FINAL DRAFT

PUBLIC WATER SYSTEM ANALYSIS

for the

TOWN OF FALMOUTH

JUNE 2016

WRIGHT-PIERCE
Engineering a Better Environment

FALMOUTH, MAINE

PUBLIC WATER SYSTEM ANALYSIS

JUNE 2016

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TOWN OF FALMOUTH – PUBLIC WATER SYSTEM ANALYSIS

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ES.1 BACKGROUND AND APPROACH

In 2013, the Town of Falmouth completed a Comprehensive Plan. Within the plan, the Town has designated two primary Growth Areas where future development will be focused. These two areas are: (1) West Falmouth bounded in the south by the City of Portland line and on the west by the Maine Turnpike and, (2) Middle Road corridor and areas to the east of this location extending to Casco Bay.

This water system analysis was needed to supplement the Comprehensive Plan to evaluate the capacity of the existing public water system to serve new development within these designated growth areas. The water system assets in Falmouth are owned and operated by the Portland Water District (PWD), a quasi-municipal regional water utility which provides public water to the greater Portland metropolitan area.

In 2003, the PWD completed a Comprehensive Water System Strategic Plan for its entire service area. Included in this plan were specific community plans developed for each service community including one for the Town of Falmouth. The 2003 Falmouth plan will be updated with this report to align with the Town's 2013 Comprehensive Plan.

ES.2 STUDY GOAL AND OBJECTIVE

The specific goal of the Falmouth water system plan is to review the Town's 2013 Comprehensive Plan and develop a supplement to the plan to serve identified growth areas with public water. The work will include assessing limitations in the existing public water system to meet the Town's objectives for infill development in the designated growth areas. The analysis will also look at those areas in the Growth Area not currently served by the existing water system and develop a conceptual water service plan using existing and proposed piping within these areas.

ES.3 FINDINGS AND CONCLUSIONS

The following findings and conclusions were reached regarding public water service in the Growth Areas in Falmouth:

- **Capacity to Serve** – The Portland Water District has the supply and hydraulic capacity to meet the future needs in each growth area. In some instances, new water mains and booster pumping stations will be required to meet the Portland Water Districts pressure requirements.
- **Fire Protection** – Existing fire protection in Falmouth is excellent and will not be compromised if future development were to occur within the designated Growth Areas.
- **Unserved Areas within the Growth Areas –** Three primary areas within the designated Growth Areas are not served by public water. These areas are shown in Figure ES-1 and are generally described as follows:
  - Middle Road between the intersection of Deer Run Road and the Cumberland town line
  - Upper Mountain Road area
  - Upper Brookside Drive area

  All three of these areas have ground surface elevations that are too high to provide adequate pressure. Strategies to extend public water to these areas using booster pumping stations are included in the report.

  Remaining areas not served by public water within the growth zones is very limited. These remaining areas can all be provided adequate pressure from the PWD water distribution system if public water is desired without the need for additional pumping.

- **Middle Road Area** – The Middle Road area is of interest to the Town because of a planned road improvement project in this area and interest expressed by area homeowners and developers. This area is shown on the attached Figure ES-2. Two specific strategies were identified to extend water to developable land in the Middle Road

area: (1) Extend water mains from either Stormy Brook Road or Longwoods Road to serve lower elevation areas and add a booster pumping station to serve high elevation areas or, (2) Extend a high pressure main down Longwoods Road from Portland Water Districts high pressure zone (Zone 340) to serve the entire Middle Road area.

The ground surface topography will require a booster pumping station to elevate pressure to serve all the developable land in this area. Abutting properties on Middle Road itself can be served by extending a water main from the terminus of the system near Deer Run Road as shown on figure ES-2.

If the Town is interested in constructing new infrastructure in advance of any development, a specific water service plan should be developed for the undeveloped lots before any water mains are extended in this area.

