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Technical Memorandum

To: Alan H. Hardy, Town Administrator; Ed Cherian, Board of Selectmen, Chair
From: Keith Pratt, P.E.; Connie Hodge E.I.T.
Date: 1/14/20 - DRAFT
Subject: Penacook Boscawen Water Precinct System Evaluation

1. Executive Summary

1.1. Background and Introduction

The Town of Boscawen, New Hampshire (Town) is evaluating governance options related to the existing water system owned and operated by the Penacook Boscawen Water Precinct (PBWP). The PBWP serves approximately 1,200 accounts, of which approximately 50 of those are located within the City of Concord, NH. The water for the PBWP system is sourced from groundwater via three wells. There is also an interconnection with Concord. In addition to the distribution system, there are four water storage tanks and a chemical feed facility for corrosion control. This memo provides a synopsis of existing information on the PBWP system to initiate an understanding of the short and long-term improvements that may be needed, as well as, identifying next steps if a governance change is to occur.

A summary of our findings is identified below.

- The three (3) wells provide a permitted production volume (PPV) capacity of 1.541 million gallons per day (MGD) with all wells on. If the largest well is out of service, the PPV is ~0.9 MGD. Based on recent data, the system average day demand is approximately 0.33 MGD.
- Based on the permitted production values, the system has the capacity to handle current demands with some room for growth, but it is not known if the wells have the ability to operate to their PPV. Poor water quality at Well 2 and inefficiency at Well 1 is likely causing the system to have a lower capacity than the PPV.
- The Precinct operates a chemical feed facility for corrosion control, iron sequestering and disinfection. Although there are color complaints at times, likely due to iron and/or manganese (secondary standards), the system has generally been meeting the regulated standards. Some administration violations have occurred.
- Based on recent four quarters of data, approximately 23% of well production is non-revenue water. This represents water that is either lost due to leaking, not billed, or used to operate the system such as flushing. The industry standard is to target 15% or lower

- for non-revenue water. It appears that there is higher consumption in the winter and higher production in the summer, but limited data was available.
- The four (4) storage tanks provide a combined capacity of about 2.28 MG.
 - There are four (4) different pressure zones, three of which are based on the three different storage tank elevations. The fourth zone is based on the discharge pressure of the Water Street pumping station. Static pressures appear to range from 47 psi to 121 psi.
 - Hydrant and select flow data were found as part of the Asset Management Plan. However, the flow data set is not complete and should be further investigated to confirm values. Therefore, fire flow capacities could not be confirmed. The Water Street zone does not have gravity storage so fire flows are limited by the capacity of the pumps.
 - The Precinct has prepared a Capital Improvements Plan (CIP) through 2029. The most significant capital items identified include well improvements, a new tank and a new water source. Budget projections beyond 2019 were not available.
 - Rates have not been significantly increased since at least 2016, despite the recent increases in operating costs. Currently, rates are about 12% higher than the State average based on a typical residential home.
 - The District currently contracts much of their operation and billing to Pennichuck Water Works (PWW; Merrimack, NH). PWW is the licensed operator.

It should be noted that much of the findings above are not atypical of similar systems. It does appear that additional planning for capital needs and operating expenses should be identified to assist with a strategy for addressing needed improvements. Suggested areas that were found through this work include:

- Condition of hydrants and available fire hydrant flow should be determined or reported if available. This is especially critical in the Water Street area. The District's engineer may have a hydraulic model that could predict fire flows. Additionally, Insurance Service Office (ISO) data may be available for select areas.
- Available service areas should be reviewed to confirm flow and pressure.
- A rate evaluation should be completed.
- The District should identify the necessary level of service desired for administrative services for users.

For Governance, the Precinct currently operates in accordance with NH RSA 52 and was established in 1891. As a Precinct, it essentially operates similar to a municipality within the identified limits (boundary) of the Precinct. Only those within the Precinct boundary may vote, however.

There are other opportunities for Governance for the Town to consider. It is recommended that additional evaluation be completed to explore these options. Since all but a few users are located in Boscawen, other approaches may be appropriate. Although there may be others, the most common options include:

1. Maintain the Precinct as it currently has been established.
2. Dissolve the Precinct and operate the system as an Enterprise Fund as part of the Town of Boscawen. All Town voters would vote on system matters.
3. Dissolve the Precinct and privatize it.

Each of the options have advantages and disadvantages. All of the options allow operations to be contracted to private companies. Only the last option includes liquidating the assets to a private company.

To assist with planning, it would be useful to obtain additional information, if available. Some of the following has been requested and may be forthcoming and others may be important to understand upcoming capital, financial and operational needs:

- Current well efficiency and capacity
- Information on the actual length and age of piping
- Future budget projections and amount of cash reserves (current)
- Annual report for 2019 with year-end financials when available
- 3 years of consumption data prior to October 2018
- Additional water quality data, if available
- Additional fire flow data and ISO data if available
- Hydraulic model
- Information on the private systems within the Precinct boundaries to understand operational responsibilities.
- Pennichuck's monthly reports to the Precinct as noted in their contract

2. Introduction

The Town of Boscawen, New Hampshire (Town) is evaluating governance options related to the existing water system owned and operated by the Penacook Boscawen Water Precinct (PBWP). The first step is to assess the existing infrastructure of the system. Underwood Engineers, Inc. (UE) was retained by the Town to evaluate the current system and provided an engineering review to assist in the development of an initial understanding of the system, so additional efforts could be pursued to understand the advantages and disadvantages of governance changes.

The PBWP serves approximately 1,200 accounts, 50 of which are reputedly located within the City of Concord, NH. The original source of water for the Precinct was Walker's Pond located in Boscawen and Webster, NH. It was utilized as a drinking water source until 1996. Since 1996, the water for the PBWP system has been sourced from groundwater via three wells. In addition to the distribution system, there are four water storage tanks and a chemical feed facility for corrosion control within the Town.

As of April 2018, Pennichuck Water Works, Inc. (Merrimack, NH) is contracted to be the operator of the system. They provide operation and administration assistance and provide the license. The District has some administrative staff on payroll.

This memo provides a summary of existing information on the PBWP system to initiate an understanding of the short and long-term improvements that may be needed to support governance changes if desired. The scope for this work includes:

- Task 1: Data Collection and Review
 - Collect data from at least the past 5 years
 - Conduct file reviews with NHDES and PBWP
 - Site inspection of the system
- Task 2: Study and Evaluation
- Deliverable – A summary technical memo with findings and recommendations for next steps

3. System Evaluation

3.1. History

The Penacook Boscawen Water Precinct was incorporated in 1891 to provide water in portions of Boscawen, NH and the Penacook section of Concord, NH. It is organized as a Village District under the laws of NH RSA 52: Village Districts, and operates under the direction of an elected board of commissioners. Various system information and updates since 1954 are summarized below.

Walker Pond, which may have been the original source, was used until 1996. In 1996 the Precinct transitioned from their surface water source to groundwater sources via two wells in an aquifer next to the Merrimack River. Wells 1 and 2 were granted permitted production volumes from the New Hampshire Department of Environmental Services (NHDES) of 612,000 gallons per day (gpd) and 640,800 gpd respectively. In 2004 the potential for a third well drawing from the same aquifer as the Wells 1 and 2 was investigated and eventually led to the completion of Well 3 in the same year. It was designed for a yield of 228,000 gpd, and eventually granted a Large Groundwater Withdrawal Permit for that amount. A fourth well was investigated by Emery & Garrett Groundwater Inc (EGGI) in 2006 in a different aquifer to serve future capacities, as well as to provide a backup if the current aquifer is compromised. A location was found within the Merrimack State Forest and the well could produce a yield of 500,000 gpd, however Well 4 has not been developed (“Preliminary Hydrogeologic Investigation, Proposed PBWP #4 Production Well,” 2006).

The first storage tank was built in 1954 off of Queen Street and can store up to 265,000 gallons. A second tank was built at the same location in 1974 with a capacity of one million gallons (MG). During the first half of the 1990’s a corrosion control facility, booster pump station, and two additional storage tanks with a combined capacity of 1.015 MG were added to the system.

In 2006, the Gage Street Project was completed which included a new portion of the distribution system spanning ~9,000 feet with new ductile iron water lines, services, and hydrants. In 2011,

950 meters in the system were replaced and the 1 MG Queen Street tank had its interior restored and repainted. Later in 2014, the larger meters were replaced and a leak detection survey was conducted over 20 miles of the distribution system. Wells 1 and 2 had a complete cleaning to improve pumping efficiently and water quality in 2016.

In 2017 Underwater Solutions Inc. conducted inspections on all four water storage tanks, cleaned the tanks of sediment, and outlined recommendations for further maintenance, details can be found in Attachment A. The 2018 Annual Report stated that a SCADA system was installed, however the site visit performed by UE in early November 2019 could not confirm the extent of the SCADA system. Also, in 2018, all the fire hydrants were inspected and repaired per the 2018 Annual Report. Another 12.5 miles of distribution system was investigated for leaks, and an online bill pay system was implemented in 2019 as well. A full list of all the improvements and investigations found since 1954 can be found in Attachment A.

3.2. Service Area

The PBWP serves approximately 1,200 accounts. NHDES reports that the system serves approximately 3,800 people, but that may be high given the population of Boscawen isn't much above 4,000. See Attachment B for a map of the Precinct's system. Some of the largest users on the system include:

- Merrimack County Nursing Home
- Merrimack County Jail
- Elektrisola, Inc

It was also reported that there are a number of private systems within Boscawen with unclear delineation of maintenance responsibilities, however further information on these areas was not found.

3.3. Asset Inventory

In 2018 PBWP received a DES Asset Management and Financial Planning Grant to develop an inventory of water assets, life cycle costing, a long-term function plan, and an asset management plan by May 31, 2019. Condition and criticality analyses of those assets were also conducted and then the assets were ranked accordingly.

The PBWP has also recently acquired land to support protection of each drinking water source. The acquisition was limited to buying and/or protecting existing, future, and potential sources of water and the infrastructure required to deliver potable water from each source to the distribution system. The Town is also working with the Conservation Commission to provide a recreation area within Precinct land.

The major assets are listed below. See Attachment C for inventory sheets showing details on the structures and equipment, and for the Criticality Analysis of Assets from the Asset Management Plan.

- Three (3) Gravel packed wells (see Table 3.1 for design details)
- One (1) Well Control Building
- One (1) Corrosion Control Facility
- Four (4) Water Storage Tanks
 - Total nominal capacity = 2.28 MG
- Water Street Booster Station
- Distribution System (approx.)
 - 172 valves
 - Hydrants (with updates from PWW)
 - 119 Utility
 - 27 Private
 - 1200 meters
 - The length of piping in the distribution system was not identified
- One (1) Pressure Reducing Valve
 - Intersection of Routes 3 and 4
- SCADA system
- Maintenance Facility/Administrative Building/Land/Equipment
 - Two Bay Garage
 - Trailer (utility)
 - John Deer Riding Lawn Mower
 - Precinct is looking to sell it in the spring
 - Various tools and maintenance equipment

It has been reported that the Precinct has sold their vehicles after they contracted Pennichuck because they were no longer utilized.

The distribution system consists mostly of asbestos-cement (AC) piping and a small amount of PVC. Since the majority of the system is AC piping, it can be assumed that most of the system was constructed in the 1950's. Due to the history of Mill complexes within the Town, some old cast iron predating the AC could exist, but information was not available. The services are either type K copper or polyethylene. It was reported in 2017 that there are four bleeds in the system that are equipped with meters and dual checks, all of which are currently being operated via blow offs. This could account for some of the non-revenue water, see Table 3.6.

Hydrant and minimal flow data were found as part of the Asset Management Plan. See Attachment C for the full list of public and private hydrants (as updated by PWW), as well as locations, hydrant characteristics, and some flow data.

A summary of the existing wells is provided in Table 3.1.

Table 3.1: PBWP Gravel Well Basis of Design

Description	Well #1	Well #2	Well #3
Completion Date	10/21/1994	10/21/1994	4/4/2004
Total Depth (ft)	51	52	39.7
Outer Casing Diameter (in)	24	24	-
Inner Casing Diameter (in)	18	18	18
Well Yield (gpm)	450	450	250
Permitted Production Value (gpd)	612,000	640,800	288,000

It was reported that Well 1 has continuous problems with clogging; the Precinct has to do frequent maintenance to try to increase efficiency. An investigation by EGGI in 2011 determined that it is most likely due to bio-fouling and recommended an in-well treatment system to serve as a long-term solution. Well 2 has certain water quality issues relating to iron and manganese. Additional evaluations on these wells may be appropriate.

According to records provided by the Precinct, the PBWP owns approximately 150 acres of land (Table 3.2).

Table 3.2: Land acquired by the Precinct

Town	Map #	Lot #	Area (acres)
Webster	6	111	2.16
Webster	6	109	0.27
Webster	6	35	4.89
Webster	6	18	9.04
Webster	6	6	32.27
Boscawen	45	74	25
Boscawen	81D	44B	0
Boscawen	83	7	0.3
Boscawen	49	21WAT	0
Boscawen	49	17-1	0.29
Boscawen	49	16	30.66
Boscawen	47	32B	0.09
Boscawen	47	6-1	1.52
Boscawen	45	78	41
Boscawen	45	72A	1.89
Boscawen	45	71	0.48
		Total	149.86

Notes:

1. Lots in Webster, NH confirmed through Town GIS.

Table 3.3 below is a summary of the existing pressure zones within the PBWP system. There are currently four zones based on the varying overflow elevations. The high and low elevation houses within each zone are also stated to determine if pressure requirements are met. The figure in Attachment D shows each pressure zone and the corresponding hydraulic gradeline.

Table 3.3: Storage Tank Information and Pressure Zones

Storage Tanks(s)	Tank Construction	Year Built	Capacity (MG)	Overflow (USGS ft)	Approximate		
					Existing Low Service	Existing High Service	Elevation At 35 PSI
Merrimack Cty. Home	Bolted Steel	1995	0.26	500	362'	390'	420'
Fairbanks Street	Pre-cast concrete	1995	0.75	532	285'	465'	452'
Queen Street 1	Welded Steel	1954	0.30	508	252'	450'	428'
Queen Street 2	Welded Steel	1974	1.00	508			
Water Street - None	Pump	1995	-	680 (HGL pump)	400'	570'	600'

Notes:

1. The sill elevations are not adjusted for tank operating bands.
2. The Merrimack and Fairbanks tanks have different HGL's due to the Altitude Valve.

3.4. Budget, Rates, and Operations

Table 3.4 below is a summary of the Precinct's budget from 2015-2019. See Attachment E for the rate sheets from 2016-2019. The base rate and water consumption rate have been constant (no increases) since 2015 or 2016 based on the Precinct's Annual Reports. Most of the other rates (service charges) have stayed consistent, however a few have risen or declined slightly. There are no fire protection charges on the current or recent rate sheets. There is currently no Capital Reserve Plan that we were able to find for the PBWP.

Table 3.4: Annual Budget for the Penacook Boscawen Water Precinct (rounded)

Budget Item	2015 Actual	2016 Actual	2017 Actual	2018 Actual	2019 Budget
Total Pennichuck Repairs	-	-	-	\$153,500	\$215,400
Total Salaries Benefits	\$204,100	\$166,000	\$195,900	\$30,800	\$35,500
Total Management Activity	\$37,800	\$35,600	\$37,700	\$22,200	\$35,300
Total Water System ¹	\$180,600	\$200,100	\$182,300	\$117,900	\$269,400
Total Equipment	\$21,300	\$5,600	\$5,400	\$3,300	\$4,400
Total Building	\$5,300	\$7,200	\$4,500	\$4,300	\$7,700
Interest on Line of Credit	\$1,400	\$1,600	\$1,600	-	\$1,000
Debt Service	\$215,000	\$215,400	\$214,400	\$213,500	\$216,000
Total Expenses	\$665,500	\$631,500	\$641,800	\$545,500	\$784,700
Metered Water Use	\$624,500	\$701,700	\$632,400	\$701,400	\$692,000
Metered Water Fine (interest)	\$9,100	\$7,200	\$14,500	\$3,100	\$5,000
Revenue Sharing	-	-	-	-	-
Installation of New Service	\$24,400	\$50,500	\$85,300	\$24,000.00	\$35,000
State of NH – Matching Funds-Loan Grant	\$25,700	\$26,200	\$26,000	\$25,400	\$25,400
Misc. Insurance/Refunds	-	\$4,300	-	-	\$20,000
NHPDIP Interest	-	-	-	\$2,000	\$2,300
Miscellaneous Accounts	\$9,500	\$8,000	\$6,700	\$1,000	\$5,000
Interest New Service Account	-	\$25.00	-	-	-
Total Revenue	\$693,200	\$797,900	\$764,900	\$756,900	\$784,700.00
Surplus/Deficit	\$27,700	\$166,400	\$123,100	\$211,400	\$0

Notes:

1. This line item includes an expense item for “Special Projects” that was budgeted ranging from \$48,000 - \$125,000 and had actual amounts of \$11,000 - \$40,000 over the past five years, however no details were found as to what those projects were.

The following information was obtained in the Independent Auditor’s Report in the Precinct’s 2018 Annual Report, which was the most recent annual report that UE received from the Precinct. For the year ended December 31, 2017:

- Total capital assets: \$3,050,999
- Long-term obligations: \$1,433,970
 - Amount due within one year: \$160,615
- Total Principal Bonds Payable: \$1,197,993

Information from the Asset Management Plan noted that there are three reserve funds with the following balances as of the beginning of 2019:

- Trustee Trust Funds: \$81,212
- Water Investment Fund: \$124,604
- NHPDIP: \$370,313
- TOTAL = \$576,129**

The annual rate per NHDES rate dashboard as of January 1, 2018 for the PBWP water system is \$626.76 per year. This yearly cost covers 72,000 gallons of water per year, which amounts to about 200 gallons per day. The statewide average annual cost is \$552.45, so the PBWP system costs about 12% higher per year than the average.

UE has noted the following regarding the Precinct's finances that require further evaluation:

- The water rate, which covers meter and consumption charges, has not increased since 2015 or 2016; due to the recent increased costs in the budget, additional rate adjustments should be considered.
- Clarification is needed regarding if fire protection is covered in the rates; fire protection charges are not shown on any of the rate sheets from 2016-2019.
- Other charges on the fee schedule such as connection fees and the Water Investment Fee (WIF) should also be reviewed as part of a rate study.

As noted previously, the PBWP has contracted administration and operation services to Pennichuck Water Works (PWW). The Precinct entered into a 3-year contract in 2018. The following is a summary of the "Agreement for the Operation and Maintenance of the Penacook-Boscawen Water Precinct" with Pennichuck, see Attachment F for the full contract:

- Effective Date: April 2, 2018 – April 1, 2021
- Upon completion of the initial term, the agreement will automatically be renewed for two (2) additional successive terms of three (3) years, unless written notice to not renew is provided by either party no later than three (3) months prior.
- Scope of Pennichuck's Services:
 - Operation and maintenance of the PBWP system
 - Emergency response and repairs; Emergency Response Center available 24/7/365
 - Water supply tasks
 - Three (3) checks per week for well stations, Raymond Street booster station, and corrosion control facility
 - Weekly tank inspections
 - Bacteria sampling as required by NHDES
 - Distribution tasks
 - Inspection of 20% of gates per contract year
 - Hydrant dry and wet checks, 135 hydrants each per contract year
 - Distribution system flushing, one (1) per year in the Spring
 - 25 dig safe locations per year
 - Four (4) meter readings per year, up to 1,200 reads/quarter
 - Hydrant painting, 50% of hydrants per year
 - Billing and customer service tasks
 - Several other activities performed on a time and material basis
 - Maintain and submit routine operating records and reports to PBWP and required regulatory agencies
 - Monthly reports to PBWP

- Fees:
 - Fixed monthly fee for three task areas listed above of \$8,873.25
 - Labor rates given in contract
 - A 35% charge will be added to all materials and subcontractor expenses incurred in the provision of services not included in the monthly fixed fee
 - The Fixed Monthly Fee and the Cost Plus rates shall be adjusted on the anniversary date of the Contract by 3.0%
 - Payment is provided on a monthly basis

A Capital Improvements Plan was generated as part of the Asset Management Plan in 2018. Capital improvements were projected from 2019-2029, as well as cash flow estimates for the same 10-year period. Over the next 10 years the Precinct has anticipated capital improvements for the office building, water mains, hydrants, corrosion control building, as well as, well expansion and filtration by 2021. The CIP also states that the Precinct is planning to construct a new water tank and develop a new water source in 2022 and 2027 respectively, which this report suggests would both improve the system for future needs. See Attachment C for the full CIP.

3.5. Consumption and Production

Well production data was gathered from NHDES’s OneStop (Table 3.5), while consumption data for portions of 2018 and 2019 were provided by Pennichuck (Table 3.6). See Attachment G for graphs showing monthly production data for each source since 1988.

Table 3.5: Average Daily Water Production (MGD)¹

Year	Well 1	Well 2	Well 3	Total
2015	0.143	0	0.136	0.279
2016	0.125	0	0.160	0.286
2017	0.145	0	0.170	0.315
2018	0.117	0.045	0.171	0.334
2019 ²	0.135	0.071	0.125	0.332
3-year Average	0.132	0.0386	0.1553	0.327

Notes:

1. From OneStop, annual reported values
2. Partial year, up to September 2019

Table 3.6: Average Quarterly Production and Usage (MGD)

Quarter ¹	Well 1	Well 2	Well 3	Total Production ²	Total Usage ³	Non-Revenue Water
2018 - 4th	8.803	6.936	12.976	28.715	27.091	1.624
2019 - 1st	9.789	12.499	6.662	28.949	27.268	1.681
2019 - 2nd	14.708	0.402	16.008	31.118	20.225	10.893
2019 - 3rd	16.790	0.000	17.890	34.679	20.737	13.942
Average	12.522	4.959	13.384	30.865	23.831	7.035

Notes:

1. Quarter breakdown: 1st = Jan – Mar; 2nd = Apr – Jun; 3rd = Jul – Sep; 4th = Oct – Dec
2. Production data from monthly submission on OneStop
3. Usage data from PWV

As seen from Table 3.6, the past 4 quarters through September 2019, suggests 23% non-revenue water, and it is about 88% greater in summer (quarters 2/3) than the winter (quarters 1/4). The industry targeted non-revenue water is to be less than 15%. The residential multifamily use makes up the difference between summer and winter; it is 1/3-1/2 of the flow in the winter and less than 1/4 of the flow in the summer. The breakdown of usage by type of user can be seen in charts in Attachment G. More data is needed to assess this further.

The three wells have a combined capacity (permitted production volume) of 1.541 MGD. As shown in Table 3.7 below, as designed, the system is able to supply current demands with capacity for future growth.

Table 3.7: Current Groundwater Supply Capacity and Requirements

	Existing Capacity (MGD)	Current Demands (MGD)
Capacity to Meet Average Day Demand (largest well off) ¹	0.900	0.327
Capacity to Meet Maximum Day Demand ² (all wells on)	1.541	0.818

Notes:

1. The largest producing well is considered to be Well 2 at 640,800 gpd
2. Daily production data is not available, so the max day was calculated by multiplying the annual daily average by a factor of 2.5

3.6. Water Quality

The Corrosion Control Facility was constructed in 1995 for chemical treatment before the water is distributed through the system. There are no other treatment processes in the system. The purpose of the corrosion control facility is to adjust the pH, control lead and copper (corrosion), provide iron and manganese sequestering, and provide a disinfectant. The following is a summary

of the operation of the facility based on records we reviewed. This should be verified by the current operator:

- 1998 – The water system was treated with the following chemicals in order of addition (Source: from a DES file review of operation procedures)
 - Polyphosphate: for sequestering of iron
 - Sodium hydroxide 25%: raises the pH and alkalinity of the raw water
 - Sodium hypochlorite 4%: provides a disinfectant in the distribution system
 - Zinc orthophosphate: provides a coating along the inside of the pipes
- 2014 – Treatment scheme from the 2014 Sanitary Survey
 - Aqua-mag: for iron sequestering
 - Caustic (Sodium hydroxide 25%)
 - Sodium hypochlorite 12.5%
- 2019 – Observed during site visit (11/4/19)
 - Five (5) chemical storage tanks were observed
 - Two (2) Sodium hydroxide 25%
 - One (1) Sodium hypochlorite 12.5%
 - Two (2) not labeled

Per the 2011-2018 Consumer Confidence Reports (CCRs), there are occasional complaints about rusty water and the Precinct attributes this to be most likely due to an opened fire hydrant or water main breaks. Tables 3.8 and 3.9 below show the water quality parameters provided to the users in the CCRs from 2012 to 2018 and from OneStop (NHDES Data Site). Samples to detect PFAS were gathered on November 30th, 2019; results are still pending due to the length of laboratory analysis.

Table 3.8: Summarized Water Quality Data 2012-2019

Contaminant	MCLG	MCL	Units	Concentration Range
Lead ³	0	0.015	ppm	0.001-0.002
Copper ³		1.3	ppm	0.24-0.264
Chlorine	MRDLG 4	MRDL 4	ppm	0.84-1.07
Total THM		80	ppb	2.8-10.4
Total HAA5		60	ppb	1.6-6
Barium	2	2	ppm	0.005-0.008
Compliance Gross Alpha	0	15	pCi/L	0.5-2.9
Combined Radium 226 + 228	0	5	pCi/L	0.1-0.8
Fluoride	4	4	ppm	ND-0.11

Notes:

1. MCL = Maximum contaminant level: the highest level of a contaminant that is allowed in drinking water.
2. MCLG = Maximum contaminant level goal: non-enforceable goals that represent the level of a contaminant below which there is no known or expected risk to health.

3. Lead and copper have action levels rather than MCLs and are measured every 3 years
4. ND = Non-detect

Table 3.9: Individual Well Water Quality Data 2016-2019 from OneStop

Parameter	Units	MCL	Secondary Standard	Well 1	Well 2	Well 3
Barium	mg/L	2		0.0055	0.0045	0.0068-0.008
Calcium	mg/L			6.29	5.46	6.89
Copper	mg/L	1.3		0.0031	0.0017	0.0015-0.047
Iron	mg/L		0.3	0.13	0.72	0.3
Magnesium	mg/L			1.38	1.26	ND-1.42
Manganese	mg/L		0.05	0.0487	0.0236	ND-0.0012
Nickel	mg/L				0.0011	ND-0.0011
Sodium	mg/L			13.4	14.4	15.7-16
Zinc	mg/L		5	0.0076	0.0119	0.0062-0.007
Alkalinity	mg/L			10	13	15
Chloride	mg/L		250	20	19	28
Sulfate	mg/L		250	9	8	8-10
pH			6.5-8.5	5.95	5.9	6-6.25
Hardness	mg/L			21.4	18.8	23.1
Nitrate	mg/L	10		0.23-0.25	ND-0.26	ND
PFAS	ng/L	TBD		Pending	Pending	Pending

Notes:

1. Values in bold do not meet the secondary standard.
2. Secondary Standard: Non-enforceable guidelines regulating contaminants that may cause cosmetic effects.
3. Data set from 2016-2019 is not complete. A range is presented when more than one result was available.

Many systems receive violations occasionally. The following are recent violations recorded by NHDES in regards to the Precinct's water quality:

- January 23 2018: Immediate Action Required (IAR): system had 2 or more coliform positive samples in the same month
 - The Precinct needed to conduct a level 1 assessment within 30 days and submit report to DES
 - Sites of positive tests
 - Mickerlys home
 - Fisher Ave
 - Davis Auto Body
 - DW Highway
 - January 18: They also received a violation for failure to perform public notice

- February 12, 2018- Complaint
 - Description of complaint: Green water from upstairs bathroom faucet. Noticed low pressure one morning from downstairs shower, but not the sink. Noise (gurgling) from upstairs bathroom at night. Pipes in in-law apartment froze recently and had to be heated to unfreeze.
 - The home was added for lead and copper sampling
 - Sampled on February 22, 2018
 - Lead and Copper Q1 2018 Non-Compliance
 - Lead= 0.38 mg/L
 - Copper = 9.5 mg/L

Based on the data available at the time the report was written, the water has met enforceable standards, except for the few violations listed in section 3.6 above. Below are the main findings and conclusions based on the water quality investigation:

- Recorded results observed since 2012 are below the MCL standards. Certain minor violations have occurred in the past. The two noted violations in NHDES records were resolved.
- Water quality data for PFAS compounds is pending.
- High iron and manganese concentrations (secondary standards) at Well 2 caused it to stop being used (refer to Table 3.5). Pennichuck brought it back online in 2018 for minimal use to be combined with the other two wells to dilute the concentration of Fe and Mn.
- Well 2 has the highest PPV of all three wells. Poor water quality (high Fe/Mn) is preventing it to be used to its design flow, therefore treatment solutions should be explored to increase the system's overall capacity.
- Lead and copper requirements have been met.
- An iron and manganese treatment plant has been mentioned, but no information was found. Constructing this would improve the water quality of Well 2, which would allow for an increase in the overall capacity of the system.

3.7. Ordinance and Regulations

The District does maintain certain rules and regulations including the documents listed below. See Attachment H for the full documents.

- Penacook-Boscawen Water Precinct Rules and Regulations (last revised 2011)
- Penacook-Boscawen Water Precinct Specifications for Water Works Construction (last revised June 2010)

3.8. Fire Flows and Pressure

The PBWP Construction Specifications state that the system was designed to maintain a minimum of 20 psi at ground level (house sill) at all points in the distribution system under all conditions of flow. The nominal working pressure should be 60-80 psi with a minimum of 35 psi. The maximum

pressure shall be 100 psi. The minimum size pipe diameter for fire protection is 8” according to the Precinct’s requirements. As noted previously, it appears that certain working pressures may not fall within these standards, see Table 3.3.

It is reported that the Water Street zone does not have gravity storage and fire protection is limited by the pumping capacity. Provisions for fire protection originally consisted of two hydrants in front of the pump station, one on the suction side and one on the discharge side so that a pumper truck could connect to the hydrants, bypass the station, and pump higher flows into the boosted zone. This was reportedly meant to be a temporary solution and that there were plans to eventually construct a storage tank in the boosted zone to provide fire protection storage. No tank has been constructed however. It is reported that the hydrants are currently either not operable or do not provide suitable fire flows.

There are developments in concept and construction phases within the Water Street zone, therefore the need for fire protection in this area is increasing. For fire flow, a minimum of 1000 gallons/house is preferred by the local fire chief. Additional investigation and/or system modeling should be considered to confirm available fire flows. Insurance Service Office (ISO) may have data that identifies fire flows in certain areas.

UE provided a letter in 2013 regarding the Water Street Pumping Station and potential solutions for fire protection in that area. In summary, UE suggested two options of providing fire protection for Water Street:

- Construct a storage facility sized to provide fire protection for the area on the upper portion of Water Street.
- Construct a fire pump facility on the lower portion of Water Street.

A storage facility has been considered in the past and rejected due to the cost.

Per the description in the 2017 NHDES Sanitary Survey, the typical operation of the Precinct’s system is as follows: The gravel packed well pumps start and stop on a five-foot operating band at the Fairbanks tank. The Merrimack County tank, which is at a lower elevation than Fairbanks, is fed through a solenoid-assisted control valve located near the complex main entrance, which opens and closes to maintain a 4 ft operating band in the County tank. Water level at the Queen Street tanks is telemetered to the electronic controls at the corrosion control facility, which in turn controls a solenoid-assisted pressure reducing valve located between the upper and lower zones near the intersection of Routes 3 and 4. The Queen Street tanks have a 5 ft operating band, and as the tank level drops, the PRV opens to increase flow to the lower zone. The Water Street zone is pressurized by the Water Street booster station, which serves about 60-70 customers. The system operators indicated that only one pump operates at a time and delivers about 20 gpm on average at a discharge pressure of 115 psi, which provides 50 psi at the top of the hill. The booster station operates on a jockey basis and there is no on-line storage. A 40kW diesel generator provides backup power for the booster station. There are no high capacity pumps provided in the Water Street zone. There is also an emergency valved connection to the Concord Water Works that flows towards Concord due to the PBWP’s higher hydraulic grade line.

UE observed that the discharge pressure at the Water Street pump station is approximately 115 psi, as stated above. The hydraulic gradeline shown on Figure 1 in Appendix D, was calculated based on this observed pressure and results in a gradeline of approximately 680' for the Water Street pressure zone. Based on the high and low elevation service connections in this zone, static pressure ranges from 47 to 121 psi high to low. The low elevation connection is therefore outside of the target maximum pressure of 100 psi, which may require a PRV if they didn't already have one.

3.9. Typical NHDES Standards

The PBWP system is categorized as a major community water system, which serves over 1,500 people, therefore it is regulated under the rules of Env-Dw-302: Large Production Wells and Wells for Large Community Drinking Water Systems and Env-Dw-404: Design Standards for Large Public Water Systems. According to section 404, these systems shall be designed in accordance with the standards in the fourth edition of "Recommended Standards for Water Works," committee report of the Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers.

A general summary of certain standards is provided to understand the operational requirements. The information below can assist the Town in understanding what is required and to note differences in the current Precinct standards. Additional study is needed to confirm conformance.

3.9.1. Pressure

According to the standards from the resources cited above, all water mains shall be designed to maintain a minimum pressure of 20 psi at ground level at all points in the distribution system under all conditions of flow (i.e., fire flows). The normal working pressure in the system should be 60-80 psi and not less than 35 psi.

3.9.2. Supply

The PBWP water system is supplied by groundwater sources. A minimum of two sources of groundwater shall be provided. No well shall be located closer than 50 feet from the normal high-water line of any surface water. The sanitary protective area shall be a circle, centered on the well, having a radius based on the permitted production volume (PPV) of the well, see Table 3.1 for the PBWP's well PPV values. All three wells have a PPV greater than 144,000 gpd so the sanitary protective area radius for each well is 400 ft, from Env-Dw-Table 302-1. The actual rate at which water is withdrawn from an approved well may vary, but it shall not exceed the PPV.

