Factory Lined Cast Iron | 1970 | 0 | 0 | FALSE |
| 2540 | HP-110 | 8 | Factory Lined Cast Iron | 1971 | 0 | 0 | FALSE |
| 2541 | HP-88 | 8 | Unlined Cast Iron | 1957 | 0 | 1 | FALSE |
| 2542 | HP-107 | 6 | Factory Lined Cast Iron | 1962 | 0 | 0 | FALSE |
| 2543 | HP-105 | 6 | Unlined Cast Iron | 1957 | 0 | 0 | FALSE |
| 2544 | HP-104 | 8 | Unlined Cast Iron | 1912 | 0.6 | 0 | FALSE |
| 2545 | HP-103 | 12 | Asbestos Cement | 1956 | 1.5 | 0 | FALSE |
| 2546 | HP-1287 | 6 | Unlined Cast Iron | 1942 | 0 | 0 | FALSE |
| 2547 | HP-1360 | 6 | Unlined Cast Iron | 1942 | 0 | 0 | FALSE |
| 2549 | HP-1359 | 6 | Unlined Cast Iron | 1942 | 0 | 0 | FALSE |
| 2550 | HP-1357 | 8 | Ductile Iron | 1981 | 0 | 0 | FALSE |
| 2551 | HP-1356 | 12 | Ductile Iron | 1995 | 0 | 0 | FALSE |
| 2552 | HP-1355 | 12 | Ductile Iron | 1995 | 0 | 0 | FALSE |
| 2553 | HP-1354 | 12 | Ductile Iron | 1995 | 0 | 0 | FALSE |
| 2554 | HP-1352 | 6 | Unlined Cast Iron | 1912 | 0 | 0 | FALSE |
| 2555 | P-1319 | 6 | Unlined Cast Iron | 1959 | 0 | 0 | FALSE |
| 2556 | P-1318a | 6 | Asbestos Cement | 1956 | 0 | 1 | FALSE |
| 2557 | HP-128 | 12 | Ductile Iron | 1995 | 0 | 0 | FALSE |
| 2558 | HP-128_1 | 6 | Unlined Cast Iron | 1912 | 0 | 0 | FALSE |
| 2559 | HP-109_1 | 12 | Ductile Iron | 1995 | 0 | 0 | FALSE |
| 2560 | P-700 | 8 | Factory Lined Cast Iron | 1963 | 0 | 0 | FALSE |
| 2561 | P-246 | 8 | Factory Lined Cast Iron | 1963 | 0 | 0 | FALSE |
| 2562 | HP-245 | 8 | Ductile Iron | 1981 | 0 | 1 | FALSE |
| 2563 | HP-233 | 6 | Asbestos Cement | 1950 | 0 | 0 | FALSE |
| 2564 | HP-232 | 6 | Unlined Cast Iron | 1949 | 0 | 0 | FALSE |
| 2565 | HP-231 | 6 | Unlined Cast Iron | 1915 | 0.9 | 0 | FALSE |
| 2566 | HP-229 | 8 | Ductile Iron | 1990 | 0 | 0 | FALSE |
| 2567 | HP-228 | 6 | Unlined Cast Iron | 1949 | 0 | 0 | FALSE |
| 2568 | HP-227 | 6 | Unlined Cast Iron | 1948 | 0 | 0 | FALSE |
| 2569 | HP-226 | 6 | Factory Lined Cast Iron | 1966 | 0 | 0 | FALSE |
| 2571 | HP-224 | 6 | Asbestos Cement | 1950 | 0 | 0 | FALSE |
| 2572 | HP-223 | 6 | Asbestos Cement | 1950 | 0 | 0 | FALSE |
| 2573 | HP-222 | 6 | Asbestos Cement | 1950 | 0 | 0 | FALSE |
| 2574 | HP-221 | 6 | Asbestos Cement | 1950 | 0 | 0 | FALSE |
| 2575 | HP-219 | 6 | Factory Lined Cast Iron | 1966 | 0 | 0 | FALSE |



Prepared by or under the supervision of:  Robert L. Roland

**Asset Management Pipe Input Data**
**Capital Efficiency Study**
**Aquarion Water Company - Hingham/Hull Water System**

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 2576 | HP-218 | 8 | Factory Lined Cast Iron | 1971 | 0 | 1 | FALSE |
| 2577 | HP-217_1 | 6 | Unlined Cast Iron | 1912 | 0 | 0 | FALSE |
| 2578 | HP-215 | 6 | Asbestos Cement | 1951 | 0 | 0 | FALSE |
| 2579 | HP-214 | 6 | Unlined Cast Iron | 1912 | 0.9 | 0 | FALSE |
| 2581 | HP-211 | 6 | Asbestos Cement | 1948 | 1.4 | 0 | FALSE |
| 2582 | HP-102 | 12 | Asbestos Cement | 1956 | 1.5 | 0 | FALSE |
| 2583 | HP-101 | 8 | Factory Lined Cast Iron | 1963 | 0 | 0 | FALSE |
| 2584 | HP-100 | 8 | Unlined Cast Iron | 1957 | 0 | 0 | FALSE |
| 2585 | HP-99 | 12 | Asbestos Cement | 1955 | 1.5 | 0 | FALSE |
| 2586 | HP-98 | 8 | Factory Lined Cast Iron | 1962 | 0 | 0 | FALSE |
| 2587 | HP-97 | 8 | Asbestos Cement | 1955 | 0 | 0 | FALSE |
| 2588 | HP-96 | 8 | Factory Lined Cast Iron | 1962 | 0 | 0 | FALSE |
| 2590 | HP-94 | 8 | Asbestos Cement | 1955 | 0 | 0 | FALSE |
| 2591 | HP-93 | 8 | Unlined Cast Iron | 1912 | 0.6 | 0 | FALSE |
| 2592 | HP-91 | 6 | Asbestos Cement | 1955 | 0 | 0 | FALSE |
| 2593 | HP-90 | 8 | Asbestos Cement | 1955 | 0 | 0 | FALSE |
| 2594 | HP-89 | 12 | Asbestos Cement | 1955 | 1.5 | 0 | FALSE |
| 2596 | Sentinel Rd | 8 | Ductile Iron | 1975 | 0 | 0 | FALSE |
| 2597 | HP-84 | 8 | Unlined Cast Iron | 1957 | 0 | 0 | FALSE |
| 2598 | HP-83 | 8 | Ductile Iron | 1975 | 0 | 0 | FALSE |
| 2599 | HP-82 | 8 | Ductile Iron | 1975 | 0 | 0 | FALSE |
| 2600 | HP-76 | 8 | Asbestos Cement | 1954 | 0 | 0 | FALSE |
| 2601 | HP-75 | 8 | Factory Lined Cast Iron | 1967 | 0 | 0 | FALSE |
| 2602 | HP-74 | 12 | Factory Lined Cast Iron | 1967 | 0 | 0 | FALSE |
| 2603 | HP-106 | 8 | Unlined Cast Iron | 1957 | 0 | 0 | FALSE |
| 2604 | Richards Rd | 8 | Unlined Cast Iron | 1957 | 0 | 0 | FALSE |
| 2605 | HP-87 | 8 | Unlined Cast Iron | 1957 | 0 | 0 | FALSE |
| 2607 | HP-92 | 8 | Factory Lined Cast Iron | 1963 | 0 | 0 | FALSE |
| 2608 | HP-80 | 8 | Factory Lined Cast Iron | 1963 | 0 | 0 | FALSE |
| 2609 | HP-79 | 8 | Factory Lined Cast Iron | 1963 | 0 | 0 | FALSE |
| 2610 | HP-78 | 8 | Unlined Cast Iron | 1912 | 0.6 | 0 | FALSE |
| 2611 | HP-142 | 8 | Factory Lined Cast Iron | 1967 | 0 | 1 | FALSE |
| 2612 | HP-141 | 8 | Factory Lined Cast Iron | 1965 | 0 | 1 | FALSE |
| 2613 | HP-140 | 8 | Ductile Iron | 1982 | 0 | 1 | FALSE |
| 2614 | P-1352 | 12 | Ductile Iron | 1995 | 0 | 0 | FALSE |
| 2615 | P-1353 | 12 | Ductile Iron | 1995 | 0 | 0 | FALSE |
| 2617 | P-1355 | 8 | Ductile Iron | 2007 | 0 | 0 | FALSE |
| 2620 | P-1358 | 12 | Asbestos Cement | 1956 | 0.3 | 1 | FALSE |
| 2621 | P-1359 | 12 | Asbestos Cement | 1956 | 0 | 1 | FALSE |
| 2622 | P-1364 | 8 | Factory Lined Cast Iron | 1966 | 0 | 1 | FALSE |
| 2623 | P-1369 | 8 | Factory Lined Cast Iron | 1965 | 0 | 0 | FALSE |

# Asset Management Pipe Input Data
# Capital Efficiency Study
# Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 2624 | P-1371 | 8 | Ductile Iron | 1985 | 0 | 1 | FALSE |
| 2625 | P-1373 | 8 | Ductile Iron | 1985 | 0 | 0 | FALSE |
| 2628 | P-1376 | 8 | Asbestos Cement | 1950 | 0.4 | 0 | FALSE |
| 2629 | P-1377 | 8 | Unlined Cast Iron | 1927 | 0 | 0 | FALSE |
| 2630 | P-1378 | 8 | Unlined Cast Iron | 1927 | 0 | 0 | TRUE |
| 2631 | P-1379 | 8 | Ductile Iron | 1973 | 0 | 0 | FALSE |
| 2632 | P-1380 | 8 | Ductile Iron | 1975 | 0 | 1 | TRUE |
| 2633 | P-1381 | 8 | Ductile Iron | 1980 | 0 | 0 | FALSE |
| 2635 | P-1383 | 12 | Unlined Cast Iron | 1917 | 0.3 | 1 | FALSE |
| 2636 | P-1384 | 12 | Unlined Cast Iron | 1917 | 0.3 | 0 | FALSE |
| 2637 | P-1385 | 12 | Unlined Cast Iron | 1891 | 0.3 | 0 | FALSE |
| 2638 | P-1386 | 12 | Unlined Cast Iron | 1891 | 0.3 | 0 | FALSE |
| 2640 | P-1388 | 6 | Unlined Cast Iron | 1895 | 0.2 | 0 | FALSE |
| 2641 | P-1389 | 8 | Factory Lined Cast Iron | 1965 | 1.5 | 0 | FALSE |
| 2642 | P-1390 | 8 | Factory Lined Cast Iron | 1965 | 0 | 0 | FALSE |
| 2644 | P-1391 | 12 | Unlined Cast Iron | 1894 | 1.3 | 0 | FALSE |
| 2646 | P-1394 | 12 | Unlined Cast Iron | 1894 | 1.3 | 1 | FALSE |
| 2647 | P-1395 | 12 | Unlined Cast Iron | 1894 | 1.3 | 1 | FALSE |
| 2648 | P-1396 | 12 | Unlined Cast Iron | 1894 | 1.3 | 1 | FALSE |
| 2649 | P-1397 | 12 | Unlined Cast Iron | 1894 | 1.3 | 1 | FALSE |
| 2650 | P-1398 | 24 | Ductile Iron | 1996 | 0 | 0 | FALSE |
| 2652 | P-1400 | 8 | Asbestos Cement | 1955 | 2.3 | 0 | FALSE |
| 2654 | P-1402 | 6 | Asbestos Cement | 1948 | 1.4 | 0 | FALSE |
| 2657 | P-1405 | 12 | Unlined Cast Iron | 1909 | 1.3 | 1 | FALSE |
| 2658 | P-1406 | 12 | Unlined Cast Iron | 1894 | 1.3 | 0 | FALSE |
| 2663 | P-1411 | 8 | Unlined Cast Iron | 1957 | 0 | 0 | FALSE |
| 2664 | P-1412 | 6 | Unlined Cast Iron | 1907 | 0 | 0 | FALSE |
| 2665 | P-1413 | 6 | Unlined Cast Iron | 1907 | 0 | 0 | FALSE |
| 2666 | P-1414 | 8 | Unlined Cast Iron | 1916 | 0.2 | 0 | FALSE |
| 2667 | P-1415 | 8 | Unlined Cast Iron | 1916 | 0.2 | 0 | FALSE |
| 2669 | P-1419 (Proposed) | 6 | Factory Lined Cast Iron | 1962 | 0.9 | 0 | TRUE |
| 2670 | P-1418 (Proposed) | 12 | Ductile Iron | 2007 | 0 | 0 | FALSE |
| 2672 | P-1418 | 24 | Ductile Iron | 1995 | 0 | 0 | TRUE |
| 2674 | P-1420 | 4 | Unlined Cast Iron | 1916 | 0 | 0 | FALSE |
| 2675 | P-1419 | 8 | Asbestos Cement | 1951 | 0 | 0 | TRUE |
| 2705 | P-1441 | 12 | Unlined Cast Iron | 1894 | 1.3 | 1 | FALSE |
| 2706 | P-1442 | 12 | Unlined Cast Iron | 1894 | 1.3 | 1 | FALSE |
| 2707 | P-1443 | 6 | Unlined Cast Iron | 1924 | 0 | 1 | FALSE |
| 2710 | P-1444 | 20 | Unlined Cast Iron | 1924 | 0 | 1 | FALSE |
| 2714 | P-1446 | 20 | Unlined Cast Iron | 1924 | 0 | 1 | FALSE |
| 2719 | P-1448 | 8 | Ductile Iron | 1985 | 0 | 0 | FALSE |