3.9.3. Distribution System

All materials for the distribution system including pipe, fittings, valves and fire hydrants shall conform to the latest standards issued by the AWWA and ANSI/NSF, where such

standards exist, and be acceptable to NHDES. The minimum size of a water main that provides fire protection should allow the withdrawal of the required fire flow, while maintaining the minimum residual pressure specified above. The general industry standard for hydrant spacing is approximately 500 ft, unless otherwise requested by the fire department.

Dead end mains shall be equipped with a means to provide adequate flushing. Flushing devices should be sized to provide flows which will give a velocity of at least 2.5 feet per second in the water main being flushed. They may be provided with a fire hydrant if flow and pressure are sufficient.

At high points in water mains where air can accumulate, provisions shall be made to remove the air by means of air relief valves. Automatic air relief valves shall not be used in situations where flooding of the manhole or chamber may occur.

Booster pumps should be located and controlled so that they will not produce a negative pressure in their suction lines, and an automatic shutoff or low-pressure controller should maintain at least 20 psi in the suction line under all operating conditions. Each booster pumping station shall contain no less than two pumps with capacities such that peak demand can be satisfied with the largest pump out of service.

3.9.4. Storage

Storage facilities should have sufficient capacity to meet domestic demands and fire flow demands. All finished water storage structures must have watertight roofs to prevent the entry of animals, insects, and dust. The design of drains should allow for cleaning or maintenance without causing a loss of pressure in the distribution system. The storage structure should be drained directly to the ground surface and have no direct connection with a sewer or storm drain. When static pressures exceed 100 psi, pressure reducing devices should be provided on mains in the distribution system.

3.9.5. Water Quality

The Precinct's water system is subject to compliance with the EPA's Drinking Water Act requirements, as well as those laid out in NHDES's Drinking Water Rules Env-Dw-700. The total list of the State of New Hampshire's drinking water regulations is in Attachment H.

4. Conclusion/Recommendations/Additional Study

4.1. The following summarizes the conclusions and recommendations:

- The three (3) wells provide a permitted production value (PPV) capacity of 1.541 million gallons per day (MGD) with all wells on. If the largest well is out of service, the PPV is ~0.9 MGD. Based on recent data, the system demands are approximately 0.33 MGD.
- Based on the permitted production values the system has the capacity to handle current demands with some room for growth, but it is not known if the wells have the ability to operate to their PPV. Poor water quality at Well 2 and inefficiency at Well 1 is most likely causing the system to have a much lower capacity than the PPV.
 - A location was determined for a fourth production well in a separate aquifer; if developed this would provide a backup for the system if the primary aquifer was contaminated. This has not been pursued.
- The Precinct operates a chemical feed facility for corrosion control, iron sequestering and disinfection. There have only been a couple water quality violations in NHDES records from the last couple years, otherwise all the other drinking water standards have been met.
 - A couple secondary, non-enforceable standards, have been exceeded in regards to iron and pH.
 - Results for PFAS testing are still pending.
- Based on recent data, approximately 23% of well production is non-revenue water. This represents water that is either lost, not billed, or used to operate the system such as flushing. The industry standard is to target 15% or lower for non-revenue water.
 - There is higher usage in the winter (Oct – Mar) than in the summer (Apr – Sep) due to large increase in use by the residential multifamily users in the winter, according to the information provided.
 - Production is higher in the summer and overall non-revenue water is about 88% greater in the summer than winter, and 23% annually.
 - Only a year of data was available, so these trends may not be the stand true.
 - Certain bleeds may still be in operation and contributing to the non-revenue water.
- The four (4) storage tanks provide a combined capacity of about 2.28 MG
- There are four (4) different pressure zones, three of which are based on the three different storage tank elevations. The fourth zone is based on the discharge pressure of the Water Street pumping station. Static pressures appear to range from 47 to 121 psi.
- It has been noted that there are many private systems connected to the Precinct system, but information was not found on where and to what extent. This should be resolved to clarify maintenance responsibilities.
- Hydrant and incomplete fire flow data was found as a portion of the Asset Management Plan. Further investigation is required to accurately report fire flow capacities. The Water Street zone does not have fire flow available due to the limited capacity of the pumps.

- Rates have not been significantly increased since at least 2016, despite the recent increases in operating costs. Currently, rates are about 12% higher than the State average based on a typical residential home.
- The District currently contracts much of their operation and billing to Pennichuck Water Works (Merrimack, NH). PWW is the licensed operator.

It should be noted that much of the findings above are not atypical of similar systems. It does appear that additional planning for capital needs and operating expenses should be identified to assist with a strategy for addressing needed improvements. Suggested areas that were found through this work include:

- Condition of hydrants and existing fire hydrant flow should be determined. This is especially critical in the Water Street area. The District's engineer may have a hydraulic model that could predict fire flows.
- Available service areas should be reviewed to confirm flow and pressure.
- A rate evaluation should be completed.
- The District should identify the necessary level of service desired for administrative services for users. This will be important to assist with defining operational expectations.

For Governance, the Precinct currently operates in accordance with NH RSA 52 and was established in 1891. As a Precinct, it essentially operates similar to a municipality within the identified limits (boundary) of the Precinct. Only those within the Precinct may vote on system issues, however.

There are other opportunities for Governance for the Town to consider. It is recommended that additional evaluation be completed to explore these options. The most common options include:

1. Maintain the Precinct as it currently has been established.
2. Dissolve the Precinct and operating the system as an Enterprise Fund as part of the Town of Boscawen. All Town voters would vote on water system matters.
3. Dissolve the Precinct and privatize it. The system would likely be subject to the PUC.

Each of the options have advantages and disadvantages. All of the options allow operations to be contracted to private companies. Only the last option includes liquidating the assets to a private company. Legal assistance will be needed to assist with governance changes.

4.2. Additional Information

To assist with planning, it would be useful to obtain additional information, if available. Some of the following has been requested and may be forthcoming and others may be important to understand upcoming capital, financial and operational needs:

- Current well efficiency and capacity
- Information on the actual length and age of piping

- Future budget projections and amount of cash reserves (current)
- Annual report for 2019 with year-end financials when available
- 3 years of consumption data prior to October 2018
- Additional water quality data, if available
- Additional fire flow data and ISO data if available
- Hydraulic model
- Information on the private systems within the Precinct boundaries to understand operational responsibilities.
- Pennichuck's monthly reports to the Precinct as noted in their contract

DRAFT

ATTACHMENT A

CHRONOLOGY

Attachment A - Chronology

The following is a chronology of the documented investigations and updates that have been conducted on the PBWP system:

- 1954 – Construction of the 265,000 gallon Queen Street Tank
- 1974 – Construction of the 1,000,000 gallon Queen Street Tank
- 1981 – The Penacook Boscawen Water Precinct was Incorporated
- 1992 – Water System Improvements Program
 - Treatment facility designed to meet a projected max day demand of 1.4 mgd
 - Treatment by utilizing packaged treatment technology which produces a waste stream of native solids and the chemicals added to remove the solids
 - Waste stream will flow to an equalization basin, gravity thickener, holding tank, and then be truck off-site for treatment
 - Completed in December 1994
 - Startup in January 1995
- 1995 –
 - Construction of the 265,000 gallon Merrimack and 750,000 gallon Fairbanks tanks
 - Booster pump station to provide flow to the Water Street zone
 - Three (3) 65 gpm nominal pumps
 - One pump operates at a time and delivers 20 gpm on average at a discharge pressure of 115 psi for 50 psi at the top of the hill
 - At some point after 1995, the fire department connected a pumper truck to one of the hydrants on Water Street, pulled a vacuum and collapsed a section of water main. Subsequently, the PBWP painted the hydrants in the boosted area black so that the Fire Department would know that these hydrants cannot be used for firefighting.
- 1996 –
 - Discontinued use of Walker Pond as one of the system's water sources for groundwater Wells 1 and 2
 - February 1996 – Approval granted by NHDES to activate Wells 1 and 2
 - Permitted Production Volumes
 - Well 1: 612,000 gpd (425 gpm)
 - Well 2: 640,800 gpd (445 gpm)
 - Recommended not to run the wells simultaneously at the PPVs due to risk of increases in iron and manganese concentrations
- 2004 – Emery & Garrett Groundwater, Inc. investigated the startup of production Well 3 to meet the increasing water demand.
 - Based on their results they recommended that Well 3 be approved for use with a conservative yield of 0.288 mgd to meet the peak of the current time and the estimated peak in 2020.
- 2005 – In November Well 3 came on-line, which has proven to be better quality water than Well 2
- 2006 –
 - Completion of Gage Street Project
 - A new water distribution system of ~9,000 feet including new water lines, services, and hydrants.

Attachment A - Chronology

- The project spanned the streets Birch, Baker, Gage, Academy, April, Jackson, Cottage, School, Eel, and Martin Ave
 - Resulted in a 20% reduction in well production and needs for the system
 - Piping Updates
 - Piping for Acre Road off King Street was updated with larger piping to adequately supply water to that area
 - Pipe size was increased for Newbury Road to ensure water pressure
 - In the spring there was extensive flood damage around the area of the three wells and treatment plant. The precinct had to redo some manholes, have the electrical wiring rerun, and the boat launch taken out as part of their repairs. FEMA and their insurance company paid for the majority of the repairs.
 - Well 4 Investigation by Emery & Garrett Groundwater Inc.
 - The Precinct was seeking to develop a new well with a maximum 24-hour average withdrawal of 500 gpm or 720,000 gpd
 - Due to the loss of Well 2 from high iron concentrations, the new Well 3 only replaces this loss of production capacity, so the Precinct is still in need of additional resources for future development
 - The Precinct also sought a new well as a backup groundwater supply that is drawn from a different aquifer as Wells 1, 2, and 3
 - Water sources within the Merrimack State Forest were investigated; it was found that this aquifer may yield much less than the desired rate, 350 gpm or 500,000 gpd
 - The construction of a 3,500 ft watermain would also be required
- 2007 – The Precinct boundary was redefined to include certain areas that already receive water services, the well sites, and to allow water service to the proposed California Fields development.
- 2008-2009 – Construction of the new Merrimack County complex, which replaced a building that used a significant amount of water with a more energy/water efficient structure.
- 2011 –
 - Queen Street 1 MG Tank Interior Re-Painting
 - Limerick Steeplejacks Inc. contracted by the Precinct
 - Work included abrasive blasting, cleaning, painting all interior surfaces, a limited number of pit repairs, welding and filling with compound, disinfection and site restoration
 - Emery & Garrett Groundwater, Inc. investigated the diminishing yield of Well 1.
 - Well 1 had been redeveloped 8 times since construction and productivity and specific capacity has varied over time.
 - In this study they found that the well screen was only 35% efficient and determined it was not due to the physical condition of the well, or clogging by large mica flakes, but instead most likely due to bio-fouling.
 - They recommended that an in-well treatment system may need to be considered to eliminate biomass and prolong a high rate of productivity without constant redevelopment.
 - Everett J. Prescott replaced 950 water meters with Sensus iPERL meters with the RadioRead+ system, which have a 20-year warranty.

Attachment A - Chronology

- The billing program did not get coordinated until 2013.
 - The Annual Report of this year mentioned that Well 1 continues to have issues with sediment clogging and therefore is required to be cleaned every year at a cost of \$10,000-\$15,000.
 - They slowed the pumping of Well 1 and blended Well 2 (which has a higher iron concentration) to reach their needed capacity.
- 2013 – The addition of a fire booster pump to the system was assessed by UE to deliver flows to the portion of Water St. above its intersection with Raymond St.
 - When the water source was switched to groundwater and new storage tanks were developed in 1995 a large section of Water Street became a low-pressure area with some portions above the new overflow elevation.
 - The booster pump station constructed in 1995 provides service to the Water Street area, but currently there is still isn't fire flow to that pressure zone.
- 2014 –
 - Larger meters were replaced
 - Leak Detection Survey Report
 - Investigated 20 miles of the water distribution system
 - UE only received a summary with the statement above, but not the actual report
 - November – Large Groundwater Withdrawal Permit granted by NHDES
 - Well #3 was given a permitted production value of 288,000 gpd
 - Expires November 3, 2024
- 2015 –
 - Record cold winter caused numerous waterline breaks and customer service lines to freeze, which led to higher than average repair costs for the year.
 - Road access to the Fairbanks tank was redone.
 - Well 1 continues to have issues with sediment being pulled into the pump and causing the motor to fail.
 - Meter replacement scheduled for Merrimack County Jail, which is the largest consumer with daily usage between 10-15% of production.
- 2016 –
 - Precinct contracted Water System's Operators to operate the system.
 - Well 1 and 2 had a complete cleaning to ensure that they pump efficiently and deliver quality water.
 - The radio system to provide communication between the well pumps and the four water tanks was finished.
 - The Precinct began looking at replacement equipment for the treatment room that is 22 years old.
- 2017 –
 - Underwater Solutions Inc. conducted inspections and cleaning (sediment removal) for the four water storage tanks. All tanks appeared mostly sound and free of obvious leakage after inspection. Recommendations given to improve aesthetics and longevity of the tanks are listed below:
 - *Fairbanks 750,000 gallon*
 - Pressure wash the exterior wall and roof dome surfaces to remove mildew.

Attachment A - Chronology

- Re-coat the roof using epoxy/polyurethane flexible coating to seal cracks.
- Install a non-corrodible screen with a 24-mesh over the end of overflow pipe to prevent animals from getting inside.
- The next time the tank is removed from service and dewatered, power tool clean the surfaces of the metal overflow pipe and couplings to remove corrosion and then recoat using ANSI/NSF61 approved coating.
- *Queen Street 265,000 gallon*
 - Pressure wash exterior walls to remove mildew and preserve adhesion value of coating.
 - Abrasive blast the roof and re-coat.
 - Power tool clean all areas of coating fatigue found on exterior walls.
 - Re-coat all areas of steel and primary coat exposure.
 - Install a screen over each overflow cutout to prevent access to the tank.
 - Next time the tank is removed from service and dewatered, pressure wash the interior floor, wall, and overhead surfaces to remove staining and any coating that has lost adhesion.
 - Power tool clean all areas of coating loss and steel exposure found on the interior, re-coat using ANSI/NSF61 approved coating.
- *Merrimack 265,000 gallon*
 - Power tool clean the surfaces of the roof panels and interior that were showing exposed steel and apply an elastomeric sealant to halt corrosion.
 - Install a screen over each overflow cutout to prevent access to the tank.
 - Pressure wash the interior to remove staining and all sealant and glass coating that has lost adhesion.
 - The 18 sacrificial anodes must be replaced because they have expired and no longer provide corrosion protection.
- *Queen Street 1,000,000 gallon*
 - Pressure wash exterior walls to remove mildew.
 - Abrasive blast the roof and re-coat exposed areas.
 - Power tool clean all areas of coating fatigue and re-coat exposed steel.
 - Install a screen over each overflow cutout to prevent access to the tank.
 - Next time the tank is removed from service and dewatered, pressure wash the interior floor, wall, and overhead surfaces to remove staining and any coating that has lost adhesion.
 - Power tool areas of coating loss and steel exposure and re-coat.
- An updated fire hydrant list was developed that was shared with the Town of Boscawen.
- Implementation of a daily water operator diary for better record keeping
- 2018—
 - A Supervisory Control and Data Acquisition (SCADA) system was installed.
 - All precinct fire hydrants were assessed and repaired.

Attachment A - Chronology

- Consulting Engineering, Inc (CEI) and Leak Detection Technical Services conducted a leak detection survey for the Precinct and completed 12.5 miles.
 - CEI recommended ongoing sounding, pinpointing, valve box assessments, and cleaning annually to conserve water and maintain infrastructure.
- Updated the Precinct's Capital Improvement Plan
- Cleaned one of the water tanks
- Developed the first PBWP website
- Received a leak detection grant and assessment determining their system is tight
- Developed an on-line bill pay system
- Working with the conservation commission to provide a recreation area with precinct land
- 2019 – A fire hydrant inventory was completed
 - 119 public hydrants
 - 27 private hydrants

ATTACHMENT B

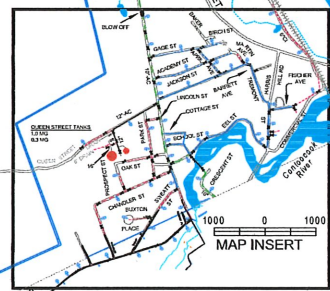
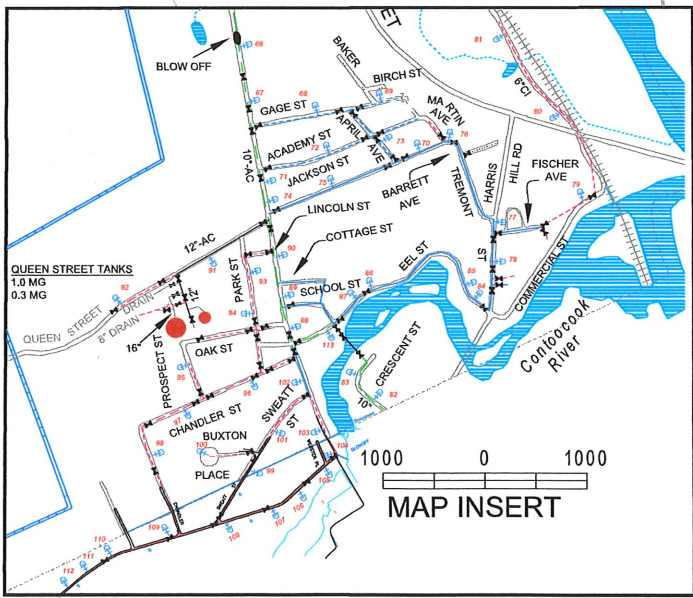
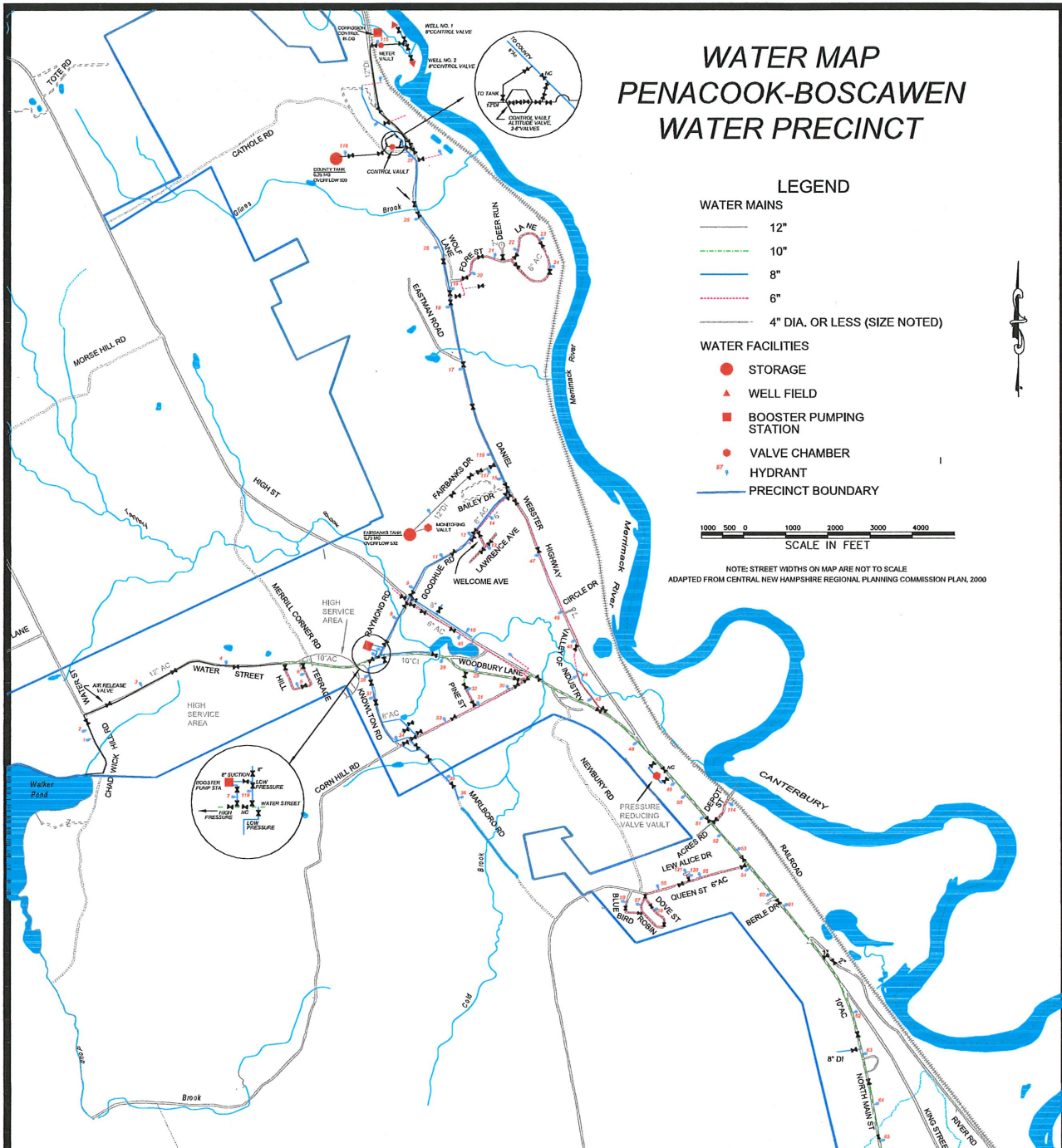
PBWP SYSTEM MAP

WATER MAP PENACOOK-BOSCAWEN WATER PRECINCT

- LEGEND**
- WATER MAINS**
- 12"
 - 10"
 - 8"
 - 6"
 - 4" DIA. OR LESS (SIZE NOTED)
- WATER FACILITIES**
- STORAGE
 - ▲ WELL FIELD
 - BOOSTER PUMPING STATION
 - VALVE CHAMBER
 - HYDRANT
 - PRECINCT BOUNDARY



NOTE: STREET WIDTHS ON MAP ARE NOT TO SCALE
ADAPTED FROM CENTRAL NEW HAMPSHIRE REGIONAL PLANNING COMMISSION PLAN, 2000



ATTACHMENT C

**ASSET DATASHEETS
AND HYDRANT DATA**

ASSET INVENTORY
PENACOOK BOSCAWEN WATER PRECINCT
TOWN OF BOSCAWEN, NH

Name: Corrosion Control Facility
 Date: November 4, 2019



General

Insured value (Primex)	
Treatment building	
Contents	
Pump house	
Contents	
Total	
Installation date	1995 (record drawing)

Site

Location	Down the road from the well field (site visit)
Map/Lot number	

Lot size, acres	
Tax assessed value	
Road Access	yes (site visit)
Fence	none (site visit)
Notes	generator outside, same as at pumping station (site visit)

Sodium Hypochlorite

	(2) pumps (site visit)
	(1) transfer pump (site visit)
Date Pump installed/upgraded	
Pump model	
Pump type	
Pump serial number	
Pump design point	
Motor HP	
Controls	
Pump column	
Surge control	

ASSET INVENTORY		
PENACOOK BOSCAWEN WATER PRECINCT TOWN OF BOSCAWEN, NH		
Name: Corrosion Control Facility		
Date: November 4, 2019		
Tank(s)	(1) 12.5% Sodium hypo tank, (2) 25% sodium hypo tanks (100 gal/ 1400? gal)	(site visit)
Lime treatment	N/A	
Other equipment		
	(2) zinc orthophospate pumps (label on controls, do they still have zinc?)	
	225 gal caustic tank (site visit)	
	30 gal chlorine tank (site visit)	
	Cl - electromagnetic dosing pump (site visit)	
	(2) eyewash stations (site visit)	
	various lab equipment: beakers, sample bottles, chemicals etc.	
Notes		
Flowmeter		
Level monitoring	Paper Discs (site visit)	
Chorine monitor	Hach Cl17 Chlorine Analyzer (site visit)	
pH monitor	873 pH/ORP Analyzer (Foxboro) (site visit)	
Pressure sensor		
Telemetry		
Alkalinity	yes	
Structural/Architectural (record drawing)		
Size	19' x 28' x 10' (record drawing)	
Building walls	vinyl siding (record drawing)	
Roof	gable (8:12 sideslope) (record drawing)	
Doors	double, metal (record drawing)	
Electrical		
Primary Service		
Emergency power		
Security Protection		
Mechanical		
Ventilation		
Heating		
Plumbing		
Generator	40kW diesel generator (2017 Sanitary Survey)	
Operational Notes		

ASSET INVENTORY	
PENACOOK BOSCAWEN WATER PRECINCT TOWN OF BOSCAWEN, NH	
Name: Corrosion Control Facility	
Date: November 4, 2019	
Improvements Needed	



ASSET INVENTORY
PENACOOK BOSCAWEN WATER PRECINCT
TOWN OF BOSCAWEN, NH

Name: Well 1
 Date: November 4, 2019



General

Insured value (Primex)	
Treatment building	off-site
Contents	
Pump house	N/A
Contents	
Total	
Installation dates	
Original Well	1994 (well completion report)
pump upgrade	

Site

Location	
Map/Lot number	

Lot size, acres	
Tax assessed value	
Road Access	
Fence	none (site visit)
Notes	

Process

Date Pump installed/upgraded	installed 1994 (well completion report)
Pump model	
Pump type	
Pump serial number	
Pump design point	
Motor HP	
Controls	
Pump column	
Surge control	
Chlorinator	
Corrosion control	

ASSET INVENTORY	
PENACOOK BOSCAWEN WATER PRECINCT TOWN OF BOSCAWEN, NH	
Name: Well 1	
Date: November 4, 2019	
Lime treatment	
Well Information	
Well type	
Casing size, in	18" inner, 24" outer (well completion report)
Grade elevation, ft MSL	260' (resource found during DES file review)
Top of casing, ft	268' (resource found during DES file review)
Suction depth, ft USGS	15.52' (pumping level) (well completion report)
Well depth, ft	51' (well completion report)
Approved yield, gpm	
Top of motor	229' (resource found during DES file review)
Bottom of motor	223' (resource found during DES file review)
Last cleaning date	
Water quality	
Notes	
Flowmeter	
Level monitoring	
Chorine monitor	
pH monitor	
Pressure sensor	
Telemetry	
Electrical	
Primary Service	
Emergency power	
Security Protection	
Mechanical	
Ventilation	
Heating	
Plumbing	
Operational Notes	
Improvements Needed	

ASSET INVENTORY
PENACOOK BOSCAWEN WATER PRECINCT
TOWN OF BOSCAWEN, NH

Name: Well 2
 Date: November 4, 2019



General

Insured value (Primex)	
Treatment building	off-site
Contents	
Pump house	N/A
Contents	
Total	
Installation dates	
Pump upgrade	
Well	1994 (well completion report)

Site

Location	
Map/Lot number	

Lot size, acres	
Tax assessed value	
Notes	
Process	
Date Pump installed/upgraded	installed 1994 (well completion report)
Pump model	
Pump type	
Pump serial number	
Pump design point	
Motor HP	
Controls	
Pump column	
Surge control	
Chlorinator	
Corrosion control	off-site
Lime treatment	none
Backup Pump/Driver	

ASSET INVENTORY	
PENACOOK BOSCAWEN WATER PRECINCT TOWN OF BOSCAWEN, NH	
Name: Well 2	
Date: November 4, 2019	
Well Information	
Well type	
Casing size, in	18" inner, 24" outer (well completion report)
Grade elevation, ft MSL	
Suction depth, ft	14.31' (pumping level) (well completion report)
Well depth, ft	521 (well completion report)
Approved yield, gpm	445 gpm (1996 NHDES approval to activate wells 1 &2)
Last cleaning date	
Water quality	high iron concentrations (various sources)
Notes	
Instrumentation	
Level monitoring	
Chorine monitor	
pH monitor	
Pressure sensor	
Telemetry	
Electrical	
Primary Service	
Emergency power	
Security Protection	
Mechanical	
Ventilation	
Heating	
Plumbing	
Operational Notes	
Improvements Needed	

ASSET INVENTORY
PENACOOK BOSCAWEN WATER PRECINCT
TOWN OF BOSCAWEN, NH

Name: Well 3
 Date: November 4, 2019



General

Insured value (Primex)	
Treatment building	off-site
Pump house	N/A
Contents	
Total	
Installation dates	
Pump upgrade	
Well	2004 (well completion report)

Site

Map/Lot number	
Lot size, acres	
Tax assessed value	

Notes

Process	
Date Pump installed/upgraded	installed 2004 (well completion report)
Pump model	
Pump type	
Pump serial number	
Pump design point	
Motor HP	
Controls	
Pump column	
Surge control	
Chlorinator	
Corrosion control	
Lime treatment	

ASSET INVENTORY	
PENACOOK BOSCAWEN WATER PRECINCT TOWN OF BOSCAWEN, NH	
Name: Well 3	
Date: November 4, 2019	
Well Information	
Well type	
Casing size, in	18" inner (well completion report)
Grade elevation, ft MSL	
Suction depth, ft	
Well depth, ft	39.7' (well completion report)
Approved yield, gpm	200 gpm (2014 Large Groundwater Withdrawal Permit granted by NHDES)
Last cleaning date	
Water quality	
Notes	
Instrumentation	
Flowmeter	
Level monitoring	
Chorine monitor	
Pressure sensor	
Telemetry	
Electrical	
Primary Service	
Emergency power	
Security Protection	
Mechanical	
Ventilation	
Heating	
Plumbing	
Operational Notes	
Improvements Needed	

ASSET INVENTORY

**PENACOOK BOSCAWEN WATER PRECINCT
TOWN OF BOSCAWEN, NH**

Name: Well Controls Building

Date: November 4, 2019



General	
Insured value (Primex)	
Structure	
Contents	
Total	
Installation date	2005 (plate on building)
Site	
Location	
Map/Lot number	
Lot size, acres	
Fence	none (site visit)
Structural	

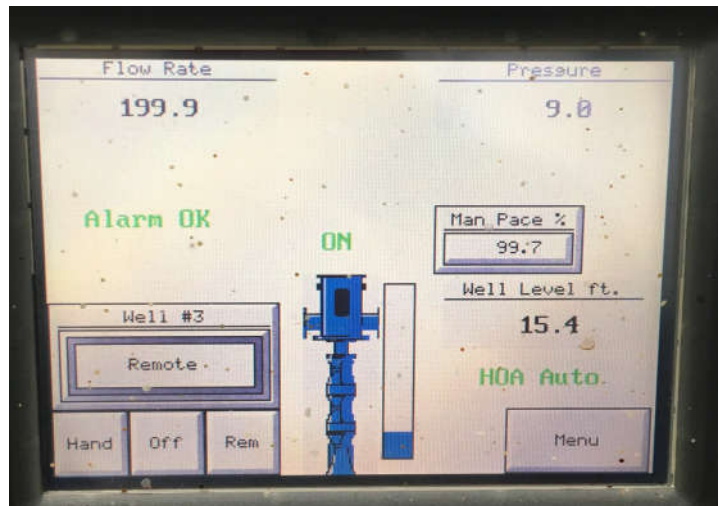
Structure	
Door	
Roof	
Operational Notes	
	SCADA (site visit)
Improvements Needed	

ASSET INVENTORY

PENACOOK BOSCAWEN WATER PRECINCT
TOWN OF BOSCAWEN, NH

Name: Well Controls Building

Date: November 4, 2019



ASSET INVENTORY
PENACOOK BOSCAWEN WATER PRECINCT
TOWN OF BOSCAWEN, NH

Name: Merrimack Tank
 Date: November 4, 2019



General	
Insured value (Primex)	
Installation dates	1995
Last Inspection	2017 (by Underwater Solution's Inc.)
Last Rehab/Repaint	
Site	
Location	Off Route 3, behind the nursing home
Pressure Zone	Upper (2017 Sanitary Review)
Map/Lot number	
Lot size, acres	0.128 (fenced in area per record drawing)
Fence	chain link
Notes	
Structural	
Material	Bolted Steel (2017 Sanitary Review)
Serial Number	8950006 (nameplate)
Shape	Circular (site visit)
Roof Hatch	30 " circular (record drawing)
Shell Hatch	
Piping	inlet/outlet pipe (record drawing)
Pipe Diameter	12" (record drawing)
Material	
Penetration	
Silt Stop	Yes (record drawing)
Drain Pipe	
Roof Cover	fixed roof (record drawing)
Instrumentation	
Telemetry	
Level	

ASSET INVENTORY	
PENACOOK BOSCAWEN WATER PRECINCT TOWN OF BOSCAWEN, NH	
Name: Merrimack Tank	
Date: November 4, 2019	
Hydraulic Data	
Nominal Volume, gallons	261,000 (nameplate)
Volume, gallons	
Useable Volume	
Tank diameter	25.18 ft (nameplate)
Max Height	70.3 ft (nameplate)
Base Elevation ft, MSL	431 ft (Precinct's tank elevation table)
Overflow Elevation ft	500 ft (record drawing)
Maximum Fill Rate, gpm	
Maximum Draw Rate, gpm	
Electrical	
Primary Service	
Emergency power	
Security Protection	
Operational Notes	



ASSET INVENTORY
PENACOOK BOSCAWEN WATER PRECINCT
TOWN OF BOSCAWEN, NH

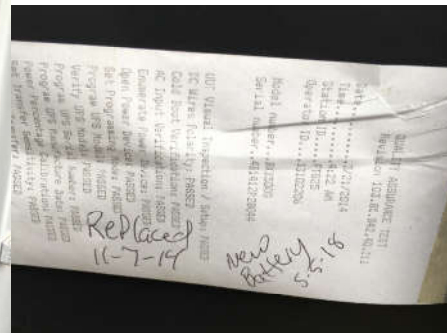
Name: Fairbanks Tank
 Date: November 4, 2019



General	
Insured value (Primex)	
Installation dates	1995 (site visit)
Last Inspection	2017 (by Underwater Solution's Inc.)
Last Rehab/Repaint	
Site	
Location	Off Fairbanks Drive (site visit)
Pressure Zone	Upper (2017 Sanitary Review)
Map/Lot number	
Lot size, acres	1.52 (record drawing)
Fence	chain link (site visit)
Notes	
Structural	
Builder	

Material	Pre-cast concrete (2017 Sanitary Review)
Shape	circular (site visit)
Roof Hatch	
Shell Hatch	
Piping	
Pipe Diameter	
Pipe Material	
Penetration	
Silt Stop	
Drain Pipe	
Roof Cover	
Instrumentation	
Telemetry	
Level	
Hydraulic Data	
Nominal Volume, gallons	750,000 (nameplate)
Volume, gallons	
Useable Volume	
Tank diameter	57 ft (Precinct's tank elevation table)
Wall Height	
Max Height	
Base Elevation ft, MSL	492 ft (Precinct's tank elevation table)
Overflow El, ft MSL	532 ft (2017 Sanitary Survey)

ASSET INVENTORY	
PENACOOK BOSCAWEN WATER PRECINCT TOWN OF BOSCAWEN, NH	
Name: Fairbanks Tank	
Date: November 4, 2019	
Electrical	
Primary Service	
Emergency power	
Security Protection	
Notes	new battery 5/5/18 (site visit)
Operational Notes	
Improvements Needed	



ASSET INVENTORY
PENACOOK BOSCAWEN WATER PRECINCT
TOWN OF BOSCAWEN, NH

Name: Queen Street (Small)
 Date: November 4, 2019



General	
Insured value (Primex)	
Installation dates	1954
Last Inspection	2017 (by Underwater Solution's Inc.)
Last Rehab/Repaint	
Site	
Location	Queen Street
Pressure Zone	Lower (2017 Sanitary Survey)
Map/Lot number	
Lot size, acres	
Fence	chain link (site visit)
Notes	
Structural	
Builder	

Material	Welded steel (2017 Sanitary Survey)
Shape	circular (site visit)
Roof Hatch	
Shell Hatch	
Piping	
Pipe Diameter	
Pipe Material	
Penetration	
Silt Stop	
Drain Pipe	
Roof Cover	
Instrumentation	
Telemetry	
Level	

ASSET INVENTORY	
PENACOOK BOSCAWEN WATER PRECINCT TOWN OF BOSCAWEN, NH	
Name: Queen Street (Small)	
Date: November 4, 2019	
Hydraulic Data	
Nominal Volume, gallons	265000 (criticality analysis of assets)
Volume, gallons	
Useable Volume	
Tank diameter	25' (Precinct's tank elevation table)
Wall Height	
Max Height	
Base Elevation ft, MSL	426 ft (tank bottom) (Precinct's tank elevation table)
Overflow El, ft MSL	508' (2017 Sanitary Survey)
Electrical	
Primary Service	
Emergency power	
Security Protection	
Operational Notes	
Improvements Needed	



ASSET INVENTORY
PENACOOK BOSCAWEN WATER PRECINCT
TOWN OF BOSCAWEN, NH

Name: Queen Street Tank, 1 MG
 Date: November 4, 2019



General	
Insured value (Primex)	
Installation dates	1974
Last Inspection	2017 (by Underwater Solution's Inc.)
Last Rehab/Repaint	
Site	
Location	
Pressure Zone	
Map/Lot number	
Lot size, acres	
Fence	chain link (site visit)
Notes	
Structural	
Builder	

Material	Bolted Steel (2017 Sanitary Survey)
Shape	
Roof Hatch	square (record drawing)
Shell Hatch	
Piping	
Pipe Diameter	
Pipe Material	
Penetration	
Silt Stop	
Drain Pipe	
Roof Cover	
Instrumentation	
Telemetry	
Level	

ASSET INVENTORY	
PENACOOK BOSCAWEN WATER PRECINCT TOWN OF BOSCAWEN, NH	
Name: Queen Street Tank, 1 MG	
Date: November 4, 2019	
Hydraulic Data	
Nominal Volume, gallons	1000000 (criticality analysis of assets)
Volume, gallons	
Useable Volume	
Tank diameter	47 ft (Precinct's tank elevation table)
Wall Height	
Max Height	81.5 ft (record drawing)
Base Elevation ft, MSL	426.3 ft (tank bottom) (Precinct's tank elevation table)
Overflow El, ft MSL	503.2 ft (2017 Sanitary Survey)
Electrical	
Primary Service	
Emergency power	
Security Protection	
Operational Notes	
Improvements Needed	

ASSET INVENTORY

**PENACOOK BOSCAWEN WATER PRECINCT
TOWN OF BOSCAWEN, NH**

Name: Booster Pump Station

Date: November 4, 2019



General

Insured value (Primex)	
Structure	
Contents	3 operating pumps, 1 spare pump, controls, 2 valves (site visit)
Total	
Installation date	1995 (Stated in 2013 UE's fire booster pump installation assessment)
Site	
Location	Water Street
Map/Lot number	
Lot size, acres	
Fence	none (site visit)
Notes	40kW diesel generator behind the building, Southworth-Milton (site visit)

Structural

Structure	
Access	
Door	metal, double (site visit)
Roof	gable (site visit)

Process

Capacity, gpm	
Pressure, psi	
Number of pumps	3 Goulds Water Technology pumps, index #: 9BF1K2CO (plates on pumps)
Pump model	3656, size: 1X 2-8, imp diameter: 7 5/16 (plates on pumps)
Pump type	
Pump serial numbers	
Pump design point	
Motor HP	
Controls	Yaskawa P-1000 (site visit)
Flowmeter	
Last calibration date	
Chart Recorder	
Operational Notes	

ASSET INVENTORY

**PENACOOK BOSCAWEN WATER PRECINCT
TOWN OF BOSCAWEN, NH**

Name: Booster Pump Station

Date: November 4, 2019

Improvements Needed



**PENACOOK-BOSCAWEN WATER PRECINCT
HYDRANT LIST**

NUMBER	LOCATION	TYPE	SIZE	YEAR	UTILITY/ PRIVATE	COMMENT
1	Chadwick Hill Rd.	Mueller	41/4	1966	U	
2	151 Water St.	AVK	51/4	1994	U	
3	120 Water St.	Mueller	51/4	1972	U	
4	64 Water st.	Mueller	41/4	1965	U	
5	8 terrace Hill Rd .	Mueller	51/4	1971	U	
6	2 Terrace Hill Rd .	Mueller	51/4	1972	U	
7	Raymond Rd and Water	Mueller	41/4	1969	U	
8	raymond Rd.	mueller	41/4	1968	U	
9	Goodhue Rd . and High	mueller	41/4	1969	U	
10	126 High st.	Mueller	51/4	1975	U	
11	9 Goodhue Rd .	Mueller	51/4	1969	U	
12	23 Goodhue Rd.	Mueller	51/4	1970	U	
13	8 Welcome Ave.	Mueller	41 /4	1964	U	
14	34 Goodhue Rd .	Mueller	41/4	1963	U	
15	203 DW Highway	Mueller	41/4	1963	U	
16	221 DW Highway	waterous	51/4	2000	U	
17	DW Highway	Smith	51/4	1970	U	
18	260 DW Highway	Darling	51/4	1999	U	
19	DW Highway andForest Lane	Smith	51/4	1970	U	
20	10 Forest lane	Smith	51/4	1970	U	
21	17 Forest Lane	Smith	51/4	1970	U	
22	23 Forest Lane	Smith	51/4	1970	U	
23	33 Forest lane	Mueller	51/4	1972	U	
24	53 Forest Lane	Mueller	51/4	1972	U	
25	283 DW Highway	Smith	51/4	1970	U	
26	298 DW Highway	Mueller	51/4	1971	U	
27	300 DW Highway	Mueller	51/4	1970	U	
28	8 water St.	Smith	4 5/8	1976	U	
29	14 Woodbury Ln.	Mueller	41/4	1965	U	
30	Cornhill Rd. and Woodbury Ln.	Mueller	41/4	1966	U	
31	21 Cornhill rd.	Mueller	51/4	1972	U	
32	6 Pine St.	Mueller	51/4	1972	U	
33	37 Cornhill Rd.	Smith	51/4	1976	U	
34	Corn hill rd. and Marlboro Rd.	Mueller	41/4	1962	U	
35	Marlboro Rd.	Mueller	51/4	1973	U	
36	Transfer Station	Waterous	51/4	1999	U	
37	3 Knowlton Rd.	Mueller	41/4		U	
38	17 Knowlton Rd.	Mueller	51/4	1971	U	
39	107 High St.	Mueller	41/4	1957	U	
40	126 High St.	Mueller	41/4	1966	U	
41	135 High St.	Eddy	4		U	
42	16 High St.	AVK	51/4	1994	U	
43	1 Valley of Industry	AVK	51/4	1994	U	
44	9 Valley of Industry	US Pipe	51/4	1993	U	
45	43 DW Highway	Eddy	4		U	

**PENACOOK-BOSCAWEN WATER PRECINCT
HYDRANT LIST**

NUMBER	LOCATION	TYPE	SIZE	YEAR	UTILITY/ PRIVATE	COMMENT
46	61 DW Highway	Mueller	41/4		U	
47	75 DW Highway	Darling	51/4	1987	U	
48	1 High St.	Mueller	41/4		U	
49	243 King St.	Darling	51/4	1998	U	
50	233 King St.	Eddy	4		U	
51	219 King St.	Waterous	51/4	1998	U	
52	201 King St.	Eddy	4		U	
53	179 King St.	waterous	51/4	1998	U	
54	King st. and Queen st.	Eddy	4		U	
55	341 Queen St.	Mueller	41/4	1962	U	
56	321 Queen sl.	Mueller	41/4	1964	U	
57	6 Robbin Sl.	Mueller	41/4	1965	U	
58	3 Dove Sl.	Mueller	41/4	1966	U	
59	Blue Bird Ln.	Mueller	41/4	1966	U	
60	150 King St.	Darling	51/4	1986	U	
61	King St and River rd	Mueller	41/4	1966	U	
62	N. Main Sl.	waterous	51/4	1999	U	
63	197 N. Main Sl.	waterous	51/4	1998	U	
64	191 N. Main Sl.	Waterous	51/4	1997	U	
65	168 N. Main Sl.	Darling	51/4	1996	U	
66	169 N. main Sl.	Eddy	4		U	
	14 Gage Street		51/4	2004	U	
	39 Gage Street		51/4	2004	U	
	9 Birch Street		51/4	2004	U	
	11 Baker Street		51/4	2004	U	
	40 Tremont Street		51/4	2004	U	
	9 Academy Street		51/4	2004	U	
	26 Academy Street		51/4	2004	U	
	11 April Street		51/4	2004	U	
	45 Martin Street		51/4	2004	U	
	11 Jackson Street		51/4	2004	U	
	Cottage at DW Highway		51/4	2004	U	
					U	
67	N. Main and Gage St	Eddy	4		U	
68	13 Gage St.	Mueller	41/4		U	
69	2 Baker Sl.	Mueller	41/4		U	
70	11 April Ave.	Mueller	41/4	1956	U	
71	N. Main St. ?,	Eddy	4		U	
72	31 Academy Sl.	Eddy	4		U	
73	45 Academy Sl.	waterous	51/4	1997	U	
74	N. Main and Jackson	Eddy	4		U	
75	21 Jackson St.	Mueller	41/4	1956	U	
76	Jackson St. and Martin	Mueller	41/4	1956	U	
77	Fisher Ave.	Waterous	51/4	1998	U	
78	8 Tremont St.	Waterous	51/4	1999	U	

**PENACOOK-BOSCAWEN WATER PRECINCT
HYDRANT LIST**

NUMBER	LOCATION	TYPE	SIZE	YEAR	UTILITY/ PRIVATE	COMMENT
79	Commercial st.	Waterous	51/4	1998	U	
80	16 River rd .	Eddy	4		U	
81	41 River Rd.	waterous	51/4	1997	U	
82	20 Crescent St.	waterous	51/4	1999	U	
83	28 Crescent St.	Waterous	51/4	2000	U	
84	81 Eel St. ?	Mueller	41/4	1960	U	
85	47 Eel St.	Mueller	41/4	1957	U	
86	41 Eel St.	Darling	51/4	1983	U	
87	33 Eel St.	Mueller	41/4	1956	U	
88	EelSt.	Darling	51/4	1985	U	
89	N. Main St. and School	Mueller	41/4		U	
90	98 N. Main St.	Eddy	4		U	
91	21 Queen st.	Eddy	4		U	
92	43 Queen St.	Mueller	41/4	1965	U	
93	37 Park St.	Mueller	41/4	1959	U	
94	Park St. and Oak St	Waterous	51/4	1999	U	
95	Prospect St.	Smith	51/4	1981	U	
96	13 Chandler St.	Mueller	41/4	1968	U	
97	37 Chandler St.	Mueller	41/4	1958	U	
98	53 Chandler St.	Waterous	51/4	1998	U	
99	28 sweatt St.	Waterous	51/4	1999	U	
100	6 Buxton place	USP	51/4	1985	U	
101	1 0 Sweatt St.	Smith	51/4	1977	U	
102	N. Main St. and Sweatt St	Eddy	4		U	
103	29 N. Main St.	Darling	51/4	1990	U	
104	N. Main St. and Elm St	Eddy	4		U	
105	5 Elm St.	Smith	51/4	1981	U	
106	21 Elm St.	Eddy	4		U	
107	39 Elm St.	waterous	51/4	1997	U	
108	Elm St. and Sweatt St	Mueller	41/4	1960	U	
109	75 Elm St.	Mueller	41/4	1960	U	
110	122 Elm St.	Mueller	41/4	1963	U	
111	126 Elm St.	Smith	5 1/4	1980	U	
112	132 Elm St.	Smith	5 1/4	1980	U	
113	15 Eel St.	Waterous	51/4	1998	U	
114	Depot St.	Darling	51/4	1995	U	
115	DW Highway Corrosion Control	Darling	51/4	1994	U	
116	County Tank	darling	51/4	1994	U	
117	Fairbanks Drive	US Pipe	51 /4	1995	U	
118	Fairbanks Tank	US Pipe	51/4	1995	U	
119	Booster Station	Darling	51/4	1994	U	
120	County-Nursing 1		51/4		P	
121	County Nursing 2		51/4		P	
122	County Nursing3		51/4		P	
123	County Nursing 4		51/4		P	

**PENACOOK-BOSCAWEN WATER PRECINCT
HYDRANT LIST**

NUMBER	LOCATION	TYPE	SIZE	YEAR	UTILITY/ PRIVATE	COMMENT
124	County Entrance Rd		51/4		P	
125	County Nursing 5		51/4		P	
126	County North Bldg		51/4		P	
127	County Building-North		51/4		P	
128	County Building-Northwest		51/4		P	
129	County Wastewater 1		51/4		P	
130	County Wastewater 2		51/4		P	
131	County Wastewater 3		51/4		P	
132	County Wastewater 4		51/4		P	
133	County Wastewater 5		51/4		P	
134	County Jail 1		51/4		P	
135	County Jail 2		51/4		P	
136	County Jail 3		51/4		P	
137	Old County Jail 1		51/4		P	
138	Old County Jail 2		51/4		P	
139	Old County Jail 3		51/4		P	
140	DW Highway Old County Jail		51/4		P	
141	Hannah Dustin 1		51/4	2016	P	
142	Hannah Dustin 2		51/4	2016	P	
143	Hannah Dustin 3		51/4	2016	P	
144	Hannah Dustin 4		51/4	2016	P	
145	174 North Main #1				P	
146	174 North Main #2				P	

Penacook – Boscawen Water Precinct

Hydrant Inventory as of 12-25-17

Notes: Change = not as listed on old list

??? = questionable data

NO	LOCATION	TYPE	SIZE	DATE	FLOW	NOTES
1	Chadwick Hill @ pump station	Mueller	4.25	1966		
2	151 Water cor of Chadwick	AVK	5.25	1994		
3	120 Water	NOT FOUND				change
4	64 Water	Waterous	5.25	1998		change
5	8 Terrace Hill	Mueller	5.25	1971		
6	2 Terrace Hill	Mueller	5.25	1972		
7	Raymond Rd & Water St	Mueller	4.25	1969		
8	Raymond Rd	Mueller	4.25	1968	1240	
9	Goodhue & High	Mueller	4.25	1969		
10	126 High	Mueller	5.25	1975		
11	9 Goodhue	Mueller	5.25	1969	1320	
12	23 Goodhue	Mueller	5.25	1970		
13	8 Welcome Ave.	Mueller	4.25	1964		needs paint
14	34 Goodhue	Mueller	4.25	1963	1740	
15.	203 DW Highway	Mueller	4.25	1963	2000	needs paint
16	221 DW Highway	Waterous	5.25	2000	5940	???
17	___ DW Highway	Smith	5.25	1970	1840	Street # needed needs paint
18	260 DW Highway	Darling	5.25	1999	5090	??? no # needs paint
19	DW Highway @ Forest Lane	Smith	5.25	1970	2210	no number
20	10 Forest Lane	Smith	5.25	1970	1600	needs paint
21	17 Forest Lane	Smith	5.25	1970		

22	23 Forest Lane	Smith	5.25	1970	1460	needs paint
23	33 Forest Lane	Mueller	5.25	1972		
24	53 Forest Lane	Mueller	5.25	1972		
25	283 DW Highway	Smith	5.25	1970	1850	needs paint
26	298 DW Highway	Darling	5.25	2007	1800	change
27	300 DW Highway	Waterous	5.25	2003	2026	change
	309 DW Highway	Waterous	5.25	2003		
28	8 Water St	Smith	4-5/8	1976	1070	
29	14 Woodbury Lane	Mueller	4.25	1965	1300	
30	Cornhill & Woodbury Lane	Waterous	5.25	2006	990	change
31	21 Cornhill Rd	Mueller	5.25	1972	1070	
32	6 Pine St	Mueller	5.25	1972		
33	37 Cornhill Rd	Smith	5.25	1976	1000	
34	Cornhill & Marlboro Rd	Darling	5.25	2014	900	change
35	Marlboro Rd	Mueller	5.25	1973	740	
36	Transfer Station	Waterous	5.25	1999		
37	3 Knowlton Rd	Mueller	4.25	unk	760	
38	17 Knowlton	Mueller	5.25	1971	970	
39	107 High St	Waterous	5.25	2016		change
40	126 High St	Mueller	4.25	1966	990	needs paint
41	135 High St	Eddy	4.00	unk	1000	
42	16 High St	AVK	5.25	1994	1130	
43	1 Valley of Industry	AVK	5.25	1994	1160	
44	9 Valley of Industry	US Pipe	5.25	1993		
45	43 DW Highway	Eddy	4.00	unk	980	
46	61 DW Highway	Mueller	4.25	unk	1080	needs paint
47	75 DW Highway	Darling	5.25	1987		

48	1 High St	Mueller	4.25	unk		
49	243 King St	Darling	5.25	1998	1440	
50	233 King St	Eddy	4.00	OLD??		Needs paint
51	219 King Street	Waterous	5.25	1998	1580	
52	201 King St X2 The Acre	Eddy	4.00	OLD??		Needs to be raised
53	179 King St	Waterous	5.25	1998		
54	Cor of King & Queen	Waterous	5.25	2009	1500	change
55	341 Queen St	Waterous	5.25	2001	325	change
56	321 Queen St	Mueller	5.25	1964	180	
57	6 Robbin St	Mueller	4.25	1965		
58	3 Dove St	Mueller	4.25	1966	190	
59	Blue Bird Lane	Mueller	4.25	1966		needs paint
60	150 King St	Darling	5.25	1986	1640	
61	King St @ River Rd	Mueller	4.25	1966	1900	
62	?? N. Main	Waterous	5.25	1999	2300	
63	197 N. Main	Waterous	5.25	1998	2370	
64	191 N. Main	Waterous	5.25	1997	2400	
65	168 N. Main	Darling	5.25	1996		
66	169 N. Main	Eddy	4.00	unk	1970	
67	N. Main & Gage St	Eddy	4.00	unk	5530 ???	
68	13 Gage St	Waterous	5.25	2004		change
69	30 Gage St	Waterous	5.25	2004		change
	Gage @ Sherman Dr.	Waterous	5.25	2004		change
?	41 Gage St	Waterous	5.25	2004		change
70	11 April Ave	Mueller	4.25	1956		
71	N. Main & Academy St	Eddy	4.00	unk	3630???	
72	31 Academy St	Waterous	5.25	2004	2090 ???	

	Martin Ave	Mueller	5.25	2004		
73	44 Academy St	Waterous	5.25	1997	2030	change
74	N. Main & Jackson St	Eddy	4.00	unk	3580???	
75	Jackson St. X2 Police	Waterous	5.25	2004		change
76	Jackson & Martin Ave	Waterous	5.25	2004		change
77	Fisher Ave	Waterous	5.25	1998	2200	
78	8 Tremont	Waterous	5.25	1999	2160	
79	Commercial St	Waterous	5.25	1998	1380	
80	16 River Rd	Waterous	5.25	2005	390	change
81	41 River Rd	Waterous	5.25	1997	360	
82	20 Crescent St	Waterous	5.25	1999		
83	28 Crescent St	Waterous	5.25	2000		
84	81 Eel St (#?)	Waterous	5.25	2003		change
85	47 Eel St	Mueller	4.25	1957		
86	41 Eel St	Darling	5.25	1983		
87	33 Eel St	Darling	5.25	2013		change
88	?? Eel St	Darling	5.25	1985		
89	N. Main & School St	Mueller	4.25	2004		
90	98 N. Main St	Eddy	4.00	unk		leaking: to be replaced
91	21 Queen St	Eddy	4:00	unk	2030	
92	43 Queen St	Mueller	4.25	1965	2060	
93	37 Park St	Mueller	4.25	1959	1900	
94	Park & Oak St	Waterous	5.25	1999		
95	Prospect St	Smith	5.25	1981	1080	
96	13 Chandler St	Mueller	4.25	1968		
97	37 chandler St	Kennedy	5.25	1998	1220	change
98	58 chandler St	Waterous	5.25	1998		

99	28 Swett St	Waterous	5.25	1999	1510	
100	6 Buxton Place	USP	5.25	1985		
101	10 Swett St	Waterous	5.25	2010	1710	change
102	N. Main & Swett St.	Eddy	4.00	unk		
103	29 N. Main St	Darling	5.25	1990	921	
104	N. Main & Elm St.	Waterous	5.25	2003	753	change
105	5 Elm St	Smith	5.25	1981		
106	21 Elm St	Mueller	5.25	1960?	729	change
107	39 Elm St	Waterous	5.25	1997		
108	Elm & Swett St	Mueller	4.25	1960		
109	75 Elm St	Mueller	4.25	1960	1670	
110	122 Elm St	Mueller	4.25	1963	620	
111	126 Elm St	Smith	5.25	1980	500	
112	132 Elm St.	Smith	5.25	1980	520	
113	15 Eel St	Waterous	5.25	1998	941	
114	Depot St	Darling	5.25	1995	902	no #
115	Corrosion Control bldg..	Darling	5.25	1994		
116	County Tank	Darling	5.25	1994		needs paint
117	Fairbanks Drive	USP	5.25	1995	1030	needs paint
118	Fairbanks Tank	USP	5.25	1995		needs paint
119	Booster Station	Darling	5.25	1994		

END OF LIST SEAN SCANNED IN.

LIST FROM JANET: NUMBERS ABOVE 119 ARE NOT ON PBWP LIST AND INCLUDED # 120 – 140 AT VARIOUS LOCATIONS AT THE COUNTY FACILITY. NONE OF THOSE NUMBERS WERE FOUND AT COUNTY. Some of those numbers were found elsewhere in the PBWP system.

JOHN _____ (COUNTY GROUNDS CREW) SAYS THOSE WERE REMOVED AND SOME REPLACED DURING VARIOUS CONSTRUCTION PROJECTS. SEE COUNTY LIST BELOW.

120	Jackson & Tremont St	Waterous	5.25	2004		change
121	Barrett Ave @ 40 Tremont St	Waterous	5.25	2004		change

122	End of Barrett Ave on L	Waterous	5.25	2004	change
123	End of Baker	Waterous	5.25	2004	change
	11 Baker St	Waterous	5.25	2004	change
124	9 Birch St	Waterous	5.25	2004	change
125	Not found				
126	1 LewAlice Dr	Metro	5.25	2001	change
127	end of LewAlice	Metro	5.25	2001	change
128	N. Main @ Cottage	Waterous	5.25	2005	needs paint
	9 Academy St	Waterous	5.25	2004	
	Merrill Corner Rd	Waterous	5.25	1999	

Others:

Bailey's (Bill-Bob's)Trailer Park

Bailey Drive & Bill-Alice	Darling	5.25	1990
Rosue Drive	Darling	5.25	1990

Boscawen Elementary School

On left X2 stop sign	USP	5.25	?
Gate @ ballfield	USP	5.25	?
Woods side of parking lot	USP	5.25	?

Merrimack County

Wastewater	Smith	5.25	??
Jail			
Rear x2 electrical room	Waterous	5.25	2004
NE cor, rear of jail	Waterous	5.25	2004
Front of jail, X2 gate	Waterous	5.25	2004
Front of new construction	Waterous	5.25	2016
North driveway	Smith	5.25	???

Maintenance	USP	4.50	?
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West side of RT 3

X2 Sheriff's	USP	5.25	2005
Front of Heath bldg.	USP	5.25	2005
Gerrish Manor	Metro	5.25	2004
Rear of Gerrish X 2 daycare	USP	5.25	2004
Heath Bldg X2 oxygen tank	USP	5.25	2004
Heath Bldg X2 parking	USP	5.25	2004

Red Oak

On right b 4 bldgs	Darling	5.25	2016
End of road on right	Darling	5.25	2016

Riverside Place (none numbered, but show as 141 – 144 on our list)

4	Watrerous	5.25	2016
---	-----------	------	------

Steenbeke Complex

2 reported: none found	1 was damaged by snow removal and is scheduled to be replaced in the future.
------------------------	--

Woody Hollow 100 Elm St

Balsam Drive	Darling	5.25	1986
Street in @ end	Darling	5.25	1983

Criticality Analysis of Assets

Component	Number	Description and Location (where applicable)	Residual Life	Critical Asset or single point of failure	Cost to Replace
Source water Type					
Ground Water	3	Gravel Packed Wells	8 - 10 Years	H	\$250,000
Surface Water	N/A				
Purchase	1	Interconnection with Concord		H	
Treatment Plant					
Control System / Computer Building(s)	1.00	Treatment Building	5 Years	M	\$25,000
Pump	N/A	Treatment Building	10 - 15 Years	H	\$300,000
Treatment Equipment (e.g. Basin, Clear Well, Filter)	3.00	Chemical Feed Pump for Chlorine, Potassium Hydroxide and Phosphate	5 Years	H	\$15,000
Process Controls	N/A				
Treatment Chemicals and Storage	3.00	Storage Tanks	10 - 15 Years	M	\$15,000
Laboratory Chemicals and Storage	3.00	Day Tanks		M	\$15,000
N/A	N/A				
Storage					
Storage Tanks	4	Queen St., 300,000 Gal (Steel) Queen St., 1,00,000 Gal (Steel) Merrimack Tank, 265,000 Gal (Steel) Fairbanks Tank, 750,000 Gal (Concrete)	25 Years	H H H H	\$330,000 \$1,000,000 \$300,000 \$1,500,000
Pressure Tanks	N/A				
Power					
Primary Power		Eversource		H	
Auxiliary Power	2 Units	Raymond Street Booster Treatment Building	10 - 15 Years 10 - 15 Years	M M	\$50,000 \$50,000
Distribution System					
Pumps	1	Booster, Raymond Street	10 - 15 Years	H	\$250,000
Pipes	3	Pumps	10 Years	H	\$10,000
Valves	172	Distribution Print-Available		H	
Appurtenances (e.g., flush hydrants, backflow preventers, meters)	135	Distribution Print-Available Hydrants Distribution Print-Available	20 Years	L	\$8,000
Other Vulnerable Points					
Meters	1200	Owned by Customers	10 Years	L	\$150
Backflow					
Communications					
Telephone					
Cell Phone					
Radio	Yes	Well and Tank Controls	5 - 10 Years	H	\$30,000
Computer/Control Systems (SCADA)	Yes	Utilizing a GS 400	8 - 10 Years	H	\$10,000
Critical Facilities Served					
Power Plant Facilities					
Hospitals					
Schools	Yes				
Waste Water Treatment Plants					
Food/Beverage Processing Plants					
Nursing Homes	Yes				
Prisons / Other Institutions	Yes				

Code	8 Year Plan - PBWP										8 Year Plan - PBWP											
	1st Half 19'	2nd Half 19'	1st Half 20'	2nd Half 20'	1st Half 21'	2nd Half 21'	1st Half 22'	2nd Half 22'	1st Half 23'	2nd Half 23'	1st Half 24'	2nd Half 24'	1st Half 25'	2nd Half 25'	1st Half 26'	2nd Half 26'	1st Half 27'	2nd Half 27'	1st Half 28'	2nd Half 28'	1st Half 29'	2nd Half 29'
Office Bldg	\$5,000.00			\$5,000.00																		
Corrosion Computers												\$25,000.00										
Corrosion Bldg		\$10,000.00																				
Well Maintenance		\$20,000.00																				
Well Expansion / Filtration							\$175,000.00															
Tank Inspection																						
Tank Repair																						
Water Mains	\$10,000.00																					
Hydrant Replacement	\$8,000.00	\$8,000.00																				
Meter Replacement																						
New Water Source																	\$700,000.00					
Truck Replacement																						
New Water Tank							\$300,000.00															
Other Major Equip.																						
Bond / Loan Funding						\$350,000.00	\$500,000.00										\$2,550,000.00					
Total Annual Expenditures		\$61,000.00		\$5,000.00		\$525,000.00	\$800,000.00		\$0.00		\$25,000.00	\$25,000.00	\$0.00	\$0.00	\$0.00	\$3,250,000.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00

Cash Flow Estimate																						
Trustee Trust Funds / Code	1st Half 19'	2nd Half 19'	1st Half 20'	2nd Half 20'	1st Half 21'	2nd Half 21'	1st Half 22'	2nd Half 22'	1st Half 23'	2nd Half 23'	1st Half 24'	2nd Half 24'	1st Half 25'	2nd Half 25'	1st Half 26'	2nd Half 26'	1st Half 27'	2nd Half 27'	1st Half 28'	2nd Half 28'	1st Half 29'	2nd Half 29'
Balance	81,212.00	81,212.00	82,212.00	82,212.00	107,212.00	107,212.00	132,212.00	132,212.00	157,212.00	157,212.00	182,212.00	182,212.00	207,212.00	207,212.00	232,212.00	232,212.00	257,212.00	57,212.00	82,212.00	107,212.00	132,212.00	157,212.00
Funding	0.00	1,000.00	0.00	25,000.00	0.00	25,000.00	0.00	25,000.00	0.00	25,000.00	0.00	25,000.00	0.00	25,000.00	0.00	25,000.00	0.00	25,000.00	25,000.00	25,000.00	25,000.00	25,000.00
Use of funds	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	200,000.00	0.00	0.00	0.00	0.00	0.00
Water Investment Fund / Code																						
Balance	124,604.00	139,604.00	154,604.00	169,604.00	184,604.00	199,604.00	39,604.00	54,604.00	69,604.00	84,604.00	99,604.00	114,604.00	129,604.00	144,604.00	159,604.00	174,604.00	189,604.00	104,604.00	119,604.00	134,604.00	149,604.00	164,604.00
Funding	15,000.00	15,000.00	15,000.00	15,000.00	15,000.00	15,000.00	15,000.00	15,000.00	15,000.00	15,000.00	15,000.00	15,000.00	15,000.00	15,000.00	15,000.00	15,000.00	15,000.00	15,000.00	15,000.00	15,000.00	15,000.00	15,000.00
Use of funds	0.00	0.00	0.00	0.00	0.00	175,000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100,000.00	0.00	0.00	0.00	0.00	0.00
NHPDIP																						
Balance	370,313.00	405,313.00	445,313.00	480,313.00	520,313.00	555,313.00	595,313.00	630,313.00	370,313.00	405,313.00	445,313.00	480,313.00	520,313.00	555,313.00	595,313.00	630,313.00	670,313.00	305,313.00	345,313.00	385,313.00	425,313.00	465,313.00
Funding	35,000.00	40,000.00	35,000.00	40,000.00	35,000.00	40,000.00	35,000.00	40,000.00	35,000.00	40,000.00	35,000.00	40,000.00	35,000.00	40,000.00	35,000.00	40,000.00	35,000.00	40,000.00	40,000.00	40,000.00	40,000.00	40,000.00
Use of funds	0.00	0.00	0.00	0.00	0.00	0.00	0.00	300,000.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	400,000.00	0.00	0.00	0.00	0.00	0.00
Outstanding Bonds / Loans	Balance	P&I	Balance	P&I	Balance	P&I	Balance	P&I	Balance	P&I	Balance	P&I	Balance	P&I	Balance	P&I	Balance	P&I	Balance	P&I	Balance	P&I
Muni Bond - Wells	\$571,471.00	-\$89,500.00	\$481,971.00	-\$89,500.00	\$392,471.00	-\$89,500.00	\$302,971.00	-\$89,500.00	\$213,471.00	-\$89,500.00	\$123,971.00	-\$89,500.00	\$34,471.00	-\$34,471.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Muni Bond - Wells / Water Mains	\$478,000.00	-\$84,050.00	\$393,950.00	-\$84,050.00	\$309,900.00	-\$84,050.00	\$225,850.00	-\$84,050.00	\$141,800.00	-\$84,050.00	\$57,750.00	-\$57,750.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Franklin Savings Bank - Meters	\$123,108.00	-\$36,267.00	\$86,841.00	-\$37,657.00	\$49,184.00	-\$39,118.00	\$10,066.00	-\$10,066.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
Future Loan for Filtration System		\$0.00	\$0.00	\$0.00	\$0.00	\$350,000.00	-\$33,408.00	\$316,592.00	-\$33,408.00	\$283,184.00	-\$33,408.00	\$249,776.00	-\$33,408.00	\$216,368.00	-\$33,408.00	\$182,960.00	-\$33,408.00	\$149,552.00	-\$33,408.00	\$116,144.00	-\$33,408.00	-\$33,408.00
Future Water Tank on Water St.							\$500,000.00	-\$44,970.00	\$455,030.00	-\$44,970.00	\$410,060.00	-\$44,970.00	\$365,090.00	-\$44,970.00	\$320,120.00	-\$44,970.00	\$275,150.00	-\$44,970.00	\$230,180.00	-\$44,970.00	-\$44,970.00	-\$44,970.00
Future loan for New Water Source																	\$2,550,000.00	-\$163,230.00	\$2,550,000.00	-\$163,230.00	\$2,550,000.00	-\$163,230.00
Total Loan/Bonds Outstanding	\$1,172,579.00		\$962,762.00		\$751,555.00		\$888,887.00		\$1,171,863.00		\$919,935.00		\$694,307.00		\$581,458.00		\$3,053,080.00		\$2,974,702.00		\$2,896,324.00	