Prepared by or under the supervision of: Robert L. Roland

# Asset Management Pipe Input Data
## Capital Efficiency Study
## Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 2720 | P-1449 | 8 | Ductile Iron | 1985 | 0 | 0 | FALSE |
| 2722 | P-1450 | 8 | Ductile Iron | 2007 | 0 | 1 | FALSE |
| 2724 | P-1451 | 8 | Ductile Iron | 2007 | 0 | 1 | FALSE |
| 2727 | P-1452 | 12 | Ductile Iron | 1996 | 0 | 0 | FALSE |
| 2728 | P-1453 | 12 | Ductile Iron | 1996 | 0 | 0 | FALSE |
| 2733 | P-1455 | 8 | Ductile Iron | 2007 | 0 | 1 | FALSE |
| 2734 | P-1456 | 8 | Ductile Iron | 2007 | 0 | 0 | FALSE |
| 2739 | P-1458 | 8 | Ductile Iron | 2007 | 0 | 0 | FALSE |
| 2740 | P-1459 | 8 | Ductile Iron | 2007 | 0 | 1 | FALSE |
| 2742 | P-1460 | 8 | Ductile Iron | 2007 | 0 | 0 | FALSE |
| 2744 | P-1461 | 12 | Ductile Iron | 2007 | 0 | 1 | FALSE |
| 2747 | P-1463 | 8 | Ductile Iron | 2007 | 0 | 0 | FALSE |
| 2749 | P-1464 | 12 | Ductile Iron | 2007 | 0 | 0 | FALSE |
| 2752 | P-1465 | 8 | Ductile Iron | 1983 | 0 | 0 | TRUE |
| 2755 | P-1466 | 8 | Ductile Iron | 1974 | 0 | 0 | FALSE |
| 2756 | P-1467 | 8 | Ductile Iron | 1974 | 0 | 0 | FALSE |
| 2758 | P-1468 | 8 | Ductile Iron | 1974 | 0 | 0 | FALSE |
| 2763 | P-1469 | 8 | Unlined Cast Iron | 1899 | 0.7 | 0 | FALSE |
| 2764 | P-1470 | 8 | Unlined Cast Iron | 1899 | 0.7 | 0 | FALSE |
| 2766 | P-1471 | 8 | Ductile Iron | 2007 | 0 | 0 | FALSE |
| 2769 | P-1472 | 12 | Factory Lined Cast Iron | 1963 | 0.2 | 0 | FALSE |
| 2772 | P-1474 | 2.3 | Factory Lined Cast Iron | 1965 | 1.9 | 0 | FALSE |
| 2774 | P-1475 | 8 | Asbestos Cement | 1952 | 4.2 | 0 | TRUE |
| 2775 | P-1476 | 8 | Asbestos Cement | 1952 | 4.2 | 0 | TRUE |
| 2777 | P-1477 | 12 | Ductile Iron | 1985 | 0 | 1 | TRUE |
| 2778 | P-1478 | 12 | Ductile Iron | 1985 | 0 | 0 | FALSE |
| 2784 | P-1480 | 12 | Ductile Iron | 1985 | 0 | 0 | FALSE |
| 2785 | P-1481 | 12 | Ductile Iron | 1985 | 0 | 0 | FALSE |
| 2787 | P-1482 | 8 | Ductile Iron | 1985 | 0 | 0 | FALSE |
| 2790 | P-1483 | 12 | Ductile Iron | 1986 | 0 | 0 | TRUE |
| 2791 | P-1484 | 12 | Ductile Iron | 1997 | 0 | 1 | FALSE |
| 2795 | P-1486 | 12 | Ductile Iron | 1997 | 0 | 0 | FALSE |
| 2796 | P-1487 | 12 | Ductile Iron | 1997 | 0 | 0 | FALSE |
| 2798 | P-1488 | 6 | Ductile Iron | 1997 | 0 | 0 | FALSE |
| 2800 | P-1489 | 12 | Ductile Iron | 1997 | 0 | 0 | FALSE |
| 2802 | P-1490 | 8 | Factory Lined Cast Iron | 1964 | 1.6 | 0 | FALSE |
| 2804 | P-1492 | 12 | Ductile Iron | 2007 | 0 | 0 | FALSE |
| 2807 | P-1493 | 12 | Ductile Iron | 2007 | 0 | 0 | FALSE |
| 2809 | P-1494 | 8 | Ductile Iron | 2007 | 0 | 0 | FALSE |
| 2812 | P-1495 | 8 | Factory Lined Cast Iron | 1964 | 1.6 | 0 | FALSE |
| 2813 | P-1496 | 8 | Factory Lined Cast Iron | 1964 | 0 | 0 | FALSE |

# Asset Management Pipe Input Data
## Capital Efficiency Study
## Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 2815 | P-1497 | 6 | Ductile Iron | 2007 | 0 | 0 | FALSE |
| 2817 | P-1498 | 12 | Factory Lined Cast Iron | 1961 | 0 | 0 | FALSE |
| 2818 | P-1499 | 12 | Factory Lined Cast Iron | 1961 | 0 | 0 | FALSE |
| 2820 | P-1500 | 8 | Unlined Cast Iron | 1912 | 0.6 | 0 | FALSE |
| 2821 | P-1501 | 8 | Unlined Cast Iron | 1912 | 0.6 | 0 | FALSE |
| 2823 | P-1502 | 8 | Ductile Iron | 2007 | 0 | 0 | FALSE |
| 2826 | P-1504 | 8 | Ductile Iron | 1981 | 0 | 1 | FALSE |
| 2831 | P-1506 | 8 | Factory Lined Cast Iron | 1962 | 0 | 0 | FALSE |
| 2833 | P-1507 | 8 | Ductile Iron | 1999 | 0 | 0 | FALSE |
| 2840 | P-1510 | 8 | Ductile Iron | 2007 | 0 | 0 | FALSE |
| 2842 | P-1511 | 8 | Ductile Iron | 2007 | 0 | 0 | FALSE |
| 2844 | P-1512 | 8 | Ductile Iron | 2007 | 0 | 0 | FALSE |
| 2846 | P-1513 | 8 | Unlined Cast Iron | 1949 | 1.9 | 0 | FALSE |
| 2847 | P-1514 | 6 | Unlined Cast Iron | 1949 | 0 | 0 | FALSE |
| 2853 | P-1516 | 12 | Ductile Iron | 2007 | 0 | 0 | FALSE |
| 2854 | P-1517 | 12 | Ductile Iron | 2007 | 0 | 0 | FALSE |
| 2855 | P-1518 | 12 | Ductile Iron | 2007 | 0 | 0 | FALSE |
| 2857 | P-1519 | 12 | Factory Lined Cast Iron | 1962 | 0 | 0 | FALSE |
| 2858 | P-1520 | 12 | Ductile Iron | 1995 | 0 | 0 | FALSE |
| 2861 | P-1522 | 12 | Ductile Iron | 2007 | 0 | 0 | FALSE |
| 2866 | P-1523 | 8 | Unlined Cast Iron | 1949 | 1.9 | 0 | FALSE |
| 2871 | P-1526 | 6 | Ductile Iron | 1999 | 0 | 0 | FALSE |
| 2873 | P-1527 | 8 | Unlined Cast Iron | 1950 | 1.26 | 0 | FALSE |
| 2874 | P-1528 | 8 | Unlined Cast Iron | 1950 | 1.26 | 0 | FALSE |
| 2876 | P-1529 | 6 | Factory Lined Cast Iron | 1962 | 0 | 0 | FALSE |
| 2878 | P-1530 | 6 | Factory Lined Cast Iron | 1965 | 0 | 0 | FALSE |
| 2880 | P-1531 | 6 | Unlined Cast Iron | 1902 | 0 | 0 | TRUE |
| 2883 | P-1533 | 6 | Unlined Cast Iron | 1939 | 0 | 0 | TRUE |
| 2885 | P-1534 | 6 | Asbestos Cement | 1957 | 0 | 0 | FALSE |
| 2886 | P-1535 | 8 | Factory Lined Cast Iron | 1966 | 0 | 0 | FALSE |
| 2887 | P-1536 | 6 | Factory Lined Cast Iron | 1968 | 4.2 | 0 | TRUE |
| 2900 | P-1543 | 6 | Ductile Iron | 1991 | 0 | 0 | FALSE |
| 2903 | P-1544 | 6 | Asbestos Cement | 1954 | 0.6 | 0 | FALSE |
| 2905 | P-1545 | 6 | Asbestos Cement | 1954 | 0.6 | 0 | FALSE |
| 2907 | P-1546 | 6 | Asbestos Cement | 1954 | 0.6 | 0 | FALSE |
| 2908 | P-1547 | 6 | Asbestos Cement | 1954 | 0.6 | 0 | FALSE |
| 2910 | P-1548 | 6 | Unlined Cast Iron | 1957 | 0 | 0 | FALSE |
| 2912 | P-1549 | 6 | Unlined Cast Iron | 1957 | 0 | 0 | FALSE |
| 2914 | P-1550 | 6 | Unlined Cast Iron | 1957 | 0 | 0 | FALSE |
| 2916 | P-1551 | 8 | Factory Lined Cast Iron | 1970 | 0 | 0 | FALSE |
| 2917 | P-1552 | 8 | Factory Lined Cast Iron | 1970 | 0 | 0 | FALSE |



Prepared by or under the supervision of: Robert L. Roland

# Asset Management Pipe Input Data
## Capital Efficiency Study
## Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 2919 | P-1553 | 8 | Factory Lined Cast Iron | 1970 | 0 | 0 | FALSE |
| 2921 | P-1554 | 8 | Factory Lined Cast Iron | 1972 | 0 | 0 | FALSE |
| 2923 | P-1555 | 8 | Asbestos Cement | 1951 | 0 | 0 | TRUE |
| 2924 | P-1556 | 8 | Asbestos Cement | 1951 | 0 | 0 | TRUE |
| 2926 | P-1557 | 6 | Ductile Iron | 1998 | 0 | 0 | TRUE |
| 2928 | P-1558 | 6 | Asbestos Cement | 1955 | 0.6 | 0 | FALSE |
| 2929 | P-1559 | 6 | Asbestos Cement | 1955 | 0.6 | 0 | FALSE |
| 2932 | P-1560 | 6 | Asbestos Cement | 1954 | 0 | 0 | FALSE |
| 2934 | P-1561 | 6 | Asbestos Cement | 1954 | 0 | 0 | FALSE |
| 2936 | P-1562 | 6 | Asbestos Cement | 1954 | 0 | 0 | FALSE |
| 2937 | P-1563 | 6 | Asbestos Cement | 1954 | 0 | 0 | FALSE |
| 2939 | P-1564 | 20 | Prestressed Concrete | 1954 | 0 | 1 | FALSE |
| 2940 | P-1565 | 20 | Prestressed Concrete | 1954 | 0 | 0 | FALSE |
| 2942 | P-1566 | 8 | Asbestos Cement | 1955 | 0 | 0 | FALSE |
| 2950 | P-1571 | 6 | Unlined Cast Iron | 1941 | 0.3 | 0 | FALSE |
| 2951 | P-1572 | 6 | Asbestos Cement | 1960 | 4.3 | 0 | FALSE |
| 2955 | P-1575 | 6 | Factory Lined Cast Iron | 1964 | 0 | 0 | FALSE |
| 2975 | P-1585 | 6 | Unlined Cast Iron | 1941 | 0.3 | 0 | FALSE |
| 2976 | P-1586 | 6 | Unlined Cast Iron | 1941 | 0.3 | 0 | FALSE |
| 2978 | P-1588 | 6 | Unlined Cast Iron | 1941 | 0.3 | 0 | FALSE |
| 2982 | P-1591 | 6 | Unlined Cast Iron | 1942 | 0 | 0 | FALSE |
| 2984 | P-1592 | 6 | Unlined Cast Iron | 1916 | 6.3 | 0 | FALSE |
| 2985 | P-1593 | 6 | Unlined Cast Iron | 1916 | 0 | 0 | FALSE |
| 2986 | P-1594 | 8 | Ductile Iron | 1999 | 0 | 0 | FALSE |
| 2988 | P-1595 | 8 | Factory Lined Cast Iron | 1963 | 0 | 0 | FALSE |
| 2989 | P-1596 | 8 | Factory Lined Cast Iron | 1963 | 0 | 0 | FALSE |
| 2991 | P-1597 | 8 | Ductile Iron | 1985 | 0 | 0 | FALSE |
| 2992 | P-1598 | 8 | Ductile Iron | 1985 | 0 | 0 | FALSE |
| 2994 | P-1599 | 6 | Unlined Cast Iron | 1922 | 0 | 0 | FALSE |
| 2996 | P-1600 | 24 | Ductile Iron | 1994 | 0 | 0 | TRUE |
| 2997 | P-1601 | 24 | Ductile Iron | 1994 | 0 | 0 | TRUE |
| 2999 | P-1602 | 8 | Ductile Iron | 1995 | 0 | 0 | TRUE |
| 3003 | P-1604 | 8 | Ductile Iron | 1986 | 2.6 | 0 | FALSE |
| 3007 | P-1606 | 12 | Unlined Cast Iron | 1917 | 1.4 | 0 | FALSE |
| 3008 | P-1607 | 12 | Unlined Cast Iron | 1917 | 1.4 | 0 | FALSE |
| 3010 | P-1608 | 6 | Unlined Cast Iron | 1917 | 0 | 0 | FALSE |
| 3014 | P-1610 | 20 | Prestressed Concrete | 1963 | 0 | 0 | FALSE |
| 3015 | P-1611 | 20 | Prestressed Concrete | 1963 | 0 | 0 | FALSE |
| 3016 | P-1612 | 6 | Unlined Cast Iron | 1923 | 0 | 0 | FALSE |
| 3018 | P-1613 | 12 | Factory Lined Cast Iron | 1967 | 0 | 0 | TRUE |
| 3019 | P-1614 | 12 | Factory Lined Cast Iron | 1967 | 0 | 0 | FALSE |

# Asset Management Pipe Input Data
## Capital Efficiency Study
## Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 3021 | P-1615 | 8 | Ductile Iron | 1995 | 0 | 0 | TRUE |
| 3023 | P-1616 | 6 | Unlined Cast Iron | 1899 | 0 | 1 | FALSE |
| 3025 | P-1617 | 6 | Ductile Iron | 1995 | 0 | 0 | FALSE |
| 3027 | P-1618 | 12 | Unlined Cast Iron | 1909 | 1.3 | 1 | FALSE |
| 3028 | P-1619 | 12 | Unlined Cast Iron | 1909 | 1.3 | 1 | FALSE |
| 3032 | P-1622 | 6 | Unlined Cast Iron | 1911 | 1.3 | 1 | FALSE |
| 3033 | P-1623 | 6 | Unlined Cast Iron | 1911 | 1.3 | 1 | FALSE |
| 3036 | P-1625 | 6 | Unlined Cast Iron | 1937 | 0 | 1 | FALSE |
| 3037 | P-1626 | 6 | Unlined Cast Iron | 1937 | 0 | 1 | FALSE |
| 3040 | P-1628 | 12 | Unlined Cast Iron | 1894 | 1.3 | 1 | FALSE |
| 3043 | P-1630 | 6 | Unlined Cast Iron | 1915 | 4.8 | 1 | FALSE |
| 3047 | P-1633 | 6 | Unlined Cast Iron | 1911 | 1.3 | 1 | FALSE |
| 3048 | P-1634 | 6 | Unlined Cast Iron | 1911 | 1.3 | 1 | FALSE |
| 3053 | P-1636 | 12 | Unlined Cast Iron | 1919 | 0 | 1 | FALSE |
| 3055 | P-1637 | 12 | Unlined Cast Iron | 1919 | 0 | 1 | FALSE |
| 3057 | P-1638 | 12 | Unlined Cast Iron | 1894 | 1.3 | 0 | FALSE |
| 3058 | P-1639 | 12 | Unlined Cast Iron | 1894 | 1.3 | 0 | FALSE |
| 3062 | P-1641 | 8 | Ductile Iron | 1998 | 0 | 0 | FALSE |
| 3065 | P-1643 | 8 | Ductile Iron | 1998 | 0 | 0 | FALSE |
| 3067 | P-1644 | 8 | Ductile Iron | 1998 | 0 | 0 | FALSE |
| 3070 | P-1646 | 8 | Ductile Iron | 1998 | 0 | 0 | FALSE |
| 3072 | P-1647 | 8 | Ductile Iron | 1998 | 0 | 0 | FALSE |
| 3076 | P-1650 | 8 | Ductile Iron | 1998 | 0 | 1 | FALSE |
| 3077 | P-1651 | 8 | Ductile Iron | 1998 | 0 | 1 | FALSE |
| 3078 | P-1652 | 8 | Ductile Iron | 1998 | 0 | 1 | FALSE |
| 3080 | P-1653 | 8 | Ductile Iron | 1998 | 0 | 0 | FALSE |
| 3081 | P-1654 | 8 | Ductile Iron | 1998 | 0 | 1 | FALSE |
| 3082 | P-1655 | 8 | Ductile Iron | 1998 | 0 | 0 | FALSE |
| 3084 | P-1656 | 6 | Unlined Cast Iron | 1908 | 8.4 | 1 | FALSE |
| 3085 | P-1657 | 6 | Unlined Cast Iron | 1908 | 8.4 | 1 | FALSE |
| 3087 | P-1658 | 6 | Unlined Cast Iron | 1908 | 0 | 1 | FALSE |
| 3089 | P-1659 | 12 | Unlined Cast Iron | 1894 | 1.3 | 1 | FALSE |
| 3090 | P-1660 | 12 | Unlined Cast Iron | 1894 | 0.6 | 1 | FALSE |
| 3092 | P-1661 | 6 | Unlined Cast Iron | 1915 | 4.8 | 1 | FALSE |
| 3093 | P-1662 | 6 | Unlined Cast Iron | 1915 | 4.8 | 1 | FALSE |
| 3096 | P-1664 | 2.3 | Unlined Cast Iron | 1922 | 23.7 | 1 | FALSE |
| 3098 | P-1665 | 6 | Unlined Cast Iron | 1930 | 0 | 1 | FALSE |
| 3099 | P-1666 | 6 | Unlined Cast Iron | 1916 | 9.2 | 1 | FALSE |
| 3101 | P-1667 | 6 | Unlined Cast Iron | 1954 | 0 | 0 | FALSE |
| 3103 | P-1668 | 6 | Asbestos Cement | 1949 | 6.3 | 1 | FALSE |
| 3104 | P-1669 | 6 | Asbestos Cement | 1949 | 6.3 | 1 | FALSE |