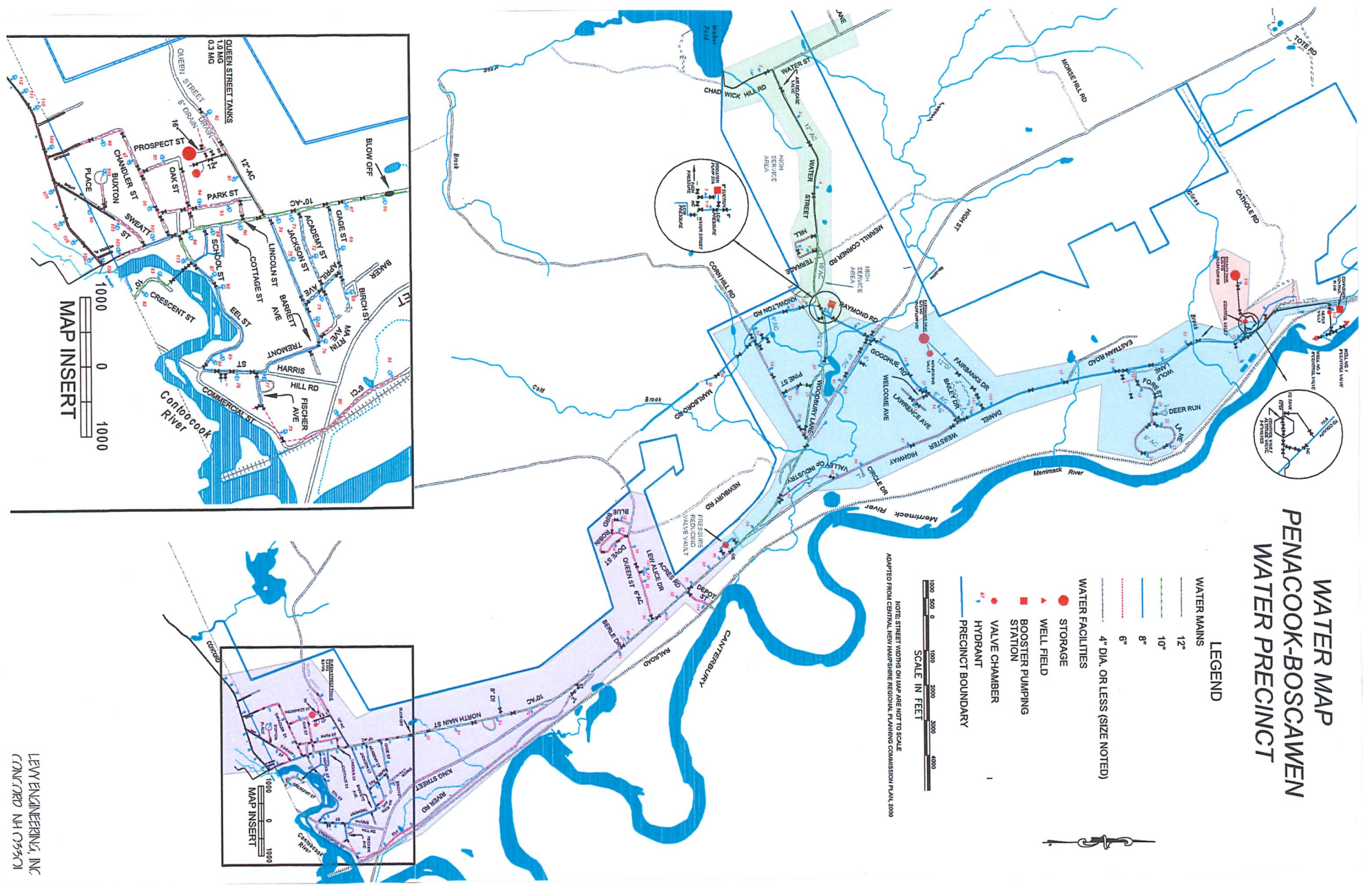
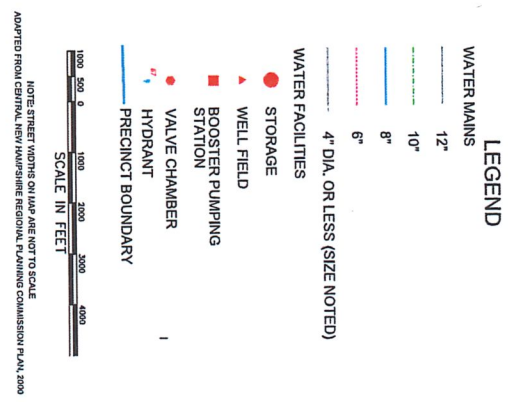
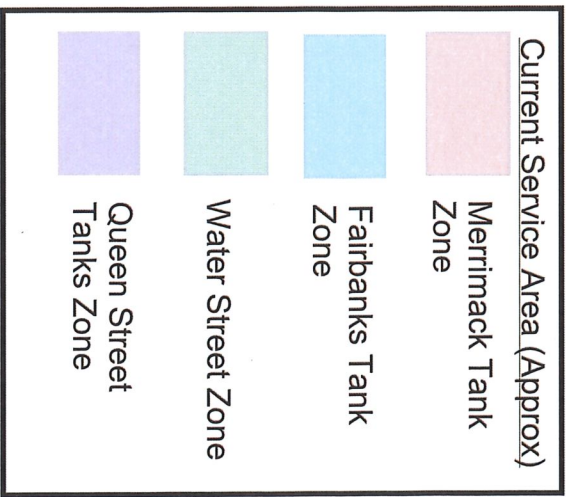
- Color Code
- Use of special funds
- Annual Budget
- Loan / Bonds

Bond / Loan Description	Rate	Variable / Fix	Adj Date	Amort	Maturity	Original Balance	Payments	Frequency	Current Balance
Well bonds : Muni Bond Bank	2.35	Fixed	N/A	\$1,419,562.00	Dec-25	\$1,419,562.00	\$91,031.00	Annual	\$734,203.00
Main and other well bonds : Muni Bond Bank	2	Var. 2% - 5%	?	\$816,000.00	Feb-25	\$816,000.00	\$42,025.00	2x Year	\$621,000.00
Meter system : FSB	3.75	Fixed	N/A	\$335,000.00	Jan-22	\$335,000.00	\$10,108.00	Quarterly	\$191,651.00
Line of Credit	P+1	Var.	?	Bal	July of each year	\$100,000	0	Monthly	0
Total						\$2,670,562.00	\$215,513.00		\$1,546,854.00

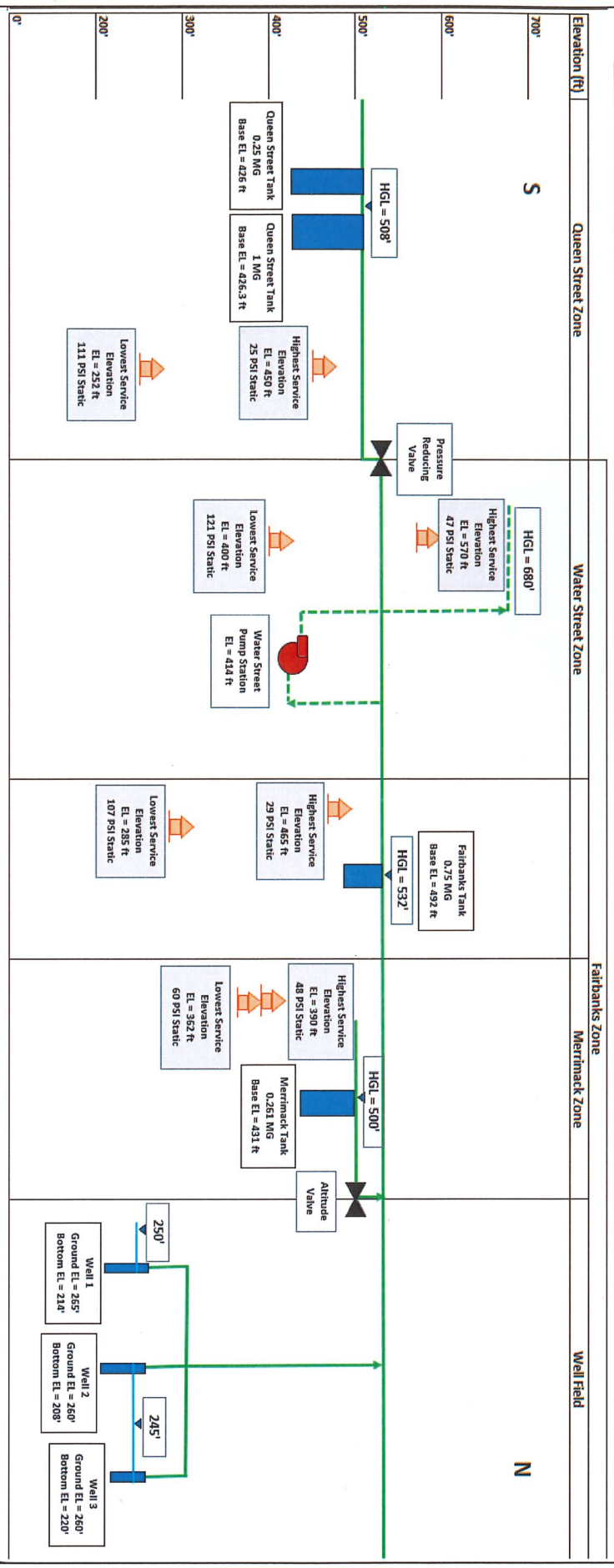
ATTACHMENT D

**HYDRAULIC PROFILE AND
PRESSURE ZONE FIGURE**

WATER MAP PENACOOK-BOSCOWEN WATER PRECINCT

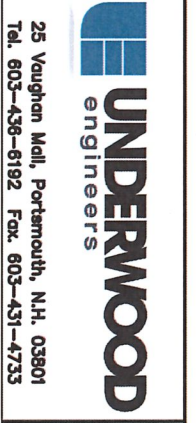


LEW ENGINEERING, INC
CONCORD, NH 03301



DATE
12/20/19

PROJECT
2490



**PBWP HYDRAULIC PROFILE
AND PRESSURE ZONES**
Boscawen, New Hampshire

FIG. 1

ATTACHMENT E

**RATE SHEETS AND
CAPITAL IMPROVEMENTS PLAN**

Schedule B-1, Fee Schedule, as amended
Addendum Schedule of Rates and Fees effective April 1, 2016
Rate Schedule

All service/labor rates based on M-F 7:00 AM to 3:30 PM. Double for other times.
Establish availability charge including 300 cf based on meter size (see below):

Base Rate	\$32 for house meter
Water Rates	\$5.92 per 100 cf
Service turn off visit	\$30 at customer request
Service turn off visit	\$30 for non-payment
Service turn on visit	\$30 at customer request
Service turn on visit	\$30 for non-payment
Frozen meter	\$200 plus cost of meter, materials and equipment, unless definitely not customer=s problem.
Collection visit fee	\$25
Late payment fee	\$10 plus interest on overdue balance. Imposed on second billing or shut off notice.
Return check fee	\$35
Final reading	\$25
Initial reading	\$30 includes setting up new account, credit check, etc.
Backflow test	\$50 - 2x year
Pool fill fr hydrant	\$50 + usual labor charges; \$100 if we furnish no labor or equipment. Charge for additional hoses.
Truck fill fr hydrant	\$35 up to 7,000 gallons, trucker supplies own equipment
Interest on past due	1 1/2% per month billed monthly
Contractor bulk use	\$50 fr hydrant
A per 100 cf	\$5.50

Rate Schedule, Cont=d.

Connection fees	Single family residence \$2000 plus expenses plus engineering fees if necessary
	2 - 3 units residence - \$1750 per unit
	4+ units residential - \$1500 per unit
	Commercial up to 1" service - \$3000 per unit
	Commercial up to 2" service - \$4000 per unit
	Commercial over 2" service - \$5000 per unit
Meter removal or reinstallation charge	Hourly rates plus materials
Meter check accuracy	N/C if fault is found w/meter; actual time if no fault is found
Locate shut off at curb	Hourly rate and costs if landscaping needs to be removed
Temp. meter deposit	\$250 to \$1500 depending on size
Labor charges	\$50 per hour for Superintendent or Assistant Superintendent (all time subject to OT charges)
	\$35 per hour for laborer
	\$35 per hour bookkeeper time reconstructing bills
Job inspection fees	\$75 per hour - engineering inspection fee if needed
Equipment charges:	Back hoe \$95 per hour
	Compressor \$30 per hour
	Light tower \$30 per hour
	Heat unit \$65 per hour
	Service truck \$35 per hour
	Pickup truck (S10) \$35 per hour
	Dump truck \$95 per hour

Schedule B-1, Fee Schedule, as amended
Addendum Schedule of Rates and Fees effective April 1, 2017
Rate Schedule

All service/labor rates based on M-F 7:00 AM to 3:30 PM. Double for other times.
Establish availability charge including 300 cf based on meter size (see below):

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Service turn off visit	\$30 at customer request
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Frozen meter	\$200 plus cost of meter, materials and equipment, unless definitely not customer=s problem.
Collection visit fee	\$25
Late payment fee	\$10 plus interest on overdue balance. Imposed on second billing or shut off notice.
Return check fee	\$35
Final reading	\$25
Initial reading	\$30 includes setting up new account, credit check, etc.
Backflow test	\$50 - 2x year
Pool fill fr hydrant	\$50 + usual labor charges; \$100 if we furnish no labor or equipment. Charge for additional hoses.
Truck fill fr hydrant	\$35 up to 7,000 gallons, trucker supplies own equipment
Interest on past due	1 1/2% per month billed monthly
Contractor bulk use	\$50 fr hydrant
A per 100 cf	\$5.50

Rate Schedule, Cont=d.

Connection fees	Single family residence \$2000 plus expenses plus engineering fees if necessary
	2 - 3 units residence - \$1750 per unit
	4+ units residential - \$1500 per unit
	Commercial up to 1" service - \$3000 per unit
	Commercial up to 2" service - \$4000 per unit
	Commercial over 2" service - \$5000 per unit
Meter removal or reinstallation charge	Hourly rates plus materials
Meter check accuracy	N/C if fault is found w/meter; actual time if no fault is found
Locate shut off at curb	Hourly rate and costs if landscaping needs to be removed
Temp. meter deposit	\$250 to \$1500 depending on size
Labor charges	\$50 per hour for Superintendent or Assistant Superintendent (all time subject to OT charges)
	\$35 per hour for laborer
	\$35 per hour bookkeeper time reconstructing bills
Job inspection fees	\$75 per hour - engineering inspection fee if needed
Equipment charges:	Back hoe \$95 per hour
	Compressor \$30 per hour
	Light tower \$30 per hour
	Heat unit \$65 per hour
	Service truck \$35 per hour
	Pickup truck (S10) \$35 per hour
	Dump truck \$95 per hour

Schedule B-1, Fee Schedule as amended

Addendum Schedule of Rates and Fees effective April 10, 2018

All service/ labor rates based on M-F 7:00 AM to 3:30 PM. Double for other times.

Established availability charge including 300 cf based on meter size (see below)

Base Rate	\$32.00 for house meter
Water Rates	\$5.92 per 100 cf
Service turn off visit	\$30.00 at customer request
Service turn off visit	\$40.00 for non-payment
Service turn on visit	\$30.00 at customer request
Service turn on visit	\$40.00 for non-payment
Frozen meter	See labor and materials
Collection visit fee	\$30.00
Late payment fee	\$10.00 plus interest on overdue balance. Imposed on second billing and shut off notice
Return check fee	\$35.00
Final reading	\$75.00
Initial reading	\$100.00 includes setting up new account, credit check, etc.
Backflow test	\$57.50 – 2X per year per D.E.S requirements
Pool fill from hydrant or	\$50.00 + usual labor charges. \$100.00 if we use no labor equipment. Extra charge for additional hoses, etc.
Truck fill from hydrant	\$35.00 up to 7,000 gallons. Trucker supplies own equipment
Interest on past due balances	1 ½ % per month billed monthly
Contractor bulk use	\$50.00 from hydrant plus metered use @ \$5.50 per 100 cf

Connection fees	Single family residence \$2000.00 plus expenses and engineering fees, if necessary
	2-3 unit residence \$1750.00 per unit
	4+ units \$1500.00 per unit
	Commercial up to 1" service \$3000.00 per unit
	Commercial up to 2" service \$4000.00 per unit
	Commercial over 2" service \$5000.00 per unit
Meter removal or reinstallation	Hourly rates plus materials
Meter check accuracy	N/C if fault is found w/ meter; time & materials if no fault is found
Locate shut off at curb	Hourly rate plus cost of landscaping or pavement repairs
Temporary meter deposit	\$250.00 to \$1500.00 depending on size
Labor charges	115% of contractor charges (actual charges determined by job title and are subject to overtime)
	115% of engineer's and inspector's charges
	\$50.00 per hour for Commissioners
	\$50.00 per hour for Bookkeeper
Equipment charges	115% of contractor or rental agency charges. Equipment charges do not include operators
Material charges	115% of actual cost, including shipping and core charges

Schedule B-1, Fee Schedule as amended

Addendum Schedule of Rated and Fees effective April 1, 2019

All service/labor rates based on M-F 7:00 am to 3:30 PM. Double for other times.

Established availability charge including 300 CF based on meter size (see below).

Base Rate	\$32.00 for house meter	
Water Rates	\$5.92 per 100CF	
Service turn off visit	\$60.00 at customer request	
Service turn off visit	\$60.00 for non-payment	
Service turn on visit	\$40.00 at customer request	
Service turn on visit	\$40.00 for non-payment	
Frozen meter	\$175.00 for meter	Plus Labor and material costs (see technician labor)
Late payment fee	\$10.00 plus interest on overdue balance. Imposed on second billing and shut off notice	
Return check fee	\$40.00	
Final reading	\$75.00	
Initial reading	\$100.00 includes setting up new account, credit check, etc.	
Pool fill from hydrant	\$150.00	
Truck fill from hydrant	\$70.00 up to 7000 gallons. Trucker supplies own equipment.	
Interest on past due balances	1.5% per month billed monthly	
Contractor bulk use	\$50.00 from hydrant plus metered us at \$5.50 per 100 CF	
Connection fees	Single family residence	\$2000.00 (WIF plus expenses, inspection and engineering fees, as necessary)
Connection fees	2-3 unit residences	\$1750.00 per unit
Connection fees	4+ unit residences	\$1500.00 per unit
Connection fees	Commercial up to 1" service	\$3000.00 per unit
Connection fees	Commercial up to 2" service	\$4000.00 per unit
Connection fees	Commercial over 2" service	\$5000.00 per unit
Water Investment Fee (WIF)	New Housing 2 bedroom	\$2500.00 plus \$500 for each additional bedroom
Meter removal or reinstallation	Hourly rate of \$100.00 per technician plus materials	
Meter check accuracy	N/C if fault is found w/meter: hourly rate of \$100.00 per technician plus materials if no fault is found	
Locate shut off at curb	Hourly rate of \$100.00 per technician plus cost of landscaping or pavement repairs	
Temporary meter deposit	\$250.00 to \$1500.00 , depending on size	
Technician labor charges	Hourly rate of \$100.00 per technician	
Inspector labor charges	Hourly rate of \$100.00 per inspector	
Engineer labor charges	Hourly rate of \$100.00 per engineer	
Commissioner labor charges	Hourly rate of \$50.00	
Bookkeeper labor charges	Hourly rate of \$50.00	

ATTACHMENT F

**AGREEMENT FOR THE OPERATION AND
MAINTENANCE OF THE PBWP**

**AGREEMENT FOR THE OPERATION AND MAINTENANCE
OF THE PENACOOK-BOSCAWEN WATER PRECINCT**

THIS AGREEMENT (the "Agreement") is made and entered into as of this _____ day of _____, 2018 by and between The Penacook-Boscawen Water Precinct, a municipal corporation in New Hampshire (hereinafter "PBWP") acting through its Board of Water Commissioners, and Pennichuck Water Service Corporation (the "Contractor"), a New Hampshire corporation, with its principal place of business at 25 Manchester Street, Merrimack, New Hampshire.

WHEREAS, the PBWP is desirous that its water supply, distribution system and billing/customer service be operated and maintained in the most efficient manner possible, while complying with all applicable Federal and State Laws; and

WHEREAS, the Contractor is in the business of operation and maintenance services for such facilities.

NOW, THEREFORE, in consideration of the mutual agreements herein contained, and subject to the terms and conditions herein stated, the parties hereto agree as follows:

1. Term

The initial term of this Agreement shall be binding upon the Parties as of the Effective Date of April 2, 2018, and expires on April 1, 2021. Upon completion of the Initial Term, this Agreement shall be automatically renewed for two (2) additional successive terms of three (3) years each (each a "Renewal Term") (the Initial Term and any Renewal Term being referred to herein collectively as the "Term"), unless either Party hereto delivers written notice to the other Party hereto of its intent not to renew this Agreement. Such notice must be delivered no later than three (3) months prior to the conclusion of the then existing Term. This Agreement shall continue during the Term until nonrenewal or termination in accordance with the provisions of this Agreement. April 2, 2021 shall be beginning of the first successive term of the additional three (3) year contract should the parties elect to extend the contract beyond the initial term.

2. Definitions

For purposes of this Agreement, the following terms have the respective meanings as set forth below:

(a) "System" means the existing PBWP water system, which includes the following assets:

- (i) Supply System (owned by the PBWP): including but not limited to all buildings, grounds, and equipment located within, or associated with, the "PBWP" wells (including assorted structures such as pump houses); all wells, and related appurtenances; and all improvements and extensions that may be made thereto.

- (ii) **Distribution System** (owned by the PBWP): including but not limited to water mains; storage tanks; service laterals; valves; valve boxes; meters; service lines; booster stations; treatment facilities; pumping stations; storage tanks and grounds; hydrants; transmission mains; standpipes and related appurtenances; and all improvements, additions, and extensions that may be made thereto.
 - (iii) **Structures and Equipment**: including but not limited to all structures and equipment associated with the System including the buildings and grounds.
- (b) **Applicable Law** means (i) any federal, state or local law or regulation having the force of law and applicable to the System, including but not limited to the Safe Drinking Water Act, the regulations of the New Hampshire Department of Environmental Services (DES), the U.S. Environmental Protection Agency (EPA); (ii) any formally adopted and generally applicable rule, requirement, determination, policy, implementation schedule or order of any governmental body having appropriate jurisdiction; (iii) any established interpretation of law or regulation of a regulatory body with jurisdiction over the System if such interpretation is documented by such regulatory body and generally applicable; and (iv) any Legal Requirement, in each case applicable from time to time to the siting, design, acquisition, construction, equipping, financing, ownership, possession, startup, testing, operation, maintenance or management of municipal water treatment and supply systems, including the System, or to the treatment, distribution or sale of drinking water.
- (c) **Good Industry Practice** means those methods, techniques, standards and practices which, at the time they are to be employed and in light of the circumstances known or reasonably believed to exist at such time, are generally accepted as good operation and maintenance practices in the municipal water treatment and supply industry as practiced in the Northeast United States region.
- (d) **Legal Requirements** means all permits, licenses, approvals, authorizations, consents and entitlements of whatever kind and however described which are required under Applicable Law to be obtained or maintained by any person with respect to the operation, maintenance, repair or replacement of the System or to the design, permitting, construction, start up or testing of any Capital Improvement, including any and all easements, permits, approvals, certifications, authorizations or consents and licenses issued by the EPA, the New Hampshire DES, or any other Federal, state or local regulatory agency.

3. Scope of Services

The Contractor will provide the following services (the “Services”) to the PBWP in compliance with Good Industry Practice and on the terms and conditions set forth in this Agreement:

- (a) Provide a Water System Operator for the System who will be responsible for the operation and maintenance of the System. The Water System Operator shall be appropriately licensed by the State of New Hampshire. The Contractor will provide a service vehicle stocked with the appropriate power and hand tools. The PBWP will be

responsible for the installation of remote monitoring equipment for Well and Booster Stations. Contractor's operating staff will be available to PBWP for emergency response and repairs. Contractor maintains a 24/7/365 Emergency Response Center at its Water Treatment Facility in Nashua, New Hampshire. The Contractor will be responsible for emergency response to the Distribution System and Supply System.

(b) Contractor shall provide the following scheduled activities for a Fixed Monthly Fee as reflected on the attached Schedule 1.

i. Water Supply Tasks:

Well Station - 3 checks per week on weekdays

Raymond Street Booster Station – 3 checks per week on weekdays

Tank inspections (4) weekly on weekdays

Treatment Building (Route 3) – 3 checks per week on weekdays

Bacteria Sampling – as required by NHDES

24/7/365 Emergency standby. Services provided in response to an emergency call out will be paid for by PBWP on a time and materials basis at the rates detailed in Exhibit A.

ii. Distribution Tasks:

Gate inspections, 20% of all gates each contract year

Hydrant Dry Checks, up to 135 hydrants per contract year

Hydrant Wet Checks, up to 135 hydrants per contract year

Distribution System Flushing – One (1) daytime flushing per year in Spring

Dig Safe, allotted 25 locations per year

Meter Reading, four per year, up to 1,200 reads per quarter

Meter Read Skips, up to 10 skips per quarterly reading

Travel Time, reporting location in Boscawen

Hydrant Painting, 50% of hydrants up to 68 hydrants per year

24/7/365 Emergency standby. Services provided in response to an emergency call out will be paid for by the PBWP on a time and materials basis at the rates detailed in Exhibit 1.

iii. Billing and Customer Service tasks per Exhibit 2

(c) Contractor shall provide the following activities on a time and material basis. The rates charged by Contractor will be those detailed in Schedule 1 of this contract:

Emergency Response

Water service turn off / turn on

Meter testing at Customer request

New Meter sets

Disconnections for non-payment

Dig Safe marking after initial 25 locations
Locating distribution gate and curb boxes
Hydrant repairs
Meter and Radio Meter Interface Units, repairs or replacements
Leak detection
Water Main and Service Repairs
Curb and Gate Box repairs.

Sending Transition letter to customers. The Contractor will help PBWP develop the transition letter to its customers. The transition letter will be mailed on or before March 15, 2018.

See attached Exhibit 1 for hourly rates. Manpower will be charged to PBWP.

Expenses incurred by Contractor for materials and subcontractor services necessary to complete any time and materials services will be marked up 35% charge for contractor oversight and administration.

(d) Reports

- (1) Records and Operating Reports: The Contractor shall maintain operating records including water treatment records and shall maintain and in a timely manner furnish to the PBWP and all required regulatory agencies any and all reports necessary to comply with the terms of any Legal Requirements related to the operation and maintenance of the System. Such reports shall be provided first to the PBWP at least five (5) days prior to their filing with any regulatory body. The Contractor shall co-sign all such reports along with the PBWP.
- (2) Monthly Reports: The Contractor shall submit monthly reports to the PBWP on operation and maintenance.

4. PBWP Responsibilities

PBWP shall:

- (a) Pay to the Contractor, on a monthly basis, the fees described in Sections 3(b) and 3(c) above within 30 days of invoice from Contractor.
- (b) Pay directly for all electrical utility and heat costs required for operation of the System.
- (c) Pay all costs including freight and miscellaneous charges for all chemicals required for operation of the Water System.
- (d) Maintain existing easements, licenses and equipment warranties for the mutual benefit of both parties, and assume the responsibility and cost to acquire such additional easements, licenses, equipment warranties and environmental permitting as may be necessary for the proper operation and maintenance of the system under the terms of this agreement. In the

event the parties disagree as to whether additional easements, licenses, equipment warranties and environmental permitting are necessary for the proper operation and maintenance of the system under the terms of this agreement, the PBWP Water Commission shall make the final decision regarding the necessity of the additional easements, licenses, equipment warranties and environmental permitting. In the event the PBWP Water Commission decides not to pursue the additional easements, licenses, equipment warranties and environmental permitting recommended by the Contractor, the Contractor shall submit in writing to the PBWP Water Commission, within 60 days of the Commission's decision a description of the activities that the Contractor cannot perform without the requested additional easements, licenses, equipment warranties and environmental permitting. The BPWP will not hold the Contractor liable for the performance of those activities detailed in the written report. The PBWP may request the technical assistance of the Contractor in the preparation of documentation necessary for application for any original or renewal permit, license or other governmental approval. Any such services shall be compensated at the hourly rate for the Contractor personnel involved, or such lump sum agreed upon by the parties hereto.

- (e) Will designate to the Contractor which BPWP Officials will be responsible for coordinating with the Contractor on receiving reports required under this Agreement. The PBWP Water Commission Chairperson will be the primary contact with the Contractor and will supervise all the operations of the Contractor.
- (f) Will purchase and ensure that all property, real and personal, be covered under an all risk peril policy to include, but not be limited to, fire and extended coverage plus vandalism and malicious mischief. The PBWP will name the Contractor as an additional insured according to its insurable interest under these policies during the term of the Agreement.
- (g) Will be responsible for: Required SDWA Water Sampling fees, (exclusive of bacteria) and Cross Connection Program.
- (h) Will plow and provide materials for the treatment of roadways and will clear snow around fire hydrants.
- (i) Will provide office space and storage areas for Contractor's supplies and equipment.
- (j) Sending Transition letter to customers. The Contractor will help PBWP develop the transition letter to its customers. The transition letter will be mailed on or before March 15, 2018.

5. General Provisions

- (a) Termination by either party. Either party to this Agreement may terminate this Agreement upon breach by the other party provided that the terminating party first provides written notice of such breach to the other party and such breach is not corrected within sixty (60) days, at which time the Agreement shall terminate. In the event of termination, the Contractor will continue to provide the current operations staffing level and all Services required under this Agreement for a period of at least sixty (60) days beyond the set date of termination at the regular contract price, as requested by the PBWP

and agreed to by the parties in writing, unless the PBWP has failed to make payments under this Agreement.

- (b) Indemnification. The Contractor agrees to, and shall indemnify and hold the PBWP, its elective and appointive boards, officers, agents, and employees harmless from any costs, expenses or liability for damage or claims for damage for personal injury, including death, claims for property damage, or regulatory non-compliance, or any fines or penalties for violations of Applicable Law to the extent that they are directly caused by or arise from the Contractor's breach of this Agreement or from the intentional, willful, or negligent acts or omissions of the Contractor or its agents, servants, employees or subcontractors under this Agreement.
 - (c) Contractor Insurance. The Contractor shall maintain, with an A-rated Insurance Company (A-M-Best) during the term of the Agreement, the following occurrence-type insurance:
 - (1) General Liability Broad Form C.G.L. to include, but not be limited to, product liability, premises operation, contractual liabilities and personal injuries - \$1,000,000 (occurrence)
 - (2) Umbrella - \$5,000,000 (aggregate)
 - (3) Auto liability with limits of \$1,000,000 (occurrence).
 - (4) Maintain workers' compensation/employer's liability policy with limits of \$1,000,000 per injury, \$1,000,000 per disease, \$1,000,000 aggregate.
- The Contractor will provide the PBWP with a certificate of insurance evidencing this coverage. A 20-day notice of cancellation shall be required prior to cancellation or material modification of any insurance. The notice shall be sent to the PBWP via certified mail, return receipt requested, addressed to the PBWP Water Commission. The PBWP shall be designated as an additional insured according to its insurable interest under these policies during the term of this Agreement.
- (d) Independent Contractor. It is understood that the relationship of the Contractor to the PBWP is that of an independent contractor and that none of the employees or agents of the Contractor shall be considered employees of the PBWP.
 - (e) Waiver. The failure on the part of either party to enforce its rights as to any provision of this Agreement shall not be construed as a waiver of its rights to enforce such provision in the future.
 - (f) Assignment. This Agreement shall not be assigned by either party nor may any duties be delegated without the prior written consent of the other.
 - (g) Equal Opportunity. The Contractor shall be an Equal Opportunity Employer and in compliance with all applicable laws relating to discrimination in employment.

- (h) Entire Agreement/Amendment. This Agreement contains the entire Agreement between PBWP and the Contractor and supersedes all previous or contemporaneous communications, representations or agreements. This Agreement may be modified only by a written amendment signed by both parties.
- (i) Entire Agreement/Applicable Law. This Agreement is executed and to be interpreted as a New Hampshire contract. If any provision of this Agreement shall be held to be invalid or unenforceable for any reason, the invalidity or unenforceability of any such provision shall not affect any of the remaining provisions of this Agreement and this Agreement shall be enforced as if such invalid or unenforceable provision had not been contained herein.
- (j) Notice. All notices shall be in writing and delivered in person or transmitted by certified mail, return receipt requested, postage prepaid.

Notices required to be given to the Contractor shall be addressed as follows:

Chief Executive Officer
 Pennichuck Water Service Corporation
 25 Manchester Street
 Merrimack, NH 03054

Notices required to be given to the PBWP shall be addressed as follows:

Penacook-Boscawen Water Precinct
 8 Woodbury Lane
 Boscawen, NH 03303

or to such other address as may be specified in a written notice provided to the other party from time to time.

IN WITNESS WHEREOF, the PBWP and the Contractor have caused this Agreement to be duly executed as of the day and year first above written.

PENACOOK-BOSCAWEN WATER PRECINCT

By _____
 Commissioner

By _____
 Commissioner

By _____
 Commissioner

CONTRACTOR:

PENNICHUCK WATER SERVICE CORPORATION

By _____
Donald L. Ware
Chief Operating Officer

**Exhibit 1
FEES**

Penacook-Boscawen Water Precinct

Fixed Monthly Fee:

The fixed monthly fee for the initial term of the contract shall be \$8,873.25.

Labor Rates

	<u>REG RATE</u>	<u>OT RATE</u>	<u>OT RATE 2</u>
FOREMAN	\$ 86.85	\$ 130.26	\$ 173.70
OPERATOR	\$ 79.90	\$ 119.85	\$159.80
UTILITY TECH	\$ 77.93	\$116.89	\$ 155.85
BACKHOE	\$ 31.08		
DUMP TRUCK	\$ 32.75		
COMPRESSOR	\$ 30.00		
SERVICE TRUCK	\$ 16.15		
FOREMAN TRUCK	\$ 24.44		

There is a 3 hour minimum for work performed at night and weekend days

Hours:

Regular Rate: Monday – Friday, Non-Holiday periods, 7:00 AM to 3 PM

OT Rate: Saturday, Sunday, Holiday periods, 7:00 AM to 11:00 PM

OT Rate 2: Monday – Sunday, 11:00 PM to 7:00 AM

Subcontractor and Materials Expense Mark ups:

A 35% charge for administration and contractor oversight will be added to all materials and subcontractor expenses incurred in the provision of services not included in the monthly fixed fee.

Annual Fee and Rate Adjustment

The Fixed Monthly Fee and the Cost Plus rates shall be adjusted on the anniversary date of the Contract by 3.0%.

Billing and Customer Service Roll-Up Fee

Should the PBWP elect to discontinue service with the Contractor, the PBWP will be charged a fee of \$5,140.00. This fee will cover the cost of Rolling-Up all Billing and Customer Service data which will be returned to the PBWP. A 90-day window will be required to Roll-Up the data.

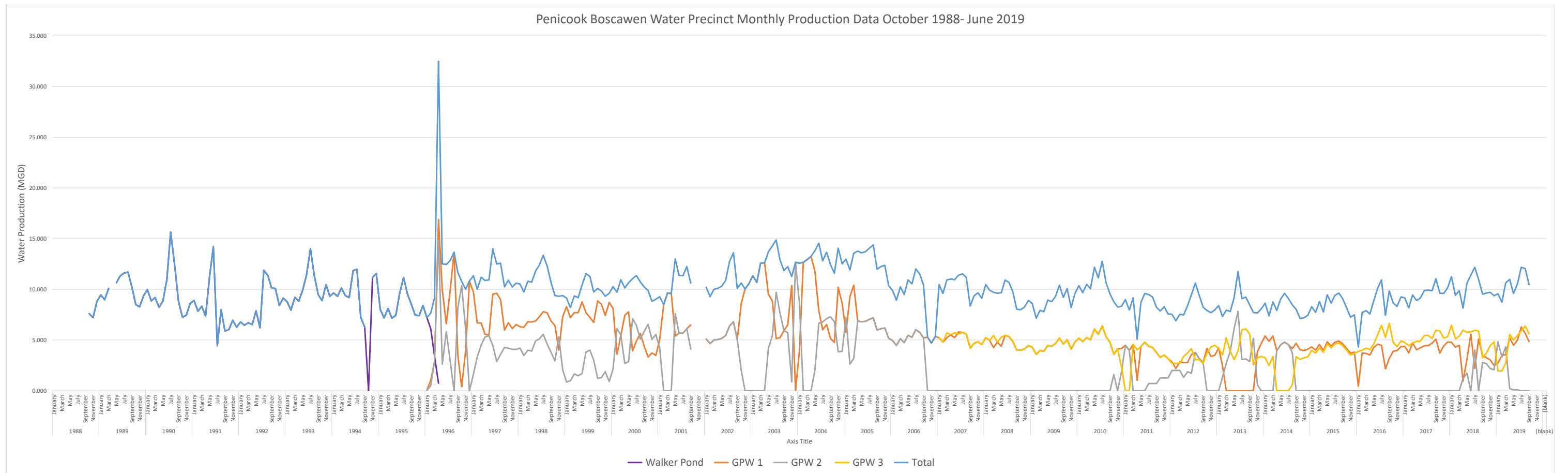
Billing and Customer Service Variable Quarterly Piece Rate Payments

- \$1.02 per piece mailed above anticipated billing volume
- \$0.29 per piece for each bill stuffer inserted with a quarterly billing

The bill for the Variable Quarterly Piece Rate will be issued with the Quarterly Fixed Fee billing and will be based on number of pieces of mail issued during the past quarter and will be payable within 30 days of the date of the billing invoice.

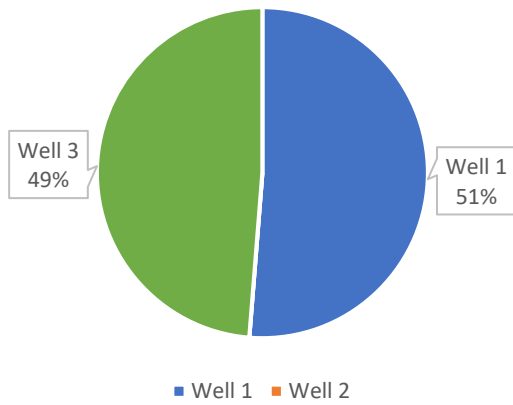
ATTACHMENT G

PRODUCTION AND USAGE FIGURES

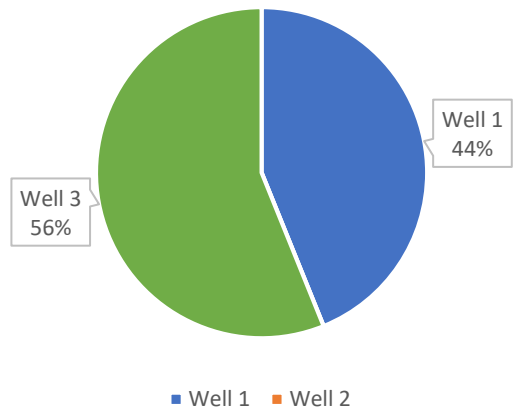


Penacook-Boscawen Water Precinct Water Production by Source

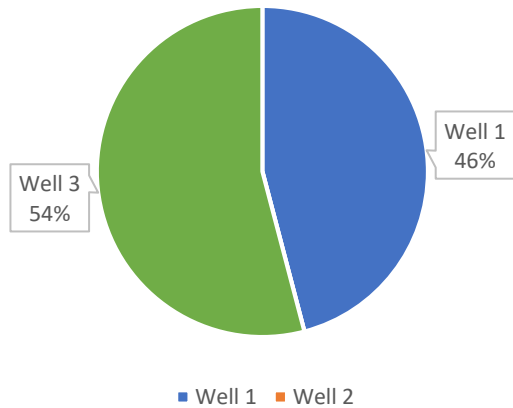
2015 PBWP Well Production



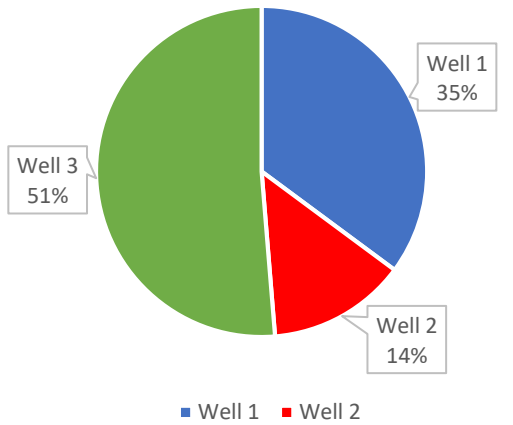
2016 PBWP Well Production



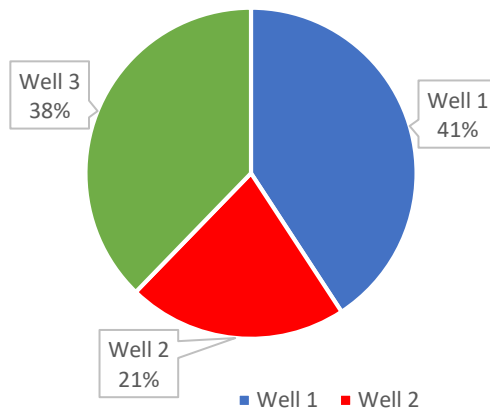
2017 PBWP Well Production



2018 PBWP Well Production

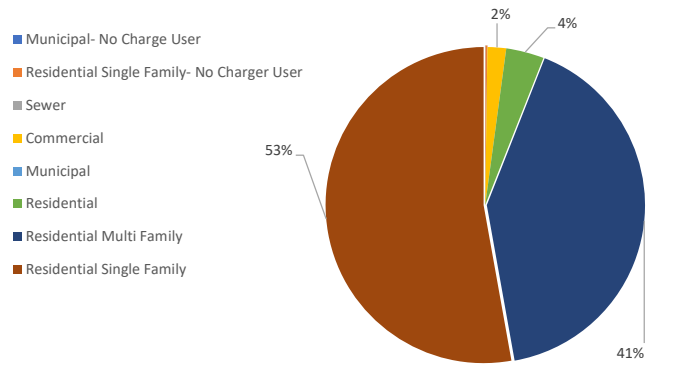


2019 PBWP Well Production

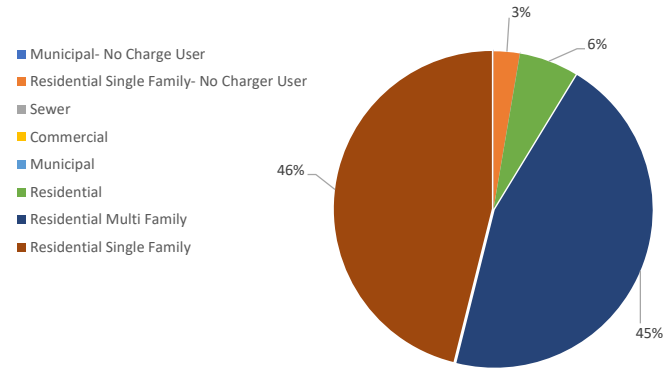


Unit: Million Gallons		No Charge Usage		Regular Usage						
Year	Quarter	Municipal- No Charge User	Residential Single Family No Charger User	Sewer	Commercial	Municipal	Residential	Residential Multi Family	Residential Single Family	Total
2018	4th	0.0075	0.049	0.0022	0.518	0	1.045	11.166	14.304	27.091
2019	1st	0.0060	0.726	0.0015	0	0	1.646	12.321	12.567	27.268
2019	2nd	0.0187	0.043	0.0015	0.553	0	1.625	2.932	15.053	20.225
2019	3rd	0.0030	0.770	0.0449	0.678	0	1.185	3.327	14.729	20.737

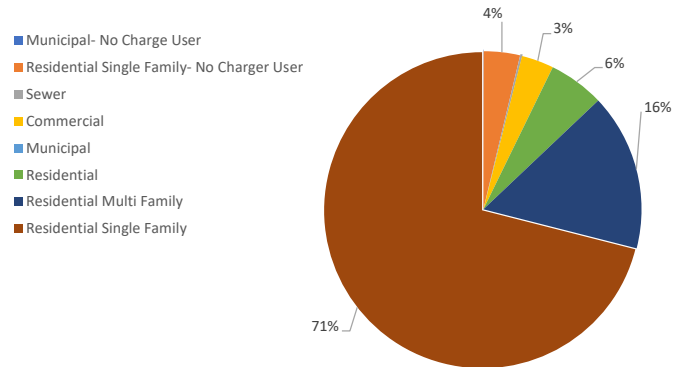
Fouth Quarter (Oct - Dec) 2018 Water Usage



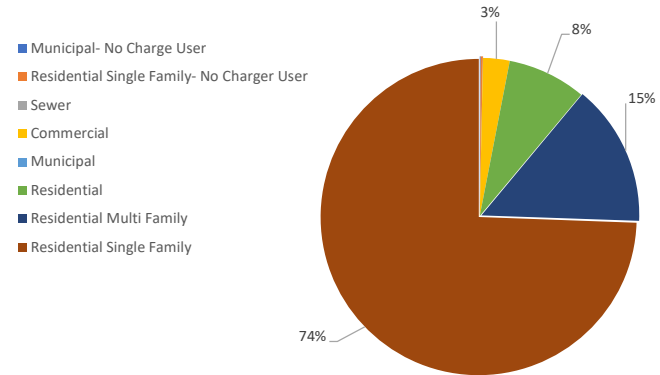
First Quarter (Jan - Mar) 2019 Water Usage



Third Quarter (Jul - Sep) 2019 Water Usage



Second Quarter (Apr - Jun) 2019 Water Usage



ATTACHMENT H

ORDINANCES AND REGULATIONS

PENACOOK-BOSCAWEN WATER PRECINCT

Rules and Regulations

Amended to: _____

PENACOOK-BOSCAWEN WATER PRECINCT
RULES AND REGULATIONS

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Rules and Regulations

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Appendices

Appendix A. Definitions

Appendix B. Rates and Fees

Appendix C. Specifications for Water Works Construction

1. Introduction.

1.1. The Precinct. The Penacook-Boscawen Water Precinct is a village precinct created in 1881 to provide water service and fire protection in portions of Boscawen and Concord, and operates with the powers and procedures established by RSA 52 and RSA 670.

1.2. Precinct Boundaries. The boundaries of the Precinct shall be as established by the Boscawen Board of Selectmen and the Concord City Council in accordance with RSA 52:1.

2. Definitions. The definition of words in Appendix A shall be applied to all use of those words in these Rules and the Appendices.

3. Precinct Meetings and Voting.

3.1. Voters. The persons eligible to vote at meetings of the Precinct shall be the persons having a domicile in the Precinct who are qualified to vote under RSA 654 and whose names appear on the Precinct's voter checklist, in accordance with RSA 670:3.

3.2. Meetings of the Precinct. The meetings of the Precinct shall be held in accordance with RSA 670 at a public place in the Town of Boscawen or City of Concord as determined by the Commissioners and stated in the notice of meeting. The annual meeting shall be held between the dates of January 1 and May 1, at such time and date established by the Commissioners. Warrants for meetings shall be posted in accordance with RSA 39:5 and RSA 52:12, in at least two public places within the Precinct, including the place of the meeting. Special meetings may be called by the Commissioners, with the additional notice by publication in a newspaper of general circulation required by RSA 39:4 and RSA 52:14.

4. Commissioners.

4.1. Powers and Duties. The governing body of the Precinct is the Board of Commissioners, which shall have the powers and duties authorized by RSA 52 and these Rules and which shall be responsible for establishing rates and fees, preparing and submitting an annual budget to the voters at the annual meeting, and conduct of the business of the Precinct.

4.2. Number of Commissioners. There shall be three commissioners.

4.3. Election of Commissioners. Commissioners are elected at the annual meeting of the Precinct for three year terms. Terms will be staggered so only one commissioner will be elected each year for a full term.

4.4. Chairman. Each year, the commissioners shall elect a chairman.

4.5. Meetings of Commissioners.

4.5.1. Location. The Commissioners may hold meetings at any suitable location within the Town of Boscawen or City of Concord.

4.5.2. Notice. Notices of meetings of the Commissioners shall be posted in at least two public locations within the Precinct, one of which shall be the Precinct's office.

5. Rules.

5.1. Rules and Appendices. These Rules are supplemented by the Appendices, as amended from time to time. All lots and structures in the Precinct and all persons accepting services from the Precinct are subject to these Rules and the Appendices.

5.2. Amendments. Any amendments made to the Rules must be approved by a majority vote of the voters at a meeting of the Precinct. Any amendments to the Appendices may be made by a majority vote of the Commissioners at any meeting of the Commissioners, provided that the notice of the meeting of the Commissioners states that a purpose of the meeting is to amend the Appendices, and a copy of the proposed amendments is made available for inspection at the offices of the Precinct at least seven days before the meeting at which the amendments are to be considered.

6. Water Service.

6.1. Eligibility for Service. Portions of Lots and structures on Lots that are located in the Precinct are eligible for water service.

6.2. Application for Service. Owners of Lots located in the Precinct may apply for water service by submitting an application for water service in accordance with the Specifications for Water Works Construction, attached as Appendix C. The Commissioners may approve applications for service upon their finding that the property or Units for which application is made are serviceable by the Precinct's water supply and facilities and any required Water Works will be constructed in accordance with these Rules.

6.3. Temporary Service. The Precinct may provide or allow provision of temporary water service to properties within the Precinct upon submission of a temporary service application. The Owner shall be responsible for all costs of the provision of water.

6.4. Limitations on Services. The Precinct may from time to time restrict or prohibit the use of water when necessary to protect the water supply, including, without limitation, restricting use of water for uses other than human consumption. No Customer may provide water service to any other Unit or property except in accordance with these Rules.

6.5. Waste. Customers shall take all reasonable steps to prevent waste of water.

6.6. Access. The Precinct and its agents and employees shall have a right of access to all properties serviced by the Precinct at all reasonable times to inspect plumbing and fixtures, to install, test, inspect, read, repair, or remove meters, to test the quantity and quality of water, and to determine compliance with these rules.

6.7. Discontinuance of Service. Customers requesting discontinuance of service or change in billing shall give at least five (5) business days written notice of the planned date of discontinuance or change, at the Precinct business office. Any Customer that fails to give the required notice shall remain liable for any water service that continues to be supplied to the property until proper notice is delivered.

6.8. Ownership. The Precinct shall own all Water Works lying within a Street to the curb-stop or to the edge of the right of way if there is no curb-stop.

6.9. Release of Liability. The Precinct and its employees and agents shall not be responsible for damages caused by the Precinct or its employees and agents for Precinct activities, including without limitation damages or inconvenience resulting from interruptions or limitations in water service resulting from (a) shortages of supply, (b) repairs, servicing, or construction of Mains or Water Works; or (c) causes not within the Precinct's reasonable control.

6.10. Standards of Construction. All Water Works shall be constructed and installed in accordance with the Specifications for Water Works Construction attached as Appendix C.

6.11. Operation of Water Works. All Water Works owned by the Precinct, including, but not limited to gates, valves, curb-stops, shut-offs, hydrants, mains, and other ancillary items installed within the distribution system, shall be operated only by authorized employees or agents of the Precinct.

6.12. Private Water Distribution Systems and Plumbing. The Precinct may decline to furnish or may discontinue water service to any Lot or Unit for which the private water system or plumbing is not in good repair and working order and does not meet standards established by these Rules or by the Commissioners for such service.

6.13. Private Fire Protection. Private fire protection systems must receive written approval by the Precinct and by the fire department in the municipality before installation, and are subject to inspection in accordance with these Rules.

6.14. Unauthorized Use. In addition to any other remedies authorized by these Rules, any use of water not authorized by these Rules shall be subject to: 1) all remedies available under law; and 2) a fee assessment equal to the charge for a minimum of thirty (30) days of use at the NHDES Daily Flow Volume in Env-Wq § 1008.03.

7. Applications for Construction of Water Works.

7.1. Approval of Construction. All Water Works construction or alteration must be approved by the Commissioners prior to commencement of construction, upon a finding by the Commissioners that the improvements are in the Precinct's best interest, will be serviceable by the Precinct's water supply and facilities, and will be constructed in accordance with the Specifications for Water Works Construction.

7.2. Application Procedure. Applications for construction of Water Works shall be filed by the owner of the property or the owner's authorized agent in accordance with the procedures described in the Specifications for Water Works Construction attached as Appendix C, on application forms established by the Commissioners.

7.3. Completed Applications. The Commissioners will only consider completed applications. To be found to be complete, an application must:

7.3.1. Comply with the requirements of the Specifications for Water Works Construction, unless waived by the Commissioners;

7.3.2. Include the application fee, which is due and payable upon submission;

7.3.3. Include any performance bond required by the Rules;

7.3.4. Include a review fee and inspection fee as established by the Commissioners.

7.4. Review of Application. The Commissioners may submit all applications and supporting materials for review to consulting engineers or such other persons as the Commissioners deem necessary, at the applicant's expense. The Commissioners may require prepayment of all estimated review and inspection fees as a condition to consideration of the application.

7.5. Decision on Application. The Commissioners shall issue a written decision on completed application, either approving, denying, or approving the application with conditions.

7.6. Construction Inspection. Construction and installation of any Water Works shall be subject to inspection by the Precinct at such intervals as the Precinct may require, the expenses for which shall be paid by the applicant.

7.7. Construction Agreement. As a condition of approval, the Commissioners may require the Owner of the land to enter into a construction agreement for construction of Water Works with such additional terms and conditions as the Commissioners deem appropriate.

7.8. Acceptance of Water Works. Upon completion of the Water Works to the satisfaction of the Commissioners, the Commissioners shall accept transfer of ownership of the Water Works to the Precinct.

7.9. Warranty. For one year following the Precinct's acceptance of Water Works, or for such longer time as the Commissioners may determine is necessary for the protection of the Precinct, the Owner shall remain obligated to repair or replace any Water Works that are not installed in accordance with the approved plans or that are defective or fail to operate in a manner acceptable to the Commissioners, and the Commissioners may require that the Owner provide security for such warranty period as a condition of acceptance.

7.10. Bonding. The Precinct may require as a condition of approval of construction or improvement of any Water Works that (i) the applicant post security for completion of the improvements and any repairs during the warranty period in the form of a self calling letter of credit from a New Hampshire bank acceptable to the Precinct or a bond or other form of corporate surety acceptable to the Precinct, in an amount at least equal to one hundred ten percent of the projected costs of completion of the improvements, and (ii) the applicant pay all of the Precinct's costs associated with the improvements.

7.11. Location of Water Mains. Unless otherwise approved by the Commissioners, Mains may be constructed only in:

7.11.1. Existing public highways maintained by the municipality, county, or state, but not limited access highways and Class III and III-a highways;

7.11.2. Private streets or other access built to standards acceptable to the Commissioners, provided that the Precinct is granted an easement for unrestricted access from a public road for repair, inspection, maintenance, and replacement of the Main and Water Works, acceptable to the Commissioners.

8. Meters.

8.1. Use of Meters. All properties or Units receiving water service must have meters that measure all water use.

8.2. Cost; Ownership. Customers shall be responsible for paying the cost of purchase and installation of any meter. Meters shall be the property of the Precinct.

8.3. Temporary Meters. The Commissioners may issue temporary meters for temporary uses.

8.4. Number of Meters. Each Unit shall have its own meter.

8.5. Installation of Meters. Meters and Meter Readers shall be installed and maintained in accordance with the Specifications for Water Works Construction described in Appendix C.

8.6. Repair of Meters and Reading Devices. Customers shall be responsible for the cost of repair and replacement of damaged meters and for notifying the Precinct of any inoperable or damaged meters or meter readers.

8.7. Meter Tampering. In addition to the Precinct's other remedies, if meters are tampered with, the Customer shall be assessed a meter tampering charge equal to the product of (a) one and one-half times the average daily billing of the last water bill known to be based on an untampered meter reading, multiplied by (b) the number of days since that meter reading; plus the expenses of re-reading, resetting, and resealing the meter and any other expenses incurred by the Precinct.

8.8. Standards for Meters and Testing. All meters must be tested before installation and shall be subject to periodic testing thereafter. The Commissioners may establish reasonable standards for meter accuracy.

9. Rates, Fees and Accounts.

9.1. Establishing Rates. In accordance with RSA 38:28, the commissioners may establish the amount of fees or rates to be charged for the types of services and expenses described below, and as specified in Appendix B, Rates and Fees, as it may be amended by the Commissioners from time to time.

9.2. Categories of Fees. Fees may be charged for the following:

9.2.1. Water Service. Each Customer shall pay a water service fees for water service provided to a Customer, which shall include a minimum water service fee plus a fee based upon the amount of water used by the Customer in the prior billing period, billed quarterly or at such other interval determined by the Commissioners.

9.2.2. Fire Protection Charge. All Lots within the Precinct containing buildings within six hundred feet of a fire hydrant shall pay a fire protection charge if the Owner does not receive water service from the Precinct.

9.2.3. Water Main Connection Fee. Any Owner of a Lot that abuts a Street in which a Main is constructed and that did not previously receive water service from the Precinct, but was not a party to the construction contract for the construction of the Main, shall pay a connection charge equal to the actual prorated per front foot cost of the Main extension, plus interest at a rate of 3% per year, at the time of connection of the Lot to the Main if the connection is made within 10 years of the start of construction of the Main.

9.2.4. Water Supply Development Fee. The Owner of each new Unit receiving water service shall pay a Water Supply Development Fee at the time of application for service or, for Units to be connected to Water Works constructed by private parties, prior to the Precinct's acceptance of the Water Works. The fees shall be kept in a separate fund, known as the Water Supply Development Account

9.2.5. Other Services. The Commissioners may offer and charge for services, including hydrant servicing and snow removal and servicing privately owned Water Works.

9.3. Funds and Accounts. The Precinct may create accounts for fees and expenses collected, which the Commissioners may expend for the costs of capital improvements and for other uses that have been properly approved at the annual meeting or a special meeting of the Precinct.

9.4. Payment Dates. Water Service fees shall be payable within thirty days of the billing date; other fees shall be payable on presentation or as the Commissioners may otherwise establish.

9.5. Remedies. In addition to any other remedies granted by law, the Precinct shall have the following remedies for nonpayment of fees:

9.5.1. Late Payment Charge. A late payment charge shall be assessed monthly at an annual rate of 15% on the unpaid balance.

9.5.2. Collection Costs. The Precinct shall be entitled to payment of all costs of collection, including the Precinct's attorneys' fees, by the Customer and any other responsible party.

9.5.3. Termination of Service. The Precinct may disconnect water service to a Customer or Unit if any fees remain unpaid for sixty days, following at least seven days written notice sent to the Customer.

9.5.4. Liens. The Precinct shall have a lien on the real estate for which any fees are payable in accordance with RSA 38:22 and may exercise any of the collection procedures provided by RSA 38:22.

9.6. Other Provisions.

9.6.1. Responsibility of Owner. Except as otherwise permitted by these rules or by law, the Owner shall be responsible for payment of all charges for water service for its property. Upon request of an Owner, and subject to the Precinct's approval, which may be revoked at any time, water service may be billed to the occupant of the property or some other person to which the services are provided, but, subject to any additional notice required by RSA 38:22, the Owner shall remain liable for any unpaid water service charges or other fees.

9.6.2. Notice. Notice given to the Owner at the address listed in the tax collector's records of the municipality in which the real estate is located shall be deemed proper notice, unless the Owner provides written notice to the Precinct of a change in address. Notice to any other occupant of any property may be addressed to the property. For Units having more than one Owner, notice to any one Owner shall be deemed notice to all of the Owners.

9.6.3. Liability of Owner. If a property or Unit has more than one Owner, all Owners are jointly and severally liable for any amounts due the Precinct, and consent by any one Owner shall be deemed consent by all Owners.

9.6.4. Mobile Home Parks.

9.6.4.1. Separate Meters. If a mobile home park owner or operator shifts responsibility for payment of water service to the tenants in the mobile home park, in accordance with RSA 205-A:6, the park owner shall remain liable for any water usage, including loss, occurring between the master water meter at the connection between the Precinct's water main to the mobile home park and the connection at each tenant's meter. The amount of water usage chargeable to the owner or operator shall be the difference between the

amount of water measured by the master meter and the aggregate water usage measured by the tenants' meters.

9.6.4.2. Merger of Mobile Home Lots. If two or more lots located within a mobile home park are merged and the water service provided to one of the merged lots had been shut off as a result of a failure to pay, then the Owner of the new lot will be responsible for payment of the outstanding balance due for any merged lot.

9.6.5. Lots Containing Multiple Units.

9.6.5.1. Apartment Buildings. For any Lot containing more than one Unit, including without limitation apartment buildings and Lots in a condominium form of ownership, in which the Units have separate meters, the owner of the Lot shall remain liable for any water usage, including loss, occurring between the master water meter at the connection between the Precinct's Main and the Lot or at a location approved by the Precinct and the connection at each Unit's meter, if the Precinct requires or permits a master meter. The amount of water usage chargeable to the Owner shall be the difference between the amount of water measured by the master meter and the aggregate water usage measured by the meters of the individual Units.

9.6.5.2. Condominiums. For any Lot in a condominium form of ownership, each condominium unit shall be separately metered. Each condominium unit shall be liable for its proportionate share of the costs of any water usage, including loss, occurring between the master water meter at the connection between the Precinct's water main to the Lot or at a location approved by the Precinct and the connection at each unit's meter that is not paid by the condominium association, if the Precinct requires or permits a master meter.

9.6.5.3. Merger of Units. If two or more Units located within a Lot are merged and the water service provided to one of the merged Lots had been shut off as a result of a failure to pay, then the Owner of the remaining or successor Lot shall be responsible for payment of the outstanding balance due for any merged Lot.

9.6.6. Water Usage Fees for Meters Servicing Multiple Customer Units. Water availability and usage fees for meters servicing more than one Customer or Unit, in accordance with Section, shall equal the sum of:

9.6.6.1. The minimum water service fee that would be charged if each Customer Unit were separately metered; plus

9.6.6.2. The water usage fee at the rate set forth in Appendix B-1, Fee Schedule, chargeable on a quantity of water equal to (1) the total water usage measured by that meter, minus (2) the product of (a) the standard base usage included in the water service fee for each Customer Unit, as set forth in the Fee Schedule then in effect, times (b) the number of Customer Units served by the meter.

9.6.7. Cost Sharing for Water Main Extensions. If, within five years after the date of the Precinct's acceptance of a Main extension or other improvement, an application is submitted for further extension of the Main, the applicant may be required to pay its proportionate share of the costs of the earlier extension, and the Commissioners may pay from any such amounts collected an equitable portion to the persons that paid for the earlier extension or improvements.

9.6.8. Appeals. A Customer may appeal any fee or rate assessed to the Customer by filing a written notice of appeal with the Commissioners within fifteen days of the date of the notice of the fee or rate, specifying the account number and property address, the date of the disputed bill, the amount of the charge, and the amount that the Customer believes is the correct charge.

10. Other

10.1. Protection of Water Works. No person shall cover or interfere with the Precinct's access to any Water Works.

10.2. Fire Hydrants.

10.2.1. Obstruction. No person shall plant or allow vegetation within five feet of any fire hydrant or allow obstructions of access to or visibility of fire hydrants.

10.2.2. Authorized Use. Only Precinct personnel or authorized municipal fire department personnel may use or access Precinct fire hydrants.

10.2.3. Cross Connection Control Program. The Precinct is authorized to enter into the Environmental Protection Agency's ("EPA") Cross Connection Control Program to ensure palatable water for customers. As part of that program, the Precinct is authorized to remain in compliance with regulations by the NHDES (Env-ws §354) available at:

<http://des.nh.gov/organization/commissioner/legal/rules/index/htm>

Customers are subject to charges for testing of devices necessary for the Cross Connection Control Program.

Penacook Boscawen Water Precinct

Appendix A

Definitions of Terms

CUSTOMER: The owner of any Lot or Unit located within the Precinct or any person or legal entity that receives any services offered by the Precinct.

COMMERCIAL UNIT: An area or portion of a structure housing a separate, independent business operation for commercial purposes, and physically separated from other commercial units that may be in the same structure or on the same Lot.

DWELLING UNIT: A room or rooms connected together, constituting a separate, independent housekeeping establishment for owner occupancy, rental or lease and physically separated from other rooms or dwelling units in the same structure, and containing independent cooking, sanitary, and sleeping facilities.

LOT: An area of land with ascertainable boundaries under the same ownership and recognized as a separate lot under the zoning ordinance of the municipality in which the land is located. For tracts of land in a condominium form of ownership, except where otherwise specified in the Rules, the Lot shall be the tract, and not the individual condominium units.

MAIN: The Precinct's primary water distribution system from which individual service connections are made to furnish water to Customers.

MULTI FAMILY DWELLING: A structure composed of two or more dwelling units.

NHDES: The New Hampshire Department of Environmental Services, a regulatory body of the State of New Hampshire.

OWNER: The person or legal entity holding the fee interest in a Unit.

PRECINCT: The Penacook-Boscawen Water Precinct, its personnel, property and defined area of jurisdiction.

SERVICE CONNECTION: That part of the water system connecting a Main with individual Units through the water meter.

STREETS: A public street maintained by the municipality, county, or state, and private roads over which the Precinct has an appropriate legal easement for access and installation, repair, and replacement of Water Works, that give access to a Lot within the Precinct, but not limited access highways or class III and III-a highways.