Prepared by or under the supervision of: Robert L. Roland

# Asset Management Pipe Input Data
## Capital Efficiency Study
## Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 3109 | P-1672 | 6 | Unlined Cast Iron | 1915 | 0 | 1 | FALSE |
| 3111 | P-1673 | 8 | Unlined Cast Iron | 1907 | 0 | 0 | FALSE |
| 3112 | P-1674 | 8 | Unlined Cast Iron | 1957 | 0.8 | 0 | FALSE |
| 3114 | P-1675 | 6 | Unlined Cast Iron | 1898 | 0 | 0 | FALSE |
| 3115 | P-1676 | 6 | Unlined Cast Iron | 1956 | 0 | 0 | FALSE |
| 3117 | P-1677 | 6 | Asbestos Cement | 1952 | 5.2 | 0 | FALSE |
| 3118 | P-1678 | 8 | Ductile Iron | 2005 | 0 | 0 | FALSE |
| 3120 | P-1679 | 6 | Asbestos Cement | 1957 | 2 | 0 | FALSE |
| 3122 | P-1680 | 6 | Unlined Cast Iron | 1903 | 5 | 1 | FALSE |
| 3123 | P-1681 | 6 | Factory Lined Cast Iron | 1961 | 0 | 1 | FALSE |
| 3126 | P-1683 | 6 | Unlined Cast Iron | 1911 | 1.6 | 0 | FALSE |
| 3128 | P-1684 | 6 | Unlined Cast Iron | 1958 | 0 | 0 | FALSE |
| 3130 | P-1685 | 6 | Ductile Iron | 1988 | 0 | 0 | FALSE |
| 3135 | P-1688 | 4 | Ductile Iron | 1988 | 0 | 1 | FALSE |
| 3137 | P-1689 | 8 | Unlined Cast Iron | 1957 | 0.8 | 0 | FALSE |
| 3138 | P-1690 | 8 | Unlined Cast Iron | 1957 | 0.8 | 0 | FALSE |
| 3140 | P-1691 | 6 | Unlined Cast Iron | 1911 | 0 | 0 | FALSE |
| 3142 | P-1692 | 6 | Unlined Cast Iron | 1929 | 0 | 0 | FALSE |
| 3144 | P-1693 | 8 | Ductile Iron | 1998 | 0 | 0 | FALSE |
| 3145 | P-1694 | 2 | Galvanized Steel | 1919 | 0 | 1 | FALSE |
| 3146 | P-1695 | 12 | Unlined Cast Iron | 1919 | 0 | 1 | FALSE |
| 3151 | P-1697 | 12 | Ductile Iron | 2009 | 0 | 0 | FALSE |
| 3153 | P-1698 | 12 | Ductile Iron | 2009 | 0 | 0 | FALSE |
| 3155 | P-1699 | 12 | Ductile Iron | 2009 | 0 | 0 | FALSE |
| 3157 | P-1700 | 12 | Ductile Iron | 2009 | 0 | 0 | FALSE |
| 3161 | P-1702 | 12 | Ductile Iron | 1989 | 0 | 0 | TRUE |
| 3163 | P-1703 | 12 | Ductile Iron | 2009 | 0 | 0 | FALSE |
| 3164 | P-1704 | 12 | Ductile Iron | 2009 | 0 | 0 | FALSE |
| 3169 | P-1707 | 12 | Ductile Iron | 2009 | 0 | 0 | FALSE |
| 3171 | P-1708 | 12 | Ductile Iron | 2009 | 0 | 0 | FALSE |
| 3210 | P-1730 | 6 | Asbestos Cement | 1949 | 0 | 0 | FALSE |
| 3211 | P-1731 | 6 | Asbestos Cement | 1949 | 0 | 0 | FALSE |
| 3213 | P-1732 | 8 | Factory Lined Cast Iron | 1965 | 0 | 0 | FALSE |
| 3214 | P-1733 | 8 | Unlined Cast Iron | 1917 | 0 | 0 | FALSE |
| 3223 | P-1739 | 12 | Unlined Cast Iron | 1894 | 1.3 | 1 | FALSE |
| 3224 | P-1740 | 12 | Unlined Cast Iron | 1891 | 0 | 0 | FALSE |
| 3225 | P-1741 | 8 | Factory Lined Cast Iron | 1964 | 0 | 0 | FALSE |
| 3226 | P-1742 | 8 | Unlined Cast Iron | 1917 | 0 | 0 | FALSE |
| 3229 | P-1744 | 16 | Unlined Cast Iron | 1917 | 0 | 0 | FALSE |
| 3230 | P-1745 | 8 | Factory Lined Cast Iron | 1964 | 0 | 0 | FALSE |
| 3236 | P-1749 | 8 | Unlined Cast Iron | 1917 | 0 | 0 | FALSE |

# Asset Management Pipe Input Data
## Capital Efficiency Study
## Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 3237 | P-1750 | 8 | Unlined Cast Iron | 1917 | 0.2 | 0 | FALSE |
| 3238 | P-1751 | 8 | Unlined Cast Iron | 1917 | 0 | 0 | FALSE |
| 3241 | P-1753 | 8 | Unlined Cast Iron | 1901 | 0.4 | 1 | FALSE |
| 3244 | P-1755 | 12 | Unlined Cast Iron | 1894 | 1.3 | 1 | FALSE |
| 3245 | P-1756 | 8 | Unlined Cast Iron | 1901 | 0 | 1 | FALSE |
| 3247 | P-1757 | 6 | Ductile Iron | 1999 | 0 | 0 | FALSE |
| 3249 | P-1758 | 8 | Ductile Iron | 1999 | 0 | 0 | FALSE |
| 3250 | P-1759 | 8 | Ductile Iron | 1999 | 0 | 0 | FALSE |
| 3252 | P-1760 | 6 | Ductile Iron | 1999 | 0 | 0 | FALSE |
| 3254 | P-1761 | 8 | Factory Lined Cast Iron | 1971 | 0.8 | 0 | TRUE |
| 3255 | P-1762 | 8 | Factory Lined Cast Iron | 1971 | 0.8 | 0 | TRUE |
| 3260 | P-1765 | 8 | Ductile Iron | 1998 | 0 | 0 | TRUE |
| 3262 | P-1766 | 8 | Ductile Iron | 1998 | 0 | 0 | TRUE |
| 3264 | P-1767 | 8 | Ductile Iron | 1998 | 0 | 0 | TRUE |
| 3265 | P-1768 | 8 | Ductile Iron | 1998 | 0 | 0 | TRUE |
| 3267 | P-1769 | 8 | Ductile Iron | 1998 | 0 | 0 | TRUE |
| 3275 | P-1774 | 12 | Factory Lined Cast Iron | 1963 | 0.2 | 0 | FALSE |
| 3278 | P-1776 | 6 | Ductile Iron | 2007 | 0 | 0 | FALSE |
| 3280 | P-1777 | 8 | Unlined Cast Iron | 1917 | 2.1 | 0 | FALSE |
| 3281 | P-1778 | 8 | Unlined Cast Iron | 1917 | 2.1 | 0 | FALSE |
| 3283 | P-1779 | 8 | Ductile Iron | 1998 | 0 | 0 | FALSE |
| 3286 | P-1781 | 8 | Asbestos Cement | 1955 | 2.3 | 0 | FALSE |
| 3288 | P-1782 | 8 | Ductile Iron | 1998 | 0 | 0 | FALSE |
| 3290 | P-1783 | 8 | Asbestos Cement | 1955 | 0 | 0 | FALSE |
| 3291 | P-1784 | 8 | Asbestos Cement | 1955 | 2.3 | 0 | FALSE |
| 3293 | P-1785 | 8 | Ductile Iron | 1998 | 0 | 0 | FALSE |
| 3297 | P-1787 | 8 | Ductile Iron | 1980 | 0 | 0 | FALSE |
| 3299 | P-1788 | 6 | Ductile Iron | 1980 | 0 | 0 | FALSE |
| 3301 | P-1789 | 8 | Asbestos Cement | 1957 | 3.3 | 0 | FALSE |
| 3302 | P-1790 | 8 | Asbestos Cement | 1957 | 3.3 | 0 | FALSE |
| 3304 | P-1791 | 8 | Ductile Iron | 1999 | 0 | 0 | FALSE |
| 3306 | P-1792 | 16 | Unlined Cast Iron | 1917 | 0.4 | 0 | FALSE |
| 3307 | P-1793 | 16 | Unlined Cast Iron | 1917 | 0.4 | 1 | FALSE |
| 3309 | P-1794 | 8 | Ductile Iron | 2007 | 0 | 0 | FALSE |
| 3314 | P-1795 | 6 | Unlined Cast Iron | 1923 | 0 | 0 | FALSE |
| 3317 | P-1797 | 6 | Asbestos Cement | 1948 | 1.4 | 0 | FALSE |
| 3318 | P-1798 | 6 | Asbestos Cement | 1948 | 1.4 | 0 | FALSE |
| 3319 | P-1799 | 8 | Ductile Iron | 2007 | 0 | 0 | FALSE |
| 3322 | P-1800 | 6 | Unlined Cast Iron | 1896 | 0 | 0 | FALSE |
| 3324 | P-1801 | 6 | Asbestos Cement | 1954 | 0 | 0 | FALSE |
| 3326 | P-1802 | 2.3 | Unlined Cast Iron | 1953 | 5.9 | 0 | FALSE |



Prepared by or under the supervision of: Robert L. Roland

**Asset Management Pipe Input Data**
**Capital Efficiency Study**
**Aquarion Water Company - Hingham/Hull Water System**

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 3329 | P-1803 | 1.5 | Galvanized Steel | 1928 | 13.2 | 0 | FALSE |
| 3338 | P-1808 | 12 | Unlined Cast Iron | 1913 | 0.7 | 0 | FALSE |
| 3339 | P-1809 | 12 | Unlined Cast Iron | 1913 | 0.7 | 0 | FALSE |
| 3343 | P-1811 | 6 | Asbestos Cement | 1955 | 2.8 | 0 | FALSE |
| 3344 | P-1812 | 2.3 | Unlined Cast Iron | 1955 | 0 | 0 | FALSE |
| 3347 | P-1814 | 6 | Asbestos Cement | 1955 | 2.8 | 0 | FALSE |
| 3350 | P-1816 | 12 | Unlined Cast Iron | 1913 | 0 | 0 | FALSE |
| 3351 | P-1817 | 2.3 | Unlined Cast Iron | 1955 | 0 | 0 | FALSE |
| 3353 | P-1818 | 6 | Asbestos Cement | 1955 | 2.8 | 0 | FALSE |
| 3354 | P-1819 | 6 | Asbestos Cement | 1955 | 2.8 | 0 | FALSE |
| 3356 | P-1820 | 12 | Unlined Cast Iron | 1913 | 0.7 | 0 | FALSE |
| 3357 | P-1821 | 12 | Unlined Cast Iron | 1913 | 0.7 | 0 | FALSE |
| 3358 | P-1822 | 2.3 | Unlined Cast Iron | 1955 | 3.6 | 0 | FALSE |
| 3361 | P-1823 | 6 | Unlined Cast Iron | 1957 | 2 | 0 | FALSE |
| 3362 | P-1824 | 6 | Unlined Cast Iron | 1957 | 2 | 0 | FALSE |
| 3369 | P-1828 | 2 | Unlined Cast Iron | 1884 | 0 | 0 | FALSE |
| 3370 | P-1829 | 2 | Unlined Cast Iron | 1884 | 0 | 0 | FALSE |
| 3373 | P-1830 | 2 | Galvanized Steel | 1894 | 4.4 | 0 | FALSE |
| 3374 | P-1831 | 8 | Ductile Iron | 1992 | 0 | 0 | FALSE |
| 3376 | P-1832 | 8 | Asbestos Cement | 1957 | 0.6 | 1 | FALSE |
| 3377 | P-1833 | 8 | Asbestos Cement | 1957 | 0.6 | 1 | FALSE |
| 3380 | P-1835 | 6 | Unlined Cast Iron | 1912 | 0 | 0 | FALSE |
| 3382 | P-1836 | 12 | Unlined Cast Iron | 1909 | 0 | 1 | FALSE |
| 3383 | P-1837 | 12 | Unlined Cast Iron | 1909 | 0 | 1 | FALSE |
| 3385 | P-1838 | 6 | Unlined Cast Iron | 1926 | 0 | 0 | FALSE |
| 3387 | P-1839 | 6 | Unlined Cast Iron | 1912 | 0 | 0 | FALSE |
| 3392 | P-1840 | 2 | PVC | 1979 | 0 | 0 | FALSE |
| 3394 | P-1841 | 12 | Asbestos Cement | 1953 | 0 | 0 | FALSE |
| 3395 | P-1842 | 12 | Asbestos Cement | 1953 | 0 | 0 | FALSE |
| 3397 | P-1843 | 2.3 | Factory Lined Cast Iron | 1967 | 0 | 0 | FALSE |
| 3399 | P-1844 | 2.3 | Factory Lined Cast Iron | 1966 | 0 | 0 | FALSE |
| 3401 | P-1845 | 2.3 | Factory Lined Cast Iron | 1969 | 1.99 | 0 | FALSE |
| 3403 | P-1846 | 2.3 | Factory Lined Cast Iron | 1968 | 3.3 | 0 | FALSE |
| 3405 | P-1847 | 8 | Asbestos Cement | 1954 | 0.9 | 0 | TRUE |
| 3406 | P-1848 | 8 | Asbestos Cement | 1954 | 0 | 0 | TRUE |
| 3408 | P-1849 | 2 | Unlined Cast Iron | 1955 | 0 | 0 | TRUE |
| 3410 | P-1850 | 2.3 | Unlined Cast Iron | 1948 | 0 | 0 | FALSE |
| 3412 | P-1851 | 6 | Unlined Cast Iron | 1942 | 0 | 0 | FALSE |
| 3413 | P-1852 | 6 | Unlined Cast Iron | 1942 | 0 | 0 | FALSE |
| 3414 | P-1853 | 2.3 | Unlined Cast Iron | 1948 | 0 | 0 | FALSE |
| 3416 | P-1854 | 2.3 | Unlined Cast Iron | 1959 | 2.9 | 0 | FALSE |