UNIT: A portion of a Lot that is a separate Commercial Unit or Dwelling Unit.

WATER SERVICE: The providing of water to a customer, whether or not through an individual meter, and fire protection.

WATER WORKS: All mains, service connections, valves, tanks, pump stations, hydrants, wells, and any other equipment or material used or able to be used to provide any services offered by the Precinct

Penacook Boscawen Water Precinct

Appendix B

Rates and Fees

1. Categories of Fees. Fees may be charged for the following:
 - A. Water Service. Water service fees shall be based upon the amount of water used by the Customer, billed quarterly, based on water usage in the prior three month billing period.
 - B. Fire Protection Charge. A fire protection charge will be payable for all Lots containing buildings within six hundred feet of a fire hydrant, whether or not the owner has water service from the Precinct.
 - C. Water Main Connection Fee. Any owner of a Lot that abuts a Street in which a water main is constructed, and the property owner is not a party to the construction contract, shall pay a connection charge equal to the actual prorated per front-foot cost of the water main extension, plus interest of 3% per year, at the time of connection of the property to the water main extension.
 - D. Water Supply Development Fee. The owner of each new Unit shall pay a Precinct Water Supply Development Fee at the time of application for service. The fee shall be kept in a separate fund, known as the Precinct Water Supply Development Fund, and shall be based upon an allocation of 350 gallons per residential unit for a two bedroom unit, and 150 gallons for each additional bedroom, for residential development. The fee for non-residential development shall equal the number of gallons of projected use (based on NHDES standards in Env-Wq § 1008.03, Daily Flow Volume) times \$6.00 per gallon, but in no event less than \$2,000.
2. Accounts. The Precinct may establish and maintain the following accounts for capital improvements, repairs, maintenance and other uses that have been approved at the annual meeting or a special meeting of the Precinct called for that purpose:
 - A. Water Supply Development Account. Funds in the Water Supply Development Account shall be used for development of additional water supply and related improvements for use by the Precinct.
 - B. Water Storage Account. Funds in the Water Storage Account shall be used for the maintenance, repair, improvement, replacement, or expansion of the water tanks located within the Precinct.
 - C. Waterworks Maintenance Account. Funds in the Waterworks Maintenance Account shall be used for the maintenance, repair, improvement, replacement, or expansion of Waterworks located within the Precinct, other than the water tanks.

3. Amount of Fees. The amounts of each fee shall be as shown on the attached Schedule B-1, Fee Schedule, as amended from time to time.

Penacook and Boscawen Water Precinct

Specifications for Water Works Construction

**9 Woodbury Lane
Boscawen, NH 03303**

**Phone: 603-796-2206
boscauwenwater@gmail.com**

**CONSTRUCTION OF WATER SYSTEM SPECIFICATIONS
PENACOOK AND BOSCAWEN WATER PRECINCT, NEW HAMPSHIRE**

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SECTION 1
PENACOOK AND BOSCAWEN WATER PRECINCT
WATER SYSTEM DESIGN

PART 1 GENERAL

1.1 DESIGN GUIDELINES

- A. These general design criteria are established for the design of water distribution systems in the Precinct. This portion of the document shall be utilized concurrently with the applicable sections of the Construction Standards and Technical Specifications.
- B. All design and construction drawings for water distribution systems shall comply with these standards, or the standards titled “Recommended Standards for Water Works,” established by the Great Lakes Upper Mississippi River Board of State Public Health and Environmental Managers, or the standards established by the Department of Environmental Services (DES), which ever is more stringent, unless otherwise approved by the Precinct.
- C. The Design Engineer/Developer should supply a utility construction plan submission to the Precinct in accordance with the Site Review Regulations and Department of Environmental Services Requirements. Anticipated design flow for the water system shall be based on the type of use and as determined in Env-Ws 370-372 DESIGN STANDARDS FOR WATER SYSTEMS. The plans shall be signed and sealed by a professional engineer licensed by the State of New Hampshire.
- D. The Design Engineer/Developer should obtain and submit Fire Department approval of fire protection system.
- E. Plans should show appropriate clear phase lines and match lines. Provide all applicable detail drawings. Call out interferences with conflicting pipes with indication of “over” or “under” on plan sheet.
- F. Certificates of Compliance shall be submitted by the Contractor for each material to the Precinct for review and approval. All material shall be North American, only.
- G. All design approvals shall lapse 4 years after issuance, if system construction has not been started. Systems that have begun construction, but not started operation on the 4th anniversary of the approval date, shall meet all then current design

criteria prior to startup. A new design review fee and appropriate design revision shall be required for reapproval of lapsed designs.

1.2 APPLICATION PROCEDURE AND REQUIREMENTS

- A. An owner of land which is subject to these regulations, or his agent, shall file an application with the Precinct for their review and approval pursuant to these regulations. The board will only consider completed applications. A completed application is one which shall:
1. be made on forms available at the Town/City Planning Department office and submitted at least twenty (20) days in advance of the meeting at which the board will receive the application.
 2. include the application fee which is due and payable upon submission;
 3. be accompanied by three (3) copies of the site plan and three (3) copies of each other required plan and PDF copy of all plans;
 4. be accompanied by all plans and documents required in this Section , in accordance with design requirements of this Section ;
 5. be accompanied by all formal legal instruments where required in these regulations, deeds, easements, and irrevocable offers of dedication to the Precinct of utilities in a form acceptable to the Precinct
 6. be accompanied by the performance bond where required in these regulations, in a form satisfactory to the Precinct and in an amount established by the Precinct;
 7. be accompanied by an review few and inspection fee as set by the Precinct Commissioners
- B. General Information Required to be Shown on All plans:
1. Title Block including: title of plan; owner's name and address, and that of an agent, if any; the date the plan was prepared and date of subsequent revisions; scale of the plan; and name and address, and seal of the preparer of the plan.
 2. Miscellaneous including: North arrow, Scale bar
- C. A Location Plan at a minimum scale of (1"=400') which shall show (1) property lines of the parcel to be developed; names and locations of existing adjacent streets including the nearest intersection of said streets; names and locations of existing adjacent watercourses and water bodies; assessor's lot number for the parcel to be developed and for parcels of abutters;
- D. Existing Conditions Plan; the Existing Conditions Plan shall show:
1. the property lines of the parcel to be developed;

2. the full names and addresses of all abutters as indicated in the records of the Tax Assessor not more than five (5) days before the filing of the application;
3. the location, layout, and use of existing buildings and structures, driveways, curb cuts, parking lots, and loading areas; the location, traveled way width/ and right-of-way
4. location all existing adjacent streets, as well as mapped future streets; location, width and purpose of any easements or rights-of-way;
5. the presence of Precinct, municipal and non-municipal utilities which currently serve the site, and the location of wells and subsurface waste disposal systems if not served by municipal water and sanitary sewer systems;
6. location of the boundary line of either or both districts if such lines pass through the property; the yard setbacks as required in the Zoning

E. Proposed Conditions Plan; the Proposed Conditions Plan shall show:

1. the plan shall be prepared by a registered engineer who shall sign the plan and place his seal upon it for multiple units site plans, single units shall be prepared by registered land surveyor.
2. the plan shall be prepared at a maximum scale of 1"=50' and shall show the following:(a) the proposed contours at a minimum of two (2) foot intervals and finished grade elevation (b) the proposed finished first floor elevations of all proposed buildings or building additions;
3. utility information, which may be shown on a separate copy of the site plan, and which shall include:
 - (1) the location, size and invert elevations of proposed sanitary and storm sewers including all manholes, catch basins, and culverts;
 - (2) the location and size of all proposed water mains including hydrants, gates, valves and blow offs;
 - (3) the location of any pump stations, lift stations, and other appurtenant facilities or structure; profiles or all municipal utilities;
 - (4) the location and size of all non-municipal utilities including but not limited to gas lines, electric transmission lines, telephone lines, cable television, steam mains, and fire and police alarm lines. The location of all manholes, transformers, poles, and other appurtenant facilities shall be shown.
4. final plans for approval shall be submitted in paper copy maximum sheet size 22"x 34", PDF and CAD

1.3 PRESSURE

- F. All water mains shall be sized after a hydraulic analysis based on flow demands and pressure requirements. The system shall be designed to maintain a minimum pressure of 20 psi (140 kPa) at ground level (house sill) at all points in the distribution system under all conditions of flow. The normal working pressure in the distribution system should be approximately 60 to 80 psi (410 - 550 kPa) and not less than 35 psi (240 kPa). Precinct shall determine compliance with this criteria. The following specific sill elevations apply for the minimum pressure:

Fairbank Road Service Area	445 USGS
Queen Street Service Area	415 USGS

- B. Individual booster pumps shall not be allowed for any individual residential service from the public water supply mains. Individual booster pumps shall be not used to achieve the 35 psi minimum pressure.
- C. Maximum pressure in the water distribution system shall be 100 psi.
- D. New water system may not connect to water mains 6-inch or less in diameter.

1.4 DIAMETER

- A. The minimum size of water main which provides for fire protection and serving fire hydrants shall be eight-inch diameter. Larger size mains will be required if necessary to allow the withdrawal of the required fire flow while maintaining the minimum residual pressure specified in Section 1.1
- B. Water main shall be 8, 12, 16, and 20 inch in diameter.
- C. When fire protection is to be provided, system design should be such that fire flows and facilities are in accordance with the requirements of the Precinct.

1.5 DEAD ENDS

- A. Dead ends shall be minimized by making appropriate tie-ins whenever practical, in order to provide increased reliability of service and reduce head loss.
- B. The maximum length of pipe with out a loop shall be 750 feet, unless specifically waived by the Precinct.
- C. Dead end mains shall be equipped with a means to provide adequate flushing. Flushing devices should be sized to provide flows which will give a velocity of at least 2.5 feet per second in the water main being flushed. They may be provided

with a fire hydrant if flow and pressure are sufficient. No flushing device shall be directly connected to any sewer.

- D. All mains that dead end and that are intended for future expansion shall include a line size valve and blow-off. The gate valve shall be mechanically restrained two full joints of pipe. The blow-off must be designed to be removed without interruption to service.

1.6 VALVES

- A. A sufficient number of valves shall be provided on water mains to minimize inconvenience and sanitary hazards during repairs.
- B. All distribution systems shall be valved to facilitate the isolation of each section of pipeline between intersections of the grid system. Generally, the number of valves at an intersection shall be one less than the number of pipes forming the intersection.
- C. It is the intent of this criteria to provide for the isolation of mains that serve areas containing more than 25 service connections. Valves should be located at not more (1)500 foot intervals in commercial districts and (2) one block or 800 foot intervals in other districts.
- D. Valves twelve inches and smaller shall be gate type, cast iron, resilient wedge and mechanical joints conforming to AWWA C509 latest revision as provided in the construction specifications. Valves shall be designed for a working pressure of not less than 200 psi, and each shall have the pressure rating cast into the body and manufacturer's name or initial cast into the body or bonnet. Valves sixteen inches (16") and larger shall be butterfly type, ductile iron with rubber seat and mechanical joint ends with side gear operator.

1.7 HYDRANTS

- A. Fire hydrants should be provided at street intersections and at intermediate points between intersections as recommended by the Boscawen Fire Department. Generally, fire hydrant spacing ranges from 350 to 600 feet depending on the area being served.
- B. Each fire hydrant shall be capable of delivering a flow of at least 500 gallons per minute with a residual pressure of not less than 20 psi. The hydrant system shall be designed to provide for the fire flow requirements of the Precinct and Boscawen Fire Department in conformance with current ISO ratings

- C. Fire hydrants should have a bottom valve size of at least five inches, one 4-1/2 inch pumper nozzle and two 2-1/2 inch nozzles.
- D. Hydrant drains should be plugged, unless otherwise approved by the Precinct. Where hydrant drains are not plugged, a gravel pocket or dry well shall be provided.

1.8 AIR RELIEF VALVES

- A. At points in the water main profile where entrapped air can accumulate, which may result in flow restriction, provisions shall be made to remove the air. This shall be accomplished in distribution systems by use of strategically placed fire hydrants or blow-offs. In general, air relief assemblies shall only be used at aerial crossings and other similar circumstances.
- B. Use of manual air relief valves is recommended wherever possible. The open end of an air relief pipe from a manually operated valve should be extended to the top of the pit and provided with a screened, downward-facing elbow if drainage is provided for the structure. Discharge piping from air relief valves shall not connect directly to any storm drain, storm sewer, or sanitary sewer.

1.9 VALVE CHAMBERS

- A. Wherever possible, chambers, pits or manholes containing valves, blow-offs, meters, or other such appurtenances to a distribution system, shall not be located in areas subject to flooding or in areas of high groundwater. Such chambers or pits should drain to the ground surface, or to absorption pits underground. The chambers, pits and manholes shall not connect directly to any storm drain or sanitary sewer. Blow-offs shall not connect directly to any storm drain or sanitary sewer.

1.10 INSTALLATION OF WATER MAINS

- A. Water mains shall be buried at a minimum depth of five feet six inches (5'-6") and a maximum depth of eight feet (8'-0"). In no case will the pipe depth be allowed in excess of 6-feet at water main valves.
- B. Standard fittings allowed by the Precinct include tees, reducers, crosses, and bends. There shall be no 90 degree bends.
- C. All tees, bends, plugs and hydrants shall be provided with mechanical restraint tie rods or joints designed to prevent movement. Concrete thrust blocks shall not be

allowed unless required for connection of a new water main to an existing water main.

- D. In areas where aggressive soil conditions are suspect, or in areas where there are known aggressive soil conditions, analyses shall be performed to determine the actual aggressiveness of the soil. If soils are found to be aggressive, take necessary action to protect the water main, such as by encasement of the water main in polyethylene, provision of cathodic protection (in very severe instances), or using corrosion resistant water main materials.
- E. Water mains shall be laid at least 10 feet horizontally from any existing or proposed gravity sewer or septic tank, and 25 feet from any subsoil treatment system. The distance shall be measured edge to edge.
- F. Water mains crossing sewers shall be laid to provide a minimum vertical distance of 18 inches between the outside of the water main and the outside of the sewer. This shall be the case where the water main is above the sewer. At crossings, one full length of water pipe shall be located so both joints will be as far from the
- G. When it is impossible to obtain the minimum specified separation distances, the Precinct/ DES must specifically approve any variance from the requirements. Such deviation may allow installation of the water main closer to a gravity sewer, provided that the water main is laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer at such an elevation that the bottom of the water main is at least 18 inches above the top of the gravity sewer. The sewer materials shall be water works grade 150 psi pressure rated pipe meeting AWWA standards or pipe approved by the Precinct/DES and shall be pressure tested to ensure water tightness.
- H. Other utilities, including but not limited to natural gas, storm drainage, electric, telephone, steam and cable television shall not be installed within three feet of water-mains.

1.11 WATER SERVICE CONNECTIONS AND METERS

- A. Individual service taps shall not be placed closer than thirty-six inches apart. A minimum of 24 inches must be maintained from all water main joints and appurtenances. Individual service taps shall be constructed with double strap saddles and corporation stops. Services shall not exceed 100 feet in length to the curb stop with the curb stop generally placed at the property line, at an accessible location.
- B. Services shall have a minimum of five feet (5'-6") cover. Proper sizing of nonresidential meters and services is the responsibility of the Developer or his Engineer subject to the Precinct approval. Acceptable size service pipe is ¾", 1", 1 ½", 2", 4", 6", 8", and 12". Dual metering of a single building service (i.e.) two one-

inch meters instead of one two-inch meter) shall not be permitted. Services over 50 feet in length shall be 1-inch minimum size.

- C. Construction drawings shall include a typical meter installation for each meter to be installed. Meters shall be installed in buildings. The backflow prevention device shall be installed in building, close to the meter. No taps or connections are allowed between the meter and the backflow prevention device. Curb stops shall be set in grassy unobstructed areas generally at property lines, clear from buildings, fences, shrubs, trees, fire hydrants, cable boxes, etc. Curb boxes shall be kept out of pedestrian walkways and out of driveway areas or other concrete/paved surface, unless approved by the Precinct.
- D. Meter size shall be as required by the Precinct for single residences. For water main construction in front of vacant lots, service lines shall be installed from the main to property line with a magnetic marker identifying the location of the end of the service. Service lines for existing residences shall be provided with a curb stop
- E. Meter horns shall be isolated with full open valves per the Precinct regulations and the International Plumbing Code, 2003 Edition.
- F. Precinct requires separate water services for Buildings with sprinklers. There shall be a separate valve/curb stop at the property line for each service.

SECTION 2
PENACOOK AND BOSCAWEN WATER PRECINCT
WATER MAINS AND APPURTENANCES

PART 1 GENERAL

1.01 SUBMITTAL

- A. The work of this section includes the furnishing of all labor, tools, equipment and materials and performing all operations necessary for the construction of water mains, fittings, valves, hydrants and other related items as specified herein and as shown on the drawings. All products and materials shall conform to the latest appropriate AWWA Standards and New Hampshire Department of Environmental Services requirements, and as otherwise specified hereinafter.
- B. All Projects shall be submitted by a Professional Engineer. As Builts shall be submitted by a Professional Engineer or Licensed Land Surveyor. As-builts are required for all Projects. Precinct requires three(3) sets of plans for review.

1.02 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. All pipe when shipped shall be packed and separated by wood separators such that pipe to pipe contact is prevented during transit and/or storage.
- B. The loading, trucking, unloading, and handling of pipe and appurtenant materials shall be done by the Contractor. Care shall be taken so as not to damage the pipe, appurtenant materials or the street surface. Dropping pipe, special castings, valves, hydrants, etc. directly from the trucks upon the ground will not be permitted. Suitable effective buffers or runners shall be provided. Metal chain shall not be used for lifting pipe materials. The Contractor shall be responsible for any damage done to the pipe or appurtenant materials until they are accepted in the completed work.
- C. Distribution of pipeline materials along the line of work will not be permitted, unless approved by the Engineer. The Contractor shall not obstruct driveways, sidewalks, walkways, etc., nor shall pipeline materials be placed on private property without the express written approval of the property owner.

PART 2 MATERIALS

2.01 DUCTILE IRON PIPE

- A. The Precinct requires a minimum pressure of 35 psi and a maximum pressure of 100 psi. If pressure in the Street exceeds 100 psi, the project requires pressure reducing valve structure. All ductile iron pipe shall have push-on joints, except as may be otherwise noted. Pipe shall be designed for the rated working pressure in pounds per square inch shown below and for laying condition type 2 (Flat bottom trench, backfill consolidated to centerline of pipe.) and for eight feet of earth cover. Thickness shall be as specified hereinafter. The grade of iron, from which the pipe is made, shall be 60-42-10; having 60,000 psi minimum tensile strength, 42,000 psi minimum yield strength, and 10 percent minimum elongation. Pipe shall be class 52. Pipe shall be designed for a maximum velocity of 5 feet/second.

Pipe Size	Thickness (inches)	Thickness Class	Rated Working Pressure
6"	0.31	52	350
8"	0.33	52	350
12"	0.37	52	350
16"	0.40	52	350

- N. The interior of all ductile iron pipe shall be cement lined to twice the thickness specified in ANSI A21.5 (AWWA C104) and asphalt seal coated twice. Asphalt seal-coat shall not impart taste or odor, or toxic or carcinogenic compounds to the water contained therein. Asphalt seal coat shall be a product acceptable to the National Sanitation Foundation (NSF) for use in potable water and shall be so listed in the most current NSF summary of approved products (ANSI/NSF Standard 61). The asphalt seal coat shall be applied and cured in strict conformance with the coating manufacturer's cautions and instructions. The seal coat shall be applied by the pipe manufacturer under controlled factory conditions and field application is strictly prohibited. Exterior surface of buried ductile iron pipe shall be bituminous coated. Joints shall be rubber gasketed , push-on type in accordance with ANSI A21.11 and AWWA C 111. Fittings shall be furnished with restraining devices as specified herein.

2.02 RESTRAINED JOINTS (12" Diameter and Smaller)

- A. At all pipe joints, fittings, valves, etc., and where indicated on the plans, restrained joints shall be used. Joint restraint shall be through the use of mechanical joint fittings with mechanical joint retainer glands. Mechanical joint restraint shall include a restraining mechanism which, when actuated, imparts multiple wedging action against the pipe, increasing its resistance as the pressure increases. Flexibility of the joint shall be maintained after burial. Glands shall be manufactured of high strength ductile iron

conforming to ASTM A 536-80. Restraining devices shall be of ductile iron heat treated to a minimum hardness of 370 BHN. Twist-off nuts shall be used to insure proper actuating of the restraining devices. Dimensions of the gland shall be such that it can be used with the standardized mechanical joint bell and tee-head bolts conforming to ANSI/AWWA A21.11 and ANSI/AWWA C153/A21.53. An example is the Mega Lug joint restraint as manufactured by EBAA Iron, Inc, or Superlug by Sigma Corp.

- B. An acceptable alternative will be FIELD LOK gasket system by U.S. Pipe & Foundry Co., or an equivalent push-on pipe system by Atlantic States Cast Iron Pipe Company.
- C. mechanical joint restraint devices shall be used with all mechanical joints. Glands shall be manufactured of ductile iron conforming to ASTM A 536. Restrained joints shall be used at MJ pipe joints, fittings, valves, short pieces (less than 10 feet from MJ joint), etc., and where directed by the Municipal Services, and shall be Romac "Grip Ring", "Field Lok" gasket system, or approved equal.

2.03 PIPE INSULATION

- A. Insulation for shall be 2-inch (min) thick rigid polystyrene thermal insulation in 4'X8' sheets having an R value of 10 and conforming to ASTM C 578, Type II and shall be Styrofoam HI-60 as manufactured by Dow Corning Chemical Company or approved equal.
- B. For water service line insulation, use non-absorbent pipe insulation equal to Climatube TM as manufactured by Nomaco, Inc.

2.04 FITTINGS

- A. Fittings shall be made in the USA.
- B. Fittings shall be ductile iron, with mechanical joint ends. All fittings shall be cement lined and coated inside and out, as specified hereinbefore for ductile iron pipe. Branch of tees for hydrants or stubs shall be mechanical joint anchoring tees. They shall conform to ANSI Specifications A21.53 (AWWA C153).
- C. Branch of tees for hydrants or stubs shall be mechanical joint anchoring tees. They shall conform to ANSI Specifications A21.53 and A21.11 (AWWA C153 and AWWA C111) for joints and ANSI A21.4 A and AWWA C-104 for cement lining." Fittings shall be class compatible with the pipe.

2.05 PLUGS AND/OR CAPS

- A. Furnish and install permanent pipe plugs, caps or blank flanges as shown on the drawings and/or as directed by the Engineer. The wetted surfaces of all plugs, caps, and blank flanges shall be cement coated and asphalt seal coated as specified hereinbefore for ductile iron pipe.

- B. Furnish and maintain on the project site temporary watertight plugs in the various sizes required for the water mains to be installed.

2.06 SOLID SLEEVE, FLEXIBLE AND TRANSITION COUPLINGS

- A. Solids sleeves shall be furnished and installed where shown on the drawings or wherever the intent for their use is indicated or may be required by the Engineer. Sleeve shall be cast iron with mechanical joints and complete with all accessories. Solid sleeves shall be as manufactured by Clow Corporation, or equal and shall be cement lined and seal coated as specified hereinbefore for ductile iron pipe.
- B. Flexible couplings and/or transition couplings shall be furnished and installed where shown on the drawings or wherever the intent for their use is indicated or may be required by the Engineer. Flexible couplings shall be cast iron with rubber gaskets. Bolts shall be properly spaced to insure uniform gasket compression. Flexible couplings shall be equivalent to Dresser Style 53 or 153 as manufactured by Smith Blair, or equal and shall be cement lined and seal coated as specified hereinbefore for ductile iron pipe.

2.07 VALVE BOXES AND COVERS

- A. Valves shall be provided at 500 foot intervals and at all intersections. Valve boxes shall be furnished and installed for all valves. They shall be cast iron, sliding type adjustable valve boxes, with cast iron covers. The word "WATER" shall be cast into the cover.
- B. The bell end of the lower sections shall in all cases be sufficiently large to fit over the stuffing boxes of the valves. (Operating nut shall be centered in the bell end of the valve boxes.) The smallest inside dimension of the shaft shall not be less than 5-1/4 inches. Upper section shall have a flange sufficiently strong to furnish the bearing for that section so that all weight or jolting from street traffic or the like shall not be transmitted to the valve. Each valve box, including cover shall weigh at least 100 pounds. Valve box extensions if required, shall be supplied at no additional cost to the Owner.

2.08 GATE VALVES (PIPE 12" AND SMALLER)

- A. All gate valves shall be manufactured in full compliance with the content and intent of this specification. Gate valves shall be iron body, bronze mounted, resilient wedge gate with two inch square operating nut and mechanical joint ends. Gate valves shall conform in every respect to AWWA C509. Valves shall be designed for 200 psi working and 300 psi test pressure and shall open left. Valves shall be M&H, Waterous, Mueller, Darling or approved equal.
- B. Valves shall also conform to the specifications of the AWWA as to size of stem, pitch of thread, etc. When mechanical joint ends are specified for use, the gasket seating area shall be fully machined to fixed dimensions and tolerances as per AWWA specifications.

All valves shall be provided with "O" rings. The design of the valve shall be such that the seal plate can be fitted with new "O" rings while the valve is under pressure in a fully open position.

- C. Valve interiors and exterior shall have a 100% solids thermoset or fusion bonded epoxy protective coatings, holiday-free in the waterway, which shall meet all requirements of AWWA C550. The epoxy coating shall not impart taste or odor to the water. The coating shall be a product acceptable to the National Sanitation Foundation (NSF) for use in potable water and shall be so listed in the most current NSF summary of approved products ANSI/NSF Standard 61. The coating shall be applied and cured in strict conformance with the coating manufacturer's cautions and instructions. The coatings shall be applied by the valve manufacturer under controlled factory conditions and field application is strictly prohibited.

2.09 BUTTERFLY VALVES

- A. The butterfly valve shall be manufactured in accordance with the latest edition of AWWA C504. The valve shall be lug type body with 125 lb flanged ends faced and drilled per ANSI b16.1 standard for cast iron flanges. Butterfly valves shall be used on pipe larger than 12".
- B. The body shall be one piece with wall thickness equal to or greater than ANSI class 125 lb. fittings. Body shall be Cast Iron conforming to the latest edition of ASTM A126, Class B. Steel will not be acceptable.
- C. The shaft shall be solid one piece manufactured from Type 416 Stainless Steel. Shaft shall conform with the latest edition of AWWA Class 75B.
- D. The disc shall be cast iron with a welded nickel edge. Cast Iron shall conform with the latest edition of ASTM A48.
- E. Bearings shall be bronze.
- F. Valve seat shall provide full body lining. Seat shall be manufactured from Nitrilebutadiene elastomer in accordance with the latest edition of ASTM D2000.
- G. Shaft seals shall protect the internal and external bearings. Shaft seals shall be manufactured from nitrile-butadiene elastomer in accordance with the latest edition of ASTM D2000.
- H. A manual hand wheel actuator shall be furnished by the valve manufacturer as a completely assembled and coordinated package. Valve shall open left.
- I. The valve shall be manufactured by Dezurik Co., Henry Pratt Co., or equal.

- J. Valve interior and exterior shall be painted in accordance with AWWA C504.

2.10 TAPPING SLEEVES AND VALVES

- A. Tapping sleeves and valves shall conform to the most current AWWA specifications for tapping sleeves and valves. Taps on water main shall be at least 50% smaller than the pipe with Precinct approval.
- B. Tapping sleeves shall be mechanical joint, two part castings, stainless steel, flanged on the vertical centerline, and come complete with all joint accessories. The surface area of each flange shall be thoroughly machined, and the sleeve flanges shall be fitted with lead gaskets. Each gasket shall cover the entire surface area of each joint for the full length of the sleeve. Bolts used to assemble the sleeves shall pass directly through each flange and through each gasket. Bolts shall be properly spaced to insure uniform gasket pressure and compression.
- C. Sleeve outlets shall have counterbored flanges to insure proper centering of the tapping valve.
- D. All tapping valves shall be flanged by mechanical joint. Tapping valves shall conform with the aforementioned specifications for gate valves.
- E. Prior to ordering the sleeve, the Contractor shall check the dimensions of the pipe on which the tapping sleeves are to be installed.
- F. Tapping sleeves shall be as manufactured by Ford, Cascade, Romax, or approved equal.
- G. Tapping sleeves will not be allowed on transite (AC) pipe.

2.11 HYDRANTS

- A. Hydrants shall be provided every 500 feet and at intersections with the approval of the Town of Boscawen Fire Department or City of Concord, depending on municipal boundary. Furnish hydrants of the following make and type:

Make and Model - Waterous Pacer or American Darling B84B, no hydrant drain.

Type of Thread - National Standard

No. Outlets 2 2-1/2" hose conn. 1 4-1/2" steamer conn.

Diameter Valve Opening - 5-1/4 inches (minimum)

Diameter of Barrel - 7-1/4 inches (minimum)

Hub - mechanical joint

Direction of opening - open left

Depth of Bury - 5'-6" minimum

Color - to match existing hydrants of the Owner.

- B. Hydrants shall be designed for 150 pounds per square inch working pressure and shall conform in every respect to the specifications adopted for hydrants by the AWWA. Hydrants shall be given two coats of quality paint before shipment.
- C. Hydrant barrel extensions shall be furnished and installed where directed by the Precinct. Extensions shall be as recommended by the manufacturer of the hydrant (length as indicated in the proposal) and shall include all couplings, pins, flanges, gaskets, nuts and bolts, etc., necessary to provide a complete and workable installation. If more than one type of extension is available, the Precinct shall direct the type to be provided.
- D. The exterior of the hydrant above finish grade shall be thoroughly cleaned and thereafter painted with one (1) coat of paint of a durable composition. One additional field coat of standard paint and color selected by Owner, shall be applied by the Contractor.

2.12 WATER SERVICES AND PERMANENT BLOWOFFS

- A. No water service for any building or use shall be issued until all public improvements have been substantially completed to the satisfaction of the Precinct and all fees paid.
- B. Service Pipe
 - 1 Service pipe larger than 1" diameter shall be copper tubing, Type K for buried service, and shall be American made, by a manufacturer approved by the Owner.
 - 2 Service pipe 1" or less shall be copper tube type K or 3/4" service pipe shall be plastic service tubing manufactured from high molecular weight polyethylene and shall meet the extruded materials standard as defined by ASTM D-1248. Tubing shall be 3/4" CTS service tubing. Pipe and tubing shall be made from all virgin materials and conform to product standard ASTM D-2239. Tubing shall conform to ASTM D2737, SDR 9 for potable water service, and shall be NSF approved.
- C. Service Boxes
 - 1. Service boxes shall be Erie Type pattern and shall be tar coated, cast iron, sliding type with inlaid covers. Covers shall have the word "WATER" cast in the top, and shall be held in place with bronze bolts. Shaft shall be 2-1/2 inches inside diameter with extension rods, and be the extension type extending from four (4) feet to five foot six inches (6'-0"). Service boxes shall be as manufactured by Ford, Caldwell, Pioneer Foundries, or equal.
- D. Required Brass Goods shall include Corporation Stops, Curb Stops, Misc. Couplings, and Fittings. Castings shall be sufficiently heavy to meet all service conditions without springing or leaking and be clean and free from roughness both inside and out. Waterways shall be smooth, full size and free from obstruction. All threads shall be cut sharp, clean and true.

- E. Washers shall be of cast bronze containing not less than 85 percent copper finished on both sides to true faces.
- F. Nuts shall be of commercial bronze containing not less than 89 percent copper and finished on both sides to true faces. Adjusting nuts shall also come to a true facing against bottom of the bronze washer, and proper adjustment shall be made to assure easy turning and freedom from leakage. Adjusting nuts shall be properly locked to the stop plug to avoid change in position in operation of stop.
- G. All plugs of corporations and curb stops shall be solid (except for waterway). Bronze in all plugs shall be of a composition harder than that of the body, such as ingot No. 245 Navy M metal, containing not less than 87 percent copper. All plugs shall be properly lubricated, and upon assembly bronze washers are to come to a true facing completely around bottom of curb stop body.
- H. Curb stops shall not have drains, and shall be subjected to a sustained hydraulic pressure of 200 pounds and tested in both the open and closed position. . Curb and corporation stops shall be Mueller Mark II, Oriseal, Ford Ball Valve, or equal.
- I. Corporation stops shall be New England Style and shall be Ford Meter Box Co., Inc., No. F1000, or equivalent with tapered AWWA thread (CC) inlet and compression pack joint (CPPJ) outlet. Brass shall be 85-5-5-5% and in accordance with AWWA.
- J. All brass goods shall be individually wrapped to protect threads during shipment. Corporation and curb stops shall open left, and shall be of the compression type.
- K. Compression fittings for joining copper tubing shall be Dresser Style 88, or equal.
- L. Service saddles shall be 304 stainless steel, suitable for use with ductile iron and cast iron water mains and corporation stops specified. Saddles shells shall be 304 stainless steel, fully passivated. Bolts, washers, and nuts shall be 304 stainless steel, with NC threads, Teflon coated. Gasket shall be NBR compounded for water service. Tapped outlet shall be 304 stainless steel. Stainless steel saddles shall be double bolt, Model "306", as manufactured by Romac Industries, Inc., or approved equal by Ford Meter Box Co., Cascade Waterworks Mfg. Co., or Mueller Co. Saddles shall meet all applicable parts of AWWA C800. Service saddles required for connection to AC pipe. Service saddles will be required for connections large than 1" on Ductile Iron pipe.
- M. Y-Branch connections shall have two inlets and one outlet, and be suitable for use with copper tubing. End connections shall be of the style required to complete the work. Connections shall be as manufactured by Hays, Ford or equal.
- N. Couplings for connecting copper to cast iron pipe shall be as manufactured by Ford Meter Box Company, Hays, Mueller, or equal.

- O. All permanent blow-offs shall be comprised of a 1-inch corporation cock, a 1-inch curb cock, a 4-foot length of 1-inch type K copper tubing, two (2) 1-inch elbows, a 4-1/2 foot length of 1-inch type K copper pipe, a 3/4-inch by 1-inch hose bib adapter, a 3/4-inch cap, and a cast iron gate box and cover (as specified previously).
- P. All water services shall have a water meter as required by the Precinct. All water services with greater than 60 psi of pressure shall have a pressure reducing valve (this shall be shown on the plans). Water services with sprinkler connections shall have backflow preventers.
 - 1. Backflow preventors shall be reduced pressure devices conforming to AWWA C506, and shall be acceptable to the **New Hampshire Department of Environmental Services** and by the Water Precinct.
 - 2. Backflow preventors shall be constructed of bronze, with 316 stainless steel trim including all valve seats, valve shafts. Units shall be supplied with bronze body ball valve test cocks. Units shall be suitable for continuous service at 150 psi.
 - 3. Backflow preventors shall be Watts Model No. 909 QTS, Hersey/Beeco Model 6CH, or approved equal.
- Q. All water services with in-ground sprinklers shall have a special permit from the Precinct and shall have a separate water meter. The Precinct reserves the right to limit, restrict, or disconnect any in-ground sprinkler system.

2.13 TAPE

- A. Tape shall be detectable polyethylene, suitable for burial and labeled "water" and shall be provided over all water mains and services.

PART 3 EXECUTION

3.01 INSTALLING WATER MAINS AND APPURTENANCES

- A. Pipes shall be thoroughly cleaned before being laid. Particular attention shall be paid to the proper positioning of the rubber gaskets. Under no conditions will the Contractor be allowed to "pop" the pipe home. Only approved methods such as driving the pipe home with a bar and block, by using the bucket of the backhoe to push the pipe home (utilizing a block in front of the bell to push against), or other methods as may be approved by the Engineer will be allowed. Special care shall be used in following the Manufacturer's instructions for pipe joint systems. Water mains shall be buried a minimum of 5'-6". Water mains shall be buried at a minimum depth of five feet six inches (5'-6") and a maximum depth of eight feet (8'-0"). In no case will the pipe depth be allowed in excess

of 6-feet at water main valves. Water main shall be buried a minimum of 5'-0" with permission. Water main shall be above sanitary sewer for all crossings.

- B. Temporary watertight plugs shall be utilized at the end of each working day to prevent the intrusion of silt, debris and water into the mains. When working in areas with a high potential for flooding the main from groundwater, streams, storm drains, sewers or other water mains, or as directed by the Engineer, temporary plug shall be provided on each pipe length.
- C. In the event of flooding of the main, all pipe laying shall cease until the mains have been thoroughly cleaned and observed by the Precinct or their representative.
- D. When joined together, pipes shall form a smooth continuous line and grade on straight sections of the road and on curved sections (both vertical and horizontal) shall have uniform deflections within the required limits and conforming in general to the line and profile of the adjacent roads. Location of rubber rings shall be determined with a checking gauge before backfilling the pipe.
- E. Pipe shall be joined and laid in accordance with the manufacturer's latest published instructions and AWWA C600 for Gray and Ductile Cast Iron Water Mains and Appurtenances,
- F. Pipe shall not be laid with deflection of more than one-half the maximum deflection as recommended by the manufacturer.
- G. Backfill shall be placed on both sides of the pipe and compacted simultaneously with approved tamping bars for the full length of pipe. Bell or coupling holes shall be excavated as necessary to ensure that the pipes and not the pipe bells or couplings are bearing the weight of backfill and the traffic load.
- H. Pipe shall not be laid in areas where excavation has been carried below trench grade, or where water conditions create unstable bottoms, until the trench is excavated, refilled and compacted to the satisfaction of the Engineer.
- I. Bells or other joints shall not be installed directly under existing utilities or structures. Use short or random lengths to avoid such conditions.
- J. The requirements of the State of New Hampshire, Department of Environmental Services, Water Supply Statutes (1992) in relation to water mains to sewer mains shall apply as required.

3.02 INSULATION

- A. Where pipe has less than 5-foot cover, the pipe shall be insulated with materials as specified.
- B. Water mains shall be insulated in two layers with staggered joints. The minimum width shall be three feet, or greater if directed by the Engineer. The surface for installing the insulation shall be level and well compacted. Backfill material shall consist of 6-inches of trench sand below and above the insulation board.
- C. Each service line exposed shall be completely encased in insulation. The slit side of the insulation shall be located at the bottom of the service pipe.
- D. When either new or existing water mains are located within 5 feet of manholes, catch basins or other pipes, or where the main has insufficient cover, the Contractor shall install a protective layer of insulation as specified under Item 2.07 of this Section.

3.03 MECHANICAL JOINTS

- A. Mechanical joints shall be an approved type with the required joint accessories, gaskets, cast iron follower glands with drilled bolt holes, cast iron teehead bolts, hexagonal nuts, etc. Torque wrenches shall be used to take up the joints. Wrenches shall be equipped with adjusting breakable tension gauge, set to break the tension at the tension loading recommended by the manufacturer.
- B. Mechanical joints shall be made to secure tight joints. Every means shall be taken to secure this result. Where required, joints shall have a deflection of not more than onehalf the recommended maximum deflection allowed by the standards of DIPRA.

3.04 FLANGED JOINTS

- A. Flanged joints shall be Class 125 drilled in accordance with ANSI Specification B16.1, with the required joint accessories, gaskets, bolts, hexagonal nuts, etc. Torque wrenches shall be used to take up such joints. Wrenches shall be equipped with adjusting breakable tension gauge, set to break the tension at the tension loading recommended by the manufacturer.
- B. Flanged joints shall be made to secure tight joints. Every means shall be taken to secure this result.

3.05 CUTTING OF PIPE

- A. All cuts of ductile iron pipe shall be made with either an electric, pneumatic, or gasoline driven power saw. Blades shall be carbide tipped for cutting cement lined ductile iron pipe. Hydraulic cutters may be used for cutting cast iron pipe, provided the cement lining

is not damaged by this method. Steel saw blades and abrasive disks may be used to cut PVC pipe.

- B. When lengths of ductile iron pipe are field cut to provide for short lengths, the outside of the cut ends shall be tapered back about 1/8 inch at an angle of 30 degrees with the centerline of the pipe, before field cut pieces are used in the push-on type joints.
- C. All PVC pipe to be cut shall be marked around its entire circumference prior to cutting, to assure a square cut. Use a factory-finished beveled end as a guide for proper bevel angle, depth of bevel, and correct distance to the insertion reference mark. The end may be beveled using a pipe beveling tool or a wood rasp capable of cutting the correct taper. A portable sander or abrasive disc may also be used to bevel the pipe end. All sharp edges on the leading edge of the bevel shall be removed.

3.06 PROCEDURE FOR INSTALLING TAPPING SLEEVES AND VALVES

- A. Pipe upon which a tapping sleeve is to be installed shall be thoroughly cleaned of all foreign matter with scraping tools and wire brushes, a minimum of six (6) inches each side of the sleeve. The interior surface of the sleeve shall be lightly dusted with calcium hypochlorite powder at the rate of approximately 150 mg per square foot of surface area.
- B. Clean the flanged surface of the sleeve with a wire brush to remove any excess bituminous coating or burrs. The two sections of the sleeve shall be lined up, with great care being taken to ensure that they are positioned in the same manner as received from the manufacturer.
- C. Sufficient blocking and wedges shall be used to secure the sleeve once it has been leveled and positioned.
- D. Sleeve bolts shall be alternately tightened from the extreme end on one side to the extreme of the opposite side with approved torque wrenches until all are securely tightened.
- E. Flange bolts shall be tightened in a similar manner, with care being taken not to disturb the gasket.
- F. Joints shall be poured in accordance with the procedures noted previously, under this section.
- G. Take care to ensure that the tapping machine is kept in leveled horizontal position and securely supported so as not to transmit any additional weight to the tapping valve.
- H. Blocking shall be left in place after completing the tap.

3.07 HYDRANT BRANCHES

- A. Furnish and install hydrants on hydrant branches where shown on the drawings or where directed by the Engineer. Each branch shall consist of a valve anchoring tee, 6-inch gate valve (mechanical joint) and one 6-inch ductile iron, mechanical joint nipple of the required length. The base of the hydrant shall be set on a concrete pad where required. Hydrants shall be restrained with bitumastic coated thrust rods. Hydrant barrel extensions shall be installed where necessary to provide a hydrant elevation acceptable to the Engineer.
- B. Following final project cleanup, all hydrants shall be given one field coat of paint, which shall be compatible with, and match the type and color given by the manufacturer (to match existing system hydrants).

3.08 REMOVING AND STACKING EXISTING HYDRANTS

- A. Where shown on the drawings and/or directed by the Engineer, and after new hydrants have been installed and tested, remove existing hydrants and stack them at a location selected by the Owner within the municipal limits. Prior to removing any existing hydrants, the Contractor shall notify the Local Fire Department and coordinate this work with that agency.
- B. For each hydrant to be removed and stacked, the Contractor shall close existing branch valve, restrain valve if necessary, cut and cap existing branch, remove gate box, and remove hydrant. Any hydrant which the Owner decides not to accept shall be disposed of by the Contractor at no additional cost.
- C. Where shown on the drawings and/or directed by the Engineer, remove existing hydrants and reinstall them at locations designated by the Engineer. Prior to incorporating such hydrants into the work, they shall be refurbished and repaired to the satisfaction of the Engineer. Inspection and repair of existing hydrants shall be performed in accordance with the applicable procedures described in AWWA Manual M17, including (but not limited to) replacement of all gaskets, packing, seals and any other parts which show indication of wear, corrosion or incipient failure. Reinstallation of existing hydrant shall be performed with materials, and in the manner specified in paragraph 3.09.

3.09 CONNECTIONS TO EXISTING MAINS

- A. At least eight (8) hours prior to connecting to any existing water main, the Contractor shall notify the water department. At no time shall the contractor operate any existing system valve. All such operations shall be performed by water department personnel. Prior to connecting or disconnecting any fire sprinkler service line, the Contractor shall notify the fire department, water department and a responsible party at the building(s) being serviced by the line.

- B. Make all taps, (wet) into the various water pipes, and install the required sleeves, tees, couplings, adaptors, reducers, pipe nipples, jointing materials, and other fittings which may be required and make all joints watertight, as shown on the drawings or as specified herein, and do whatever work is shown or intended to be done in order to make complete and effective connections to existing water mains.
- C. The cutting, removal, plugging, and bracing of parts of the existing water mains made necessary by this work, and the shutdown of the existing water system, and subsequent pumping, hand excavating and whatever time that may be required by the Owner to notify customers of discontinuation of water service, time required to effect tight closures of existing valves, and any reasonable changes that may be required by the Engineer, or any other work done hereunder shall be considered as an obligation of the Contractor to complete the work. No additional compensation will be made for such work, other than that directly covered by the applicable bid items listed in the proposal.
- D. The work shall be coordinated with the Owner and such connections that may be required shall be made at such times and in such a manner as to cause as little interference in water service within the existing system as practicable.

3.10 RESTRAINED JOINTS

- A. Restrained joint fittings shall be installed according to manufacturer's recommendations.

3.11 CONCRETE THRUST BLOCKS AND FRICTION CLAMPS

- A. Furnish and place cement concrete in such locations and quantities as allowed by the Precinct.
- B. Concrete shall be of proportions, 1 part cement to 2 parts sand and 4 parts coarse aggregate, as approved by the Engineer.
- C. Care shall be taken to ensure that all concrete thrust blocks bear against undisturbed trench walls, and not to encase flanges and bolts on mechanical joint fittings.
- D. Thrust block bearing areas and volumes shall conform to the minimum dimensions found in the "Thrust Block Sizing", for the various soil and fitting types noted. Where unsuitable bearing material is encountered, the Contractor shall excavate and place sufficient concrete ballast, to offset the anticipated thrusts. Plate provided on request.
- E. Precast thrust blocks may only be used for hydrant installations when authorization is obtained from the Precinct or their Engineer.
- F. Thrust rods shall be used in conjunction with concrete thrust blocks for each hydrant installation or as otherwise directed by the Engineer.

- G. Friction clamps and thrust rods shall be installed in accordance with the manufacturer's instructions, as directed by the Engineer. All exposed rods shall be coated twice with asphaltum after installation.

3.12 PIPE BLOCKING

- A. Where required due to condition of the trench bottom, blocking shall be used as directed by the Engineer. Blocking furnished by the Contractor shall be new spruce plank 1-inch and 2-inches in thickness. Blocks shall be bedded firmly and level across the bottom of the trench. When any block has been sunk too deeply, additional blocking of suitable thickness shall be placed to bring the pipe to the required grade. Blocks shall be placed at a point 1/5th of the span from each joint. Each block shall be 2 inch X 4 inch, with a length of four (4) inches larger than the diameter of the pipe. A sufficient quantity of wedges 12-inches long of 4 inch x 4 inch fir shall be furnished to properly hold gates and special castings in place; a new 4 inch x 4 inch timber shall be used to properly brace hydrant posts.

3.13 VALVE BOXES

- A. Valve boxes shall be cut with a wheel cutter, if it becomes necessary to cut them to adjust for height.
- B. Valve boxes shall be properly centered and plumbed over the operating nuts of valves and adjusted to the proper height to correspond to the finished street or ground surface.

3.14 SERVICE CONNECTIONS AND PERMANENT BLOW-OFFS

- A. All services shall be connected to the new main as directed by the Owner, the Engineer, and as specified herein. Services shall be connected after the new main has been tested, chlorinated and approved for service. The work shall be scheduled and executed to result in a minimum disruption of service to water customers.
- B. Only "wet taps" shall be made into new water mains unless specifically authorized otherwise by the Engineer. Corporation cocks, water service pipe, new curb cocks (if required), new service boxes (if required), fittings, etc., shall be installed, and all joints shall be made water tight. Services shall be installed to the limits and at locations directed by the Engineer, utilizing to the fullest the existing materials.
- C. Prior to excavating for the service connections, all sod on established lawns shall be stacked. Shrubs, hedges, fences, trees, etc. that may require removal, or are damaged by construction operations, shall be removed and replanted and/or replaced.
- D. The Contractor shall install Service pipe beneath paved surfaces and sidewalks wherever possible, by jetting, jacking, boring or pulling the existing service pipe. Breaking up of

existing pavement will not be permitted if jetting, jacking, boring, or pulling the pipe is possible.

- E. Equipment with pneumatic tires shall be used to excavate and backfill within a paved road surface of an established lawn. Excavation, backfilling and disposal of materials shall be done in accordance with the provisions of Section Earthwork.
- F. Water mains shall be tapped in accordance with the manufacturer's latest published recommendations, i.e., depth of tap, number of threads exposed, allowable sizes, etc., and the Contractor shall adhere strictly to these recommendations. The Contractor shall be held responsible for all subsequent leaks or failure of the taps for one year from the date of final acceptance of the project and he shall make all necessary repairs that may be required during this period.
- G. Drills and/or taps shall be inspected frequently for signs of wear, and in general the Contractor shall not exceed the number of taps specified by the manufacturer before reconditioning or replacement. Service pipe shall be cut only with approved wheel cutters.
- H. Service pipe shall be laid to a minimum depth of five feet (5'-0") and laid in a straight line wherever practicable to the structure to be serviced or to the point of termination of existing service. All service pipe shall be insulated regardless of depth.
- I. The Contractor shall excavate at the existing water main and shut off all old corporations that are to be abandoned.
- J. Where required, the Contractor shall flush all new services before connecting to the existing water service. The Contractor shall also assist Water Department personnel in flushing service lines if sediment or debris from existing mains plugs piping or meters, as a result of the work under this contract.
- K. The Contractor shall furnish and install all required brass goods to connect to existing service pipes on the customer side of curb stops.

3.15 ABANDONED VALVE BOXES

- A. Upon completion of all work and testing and chlorinating of the proposed mains, the Contractor shall, with the assistance of the water department personnel, close all existing valves on mains which have been cut and capped and/or are no longer in service. After closure, the valve box shall be removed or filled with gravel and capped with grout prior to repaving.

3.16 FLUSHING

- A. All new water mains, and existing water mains that have been drained and cut-into for making connections, shall be thoroughly flushed prior to pressure or leakage testing or final chlorination. Each section of main shall be slowly filled with water. Flushing shall be accomplished by partially opening and closing valves, hydrants, and blowoffs, etc., several times, under expected line pressure, with flow velocities of not less than 2.5 feet per second, in the main(s)

3.17 PRESSURE TESTING

- A. All new water mains, or any valved sections thereof shall be subjected to a hydrostatic pressure of at least 1.5 times the working pressure that will exist at the point of testing, or 200 psi, whichever is greater. All pressure and leakage testing must be done in accordance with AWWA C 600.
- A. Test Pressure Restrictions. Test pressures shall:
 - 1. Be of at least 2-hour duration.
 - 2. Be not less than 1.25 times the expected system working pressure at the highest point along the test section.
 - 3. Not exceed pipe or thrust-restraint design pressures.
 - 4. Not vary by more than ± 5 psi for the duration of the test.
 - 5. Not exceed 2-times the rated pressure of the valves or hydrants when the pressure boundary includes closed gate valves or hydrants. Note: Valves shall not be operated in either direction at differential pressure greater than the rated pressure.
- B. Air Removal
 - 1. Following flushing, and before applying the specified test pressure, air shall be completely expelled from the pipes, valves, and hydrants. After all air has been expelled, the air blowoffs can be closed, and the test pressure applied.
- C. Pressure Test
 - 1. Each valved section of pipe shall be slowly raised to the specified test pressure for two separate periods. The first period shall be for 15 minutes, after which the pressure in the main(s) shall be allowed to drop slowly back to system pressure. The pressure shall then be slowly raised again to the specified test pressure and maintained for 2.5 hours. The test pressure, as defined in Article 3.03 and Paragraph 3.03A above, shall be based on the elevation of the lowest point of the pipe, or section under test, and shall be corrected to the elevation of the test gauge, as directed by the Municipal Services. The test pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Municipal Services, and which will prevent any backflow into the existing system. Valves shall not be operated in either the closing or opening direction at differential pressure greater than the rated pressure.

D. Examination

1. Any exposed pipe, fittings, valves, hydrants and joints shall be carefully examined during the test. Any damaged or defective pipe, fittings, hydrants, or valves discovered following, or as a result of the pressure test shall be repaired or replaced with sound material. If faulty materials are removed and replaced, the pressure test(s) shall be repeated until satisfactory to the Municipal Services.

3.18 LEAKAGE TEST

- A. The leakage test shall be conducted concurrently with the pressure test.

1. Leakage Defined

- a. Leakage shall be defined as the quantity of water that must be pumped into the new main, or any valved section thereof, to maintain pressure within 5 psi of the specified test pressure, after the main(s) have been filled with water and all air has been expelled. Leakage shall be recorded to the nearest one-tenth of a gallon, by means of a calibrated test meter. If allowed by the precinct, drawdown may be measured in a calibrated barrel. All records and charts shall become the property of the precinct. The Contractor shall employ qualified personnel throughout the testing. Leakage shall not be measured by a drop in pressure over a period of time.

2. Allowable Leakage

- a. No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{SD(P^{0.5})}{133200}$$

where

L = allowable gallons of leakage per hour

S = the length of pipe tested, in feet

D = the nominal pipe diameter in inches

P = the average test pressure during the test, in psi

- b. This formula is based on the allowable leakage of 11.65 gallons per day, per mile of pipe, per inch, (nominal) of pipe diameter, at a pressure of 150 psi. Allowable leakage at various pressures, for various pipe diameters is shown in Table 2.

TABLE 2

ALLOWABLE LEAKAGE PER 1,000 FEET OF PIPELINE*
NOMINAL PIPE DIAMETER - IN.

Average Test Pressure psi	6		8		10		12		16		20		24		30	
	450	0.95	1.27	1.59	1.91	2.55	3.18	3.82	4.78							
400	0.90	1.20	1.50	1.80	2.40	3.00	3.60	4.50								
350	0.84	1.12	1.40	1.69	2.25	2.81	3.37	4.21								
300	0.78	1.04	1.30	1.56	2.08	2.60	3.12	3.90								
275	0.75	1.00	1.24	1.49	1.99	2.49	2.99	3.73								
250	0.71	0.95	1.19	1.42	1.90	2.37	2.85	3.56								
225	0.68	0.90	1.13	1.35	1.80	2.25	2.70	3.38								
200	0.64	0.85	1.06	1.28	1.70	2.12	2.55	3.19								
175	0.59	0.80	0.99	1.19	1.59	1.98	2.38	2.98								
150	0.55	0.74	0.92	1.10	1.47	1.84	2.21	2.76								
125	0.50	0.67	0.84	1.01	1.34	1.68	2.01	2.52								
100	0.45	0.60	0.75	0.90	1.20	1.50	1.80	2.25								

* If the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.

- 1) When testing against closed metal seated valves, an additional leakage shall be allowed per closed valve, of 0.0078 gallons per hour, per inch of nominal valve diameter.
- 2) When hydrants are in the test section, the test shall be made against the closed hydrant(s).
- 3) Zero leakage will be allowed on bridge crossings or jackings or borings.

3. Acceptance

a. Acceptance shall be determined on the basis of allowable leakage. If any test of pipe discloses leakage greater than that specified above, the Contractor shall, at his own expense locate and make repairs as necessary until the leakage is within the specified allowance.

- 1) All visible leaks are to be repaired regardless of the amount of leakage.
- 2) All water mains shall be pressure and leakage tested in the presence of the Municipal Services, in order to qualify for acceptance.

3.19 CHLORINATION OF NEW MAINS

- A. All water mains greater than two inches in diameter must be disinfected. Disinfection shall be in accordance with the American Water Works Association (AWWA) standard C651(Disinfecting Water Mains). The contractor will use a liquid disinfectant to clean the pipeline. The chlorine solution shall remain in the pipeline a minimum of 24 hours.
- B. Standard Conditions: After final flushing and before the water main is placed in service, a sample or samples shall be collected from the end of the line, shall be tested for bacteriological quality in accordance with Standard Methods, and shall show the absence of bacteria. Samples shall be collected a minimum of 16 hours after the replacement water has occupied the water main.
- C. Samples for bacteriological analysis shall be collected, in the presence of the Precinct representative, in sterile bottles treated with sodium thiosulfate as required by Standard Methods. No hose or fire hydrant shall be used in collection of samples. A corporation cock shall be installed in the main with a copper tube gooseneck assembly. After samples have been collected, the gooseneck assembly may be removed and retained, by the Contractor for future use.
- D. The Contractor shall deliver samples to the Department of Environmental Services (NHDES) laboratory, or other approved laboratory by the Precinct for bacterial analysis. Only after the samples are approved shall the mains be incorporated into the water system. In the event, that positive reports of contamination are received, the mains shall be flushed and chlorinated as many times as may be necessary to obtain approved (negative) results.

END OF TEXT

6" COMPACTED LOAM
AND SEED, MOUNDED 6"
ABOVE EXIST. GRADE

CROSS-
COUNTRY

PAVED
SURFACE

WEARING SURFACE AND BASE
COURSES AS PER
SPECIFICATIONS AND TYPICAL
ROADWAY SECTION OF
TOWN/CITY.

EXIST. GRADE

DETECTABLE LOCATER
TAPE OVER WATER

SUB-BASE
PER TOWN OR
CITY STANDARD

BACKFILL MATERIAL

WOOD SHEETING AS
REQUIRED

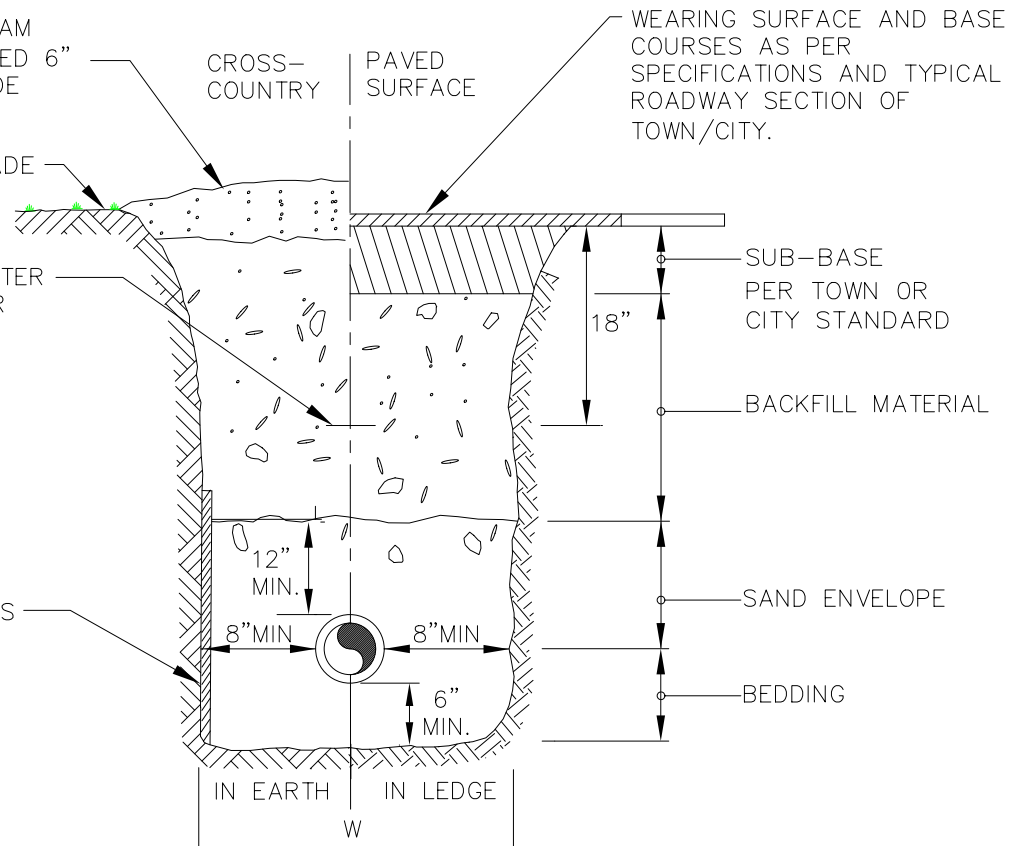
SAND ENVELOPE

BEDDING

IN EARTH

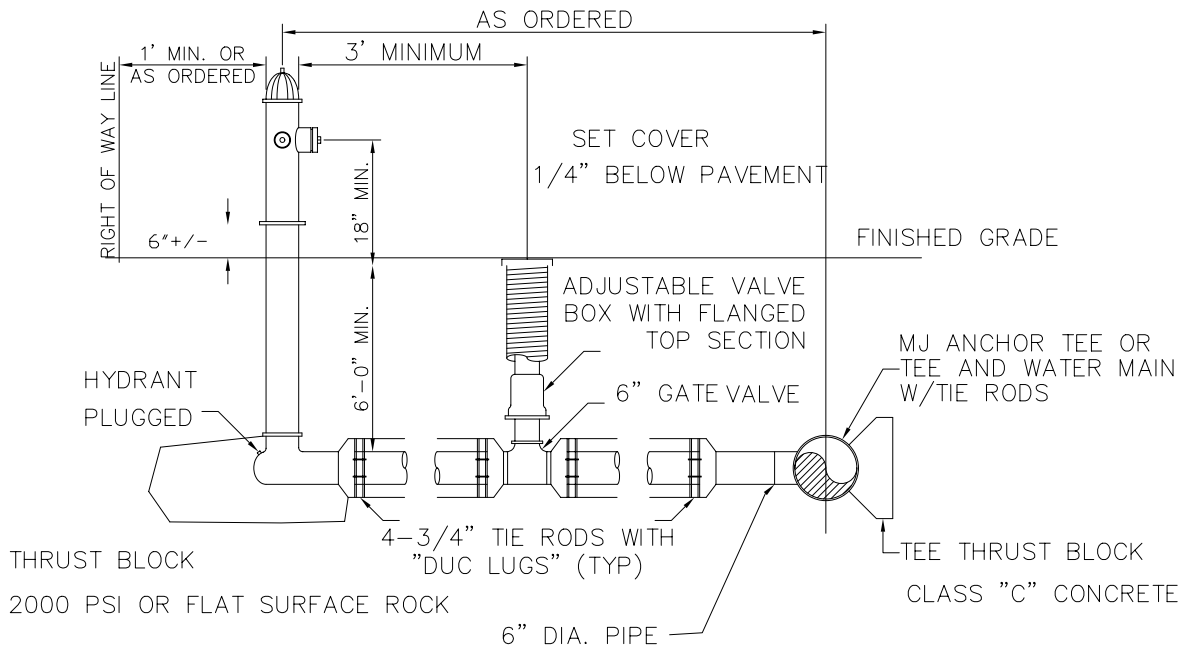
IN LEDGE

W



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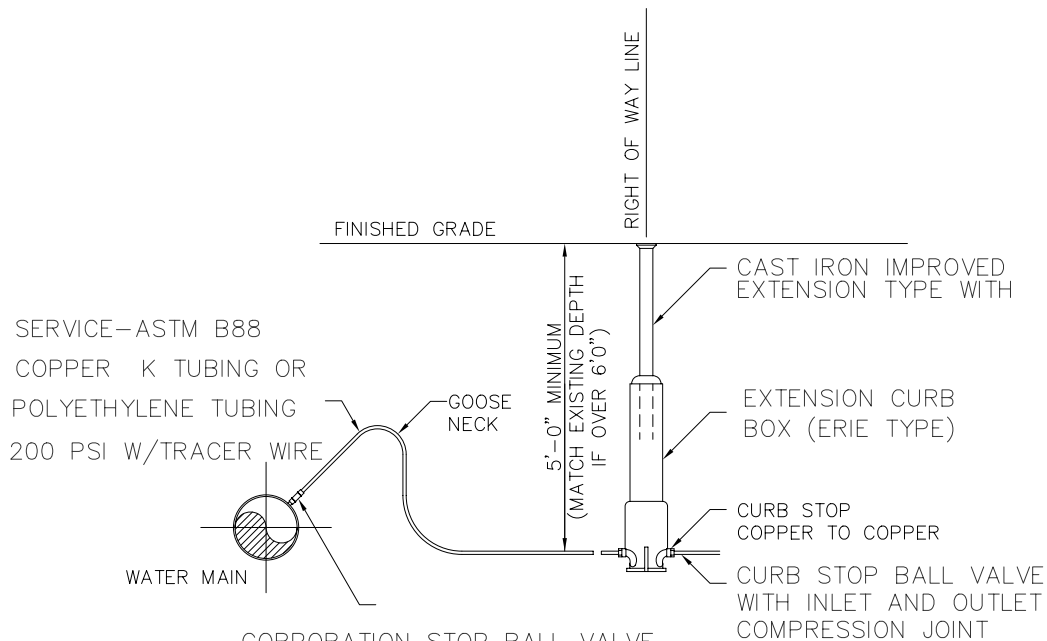
LEGEND SYMBOL	PENACOOK-BOSCAWEN WATER PRECINCT TYPICAL TRENCH DETAIL CLASS.: STANDARD	DRAWN BY	SCALE NONE
		DESIGNED BY -	LAST REVISION May 2010
		CHECKED BY -	DETAIL NO. A-1



1. HYDRANT ASSEMBLY INCLUDES RESTRAINED MJ HYDRANT TEE, WHERE POSSIBLE.
2. HYDRANT SHALL BE WATEROUS PACER OR AMERICAN DARLING B848, PER PENACOOK-BOSCAWEN WATER PRECINCT STANDARDS.

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LEGEND SYMBOL	PENACOOK-BOSCAWEN WATER PRECINCT HYDRANT DETAIL DETAIL CLASS.: STANDARD	DRAWN BY	SCALE NONE
		DESIGNED BY -	LAST REVISION May 2010
		CHECKED BY -	DETAIL NO. A-2



CORPORATION STOP BALL VALVE, AWWA TAPER (CC) INLET AND OUTLET COMPRESSION JOINT. MINIMUM TWO FULL THREADS IN DUCTILE IRON PIPE, THREE FULL THREADS IN CAST IRON, OTHERWISE USE SERVICE SADDLE. SERVICE SADDLE REQUIRED FOR AC PIPE

1. PROVIDE NEW LINE USING CONTINUOUS LENGTHS OF POLYETHYLENE. NO COUPLING ALLOWED IN ROADWAY WITHOUT APPROVAL.
2. TAPS TO BE MADE AT APPROX. 2:00 AND 10:00.
3. PROVIDE FOR SERVICE LINE CONTRACTION AND EXPANSION BY INSTALLING "S" IN SERVICE LINE NEAR MAIN.
4. CURB BOX SHALL BE SET APPROXIMATELY 1'-0" FROM PROPERTY LINE.
5. ALL SERVICES 1½" AND LARGER SHALL BE COPPER AND USE STAINLESS STEEL SERVICE SADDLE.