Prepared by or under the supervision of: Robert L. Roland

# Asset Management Pipe Input Data
## Capital Efficiency Study
## Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 3418 | P-1855 | 2 | Unlined Cast Iron | 1948 | 0 | 0 | FALSE |
| 3420 | P-1856 | 8 | Factory Lined Cast Iron | 1980 | 0 | 0 | FALSE |
| 3423 | P-1858 | 4 | Factory Lined Cast Iron | 1980 | 0 | 0 | FALSE |
| 3425 | P-1859 | 8 | Factory Lined Cast Iron | 1980 | 0 | 0 | FALSE |
| 3426 | P-1860 | 8 | Factory Lined Cast Iron | 1980 | 0 | 0 | FALSE |
| 3428 | P-1861 | 4 | Factory Lined Cast Iron | 1980 | 0 | 0 | FALSE |
| 3431 | P-1862 | 2.3 | Unlined Cast Iron | 1959 | 0 | 0 | FALSE |
| 3433 | P-1863 | 2.3 | Unlined Cast Iron | 1956 | 0 | 0 | FALSE |
| 3435 | P-1864 | 6 | Asbestos Cement | 1950 | 0 | 0 | FALSE |
| 3436 | P-1865 | 6 | Asbestos Cement | 1950 | 0 | 0 | FALSE |
| 3438 | P-1866 | 2.3 | Unlined Cast Iron | 1950 | 0 | 0 | FALSE |
| 3441 | P-1867 | 2.3 | Factory Lined Cast Iron | 1963 | 0 | 0 | FALSE |
| 3443 | P-1868 | 2 | Unlined Cast Iron | 1952 | 0 | 0 | TRUE |
| 3445 | P-1869 | 8 | Factory Lined Cast Iron | 1968 | 0 | 1 | FALSE |
| 3446 | P-1870 | 8 | Factory Lined Cast Iron | 1968 | 0 | 1 | FALSE |
| 3448 | P-1871 | 2.3 | Factory Lined Cast Iron | 1970 | 2.5 | 0 | FALSE |
| 3450 | P-1872 | 2.3 | Unlined Cast Iron | 1948 | 3.5 | 0 | FALSE |
| 3452 | P-1873 | 6 | Unlined Cast Iron | 1939 | 0 | 0 | TRUE |
| 3453 | P-1874 | 6 | Unlined Cast Iron | 1939 | 0 | 0 | FALSE |
| 3455 | P-1875 | 2.3 | Unlined Cast Iron | 1941 | 0 | 0 | FALSE |
| 3457 | P-1876 | 2 | Galvanized Steel | 1975 | 4.8 | 0 | FALSE |
| 3459 | P-1877 | 2 | Galvanized Steel | 1975 | 4.8 | 0 | FALSE |
| 3461 | P-1878 | 8 | Factory Lined Cast Iron | 1969 | 0 | 1 | TRUE |
| 3462 | P-1879 | 8 | Factory Lined Cast Iron | 1969 | 0 | 1 | TRUE |
| 3464 | P-1880 | 2.3 | Factory Lined Cast Iron | 1969 | 0 | 0 | TRUE |
| 3466 | P-1881 | 8 | Asbestos Cement | 1956 | 0 | 1 | TRUE |
| 3467 | P-1882 | 8 | Asbestos Cement | 1956 | 0 | 1 | FALSE |
| 3469 | P-1883 | 2.3 | Factory Lined Cast Iron | 1978 | 0 | 0 | FALSE |
| 3471 | P-1884 | 2 | Galvanized Steel | 1925 | 1.5 | 0 | TRUE |
| 3474 | P-1886 | 20 | Prestressed Concrete | 1952 | 0 | 1 | FALSE |
| 3476 | P-1887 | 2.3 | Galvanized Steel | 1955 | 0 | 0 | FALSE |
| 3478 | P-1888 | 2.3 | Unlined Cast Iron | 1947 | 3.6 | 0 | FALSE |
| 3480 | P-1889 | 2.3 | Unlined Cast Iron | 1947 | 0 | 0 | FALSE |
| 3482 | P-1890 | 2.3 | Unlined Cast Iron | 1938 | 0 | 0 | FALSE |
| 3484 | P-1891 | 12 | Factory Lined Cast Iron | 1963 | 0.2 | 0 | FALSE |
| 3486 | P-1893 | 2.3 | Unlined Cast Iron | 1938 | 0 | 0 | FALSE |
| 3488 | P-1894 | 2.3 | Unlined Cast Iron | 1946 | 0 | 0 | FALSE |
| 3490 | P-1895 | 6 | Asbestos Cement | 1947 | 0 | 0 | FALSE |
| 3491 | P-1896 | 6 | Asbestos Cement | 1947 | 0 | 0 | FALSE |
| 3493 | P-1897 | 2.3 | Unlined Cast Iron | 1947 | 0 | 0 | FALSE |
| 3495 | P-1898 | 12 | Factory Lined Cast Iron | 1963 | 0.2 | 0 | FALSE |

# Asset Management Pipe Input Data
## Capital Efficiency Study
## Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 3498 | P-1900 | 8 | Ductile Iron | 2010 | 0 | 0 | FALSE |
| 3501 | P-1901 | 2 | Factory Lined Cast Iron | 1965 | 0 | 0 | FALSE |
| 3503 | P-1902 | 6 | Unlined Cast Iron | 1928 | 0 | 0 | FALSE |
| 3504 | P-1903 | 6 | Unlined Cast Iron | 1928 | 0 | 0 | FALSE |
| 3506 | P-1904 | 2 | Unlined Cast Iron | 1927 | 0 | 0 | FALSE |
| 3508 | P-1905 | 8 | Asbestos Cement | 1956 | 0 | 0 | FALSE |
| 3509 | P-1906 | 8 | Asbestos Cement | 1956 | 0 | 0 | FALSE |
| 3511 | P-1907 | 2.3 | Unlined Cast Iron | 1948 | 3 | 0 | FALSE |
| 3514 | P-1909 | 6 | Unlined Cast Iron | 1922 | 0 | 0 | FALSE |
| 3516 | P-1910 | 8 | Unlined Cast Iron | 1922 | 0 | 0 | FALSE |
| 3517 | P-1911 | 4 | Unlined Cast Iron | 1922 | 0 | 0 | FALSE |
| 3518 | P-1912 | 4 | Unlined Cast Iron | 1909 | 2.1 | 0 | FALSE |
| 3520 | P-1913 | 12 | Factory Lined Cast Iron | 1965 | 0 | 0 | FALSE |
| 3521 | P-1914 | 12 | Factory Lined Cast Iron | 1965 | 0 | 0 | FALSE |
| 3523 | P-1915 | 2 | Galvanized Steel | 1929 | 1.8 | 0 | FALSE |
| 3525 | P-1916 | 2.3 | Unlined Cast Iron | 1959 | 0 | 0 | FALSE |
| 3527 | P-1917 | 20 | Unlined Cast Iron | 1910 | 0.6 | 0 | TRUE |
| 3530 | P-1919 | 4 | Unlined Cast Iron | 1920 | 0 | 0 | TRUE |
| 3532 | P-1920 | 6 | Unlined Cast Iron | 1927 | 0 | 0 | TRUE |
| 3534 | P-1921 | 12 | Factory Lined Cast Iron | 1963 | 0 | 0 | TRUE |
| 3535 | P-1922 | 12 | Factory Lined Cast Iron | 1963 | 0 | 0 | TRUE |
| 3537 | P-1923 | 2 | Galvanized Steel | 1914 | 0 | 0 | TRUE |
| 3539 | P-1924 | 20 | Unlined Cast Iron | 1910 | 0.6 | 0 | TRUE |
| 3540 | P-1925 | 20 | Unlined Cast Iron | 1910 | 0.6 | 0 | TRUE |
| 3542 | P-1926 | 20 | Unlined Cast Iron | 1910 | 0.6 | 0 | FALSE |
| 3543 | P-1927 | 20 | Unlined Cast Iron | 1910 | 0.6 | 0 | FALSE |
| 3546 | P-1929 | 20 | Unlined Cast Iron | 1910 | 0.6 | 0 | TRUE |
| 3547 | P-1930 | 20 | Unlined Cast Iron | 1910 | 0.6 | 0 | TRUE |
| 3549 | P-1931 | 2 | Galvanized Steel | 1928 | 0 | 0 | TRUE |
| 3554 | P-1933 | 2.3 | Unlined Cast Iron | 1941 | 2 | 0 | TRUE |
| 3556 | P-1934 | 2.3 | Unlined Cast Iron | 1937 | 2.6 | 0 | FALSE |
| 3560 | P-1937 | 8 | Asbestos Cement | 1956 | 0.4 | 0 | FALSE |
| 3633 | P-1977 | 8 | Ductile Iron | 1986 | 0 | 0 | TRUE |
| 3640 | P-1981 | 6 | Unlined Cast Iron | 1952 | 3.8 | 0 | TRUE |
| 3643 | P-1983 | 6 | Unlined Cast Iron | 1952 | 3.8 | 0 | TRUE |
| 3644 | P-1984 | 6 | Unlined Cast Iron | 1952 | 3.8 | 0 | TRUE |
| 3645 | P-1985 | 2.3 | Unlined Cast Iron | 1952 | 7.2 | 0 | TRUE |
| 3647 | P-1986 | 8 | Unlined Cast Iron | 1917 | 2.1 | 0 | FALSE |
| 3648 | P-1987 | 8 | Unlined Cast Iron | 1917 | 2.1 | 0 | FALSE |
| 3650 | P-1988 | 2.3 | Unlined Cast Iron | 1909 | 2.8 | 0 | FALSE |
| 3652 | P-1989 | 2.3 | Unlined Cast Iron | 1938 | 2.8 | 0 | FALSE |

# Asset Management Pipe Input Data
## Capital Efficiency Study
## Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 3654 | P-1990 | 2.3 | Unlined Cast Iron | 1948 | 29.2 | 0 | FALSE |
| 3656 | P-1991 | 2.3 | Unlined Cast Iron | 1955 | 2.2 | 0 | FALSE |
| 3657 | P-1992 | 4 | Unlined Cast Iron | 1900 | 0 | 0 | FALSE |
| 3659 | P-1993 | 4 | Unlined Cast Iron | 1907 | 0 | 0 | FALSE |
| 3660 | P-1994 | 4 | Unlined Cast Iron | 1907 | 0 | 0 | FALSE |
| 3661 | P-1995 | 4 | Unlined Cast Iron | 1908 | 0 | 0 | FALSE |
| 3663 | P-1996 | 4 | Factory Lined Cast Iron | 1965 | 2.1 | 0 | FALSE |
| 3665 | P-1997 | 8 | Asbestos Cement | 1956 | 0 | 0 | FALSE |
| 3668 | P-1999 | 2.3 | Unlined Cast Iron | 1940 | 25.5 | 0 | FALSE |
| 3670 | P-2000 | 8 | Asbestos Cement | 1956 | 0 | 0 | FALSE |
| 3671 | P-2001 | 8 | Unlined Cast Iron | 1933 | 5 | 0 | FALSE |
| 3673 | P-2002 | 2.3 | Unlined Cast Iron | 1949 | 0 | 0 | FALSE |
| 3675 | P-2003 | 2.3 | Unlined Cast Iron | 1934 | 5.1 | 0 | FALSE |
| 3677 | P-2004 | 8 | Asbestos Cement | 1956 | 0 | 0 | FALSE |
| 3680 | P-2006 | 2 | Galvanized Steel | 1925 | 1.8 | 0 | FALSE |
| 3682 | P-2007 | 2 | Galvanized Steel | 1927 | 0 | 0 | FALSE |
| 3684 | P-2008 | 2.3 | Unlined Cast Iron | 1956 | 0 | 0 | FALSE |
| 3687 | P-2010 | 12 | Factory Lined Cast Iron | 1962 | 0.2 | 0 | FALSE |
| 3689 | P-2011 | 2 | Galvanized Steel | 1904 | 6 | 0 | FALSE |
| 3691 | P-2012 | 8 | Ductile Iron | 2010 | 0 | 0 | FALSE |
| 3693 | P-2013 | 12 | Factory Lined Cast Iron | 1963 | 0.2 | 0 | FALSE |
| 3694 | P-2014 | 12 | Factory Lined Cast Iron | 1963 | 0.2 | 0 | FALSE |
| 3695 | P-2015 | 4 | Unlined Cast Iron | 1892 | 1.3 | 0 | FALSE |
| 3697 | P-2016 | 2.3 | Unlined Cast Iron | 1941 | 1.9 | 0 | FALSE |
| 3699 | P-2017 | 6 | Factory Lined Cast Iron | 1961 | 1.7 | 0 | FALSE |
| 3700 | P-2018 | 6 | Factory Lined Cast Iron | 1961 | 1.7 | 0 | FALSE |
| 3702 | P-2019 | 8 | Ductile Iron | 1990 | 0 | 0 | FALSE |
| 3703 | P-2020 | 8 | Ductile Iron | 1990 | 0 | 0 | FALSE |
| 3704 | P-2021 | 4 | Unlined Cast Iron | 1907 | 0 | 0 | FALSE |
| 3705 | P-2022 | 2 | Galvanized Steel | 1927 | 3.7 | 0 | FALSE |
| 3707 | P-2023 | 2 | Galvanized Steel | 1928 | 3.7 | 0 | FALSE |
| 3709 | P-2024 | 6 | Unlined Cast Iron | 1932 | 0 | 0 | FALSE |
| 3710 | P-2025 | 6 | Unlined Cast Iron | 1932 | 0 | 0 | FALSE |
| 3712 | P-2026 | 2.3 | Unlined Cast Iron | 1939 | 21.5 | 0 | FALSE |
| 3714 | P-2027 | 2.3 | Unlined Cast Iron | 1937 | 0 | 0 | FALSE |
| 3716 | P-2028 | 20 | Unlined Cast Iron | 1910 | 0 | 0 | FALSE |
| 3717 | P-2029 | 20 | Unlined Cast Iron | 1910 | 0 | 0 | FALSE |
| 3719 | P-2030 | 4 | Unlined Cast Iron | 1896 | 1.9 | 0 | FALSE |
| 3721 | P-2031 | 2.3 | Unlined Cast Iron | 1939 | 2.8 | 0 | FALSE |
| 3723 | P-2032 | 6 | Unlined Cast Iron | 1939 | 0 | 0 | FALSE |
| 3724 | P-2033 | 6 | Unlined Cast Iron | 1939 | 0 | 0 | FALSE |



Prepared by or under the supervision of: Robert L. Roland

**Asset Management Pipe Input Data**
**Capital Efficiency Study**
**Aquarion Water Company - Hingham/Hull Water System**

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 3726 | P-2034 | 2.3 | Unlined Cast Iron | 1947 | 0 | 0 | FALSE |
| 3728 | P-2035 | 2.3 | Factory Lined Cast Iron | 1969 | 2.3 | 0 | FALSE |
| 3730 | P-2036 | 2.3 | Factory Lined Cast Iron | 1969 | 2.3 | 0 | FALSE |
| 3732 | P-2037 | 6 | Unlined Cast Iron | 1941 | 0.3 | 0 | FALSE |
| 3733 | P-2038 | 6 | Unlined Cast Iron | 1941 | 0.3 | 0 | FALSE |
| 3735 | P-2039 | 2.3 | Factory Lined Cast Iron | 1962 | 10.1 | 0 | FALSE |
| 3737 | P-2040 | 4 | Factory Lined Cast Iron | 1965 | 3 | 0 | FALSE |
| 3739 | P-2041 | 6 | Unlined Cast Iron | 1958 | 2.7 | 0 | FALSE |
| 3740 | P-2042 | 6 | Unlined Cast Iron | 1958 | 0 | 0 | FALSE |
| 3742 | P-2043 | 2 | PVC | 1979 | 0 | 0 | FALSE |
| 3744 | P-2044 | 12 | Unlined Cast Iron | 1917 | 1.4 | 0 | FALSE |
| 3745 | P-2045 | 12 | Unlined Cast Iron | 1917 | 1.4 | 0 | FALSE |
| 3747 | P-2046 | 2.3 | Unlined Cast Iron | 1953 | 2.4 | 0 | FALSE |
| 3749 | P-2047 | 20 | Unlined Cast Iron | 1910 | 1.1 | 0 | FALSE |
| 3750 | P-2048 | 20 | Unlined Cast Iron | 1910 | 1.1 | 0 | FALSE |
| 3752 | P-2049 | 2.3 | Unlined Cast Iron | 1951 | 2.3 | 0 | FALSE |
| 3754 | P-2050 | 12 | Unlined Cast Iron | 1917 | 1.4 | 0 | FALSE |
| 3755 | P-2051 | 12 | Unlined Cast Iron | 1917 | 1.4 | 0 | FALSE |
| 3758 | P-2053 | 3 | Unlined Cast Iron | 1924 | 0 | 0 | FALSE |
| 3760 | P-2054 | 2.3 | Unlined Cast Iron | 1947 | 17.1 | 0 | FALSE |
| 3762 | P-2055 | 2.3 | Unlined Cast Iron | 1949 | 0 | 0 | TRUE |
| 3764 | P-2056 | 8 | Unlined Cast Iron | 1941 | 0 | 0 | FALSE |
| 3767 | P-2058 | 6 | Asbestos Cement | 1956 | 0 | 0 | FALSE |
| 3769 | P-2059 | 2.3 | Unlined Cast Iron | 1956 | 3.4 | 0 | FALSE |
| 3771 | P-2060 | 8 | Unlined Cast Iron | 1941 | 0 | 0 | FALSE |
| 3772 | P-2061 | 8 | Unlined Cast Iron | 1941 | 0 | 0 | FALSE |
| 3774 | P-2062 | 2.3 | Unlined Cast Iron | 1920 | 36.5 | 0 | FALSE |
| 3776 | P-2063 | 8 | Asbestos Cement | 1952 | 0 | 0 | FALSE |
| 3777 | P-2064 | 8 | Asbestos Cement | 1952 | 1.6 | 0 | FALSE |
| 3779 | P-2065 | 4 | Unlined Cast Iron | 1924 | 0 | 0 | FALSE |
| 3781 | P-2066 | 2 | Galvanized Steel | 1936 | 5.3 | 0 | FALSE |
| 3783 | P-2067 | 2.3 | Unlined Cast Iron | 1937 | 5.1 | 0 | FALSE |
| 3785 | P-2068 | 2.3 | Unlined Cast Iron | 1940 | 6.7 | 0 | FALSE |
| 3789 | P-2070 | 6 | Unlined Cast Iron | 1929 | 0 | 0 | FALSE |
| 3790 | P-2071 | 6 | Unlined Cast Iron | 1929 | 0 | 0 | FALSE |
| 3791 | P-2072 | 2.3 | Factory Lined Cast Iron | 1968 | 31.4 | 0 | FALSE |
| 3793 | P-2073 | 8 | Unlined Cast Iron | 1947 | 0.3 | 0 | FALSE |
| 3794 | P-2074 | 8 | Unlined Cast Iron | 1947 | 0 | 0 | FALSE |
| 3795 | P-2075 | 4 | Unlined Cast Iron | 1925 | 6.84 | 0 | FALSE |
| 3797 | P-2076 | 2.3 | Unlined Cast Iron | 1937 | 28.2 | 0 | FALSE |
| 3799 | P-2077 | 6 | Asbestos Cement | 1953 | 0 | 0 | FALSE |

# Asset Management Pipe Input Data
## Capital Efficiency Study
## Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 3800 | P-2078 | 6 | Asbestos Cement | 1953 | 0 | 0 | FALSE |
| 3802 | P-2079 | 2.3 | Unlined Cast Iron | 1953 | 0 | 0 | FALSE |
| 3804 | P-2080 | 8 | Factory Lined Cast Iron | 1960 | 0 | 0 | FALSE |
| 3805 | P-2081 | 8 | Factory Lined Cast Iron | 1960 | 0 | 0 | FALSE |
| 3808 | P-2083 | 2 | Galvanized Steel | 1927 | 0 | 0 | FALSE |
| 3809 | P-2084 | 2.3 | Unlined Cast Iron | 1952 | 5 | 0 | FALSE |
| 3811 | P-2085 | 6 | Asbestos Cement | 1952 | 0 | 0 | FALSE |
| 3812 | P-2086 | 6 | Asbestos Cement | 1952 | 0 | 0 | FALSE |
| 3814 | P-2087 | 2.3 | Factory Lined Cast Iron | 1968 | 4 | 0 | FALSE |
| 3816 | P-2088 | 2.3 | Unlined Cast Iron | 1940 | 0 | 0 | FALSE |
| 3818 | P-2089 | 4 | Unlined Cast Iron | 1905 | 0 | 0 | FALSE |
| 3820 | P-2090 | 8 | Unlined Cast Iron | 1898 | 0 | 0 | FALSE |
| 3821 | P-2091 | 8 | Unlined Cast Iron | 1898 | 0 | 0 | FALSE |
| 3823 | P-2092 | 4 | Unlined Cast Iron | 1923 | 0 | 0 | FALSE |
| 3827 | P-2094 | 6 | Unlined Cast Iron | 1898 | 0 | 0 | FALSE |
| 3828 | P-2095 | 2.3 | Galvanized Steel | 1908 | 0 | 0 | FALSE |
| 3830 | P-2096 | 10 | Unlined Cast Iron | 1911 | 0.4 | 0 | FALSE |
| 3831 | P-2097 | 10 | Unlined Cast Iron | 1911 | 0.4 | 0 | FALSE |
| 3833 | P-2098 | 2.3 | Factory Lined Cast Iron | 1966 | 2.5 | 0 | FALSE |
| 3835 | P-2099 | 10 | Unlined Cast Iron | 1917 | 0.4 | 0 | FALSE |
| 3836 | P-2100 | 10 | Unlined Cast Iron | 1917 | 0.4 | 0 | FALSE |
| 3840 | P-2102 | 2.3 | Factory Lined Cast Iron | 1964 | 3 | 0 | FALSE |
| 3841 | P-2103 | 2 | Unlined Cast Iron | 1923 | 0 | 0 | FALSE |
| 3843 | P-2104 | 6 | Factory Lined Cast Iron | 1968 | 0 | 0 | FALSE |
| 3844 | P-2105 | 6 | Factory Lined Cast Iron | 1968 | 0 | 0 | FALSE |
| 3846 | P-2106 | 2.3 | Unlined Cast Iron | 1949 | 2.3 | 0 | FALSE |
| 3848 | P-2107 | 6 | Unlined Cast Iron | 1908 | 0.2 | 0 | FALSE |
| 3849 | P-2108 | 6 | Unlined Cast Iron | 1908 | 0.2 | 0 | FALSE |
| 3857 | P-2112 | 6 | Unlined Cast Iron | 1949 | 0 | 0 | FALSE |
| 3859 | P-2113 | 4 | Unlined Cast Iron | 1922 | 17.6 | 0 | FALSE |
| 3862 | P-2115 | 8 | Factory Lined Cast Iron | 1965 | 0 | 0 | FALSE |
| 3864 | P-2116 | 2 | Galvanized Steel | 1910 | 1.9 | 0 | FALSE |
| 3866 | P-2117 | 6 | Unlined Cast Iron | 1929 | 2 | 0 | FALSE |
| 3867 | P-2118 | 6 | Unlined Cast Iron | 1929 | 2 | 0 | FALSE |
| 3869 | P-2119 | 6 | Unlined Cast Iron | 1929 | 2 | 0 | FALSE |
| 3870 | P-2120 | 4 | Unlined Cast Iron | 1929 | 3.1 | 0 | FALSE |
| 3872 | P-2121 | 2.3 | Unlined Cast Iron | 1947 | 11.3 | 0 | FALSE |
| 3874 | P-2122 | 6 | Asbestos Cement | 1955 | 3.6 | 0 | FALSE |
| 3875 | P-2123 | 6 | Asbestos Cement | 1955 | 3.6 | 0 | FALSE |
| 3877 | P-2124 | 3 | PVC | 1999 | 0 | 0 | FALSE |
| 3879 | P-2125 | 2 | Unlined Cast Iron | 1925 | 6 | 0 | FALSE |



Prepared by or under the supervision of: Robert L. Roland

# Asset Management Pipe Input Data
## Capital Efficiency Study
## Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 3881 | P-2126 | 4 | Unlined Cast Iron | 1915 | 1.9 | 0 | FALSE |
| 3882 | P-2127 | 4 | Unlined Cast Iron | 1907 | 0 | 0 | FALSE |
| 3883 | P-2128 | 4 | Unlined Cast Iron | 1907 | 0 | 0 | FALSE |
| 3884 | P-2129 | 4 | Unlined Cast Iron | 1907 | 0 | 0 | FALSE |
| 3885 | P-2130 | 4 | Unlined Cast Iron | 1907 | 4.1 | 0 | FALSE |
| 3887 | P-2131 | 6 | Unlined Cast Iron | 1908 | 0.9 | 0 | FALSE |
| 3888 | P-2132 | 6 | Unlined Cast Iron | 1908 | 0.9 | 0 | FALSE |
| 3889 | P-2133 | 4 | Unlined Cast Iron | 1908 | 0 | 0 | FALSE |
| 3891 | P-2134 | 6 | Unlined Cast Iron | 1906 | 1.1 | 0 | FALSE |
| 3892 | P-2135 | 6 | Unlined Cast Iron | 1906 | 1.1 | 0 | FALSE |
| 3894 | P-2136 | 6 | Unlined Cast Iron | 1906 | 0 | 0 | FALSE |
| 3895 | P-2137 | 6 | Unlined Cast Iron | 1906 | 0 | 0 | FALSE |
| 3896 | P-2138 | 4 | Unlined Cast Iron | 1906 | 0 | 0 | FALSE |
| 3898 | P-2139 | 4 | Unlined Cast Iron | 1892 | 0 | 0 | FALSE |
| 3901 | P-2141 | 4 | Unlined Cast Iron | 1892 | 0 | 0 | FALSE |
| 3902 | P-2142 | 4 | Unlined Cast Iron | 1892 | 0 | 0 | FALSE |
| 3904 | P-2143 | 6 | Unlined Cast Iron | 1892 | 0 | 0 | FALSE |
| 3905 | P-2144 | 6 | Unlined Cast Iron | 1892 | 0 | 0 | FALSE |
| 3906 | P-2145 | 4 | Unlined Cast Iron | 1882 | 0 | 0 | FALSE |
| 3908 | P-2146 | 4 | Unlined Cast Iron | 1908 | 0 | 0 | FALSE |
| 3910 | P-2147 | 6 | Asbestos Cement | 1954 | 7.1 | 0 | FALSE |
| 3913 | P-2149 | 2.3 | Factory Lined Cast Iron | 1967 | 5.6 | 0 | FALSE |
| 3915 | P-2150 | 8 | Factory Lined Cast Iron | 1971 | 0 | 0 | FALSE |
| 3918 | P-2152 | 2.3 | Factory Lined Cast Iron | 1967 | 1.7 | 0 | FALSE |
| 3920 | P-2153 | 6 | Unlined Cast Iron | 1921 | 0 | 0 | FALSE |
| 3921 | P-2154 | 6 | Unlined Cast Iron | 1921 | 0 | 0 | FALSE |
| 3922 | P-2155 | 4 | Factory Lined Cast Iron | 1960 | 0 | 0 | FALSE |
| 3924 | P-2156 | 12 | Unlined Cast Iron | 1894 | 1.3 | 0 | FALSE |
| 3927 | P-2158 | 2 | Galvanized Steel | 1914 | 2.8 | 0 | FALSE |
| 3929 | P-2159 | 12 | Unlined Cast Iron | 1894 | 1.3 | 0 | FALSE |
| 3930 | P-2160 | 12 | Unlined Cast Iron | 1894 | 1.3 | 0 | FALSE |
| 3932 | P-2161 | 4 | Factory Lined Cast Iron | 1960 | 1 | 0 | FALSE |
| 3934 | P-2162 | 20 | Unlined Cast Iron | 1924 | 0 | 0 | FALSE |
| 3935 | P-2163 | 20 | Unlined Cast Iron | 1924 | 0 | 0 | FALSE |
| 3937 | P-2164 | 2.3 | Unlined Cast Iron | 1953 | 0 | 0 | FALSE |
| 3939 | P-2165 | 6 | Ductile Iron | 1993 | 0 | 0 | FALSE |
| 3940 | P-2166 | 6 | Ductile Iron | 1993 | 0 | 0 | FALSE |
| 3942 | P-2167 | 2.3 | Factory Lined Cast Iron | 1966 | 13.6 | 0 | FALSE |
| 3944 | P-2168 | 6 | Unlined Cast Iron | 1958 | 1 | 0 | FALSE |
| 3945 | P-2169 | 6 | Unlined Cast Iron | 1958 | 1 | 0 | FALSE |
| 3947 | P-2170 | 4 | Unlined Cast Iron | 1922 | 0 | 0 | FALSE |