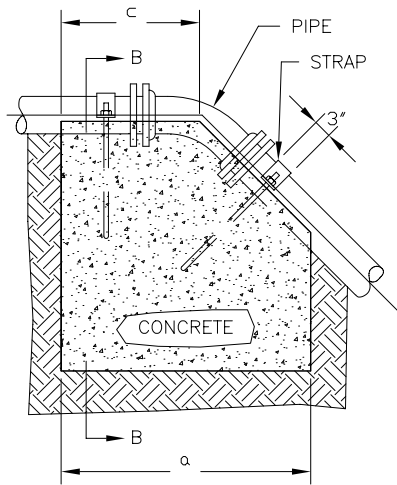
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LEGEND SYMBOL	PENACOOK-BOSCAWEN WATER PRECINCT SERVICE CONNECTION DETAIL CLASS.: STANDARD	DRAWN BY	SCALE NONE
		DESIGNED BY -	LAST REVISION May 2010
		CHECKED BY -	DETAIL NO. A-3

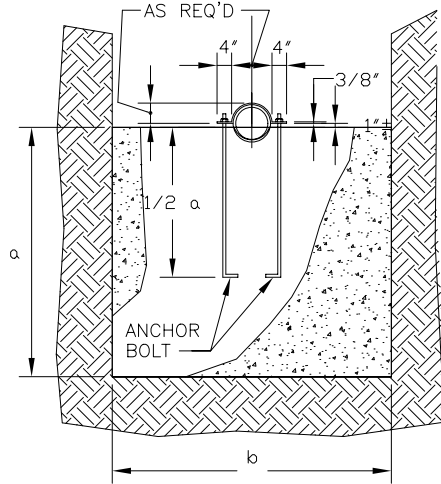
VERTICAL ANCHOR DIMENSIONS

UP TO 150 P.S.I. WORKING PRESSURE

PIPE SIZE	45° BEND				22 1/2° BEND				11 1/4° BEND			
	DIMENSION			ROD DIA.	DIMENSION			ROD DIA.	DIMENSION			ROD DIA.
	a	b	c		a	b	c		a	b	c	
4"	3'-0"	3'-0"	2'-0"	3/4"	2'-6"	2'-3"	1'-6"	3/4"	2'-0"	2'-0"	1'-6"	3/4"
6"	3'-0"	3'-0"	2'-0"	3/4"	2'-6"	2'-3"	1'-6"	3/4"	2'-0"	2'-0"	1'-6"	3/4"
8"	3'-6"	3'-6"	2'-6"	3/4"	3'-0"	3'-0"	1'-9"	3/4"	2'-6"	2'-6"	1'-3"	3/4"
10"	4'-3"	4'-0"	3'-0"	3/4"	3'-6"	3'-3"	2'-0"	3/4"	2'-9"	2'-9"	1'-6"	3/4"
12"	4'-9"	4'-6"	3'-3"	3/4"	4'-0"	3'-9"	2'-6"	3/4"	3'-3"	3'-3"	1'-9"	3/4"

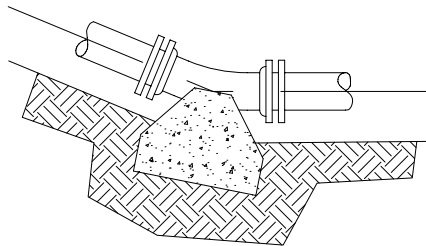


ELEVATION



VERTICAL BEND SECTION E-E

ALL EXPOSED PORTIONS OF ANCHOR STRAPS TO RECEIVE
TWO FIELD COATS (MIN.) OF BITUMASTIC MATERIAL

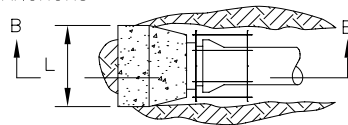


RESTRAINED PLUG OR CAP

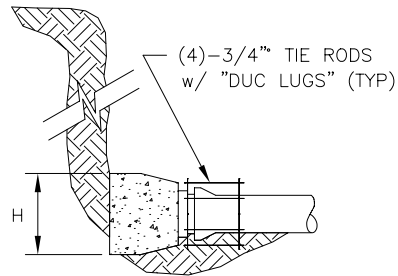
NOTE: SEE CHART "HORIZONTAL ANCHOR DIMENSIONS"

TIE RODS TO BE PROVIDED IN LIEU OF THRUST BLOCK

USE SAME DIMENSIONS AS FOR
HORIZONTAL BEND ANCHORS



PLAN



SECTION C-C

MECHANICAL RESTRAINT REQUIRED, CONCRETE (SEE SPEC)
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LEGEND SYMBOL	PENACOOK-BOSCAWEN WATER PRECINCT	DRAWN BY	SCALE
	VERTICAL THRUST BLOCK	DESIGNED BY —	NONE
	DETAIL CLASS.: STANDARD	CHECKED BY —	LAST REVISION May 2010
			DETAIL NO. A-4

HORIZONTAL ANCHOR DIMENSIONS FOR PIPE INSTALLATION IN ROCK

UP TO 150 P.S.I. WORKING PRESSURE

PIPE SIZE	TEE OR TAP SLEEVE		90° BEND		45° BEND		22 1/2° BEND		11 1/4° BEND	
	H	L	H	L	H	L	H	L	H	L
* 4"	0'-9"	1'-0"	0'-9"	1'-0"	0'-9"	1'-0"	0'-9"	1'-0"	0'-9"	1'-0"
6"	0'-9"	1'-0"	0'-9"	1'-0"	0'-9"	1'-0"	0'-9"	1'-0"	0'-9"	1'-0"
8"	1'-2"	1'-2"	1'-2"	1'-2"	1'-0"	1'-0"	0'-9"	1'-0"	0'-9"	1'-0"
10"	1'-4"	1'-4"	1'-4"	1'-4"	1'-0"	1'-0"	0'-9"	1'-0"	0'-9"	1'-0"
12"	1'-8"	1'-8"	1'-8"	1'-8"	1'-3"	1'-3"	1'-0"	1'-0"	0'-9"	1'-0"

* - FOR 3" AND SMALLER PIPES

HORIZONTAL ANCHOR DIMENSIONS FOR AVERAGE SOIL CONDITIONS

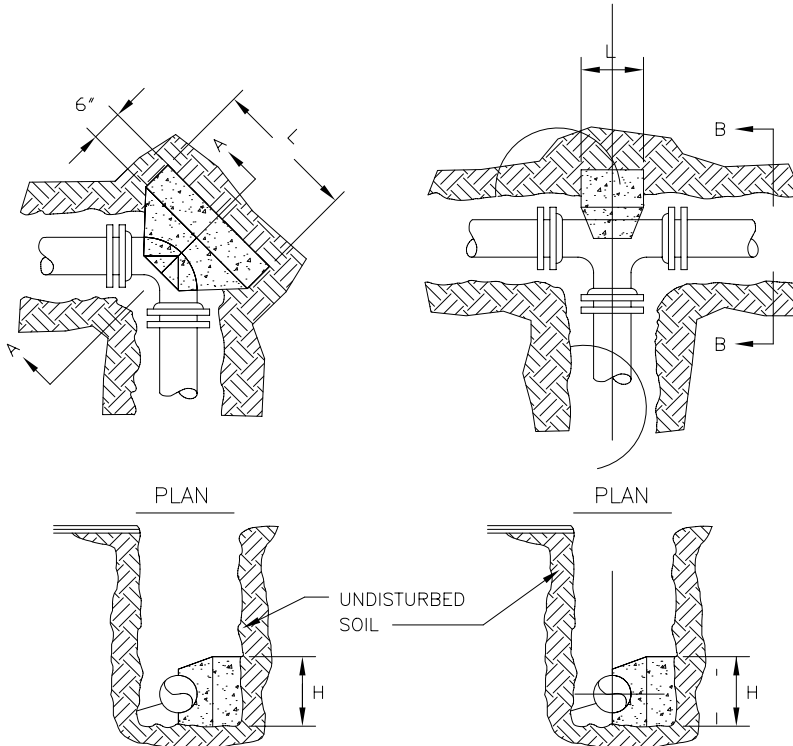
UP TO 150 P.S.I. WORKING PRESSURE

PIPE SIZE	TEE OR TAP SLEEVE		90° BEND		45° BEND		22 1/2° BEND		11 1/4° BEND	
	H	L	H	L	H	L	H	L	H	L
* 4"	1'-0"	2'-0"	1'-0"	2'-0"	1'-0"	1'-4"	0'-9"	1'-0"	0'-6"	1'-0"
6"	1'-0"	2'-0"	1'-0"	2'-0"	1'-0"	1'-4"	0'-9"	1'-0"	0'-6"	1'-0"
8"	1'-4"	2'-8"	1'-4"	2'-8"	1'-4"	1'-6"	1'-0"	1'-0"	0'-9"	1'-0"
10"	1'-8"	3'-4"	1'-8"	3'-4"	1'-8"	2'-0"	1'-3"	1'-3"	1'-0"	1'-0"
12"	2'-0"	4'-0"	2'-0"	4'-0"	2'-0"	2'-2"	1'-6"	1'-6"	1'-3"	1'-3"

* - FOR 3" AND SMALLER PIPES

TABLES ARE BASED ON AN ALLOWABLE SOIL PRESSURE OF 3000 PSF ON UNDISTURBED EARTH BEHIND THE ANCHOR BLOCK. WHERE SOIL HAS BEEN DISTURBED BY ADJACENT EXCAVATIONS OR WHERE SOIL CAN NOT WITHSTAND SUCH A PRESSURE, THE TABLE DOES NOT APPLY.

WHERE ENTIRE DEPTH OF PIPE IS BELOW THE TOP SURFACE OF SOUND ROCK, USE "HORIZONTAL ANCHOR DIMENSIONS FOR PIPE INSTALLATION IN ROCK" TABLE



SECTION A-A

SECTION B-B

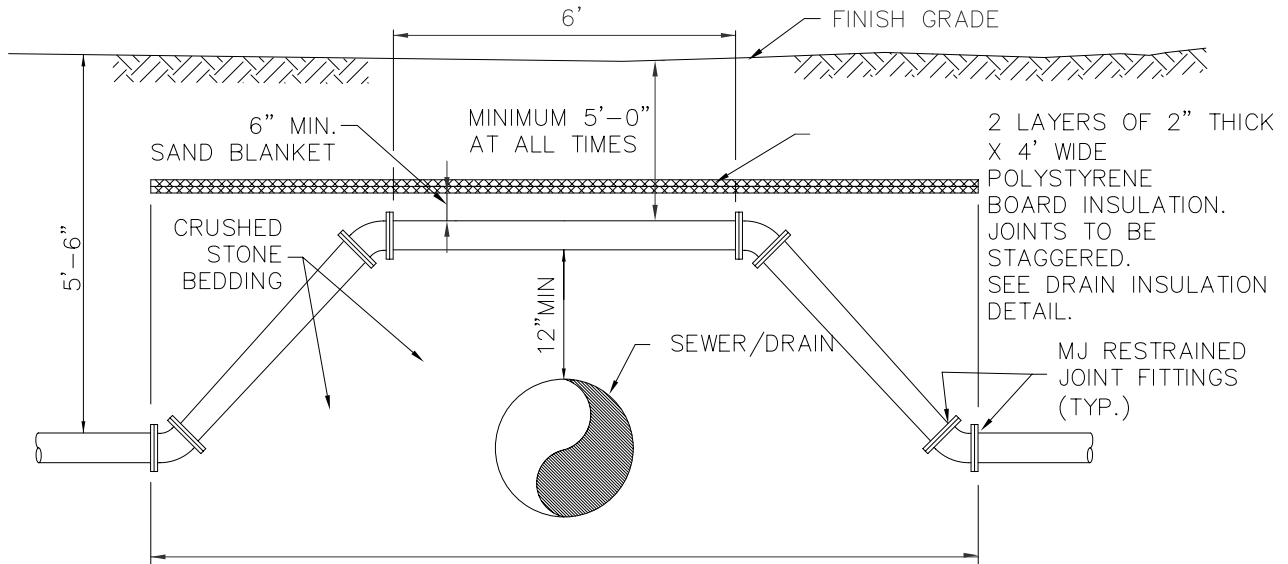
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ALL HORIZONTAL BENDS

TEE OR TAPPING SLEEVE

MECHANICAL RESTRAINT REQUIRED, CONCRETE (SEE SPEC)

LEGEND SYMBOL	PENACOOK-BOSCAWEN WATER PRECINCT	DRAWN BY	SCALE NONE
	HORIZONTAL THRUST BLOCK	DESIGNED BY -	LAST REVISION May 2010
	DETAIL CLASS.: STANDARD	CHECKED BY -	DETAIL NO. A-5



NOTE:

1. INSTALL (4) FOUR 45° MJ BENDS WITH RESTRAINED JOINT FITTINGS.
2. ALL SEWER CROSSINGS SHALL USE THIS DETAIL.

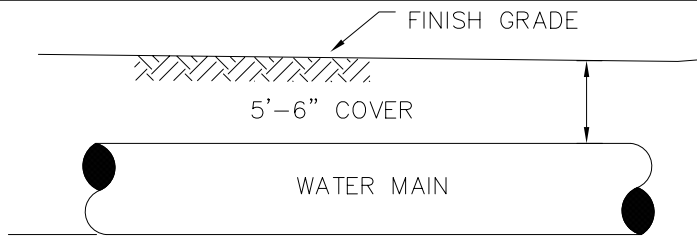
WATER MAIN/SEWER CROSSING
NOT TO SCALE

MINIMUM COVER: NOT LESS THAN 5 FEET, 6 INCHES, EXCEPT TO AVOID SUBSURFACE STRUCTURES.

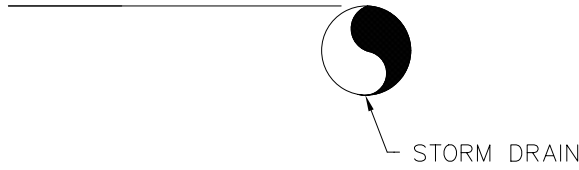
ALL VALVES SHALL HAVE 5'-6" COVER AND MAXIMUM COVER 6'-0".

DRAFT NOT FOR CONSTRUCTION

LEGEND SYMBOL	PENACOOK-BOSCAWEN WATER PRECINCT WATER/SEWER TRENCH DETAIL CLASS.: STANDARD	DRAWN BY	SCALE NONE
		DESIGNED BY -	LAST REVISION May 2010
		CHECKED BY -	DETAIL NO. A-6

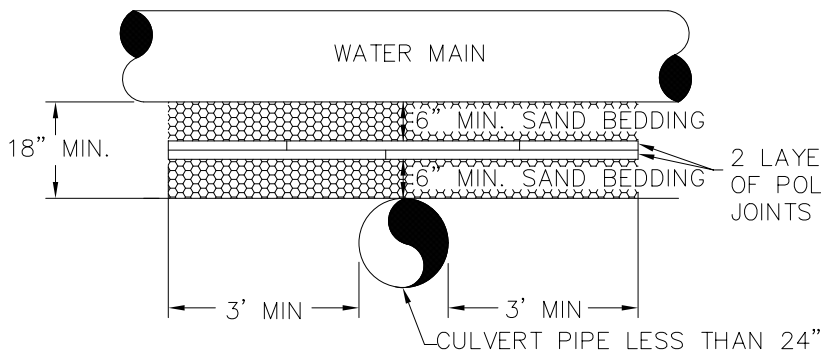


INSULATION ABOVE PIPE ALLOWED FOR LESS COVER AS SHOWN ON SEWER/WATER DETAIL.

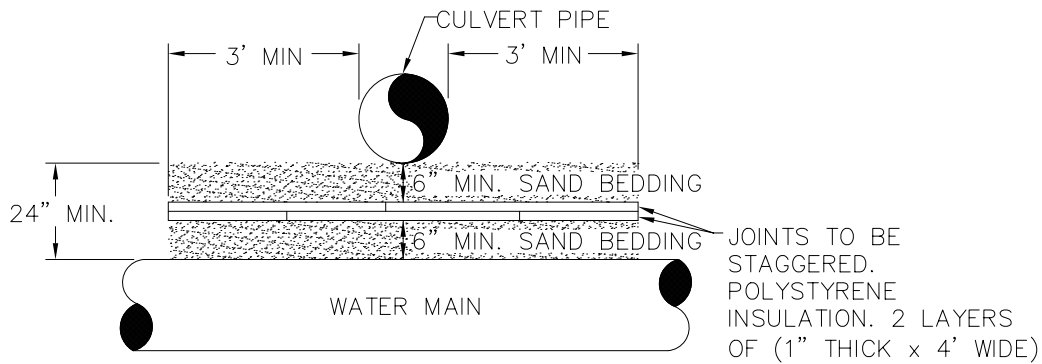


WATER MAIN OVER DRAIN

NOT TO SCALE



2 LAYERS (1" THICK x 4' WIDE) OF POLYSTYRENE INSULATION. JOINTS TO BE STAGGERED.



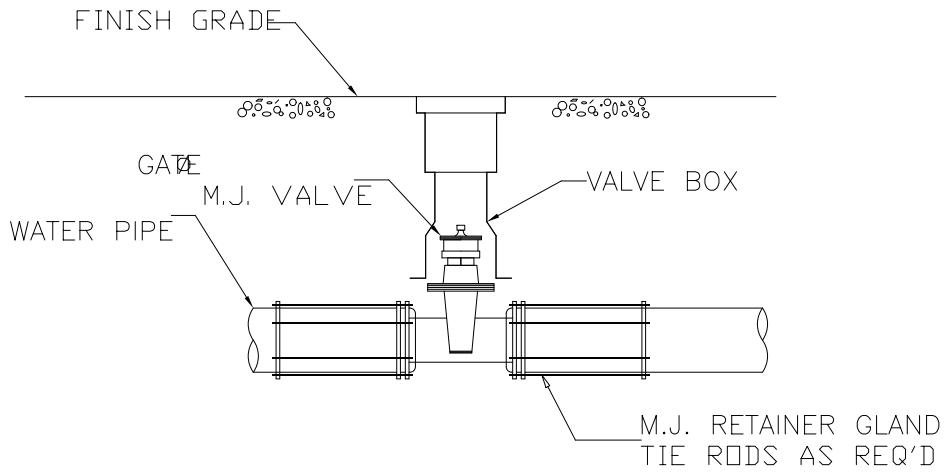
INSULATION TO BE USED WHERE PIPE SEPARATION IS 24" OR LESS.

CULVERT CROSSING DETAIL

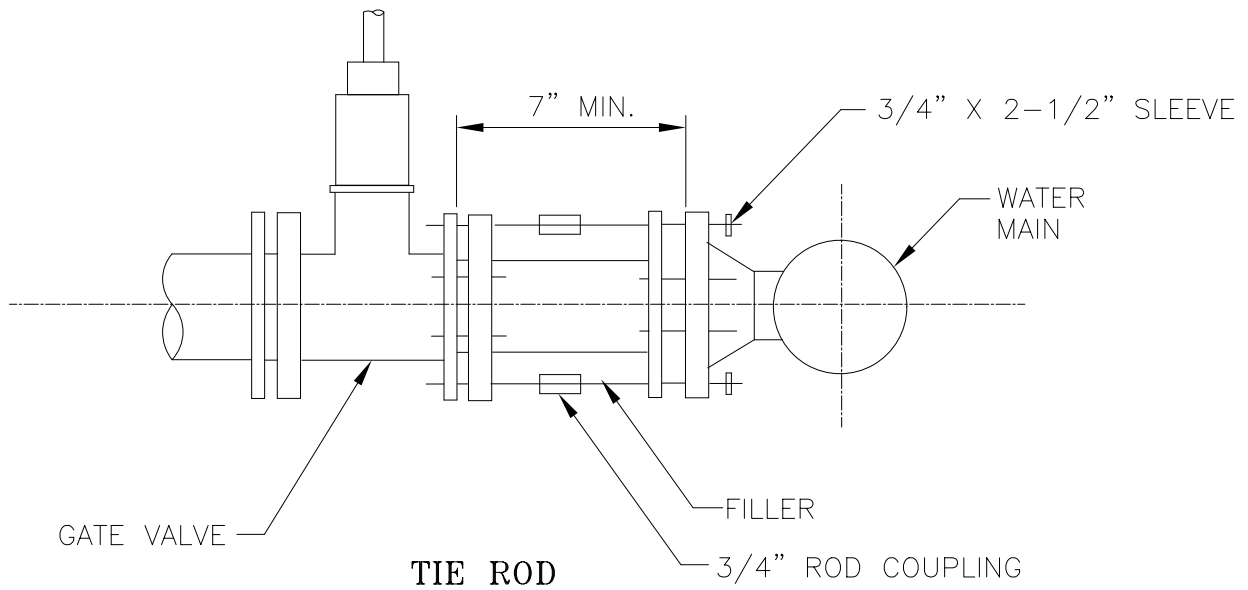
NOT TO SCALE

DRAFT NOT FOR CONSTRUCTION

LEGEND	PENACOOK-BOSCAWEN WATER PRECINCT TYPICAL WATER/DRAIN TRENCH DETAIL CLASS.: STANDARD	DRAWN BY	SCALE NONE
		DESIGNED BY -	LAST REVISION MAY 2010
		CHECKED BY -	DETAIL NO. A-7



VALVE DETAIL
NTS



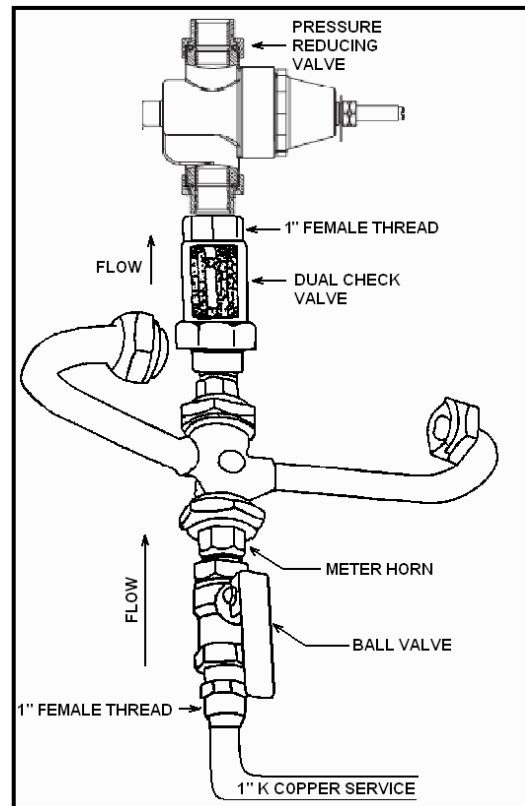
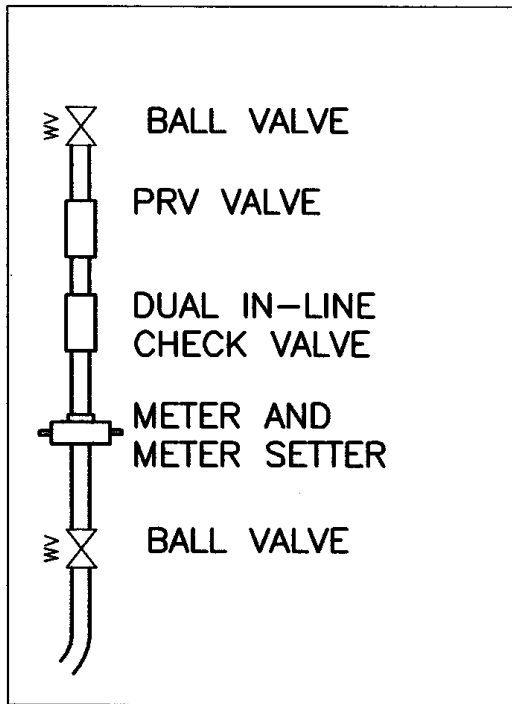
DRAFT NOT FOR CONSTRUCTION

LEGEND	PENACOOK-BOSCAWEN WATER PRECINCT TYPICAL VALVE DETAIL DETAIL CLASS.: STANDARD	DRAWN BY	SCALE NONE
		DESIGNED BY -	LAST REVISION MAY 2010
		CHECKED BY -	DETAIL NO. A-8

**Penacook-Boscawen Water Precinct
Boscawen, NH**

**A-9 METER DIAGRAM 5/8" and 1" Residential Meter
FOR HIGH PRESSURE ZONES – 60psi Greater**

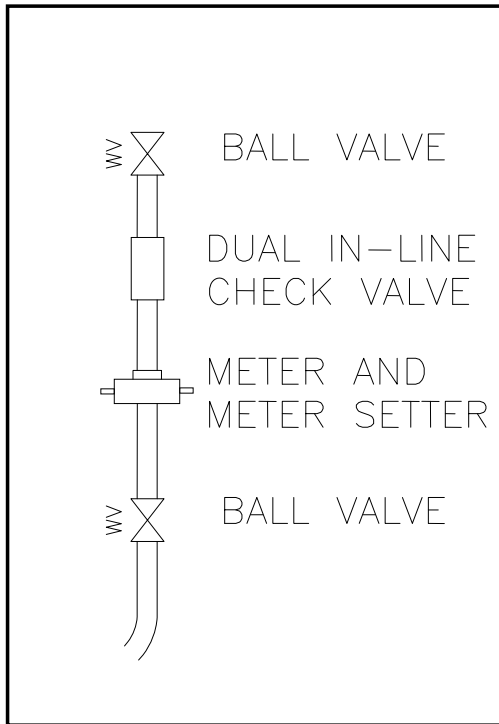
- All backflow prevention devices and all pressure reducing valves must be connected after the meter assembly.
- Minimum floor clearance: 2'-4" / Minimum wall distance: 6"
- 1" K Copper or Polyethylene ASTM D 2239, pressure rated at 200 psi, from curb box through wall to meter yoke, must be inspected by the Precinct.
- Thermal Expansion Tank near hot water heater on cold water side (recommended but not required).
- Dual Check valve shall be Watts #7 or approved equal.
- Water Meter shall be approved by the Precinct (Sensus ARM or Neptune)
- Distance between valves and meter shall be approved of by the Precinct
- Existing 3/4" service: Meter Yoke shall be K-horn (52570-EJ Precott): Dual Check Valve shall be (52035-EJ Precott) or #7 Watts; Ball valve shall be (52033-EJ Precott) with pack joint assembly (52070-EJ Precott).
- Copperhorn for new service as approved by Precinct



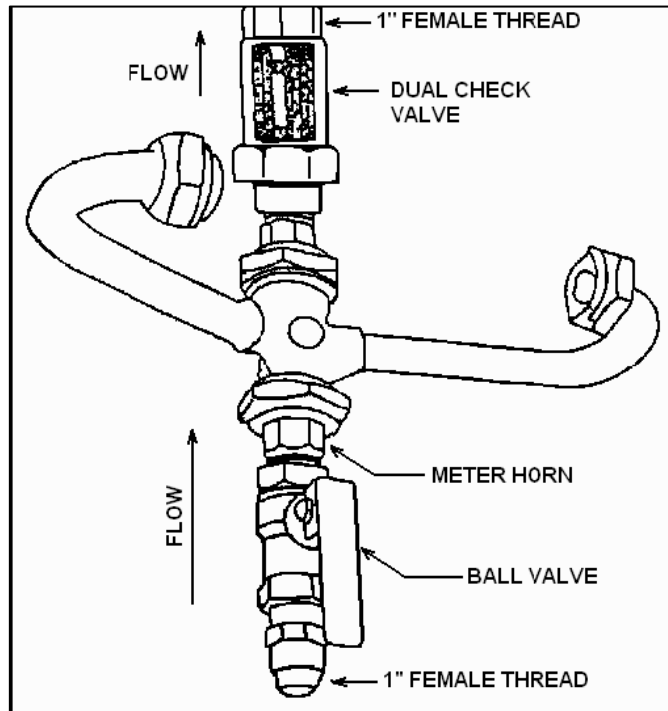
**Penacook-Boscawen Water Precinct
Boscawen, NH**

A-10 METER DIAGRAM 5/8" and 1" Residential Meter

- All backflow prevention devices and all pressure reducing valves must be connected after the meter assembly.
- Minimum floor clearance: 2'-4" / Minimum wall distance: 6"
- 1" K Copper or Polyethylene ASTM D 2239, pressure rated at 200 psi, from curb box through wall to meter yoke, must be inspected by the Precinct.
- Thermal Expansion Tank near hot water heater on cold water side (recommended but not required).
- Dual Check valve shall be Watts #7 or approved equal.
- Water Meter shall be approved by the Precinct (Sensus ARM or Neptune)
- Distance between valves and meter shall be approved of by the Precinct
- Existing 3/4" service: Meter Yoke shall be K-horn (52570-EJ Precott): Dual Check Valve shall be (52035-EJ Precott) or #7 Watts; Ball valve shall be (52033-EJ Precott) with pack joint assembly (52070-EJ Precott)
- Copperhorn for new service as approved by Precinct



Meter Installation Less than 60 psi



Meter Equipment for Less than 60 psi

Env-Dw-700 Water Quality Standards

Parameter	Units	MCL	MCLG
Microbiological			
Cryptosporidium			0
E.coli			0
Giardia Lamblia			0
Legionella			0
Viruses			0
Radionuclides			
Compliance Gross Alpha	pCi/L	15	0
Radium 226 + 228	pCi/L	5	0
Uranium	ug/L	30	0
Beta Particle and Photon Radioactivity	mrem/year	4	0
Inorganic Compounds			
Antimony	mg/L	0.006	0.006
Arsenic	mg/L	0.01	0
Asbestos	million fibers/L (longer than 10 um)	7	7
Barium	mg/L	2	2
Beryllium	mg/L	0.004	0.004
Cadmium	mg/L	0.005	0.005
Chromium	mg/L	0.1	0.1
Copper	mg/L		1.3
Cyanide (as free cyanide)	mg/L	0.2	0.2
Flouride	mg/L	4	4
Lead	mg/L		0
Mercury	mg/L	0.002	0.002
Nitrate (as N)	mg/L	10	10
Nitrite (as N)	mg/L	1	1
Total Nitrate + Nitrite	mg/L	10	10
Selenium	mg/L	0.05	0.05
Thallium	mg/L	0.002	0.0005
Volatile Organic Compounds			
Benzene	mg/L	0.005	0
Carbon tetrachloride	mg/L	0.005	0
o-Dichlorobenzene (1,2-Dichlorobenzene)	mg/L	0.6	0.6
para-Dichlorethane	mg/L	0.075	0.075
1,2-Dichloroethane	mg/L	0.005	0
1,1-Dichloroethylene	mg/L	0.007	0.007
cis-1,2-Dichloroethylene	mg/L	0.07	0.07
trans-1,2-Dichloroethylene	mg/L	0.1	0.1
Dichloromethane (Methylene chloride)	mg/L	0.005	0
1,2-Dichloropropane	mg/L	0.005	0
Ethylbenzene	mg/L	0.7	0.7
Methyl tertiary-butyl ether (MtBE)	mg/L	0.013	0.013
Monochlorobenzene (chlorobenzene)	mg/L	0.1	0.1
Styrene	mg/L	0.1	0.1
Tetrachloroethylene	mg/L	0.005	0
Toluene	mg/L	1	1
1,2,4-Trichlorobenzene	mg/L	0.07	0.07
1,1,1-Trichloroethane	mg/L	0.2	0.2
1,1,2-Trichloroethane	mg/L	0.005	0.003
Trichloroethylene	mg/L	0.005	0
Vinyl Chloride	mg/L	0.002	0
Xylene, Total	mg/L	10	10

Env-Dw-700 Water Quality Standards

Synthetic Organic Chemical			
Alachlor (Lasso)	mg/L	0.002	0
Aldicarb (Temik)	mg/L	0.002	0.001
Aldicarb sulfoxide	mg/L	0.004	0.001
Aldicarb sulfone (aldoxycarb)	mg/L	0.002	0.001
Atrazine (Atranex, Crisazine)	mg/L	0.003	0.003
Carbofuran (Furadon, 4F)	mg/L	0.04	0.04
Chlordane	mg/L	0.002	0
Dalapon	mg/L	0.2	0.2
Dibromochloropropane (DBCP)	mg/L	0.0002	0
Di(2-ethylhexyl)adipate	mg/L	0.4	0.4
Di(2-ethylhexyl)phthalate	mg/L	0.006	0
Dinoseb	mg/L	0.007	0.007
Diquat	mg/L	0.02	0.02
Endothall	mg/L	0.1	0.1
Endrin	mg/L	0.002	0.002
Ethylene Dibromide (EDB)	mg/L	0.00005	0
Glyphosate	mg/L	0.7	0.7
Heptachlor	mg/L	0.0004	0
Heptachlor Epoxide	mg/L	0.0002	0
Hexachlorobenzene	mg/L	0.001	0
Hexachlorocyclopentadiene	mg/L	0.05	0.05
Lindane	mg/L	0.0002	0.0002
Methoxychlor (DMDT, Martate)	mg/L	0.04	0.04
Oxamyl (Vydate)	mg/L	0.2	0.2
PAH-Benzo(a)pyrene	mg/L	0.0002	0
Picloram	mg/L	0.5	0.5
Polychlorinated Biphenyls (PCB)	mg/L	0.0005	0
Pentachlorophenol	mg/L	0.001	0
Simazine	mg/L	0.004	0.004
Toxaphene	mg/L	0.003	0
2,3,7,8 TCDD (Dioxin)	mg/L	0.00000003	0
2,4,5 TP (Silvex)	mg/L	0.05	0.05
2,4 D	mg/L	0.07	0.07
Disinfection Byproducts			
Total trihalomethanes (TTHM)	mg/L	0.08	
haloacetic acids (five) (HAA5)	mg/L	0.06	
Bromate	mg/L	0.01	0
Chlorite	mg/L	1	0.8
Bromodichloromethane	mg/L		0
Bromoform	mg/L		0
Chloroform	mg/L		0.07
Dibromochloromethane	mg/L		0.06
Dichloroacetic Acid	mg/L		0
Monochloroacetic Acid	mg/L		0.07
Trichloroacetic Acid	mg/L		0.02
PFAS Contaminants (Pending)			
Perfluorohexane sulfonic acid (PFHxS)	ug/L	18	0
Perfluorononanoic acid (PFNA)	ug/L	11	0
Perfluorooctane sulfonic acid (PFOS)	ug/L	15	0
Perfluorooctanoic acid (PFOA)	ug/L	12	0