# Asset Management Pipe Input Data
## Capital Efficiency Study
## Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 3949 | P-2171 | 10 | Unlined Cast Iron | 1923 | 1.2 | 0 | FALSE |
| 3950 | P-2172 | 10 | Unlined Cast Iron | 1923 | 1.2 | 0 | FALSE |
| 3952 | P-2173 | 2.3 | Unlined Cast Iron | 1954 | 0 | 0 | FALSE |
| 3955 | P-2175 | 12 | Ductile Iron | 2010 | 0 | 1 | FALSE |
| 3957 | P-2176 | 4 | Factory Lined Cast Iron | 1960 | 0 | 0 | FALSE |
| 3960 | P-2178 | 12 | Ductile Iron | 2009 | 0 | 1 | FALSE |
| 3962 | P-2179 | 8 | Ductile Iron | 2000 | 0 | 0 | FALSE |
| 3965 | P-2181 | 12 | Ductile Iron | 2011 | 0 | 1 | FALSE |
| 3967 | P-2182 | 4 | Unlined Cast Iron | 1889 | 0 | 0 | FALSE |
| 3970 | P-2184 | 12 | Ductile Iron | 2011 | 0 | 1 | FALSE |
| 3971 | P-2185 | 4 | Unlined Cast Iron | 1889 | 0 | 0 | FALSE |
| 3973 | P-2186 | 6 | Factory Lined Cast Iron | 1966 | 2.1 | 1 | FALSE |
| 3976 | P-2188 | 2 | PVC | 2005 | 0 | 0 | FALSE |
| 3978 | P-2189 | 6 | Factory Lined Cast Iron | 1966 | 2.1 | 1 | FALSE |
| 3979 | P-2190 | 6 | Factory Lined Cast Iron | 1966 | 0 | 1 | FALSE |
| 3981 | P-2191 | 6 | Unlined Cast Iron | 1882 | 2.5 | 1 | FALSE |
| 3982 | P-2192 | 6 | Unlined Cast Iron | 1882 | 2.5 | 1 | FALSE |
| 3983 | P-2193 | 4 | Unlined Cast Iron | 1891 | 0.8 | 0 | FALSE |
| 3985 | P-2194 | 2 | Unlined Cast Iron | 1910 | 36.6 | 0 | FALSE |
| 3987 | P-2195 | 2 | Galvanized Steel | 1919 | 0 | 0 | FALSE |
| 3989 | P-2196 | 2 | Unlined Cast Iron | 1954 | 0 | 0 | FALSE |
| 3991 | P-2197 | 2.3 | Unlined Cast Iron | 1949 | 6.6 | 0 | FALSE |
| 3993 | P-2198 | 6 | Unlined Cast Iron | 1916 | 1.2 | 0 | FALSE |
| 3996 | P-2200 | 8 | Unlined Cast Iron | 1901 | 0.4 | 0 | FALSE |
| 3997 | P-2201 | 8 | Unlined Cast Iron | 1901 | 0.4 | 0 | FALSE |
| 3998 | P-2202 | 2.3 | Factory Lined Cast Iron | 1962 | 3.5 | 0 | FALSE |
| 4000 | P-2203 | 8 | Unlined Cast Iron | 1901 | 0.4 | 0 | FALSE |
| 4001 | P-2204 | 8 | Unlined Cast Iron | 1901 | 0.4 | 0 | FALSE |
| 4003 | P-2205 | 2.3 | Factory Lined Cast Iron | 1969 | 0 | 0 | FALSE |
| 4008 | P-2208 | 6 | Unlined Cast Iron | 1915 | 0.5 | 1 | FALSE |
| 4010 | P-2209 | 4 | Unlined Cast Iron | 1915 | 0 | 1 | FALSE |
| 4012 | P-2210 | 6 | Unlined Cast Iron | 1915 | 0.5 | 1 | FALSE |
| 4013 | P-2211 | 6 | Unlined Cast Iron | 1915 | 0.5 | 1 | FALSE |
| 4014 | P-2212 | 4 | Unlined Cast Iron | 1915 | 0 | 0 | FALSE |
| 4016 | P-2213 | 6 | Unlined Cast Iron | 1928 | 0 | 1 | FALSE |
| 4017 | P-2214 | 6 | Unlined Cast Iron | 1928 | 2.9 | 1 | FALSE |
| 4019 | P-2215 | 2.3 | Factory Lined Cast Iron | 1965 | 2.8 | 0 | FALSE |
| 4021 | P-2216 | 12 | Unlined Cast Iron | 1894 | 1.3 | 1 | FALSE |
| 4022 | P-2217 | 12 | Unlined Cast Iron | 1894 | 1.3 | 1 | FALSE |
| 4023 | P-2218 | 2 | Factory Lined Cast Iron | 1965 | 2.8 | 0 | FALSE |
| 4025 | P-2219 | 8 | Ductile Iron | 1988 | 0 | 1 | FALSE |

**Asset Management Pipe Input Data**
**Capital Efficiency Study**
**Aquarion Water Company - Hingham/Hull Water System**

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 4026 | P-2220 | 8 | Ductile Iron | 1988 | 0 | 1 | FALSE |
| 4028 | P-2221 | 6 | Asbestos Cement | 1950 | 0 | 1 | FALSE |
| 4029 | P-2222 | 6 | Asbestos Cement | 1950 | 0 | 1 | FALSE |
| 4030 | P-2223 | 2 | Galvanized Steel | 1933 | 12.7 | 0 | FALSE |
| 4034 | P-2225 | 6 | Unlined Cast Iron | 1895 | 0.5 | 1 | FALSE |
| 4036 | P-2227 | 4 | Unlined Cast Iron | 1935 | 0 | 0 | FALSE |
| 4039 | P-2229 | 6 | Unlined Cast Iron | 1915 | 4.8 | 1 | FALSE |
| 4041 | P-2230 | 12 | Unlined Cast Iron | 1894 | 1.3 | 1 | FALSE |
| 4042 | P-2231 | 12 | Unlined Cast Iron | 1894 | 1.3 | 1 | FALSE |
| 4043 | P-2232 | 2 | Unlined Cast Iron | 1928 | 4.3 | 0 | FALSE |
| 4045 | P-2233 | 6 | Unlined Cast Iron | 1915 | 4.8 | 1 | FALSE |
| 4046 | P-2234 | 6 | Unlined Cast Iron | 1915 | 4.8 | 1 | FALSE |
| 4048 | P-2235 | 2 | Unlined Cast Iron | 1923 | 6.3 | 0 | FALSE |
| 4050 | P-2236 | 6 | Unlined Cast Iron | 1923 | 3.6 | 1 | FALSE |
| 4051 | P-2237 | 6 | Unlined Cast Iron | 1923 | 3.6 | 1 | FALSE |
| 4053 | P-2238 | 2.3 | Factory Lined Cast Iron | 1967 | 4.5 | 0 | FALSE |
| 4055 | P-2239 | 6 | Unlined Cast Iron | 1915 | 4.8 | 1 | FALSE |
| 4058 | P-2241 | 2 | Unlined Cast Iron | 1935 | 10.4 | 0 | FALSE |
| 4060 | P-2242 | 6 | Unlined Cast Iron | 1915 | 4.8 | 1 | FALSE |
| 4061 | P-2243 | 6 | Unlined Cast Iron | 1915 | 4.8 | 1 | FALSE |
| 4062 | P-2244 | 2.3 | Unlined Cast Iron | 1946 | 25.8 | 0 | FALSE |
| 4064 | P-2245 | 6 | Asbestos Cement | 1954 | 0 | 1 | FALSE |
| 4065 | P-2246 | 6 | Asbestos Cement | 1954 | 0 | 1 | FALSE |
| 4067 | P-2247 | 2.3 | Unlined Cast Iron | 1957 | 17.9 | 0 | FALSE |
| 4069 | P-2248 | 6 | Unlined Cast Iron | 1895 | 0.5 | 1 | FALSE |
| 4073 | P-2251 | 2.3 | Unlined Cast Iron | 1954 | 2.4 | 1 | FALSE |
| 4074 | P-2252 | 2.3 | Unlined Cast Iron | 1954 | 2.4 | 1 | FALSE |
| 4076 | P-2253 | 6 | Unlined Cast Iron | 1911 | 1.3 | 1 | FALSE |
| 4077 | P-2254 | 6 | Unlined Cast Iron | 1911 | 1.3 | 1 | FALSE |
| 4078 | P-2255 | 4 | Unlined Cast Iron | 1915 | 0 | 0 | FALSE |
| 4080 | P-2256 | 6 | Unlined Cast Iron | 1895 | 0 | 1 | FALSE |
| 4081 | P-2257 | 6 | Unlined Cast Iron | 1895 | 0 | 1 | FALSE |
| 4082 | P-2258 | 2 | Unlined Cast Iron | 1928 | 17.7 | 0 | FALSE |
| 4084 | P-2259 | 6 | Unlined Cast Iron | 1930 | 3.9 | 1 | FALSE |
| 4087 | P-2261 | 12 | Unlined Cast Iron | 1933 | 6.6 | 1 | FALSE |
| 4088 | P-2262 | 12 | Unlined Cast Iron | 1933 | 6.6 | 1 | FALSE |
| 4090 | P-2263 | 8 | Factory Lined Cast Iron | 1964 | 0.5 | 1 | FALSE |
| 4094 | P-2266 | 6 | Unlined Cast Iron | 1937 | 0 | 1 | FALSE |
| 4095 | P-2267 | 6 | Unlined Cast Iron | 1896 | 0.7 | 1 | FALSE |
| 4098 | P-2269 | 12 | Unlined Cast Iron | 1909 | 1.3 | 1 | FALSE |
| 4099 | P-2270 | 12 | Unlined Cast Iron | 1909 | 1.3 | 1 | FALSE |

# Asset Management Pipe Input Data
## Capital Efficiency Study
## Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 4100 | P-2271 | 4 | Unlined Cast Iron | 1925 | 0 | 0 | FALSE |
| 4107 | P-2275 | 4 | Unlined Cast Iron | 1925 | 1 | 0 | FALSE |
| 4108 | P-2276 | 4 | Unlined Cast Iron | 1925 | 1 | 0 | FALSE |
| 4110 | P-2277 | 6 | Unlined Cast Iron | 1894 | 0 | 0 | FALSE |
| 4111 | P-2278 | 6 | Unlined Cast Iron | 1894 | 0 | 0 | FALSE |
| 4112 | P-2279 | 4 | Unlined Cast Iron | 1925 | 1 | 0 | FALSE |
| 4113 | P-2280 | 4 | Unlined Cast Iron | 1912 | 13.5 | 0 | FALSE |
| 4115 | P-2281 | 2.3 | Unlined Cast Iron | 1957 | 4.9 | 0 | FALSE |
| 4116 | P-2282 | 8 | Ductile Iron | 1990 | 2.4 | 0 | FALSE |
| 4119 | P-2283 | 4 | Unlined Cast Iron | 1893 | 3.7 | 0 | FALSE |
| 4120 | P-2284 | 4 | Unlined Cast Iron | 1893 | 3.7 | 0 | FALSE |
| 4121 | P-2285 | 4 | Unlined Cast Iron | 1893 | 3.7 | 0 | FALSE |
| 4122 | P-2286 | 4 | Unlined Cast Iron | 1893 | 5.8 | 0 | FALSE |
| 4123 | P-2287 | 6 | Factory Lined Cast Iron | 1960 | 0 | 1 | FALSE |
| 4125 | P-2288 | 12 | Unlined Cast Iron | 1909 | 1.3 | 1 | FALSE |
| 4126 | P-2289 | 12 | Unlined Cast Iron | 1909 | 1.3 | 1 | FALSE |
| 4127 | P-2290 | 2 | Galvanized Steel | 1928 | 3.3 | 0 | FALSE |
| 4129 | P-2291 | 4 | Unlined Cast Iron | 1910 | 0 | 0 | FALSE |
| 4131 | P-2292 | 2.3 | Unlined Cast Iron | 1927 | 0 | 0 | FALSE |
| 4133 | P-2293 | 6 | Unlined Cast Iron | 1898 | 0.7 | 1 | FALSE |
| 4134 | P-2294 | 6 | Unlined Cast Iron | 1898 | 0.7 | 1 | FALSE |
| 4135 | P-2295 | 2 | Galvanized Steel | 1927 | 0 | 0 | FALSE |
| 4136 | P-2296 | 4 | Unlined Cast Iron | 1915 | 0 | 0 | FALSE |
| 4138 | P-2297 | 12 | Unlined Cast Iron | 1909 | 1.3 | 1 | FALSE |
| 4140 | P-2299 | 2.3 | Unlined Cast Iron | 1952 | 13.8 | 0 | FALSE |
| 4142 | P-2300 | 2 | Galvanized Steel | 1928 | 8.4 | 0 | FALSE |
| 4144 | P-2301 | 2.3 | Unlined Cast Iron | 1946 | 0 | 0 | FALSE |
| 4146 | P-2302 | 6 | Unlined Cast Iron | 1898 | 0.7 | 1 | FALSE |
| 4147 | P-2303 | 6 | Unlined Cast Iron | 1898 | 0.7 | 1 | FALSE |
| 4148 | P-2304 | 2 | Galvanized Steel | 1940 | 0 | 0 | FALSE |
| 4150 | P-2305 | 6 | Asbestos Cement | 1950 | 4.6 | 1 | FALSE |
| 4151 | P-2306 | 6 | Unlined Cast Iron | 1931 | 0 | 1 | FALSE |
| 4152 | P-2307 | 2.3 | Unlined Cast Iron | 1950 | 9.6 | 0 | FALSE |
| 4154 | P-2308 | 12 | Unlined Cast Iron | 1909 | 1.3 | 1 | FALSE |
| 4155 | P-2309 | 12 | Unlined Cast Iron | 1909 | 1.3 | 1 | FALSE |
| 4156 | P-2310 | 4 | Unlined Cast Iron | 1915 | 4.2 | 0 | FALSE |
| 4157 | P-2311 | 4 | Unlined Cast Iron | 1909 | 3.5 | 0 | FALSE |
| 4159 | P-2312 | 6 | Unlined Cast Iron | 1898 | 0.7 | 1 | FALSE |
| 4160 | P-2313 | 6 | Unlined Cast Iron | 1898 | 0.7 | 1 | FALSE |
| 4161 | P-2314 | 2 | Galvanized Steel | 1927 | 4.5 | 0 | FALSE |
| 4162 | P-2315 | 4 | Unlined Cast Iron | 1916 | 0 | 0 | FALSE |



Prepared by or under the supervision of: Robert L. Roland

# Asset Management Pipe Input Data
## Capital Efficiency Study
## Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 4164 | P-2316 | 6 | Factory Lined Cast Iron | 1964 | 0 | 1 | FALSE |
| 4166 | P-2318 | 2 | Galvanized Steel | 1950 | 11.8 | 0 | FALSE |
| 4168 | P-2319 | 12 | Unlined Cast Iron | 1909 | 1.3 | 1 | FALSE |
| 4169 | P-2320 | 12 | Unlined Cast Iron | 1909 | 1.3 | 1 | FALSE |
| 4170 | P-2321 | 4 | Unlined Cast Iron | 1909 | 0 | 0 | FALSE |
| 4172 | P-2322 | 2 | Unlined Cast Iron | 1924 | 0 | 0 | FALSE |
| 4174 | P-2323 | 2.3 | Unlined Cast Iron | 1924 | 0 | 0 | FALSE |
| 4176 | P-2324 | 6 | Factory Lined Cast Iron | 1964 | 0 | 1 | FALSE |
| 4177 | P-2325 | 6 | Factory Lined Cast Iron | 1964 | 0 | 1 | FALSE |
| 4178 | P-2326 | 1.5 | Unlined Cast Iron | 1924 | 14.8 | 0 | FALSE |
| 4180 | P-2327 | 2.3 | Factory Lined Cast Iron | 1964 | 25 | 0 | FALSE |
| 4182 | P-2328 | 12 | Unlined Cast Iron | 1909 | 1.3 | 1 | FALSE |
| 4185 | P-2330 | 6 | Factory Lined Cast Iron | 1965 | 0 | 1 | FALSE |
| 4187 | P-2332 | 4 | Unlined Cast Iron | 1915 | 4 | 0 | FALSE |
| 4188 | P-2333 | 4 | Factory Lined Cast Iron | 1978 | 1.3 | 0 | FALSE |
| 4190 | P-2334 | 6 | Unlined Cast Iron | 1922 | 0.9 | 1 | FALSE |
| 4191 | P-2335 | 6 | Unlined Cast Iron | 1922 | 0.9 | 1 | FALSE |
| 4192 | P-2336 | 4 | Unlined Cast Iron | 1915 | 4.3 | 0 | FALSE |
| 4194 | P-2337 | 12 | Unlined Cast Iron | 1909 | 1.3 | 1 | FALSE |
| 4196 | P-2339 | 4 | Unlined Cast Iron | 1922 | 1.4 | 0 | FALSE |
| 4198 | P-2340 | 4 | Unlined Cast Iron | 1915 | 0 | 0 | FALSE |
| 4201 | P-2341 | 6 | Unlined Cast Iron | 1922 | 0.9 | 1 | FALSE |
| 4202 | P-2342 | 6 | Unlined Cast Iron | 1922 | 0.9 | 1 | FALSE |
| 4203 | P-2343 | 2.3 | Unlined Cast Iron | 1947 | 0 | 0 | FALSE |
| 4205 | P-2344 | 12 | Unlined Cast Iron | 1909 | 1.3 | 1 | FALSE |
| 4206 | P-2345 | 12 | Unlined Cast Iron | 1909 | 1.3 | 1 | FALSE |
| 4207 | P-2346 | 2 | Galvanized Steel | 1924 | 6.8 | 0 | FALSE |
| 4209 | P-2347 | 6 | Factory Lined Cast Iron | 1965 | 0 | 1 | FALSE |
| 4210 | P-2348 | 6 | Factory Lined Cast Iron | 1965 | 0 | 1 | FALSE |
| 4213 | P-2350 | 2 | Galvanized Steel | 1912 | 0 | 0 | FALSE |
| 4215 | P-2351 | 2 | Galvanized Steel | 1910 | 0 | 0 | FALSE |
| 4218 | P-2352 | 2 | Galvanized Steel | 1905 | 9.9 | 0 | FALSE |
| 4220 | P-2353 | 2 | Galvanized Steel | 1913 | 3.4 | 0 | FALSE |
| 4222 | P-2354 | 8 | Ductile Iron | 1985 | 0 | 1 | FALSE |
| 4223 | P-2355 | 8 | Factory Lined Cast Iron | 1985 | 0 | 1 | FALSE |
| 4226 | P-2357 | 4 | Unlined Cast Iron | 1900 | 0 | 0 | FALSE |
| 4228 | P-2358 | 2 | Unlined Cast Iron | 1900 | 8.4 | 0 | FALSE |
| 4230 | P-2359 | 6 | Unlined Cast Iron | 1900 | 0 | 0 | FALSE |
| 4231 | P-2360 | 6 | Unlined Cast Iron | 1900 | 0 | 0 | FALSE |
| 4233 | P-2361 | 2.3 | Unlined Cast Iron | 1905 | 0 | 0 | FALSE |
| 4235 | P-2362 | 12 | Unlined Cast Iron | 1909 | 1.3 | 1 | FALSE |



Prepared by or under the supervision of: Robert L. Roland

# Asset Management Pipe Input Data
# Capital Efficiency Study
# Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 4236 | P-2363 | 12 | Unlined Cast Iron | 1909 | 1.3 | 1 | FALSE |
| 4237 | P-2364 | 2 | Galvanized Steel | 1905 | 9.7 | 0 | FALSE |
| 4238 | P-2365 | 4 | Unlined Cast Iron | 1892 | 4.8 | 0 | FALSE |
| 4240 | P-2366 | 2.3 | Factory Lined Cast Iron | 1972 | 7.7 | 0 | FALSE |
| 4242 | P-2367 | 4 | Unlined Cast Iron | 1892 | 0 | 0 | FALSE |
| 4244 | P-2368 | 2 | Unlined Cast Iron | 1927 | 14.1 | 0 | FALSE |
| 4246 | P-2369 | 2 | Galvanized Steel | 1935 | 3.1 | 0 | FALSE |
| 4248 | P-2370 | 2 | Galvanized Steel | 1935 | 3.1 | 0 | FALSE |
| 4252 | P-2372 | 2 | Galvanized Steel | 1935 | 3.1 | 0 | FALSE |
| 4253 | P-2373 | 2.3 | Factory Lined Cast Iron | 1969 | 2.7 | 0 | FALSE |
| 4255 | P-2374 | 2.3 | Factory Lined Cast Iron | 1971 | 25.6 | 0 | FALSE |
| 4257 | P-2375 | 2.3 | Unlined Cast Iron | 1950 | 2.5 | 0 | FALSE |
| 4259 | P-2376 | 2 | Galvanized Steel | 1926 | 0 | 0 | FALSE |
| 4261 | P-2377 | 2.3 | Unlined Cast Iron | 1940 | 2.6 | 0 | TRUE |
| 4262 | P-2378 | 2 | Galvanized Steel | 1932 | 3.7 | 0 | TRUE |
| 4264 | P-2379 | 6 | Unlined Cast Iron | 1934 | 0.43 | 0 | FALSE |
| 4265 | P-2380 | 6 | Unlined Cast Iron | 1934 | 0 | 0 | FALSE |
| 4267 | P-2381 | 2.3 | Unlined Cast Iron | 1937 | 16.6 | 0 | FALSE |
| 4270 | P-2382 | 6 | Unlined Cast Iron | 1897 | 0 | 1 | FALSE |
| 4271 | P-2383 | 6 | Unlined Cast Iron | 1897 | 1.9 | 1 | FALSE |
| 4273 | P-2384 | 2 | Factory Lined Cast Iron | 1968 | 15.3 | 0 | FALSE |
| 4275 | P-2385 | 6 | Unlined Cast Iron | 1934 | 1.2 | 0 | FALSE |
| 4276 | P-2386 | 6 | Unlined Cast Iron | 1934 | 1.2 | 0 | FALSE |
| 4278 | P-2387 | 1 | PVC | 1979 | 12.6 | 0 | FALSE |
| 4281 | P-2388 | 2 | Unlined Cast Iron | 1949 | 26.1 | 0 | FALSE |
| 4283 | P-2389 | 6 | Unlined Cast Iron | 1915 | 0.6 | 0 | FALSE |
| 4284 | P-2390 | 6 | Unlined Cast Iron | 1915 | 0.6 | 0 | FALSE |
| 4286 | P-2391 | 2 | Galvanized Steel | 1935 | 9.2 | 0 | FALSE |
| 4288 | P-2392 | 2 | Galvanized Steel | 1924 | 3.3 | 0 | TRUE |
| 4290 | P-2393 | 2.3 | Factory Lined Cast Iron | 1966 | 3 | 0 | FALSE |
| 4292 | P-2394 | 1 | Galvanized Steel | 1920 | 13.8 | 0 | FALSE |
| 4294 | P-2395 | 6 | Asbestos Cement | 1949 | 4.8 | 0 | FALSE |
| 4296 | P-2396 | 6 | Asbestos Cement | 1954 | 7.1 | 0 | FALSE |
| 4297 | P-2397 | 6 | Asbestos Cement | 1954 | 0 | 0 | FALSE |
| 4299 | P-2398 | 2 | PVC | 1998 | 0 | 0 | FALSE |
| 4301 | P-2399 | 2 | Galvanized Steel | 1923 | 1.9 | 0 | FALSE |
| 4303 | P-2400 | 6 | Unlined Cast Iron | 1957 | 0 | 0 | FALSE |
| 4304 | P-2401 | 6 | Unlined Cast Iron | 1957 | 0 | 0 | FALSE |
| 4306 | P-2402 | 1 | Galvanized Steel | 1924 | 8 | 0 | FALSE |
| 4308 | P-2403 | 2.3 | Unlined Cast Iron | 1955 | 13.1 | 0 | FALSE |
| 4310 | P-2404 | 6 | Unlined Cast Iron | 1915 | 4.8 | 1 | FALSE |

# Asset Management Pipe Input Data
## Capital Efficiency Study
## Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 4313 | P-2406 | 1 | Galvanized Steel | 1921 | 19 | 0 | FALSE |
| 4315 | P-2407 | 6 | Unlined Cast Iron | 1915 | 4.8 | 1 | FALSE |
| 4316 | P-2408 | 6 | Unlined Cast Iron | 1915 | 4.8 | 1 | FALSE |
| 4318 | P-2409 | 2.3 | Unlined Cast Iron | 1954 | 10.4 | 0 | FALSE |
| 4320 | P-2410 | 2.3 | Unlined Cast Iron | 1953 | 9 | 0 | FALSE |
| 4322 | P-2411 | 6 | Factory Lined Cast Iron | 1960 | 1.3 | 0 | FALSE |
| 4323 | P-2412 | 6 | Factory Lined Cast Iron | 1960 | 1.3 | 0 | FALSE |
| 4325 | P-2413 | 1 | Galvanized Steel | 1948 | 37.2 | 0 | FALSE |
| 4327 | P-2414 | 6 | Unlined Cast Iron | 1916 | 1.2 | 0 | FALSE |
| 4328 | P-2415 | 6 | Unlined Cast Iron | 1916 | 1.2 | 0 | FALSE |
| 4330 | P-2416 | 8 | Ductile Iron | 1980 | 0 | 0 | FALSE |
| 4331 | P-2417 | 8 | Ductile Iron | 1980 | 0 | 0 | FALSE |
| 4333 | P-2418 | 12 | Factory Lined Cast Iron | 1962 | 0.2 | 0 | FALSE |
| 4334 | P-2419 | 12 | Factory Lined Cast Iron | 1962 | 0.2 | 0 | FALSE |
| 4336 | P-2420 | 4 | Unlined Cast Iron | 1899 | 3 | 0 | FALSE |
| 4338 | P-2421 | 6 | Unlined Cast Iron | 1913 | 0 | 0 | FALSE |
| 4339 | P-2422 | 6 | Unlined Cast Iron | 1913 | 0 | 0 | FALSE |
| 4341 | P-2423 | 6 | Unlined Cast Iron | 1904 | 2.5 | 1 | FALSE |
| 4342 | P-2424 | 6 | Unlined Cast Iron | 1904 | 1.3 | 1 | FALSE |
| 4344 | P-2425 | 6 | Unlined Cast Iron | 1917 | 2.3 | 0 | FALSE |
| 4345 | P-2426 | 6 | Unlined Cast Iron | 1917 | 0 | 0 | FALSE |
| 4347 | P-2427 | 8 | Factory Lined Cast Iron | 1971 | 0 | 0 | FALSE |
| 4348 | P-2428 | 8 | Factory Lined Cast Iron | 1971 | 0 | 0 | FALSE |
| 4350 | P-2429 | 6 | Ductile Iron | 1981 | 0 | 0 | FALSE |
| 4351 | P-2430 | 6 | Ductile Iron | 1981 | 0 | 0 | FALSE |
| 4353 | P-2431 | 6 | Unlined Cast Iron | 1957 | 2 | 0 | FALSE |
| 4354 | P-2432 | 6 | Unlined Cast Iron | 1957 | 2 | 0 | FALSE |
| 4356 | P-2433 | 2 | Galvanized Steel | 1924 | 9.7 | 0 | FALSE |
| 4358 | P-2434 | 8 | Asbestos Cement | 1956 | 0 | 0 | FALSE |
| 4359 | P-2435 | 8 | Asbestos Cement | 1956 | 0 | 0 | FALSE |
| 4361 | P-2436 | 1.3 | Galvanized Steel | 1921 | 14.8 | 0 | FALSE |
| 4363 | P-2437 | 6 | Factory Lined Cast Iron | 1964 | 1.2 | 0 | FALSE |
| 4364 | P-2438 | 6 | Factory Lined Cast Iron | 1964 | 0 | 0 | FALSE |
| 4366 | P-2439 | 6 | Unlined Cast Iron | 1922 | 2.9 | 0 | FALSE |
| 4370 | P-2442 | 6 | Unlined Cast Iron | 1922 | 2.9 | 0 | FALSE |
| 4372 | P-2443 | 12 | Unlined Cast Iron | 1894 | 1.3 | 0 | FALSE |
| 4373 | P-2444 | 12 | Unlined Cast Iron | 1894 | 1.3 | 0 | FALSE |
| 4374 | P-2445 | 8 | Ductile Iron | 2008 | 0 | 0 | FALSE |
| 4376 | P-2446 | 6 | Ductile Iron | 2008 | 0 | 0 | FALSE |
| 4380 | P-2448 | 6 | Ductile Iron | 2008 | 0 | 0 | FALSE |
| 4381 | P-2449 | 6 | Ductile Iron | 2008 | 0 | 0 | FALSE |



Prepared by or under the supervision of: Robert L. Roland

# Asset Management Pipe Input Data
## Capital Efficiency Study
## Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 4383 | P-2450 | 6 | Ductile Iron | 2008 | 0 | 0 | FALSE |
| 4385 | P-2451 | 8 | Ductile Iron | 1983 | 0 | 0 | FALSE |
| 4388 | P-2453 | 4 | Ductile Iron | 1983 | 0 | 0 | FALSE |
| 4390 | P-2454 | 8 | Ductile Iron | 1983 | 0 | 0 | FALSE |
| 4393 | P-2456 | 4 | Factory Lined Cast Iron | 1983 | 0 | 0 | FALSE |
| 4395 | P-2457 | 8 | Ductile Iron | 1983 | 0 | 0 | FALSE |
| 4398 | P-2459 | 4 | Factory Lined Cast Iron | 1983 | 0 | 0 | FALSE |
| 4400 | P-2460 | 8 | Ductile Iron | 1983 | 0 | 0 | FALSE |
| 4401 | P-2461 | 8 | Ductile Iron | 1983 | 0 | 0 | FALSE |
| 4403 | P-2462 | 4 | Factory Lined Cast Iron | 1983 | 0 | 0 | FALSE |
| 4405 | P-2463 | 8 | Ductile Iron | 1996 | 0 | 0 | FALSE |
| 4406 | P-2464 | 8 | Ductile Iron | 1996 | 0 | 0 | FALSE |
| 4408 | P-2465 | 4 | Ductile Iron | 1996 | 0 | 0 | FALSE |
| 4410 | P-2466 | 4 | Ductile Iron | 1996 | 0 | 0 | FALSE |
| 4412 | P-2467 | 6 | Unlined Cast Iron | 1927 | 0 | 0 | TRUE |
| 4413 | P-2468 | 6 | Unlined Cast Iron | 1927 | 0 | 0 | TRUE |
| 4415 | P-2469 | 1.5 | Galvanized Steel | 1927 | 0 | 0 | TRUE |
| 4417 | P-2470 | 6 | Unlined Cast Iron | 1908 | 0.2 | 0 | FALSE |
| 4418 | P-2471 | 6 | Unlined Cast Iron | 1908 | 0.2 | 0 | FALSE |
| 4420 | P-2472 | 6 | Ductile Iron | 1998 | 0 | 0 | FALSE |
| 4422 | P-2473 | 6 | Ductile Iron | 1998 | 0 | 0 | FALSE |
| 4424 | P-2474 | 6 | Ductile Iron | 1998 | 0 | 0 | FALSE |
| 4426 | P-2475 | 20 | Prestressed Concrete | 1952 | 0 | 1 | FALSE |
| 4427 | P-2476 | 20 | Prestressed Concrete | 1952 | 0 | 1 | FALSE |
| 4429 | P-2477 | 8 | Asbestos Cement | 1950 | 0.4 | 0 | FALSE |
| 4430 | P-2478 | 8 | Asbestos Cement | 1950 | 0.4 | 0 | FALSE |
| 4437 | P-2479 | 8 | Factory Lined Cast Iron | 1970 | 0 | 0 | FALSE |
| 4439 | P-2480 | 8 | Ductile Iron | 2008 | 0 | 0 | FALSE |
| 4443 | P-2483 | 8 | Ductile Iron | 1998 | 0 | 1 | FALSE |
| 4446 | P-2485 | 12 | Unlined Cast Iron | 1917 | 0.3 | 0 | FALSE |
| 4447 | P-2486 | 12 | Unlined Cast Iron | 1917 | 0.3 | 0 | FALSE |
| 4449 | P-2487 | 12 | Unlined Cast Iron | 1894 | 1.3 | 1 | FALSE |
| 4450 | P-2488 | 12 | Unlined Cast Iron | 1894 | 1.3 | 1 | FALSE |
| 4452 | P-2489 | 20 | Unlined Cast Iron | 1924 | 0 | 1 | FALSE |
| 4453 | P-2490 | 20 | Unlined Cast Iron | 1924 | 0 | 1 | FALSE |
| 4454 | P-2491 | 12 | Unlined Cast Iron | 1924 | 0 | 0 | FALSE |
| 4456 | P-2492 | 10 | Unlined Cast Iron | 1922 | 7 | 0 | FALSE |
| 4457 | P-2493 | 10 | Unlined Cast Iron | 1922 | 0 | 0 | FALSE |
| 4459 | P-2494 | 6 | Unlined Cast Iron | 1921 | 0 | 0 | FALSE |
| 4461 | P-2495 | 8 | Unlined Cast Iron | 1901 | 0.4 | 1 | FALSE |
| 4462 | P-2496 | 8 | Unlined Cast Iron | 1901 | 0.4 | 1 | FALSE |



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# Asset Management Pipe Input Data
## Capital Efficiency Study
## Aquarion Water Company - Hingham/Hull Water System

| ID | Label | Diameter (in) | Material | Installation Year | Breaks per 1000' | Corrosive Soils | Water Quality |
|---|---|---|---|---|---|---|---|
| 4464 | P-2497 | 8 | Factory Lined Cast Iron | 1965 | 0.33 | 0 | FALSE |
| 4465 | P-2498 | 6 | Unlined Cast Iron | 1935 | 3.8 | 0 | FALSE |
| 4467 | P-2499 | 8 | Unlined Cast Iron | 1955 | 1.3 | 1 | FALSE |
| 4468 | P-2500 | 8 | Unlined Cast Iron | 1955 | 1.3 | 1 | FALSE |
| 4470 | P-2501 | 8 | Asbestos Cement | 1960 | 3.7 | 0 | FALSE |
| 4471 | P-2502 | 8 | Asbestos Cement | 1960 | 0 | 0 | FALSE |
| 4480 | P-2505 | 6 | Unlined Cast Iron | 1922 | 0 | 0 | FALSE |
| 4481 | P-2506 | 6 | Unlined Cast Iron | 1922 | 0 | 0 | FALSE |
| 4485 | P-2508 | 2 | PVC | 1979 | 48.5 | 0 | FALSE |
| 4490 | P-2509 | 6 | Factory Lined Cast Iron | 1972 | 2.5 | 1 | FALSE |
| 4491 | P-2510 | 6 | Factory Lined Cast Iron | 1972 | 2.5 | 1 | FALSE |
| 4495 | P-2511 | 12 | Ductile Iron | 2007 | 0 | 1 | FALSE |
| 4496 | P-2512 | 8 | Ductile Iron | 2007 | 0 | 1 | FALSE |
| 4500 | P-2514 | 12 | Ductile Iron | 0 | 0 | 0 | FALSE |
| 4501 | P-2515 | 12 | Ductile Iron | 0 | 0 | 0 | FALSE |
| 4503 | P-2516 | 12 | Ductile Iron | 0 | 0 | 0 | FALSE |
| 4505 | P-2517 | 8 | PVC | 0 | 0 | 0 | FALSE |
| 4509 | P-2518 | 1.5 | Galvanized Steel | 1926 | 5.1 | 0 | FALSE |
| 4513 | P-2520 | 1.5 | Galvanized Steel | 1926 | 5.1 | 0 | FALSE |
| 4514 | P-2521 | 1.5 | Galvanized Steel | 1926 | 5.1 | 0 | FALSE |
| 4531 | P-2529 | 12 | Unlined Cast Iron | 1909 | 1.1 | 0 | FALSE |
| 4536 | P-2532 | 12 | Unlined Cast Iron | 1909 | 0 | 1 | FALSE |
| 4537 | P-2533 | 12 | Unlined Cast Iron | 1909 | 0 | 1 | FALSE |
| 0 | P-2534 | 6 | Unlined Cast Iron | 1912 | 2.5 | 1 | FALSE |
| 0 | P-2535 | 12 | Ductile Iron | 2011 | 0 | 1 | FALSE |



Prepared by or under the supervision of: Robert L. Roland


N
Legend
Service Area Boundary
Pipe
Junction
Hull Booster Pump Station
Atlantic Ocean
Hingham Harbor
HULL
Straits Pond
Turkey Hill Standpipe
Capacity: 2.0 mg
Overflow Elevation: 240 feet
Downing Street Well
HINGHAM
COHASSET
Free Street Well No. 2
Free Street Well No. 4
Free Street Well No. 3
Free Street Well No. 5
WEYMOUTH
Fulling Mill Well
Hingham Water Treatment Facility
Capacity: 7.7 mgd
Prospect Street Well
Scotland Street Well
SCITUATE
NORWELL
Accord Tank
Capacity: 0.75 mg
Overflow Elevation: 282 feet
Lily Pond
Aaron Reservoir
Accord Pond
Accord Brook Pond
Triphammer Pond
Link Map
Hingham/Hull, Massachusetts
Aquarion Water Company
TATA & HOWARD
Water and Wastewater Consultants
MARCH 2011
Approximate Scale: 1" = 1,500'


N
Legend
Hydraulic Improvements
Service Area Boundary
Water Main Diameter
4-Inch or Smaller
6-Inch
8-Inch
10-Inch
12-Inch
14-Inch
16-Inch
18-Inch
20-Inch
24-Inch
Hull Booster Pump Station
1. Hull Booster Station Upgrades
New Fire Pump
2. Beach Avenue
New 12" Water Main
Atlantic Ocean
16. Edgewater Road
New 8" Water Main
12. Mayflower Avenue
New 8" Water Main
9. Rockway Avenue, Wyola Road
and Delawanda Road
New 8" Water Main
4a. Atlantic Avenue
New 12" Water Main
4b. Summit Avenue
New 8" Water Main
20. Dighton Street
New 8" Water Main
21. Howe Street
New 8" Water Main
6. Washington Boulevard
New 12" Water Main
HULL
Straits Pond
10. Downer Avenue
New 12" Water Main
19. Summit Drive and
Harbor View Drive
New 8" Water Main
17. Simmons Road
New 8" Water Main
Hingham Harbor
22. Spruce Street and Hull Street
New 8" Water Main
3. Beal Street
New 12" Water Main
Turkey Hill Standpipe
Capacity: 2.0 mg
Oveflow Elevation: 240 feet
7. East Gate Lane
New 12" Water Main
Downing Street Well
13. Rockwood Road and Ledgewood Circle
New 8" Water Main
Fresh River
Accord Brook
18. Smith Road and Hobart Street
New 8" Water Main
8. Pleasant Street
New 8" Water Main
Lily Pond
COHASSET
HINGHAM
23. Carleton Road
New 8" Water Main
Free Street Well No. 4
Free Street Well No. 2
Free Street Well No. 3
Free Street Well No. 5
Crooked Meadow River
WEYMOUTH
14. Grist Mill Lane, Howland Lane, and Whitcomb Avenue
New 8" Water Main
15. Nutty Hill Road and Whitehorse Road
New 8" Water Main
Fulling Mill Well
Aaron Reservoir
Hingham Water Treatment Facility
Capacity: 7.7 mgd
Plymouth River
Fulling Mill Pond
SCITUATE
Prospect Street Well
Scotland Street Well
NORWELL
5. Keith Way and Recreation Park Drive
New 16" Water Main
Accord Brook Pond
11. Pine Grove Road and Main Street
New 12" Water Main
Accord Pond
Accord Tank
Capacity: 0.75 mg
Overflow Elevation: 282 feet
Hydraulically Deficient Areas
Hingham/Hull, Massachusetts
Aquarion Water Company
TATA & HOWARD
Water and Wastewater Consultants
MARCH 2011
Approximate Scale: 1" = 1,500'


N
Legend
School
Healthcare Facility
Other Critical Customer
Critical Areas
Service Area Boundary
Water Main Diameter
4-Inch or Smaller
6-Inch
8-Inch
10-Inch
12-Inch
14-Inch
16-Inch
18-Inch
20-Inch
24-Inch
Hull Booster Pump Station
Atlantic Ocean
HULL
Straits Pond
Hingham Harbor
Turkey Hill Standpipe
Capacity: 2.0 mg
Overflow Elevation: 240 feet
Downing Street Well
Free Street Well No. 2
Free Street Well No. 4
Free Street Well No. 3
Free Street Well No. 5
HINGHAM
COHASSET
WEYMOUTH
Fulling Mill Well
Hingham Water Treatment Facility
Capacity: 7.7 mgd
Prospect Street Well
Scotland Street Well
SCITUATE
NORWELL
Aaron Reservoir
Lily Pond
Triphammer Pond
Accord Brook Pond
Accord Pond
Accord Tank
Capacity: 0.75 mg
Overflow Elevation: 282 feet
Critical Component Areas
Hingham/Hull, Massachusetts
Aquarion Water Company
TATA & HOWARD
Water and Wastewater Consultants
MARCH 2011
Approximate Scale: 1" = 1,500'


N
Legend
Service Area Boundary
Asset Management Rating
Good - Excellent
Fair - Good
Poor - Good
Hull Booster Pump Station
Atlantic Ocean
Hingham Harbor
HULL
Turkey Hill Standpipe
Capacity: 2.0 mg
Overflow Elevation: 240 feet
Downing Street Well
Free Street Well No. 2
Free Street Well No. 4
Free Street Well No. 3
Free Street Well No. 5
HINGHAM
COHASSET
WEYMOUTH
Fulling Mill Well
Hingham Water Treatment Facility
Capacity: 7.7 mgd
Prospect Street Well
Scotland Street Well
SCITUATE
NORWELL
Accord Tank
Capacity: 0.75 mg
Overflow Elevation: 282 feet
Straits Pond
Lily Pond
Aaron Reservoir
Accord Pond
Accord Brook Pond
Triphammer Pond
Crooked Meadow River
Fulling Mill Brook
Accord Brook
Fresh River
Asset Management Summary
Hingham/Hull, Massachusetts
Aquarion Water Company
TATA & HOWARD
Water and Wastewater Consultants
MARCH 2011
Approximate Scale: 1" = 1,500'


Legend
School
Healthcare Facility
Other Critical Customer
Hydraulic Improvements
Critical Areas
Service Area Boundary
Asset Management Rating
Good - Excellent
Fair - Good
Poor - Fair
N
Atlantic Ocean
Hingham Harbor
Straits Pond
HULL
HINGHAM
COHASSET
WEYMOUTH
SCITUATE
NORWELL
Hull Booster Pump Station
Turkey Hill Standpipe
Capacity: 2.0 mg
Overflow Elevation: 240 feet
Downing Street Well
Free Street Well No. 2
Free Street Well No. 4
Free Street Well No. 3
Free Street Well No. 5
Fulling Mill Well
Hingham Water Treatment Facility
Capacity: 7.7 mgd
Prospect Street Well
Scotland Street Well
Accord Tank
Capacity: 0.75 mg
Overflow Elevation: 282 feet
Accord Pond
Accord Brook Pond
Aaron Reservoir
Lily Pond
Three Circles Integration Map
Hingham/Hull, Massachusetts
Aquarion Water Company
TATA & HOWARD
Water and Wastewater Consultants
MARCH 2011
Approximate Scale: 1" = 1,500'


N
Legend
Phase I Improvement
Phase II Improvement
Service Area Boundary
Water Main Diameter
4-Inch or Smaller
6-Inch
8-Inch
10-Inch
12-Inch
14-Inch
16-Inch
20-Inch
24-Inch
Hull Booster Pump Station
2. Beach Avenue & X Street New 12" Water Main
15. O Street New 8" Water Main
20. N Street New 8" Water Main
21. M, K, & H Streets New 8" Water Main
16. Beach Ave New 12" Water Main
22. Central Ave New 8" Water Main
14. Channel Street New 8" Water Main
Atlantic Ocean
10. Mayflower Ave & Hampton Circle New 8" Water Main
9. Park Avenue, Rockway Avenue, & Wyola Road New 8" Water Main
6. Edgewater Road New 8" Water Main
5a. Atlantic Avenue New 12" Water Main
5b. Summit Avenue New 8" Water Main
12. Howe Street New 8" Water Main
3. Downer Avenue New 8" Water Main
HULL
27. Hull Street & Clark Drive New 8" Water Main
19. Simmons Road New 8" Water Main
23. Summit Drive & Harbor View Drive New 8" Water Main
24. Otis Hill Road New 8" Water Main
4. Hull Street & Spruce Street New 8" Water Main
Hingham Harbor
Turkey Hill Standpipe Capacity: 2.0 mg Overflow Elevation: 240 feet
Downing Street Well
29. Smith Road and Hobart Street New 8" Water Main New 20" Gate Valve
1. Pleasant Street New 8" Water Main
25. Downing Street New 8" Water Main
HINGHAM
COHASSET
Free Street Well No. 2
17. Carleton Road New 8" Water Main
Free Street Well No. 4
Free Street Well No. 3
WEYMOUTH
Free Street Well No. 5
7. Nutty Hill Road & Hemlock Road New 8" Water Main
11. Grist Mill Lane, Howland Lane, & Whitcomb Avenue New 8" Water Main
28. High Street New 8" Water Main
Fulling Mill Well
Hingham Water Treatment Facility Capacity: 7.7 mgd
8. Liberty Pole Road New 8" Water Main
Prospect Street Well
26. Independence Lane New 8" Water Main
SCITUATE
Scotland Street Well
NORWELL
13. Keith Way & Recreation Park Drive New 16" Water Main
18. Pine Grove Road & Main Street New 12" Water Main
Accord Tank Capacity: 0.75 mg Overflow Elevation: 282 feet
Phase I and II Improvements
Hingham/Hull, Massachusetts
Aquarion Water Company
TATA & HOWARD
Water and Wastewater Consultants
MARCH 2011
Approximate Scale: 1" = 1,500'


N
Legend
Phase III Improvements
Priority 1
Priority 2
Priority 3
Service Area Boundary
Water Main Diameter
4-Inch or Smaller
6-Inch
8-Inch
10-Inch
12-Inch
14-Inch
16-Inch
20-Inch
24-Inch
Hull Booster Pump Station
45. T Street New 8" Water Main
44. Sunset Avenue New 8" Water Main
42. Manomet Avenue New 8" Water Main
43. Whitehead Avenue New 8" Water Main
Atlantic Ocean
34. Dighton Street New 8" Water Main
30. George Washington Boulevard New 12" Water Main
40. Elmore Road New 8" Water Main
41. Hayes Road New 8" Water Main
Hingham Harbor
36. Eldridge Court New 8" Water Main
HULL
Straits Pond
39. East Street New 8" Water Main
32. Beal Street New 12" Water Main
37. Elm Street New 8" Water Main
Turkey Hill Standpipe Capacity: 2.0 mg Oveflow Elevation: 240 feet
35. Bradford Road New 8" Water Main
31. East Gate Lane New 12" Water Main
Downing Street Well
33. Rockwood Road and Ledgewood Circle New 8" Water Main
HINGHAM
COHASSET
Lily Pond
Free Street Well No. 2
Free Street Well No. 4
Free Street Well No. 3
Free Street Well No. 5
WEYMOUTH
Fulling Mill Well
Hingham Water Treatment Facility Capacity: 7.7 mgd
Aaron Reservoir
SCITUATE
Prospect Street Well
Scotland Street Well
NORWELL
38. Brewster Road New 8" Water Main
Accord Tank Capacity: 0.75 mg Overflow Elevation: 282 feet
Accord Pond
Phase III Improvements
Hingham/Hull, Massachusetts
Aquarion Water Company
TATA & HOWARD
Water and Wastewater Consultants
MARCH 2011
Approximate Scale: 1" = 1,500'