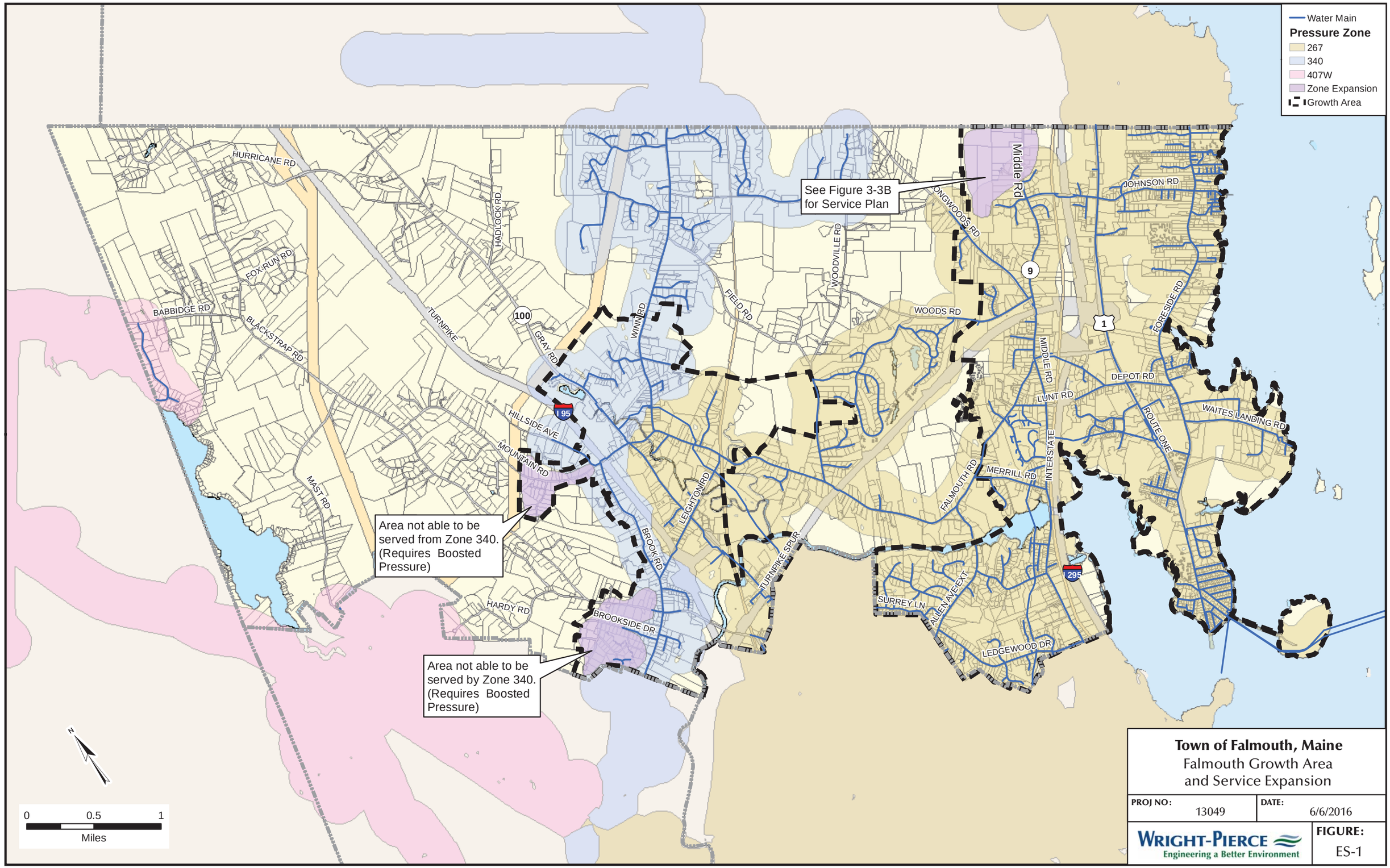
Water Main
Pressure Zone
267
340
407W
Zone Expansion
Growth Area
See Figure 3-3B for Service Plan
Area not able to be served from Zone 340. (Requires Boosted Pressure)
Area not able to be served by Zone 340. (Requires Boosted Pressure)
HURRICANE RD
FOX RUN RD
BABBIDGE RD
BLACKSTRAP RD
HADLOCK RD
TURNPIKE
100
GRAY RD
WINN RD
FIELD RD
WOODVILLE RD
HILLSIDE AVE
I 95
MOUNTAIN RD
MAST RD
BROOK RD
LEIGHTON RD
HARDY RD
BROOKSIDE DR
TURNPIKE SPUR
WOODS RD
LONGWOODS RD
Middle Rd
9
1
JOHNSON RD
FORESIDE RD
DEPOT RD
LUNT RD
MIDDLE RD
WAITES LANDING RD
ROUTE ONE
FALMOUTH RD
MERRILL RD
INTERSTATE
295
SURREY LN
ALLEN AVE EXT
LEDGEWOOD DR
N
0
0.5
1
Miles
Town of Falmouth, Maine
Falmouth Growth Area and Service Expansion
PROJ NO: 13049
DATE: 6/6/2016
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FIGURE: ES-1

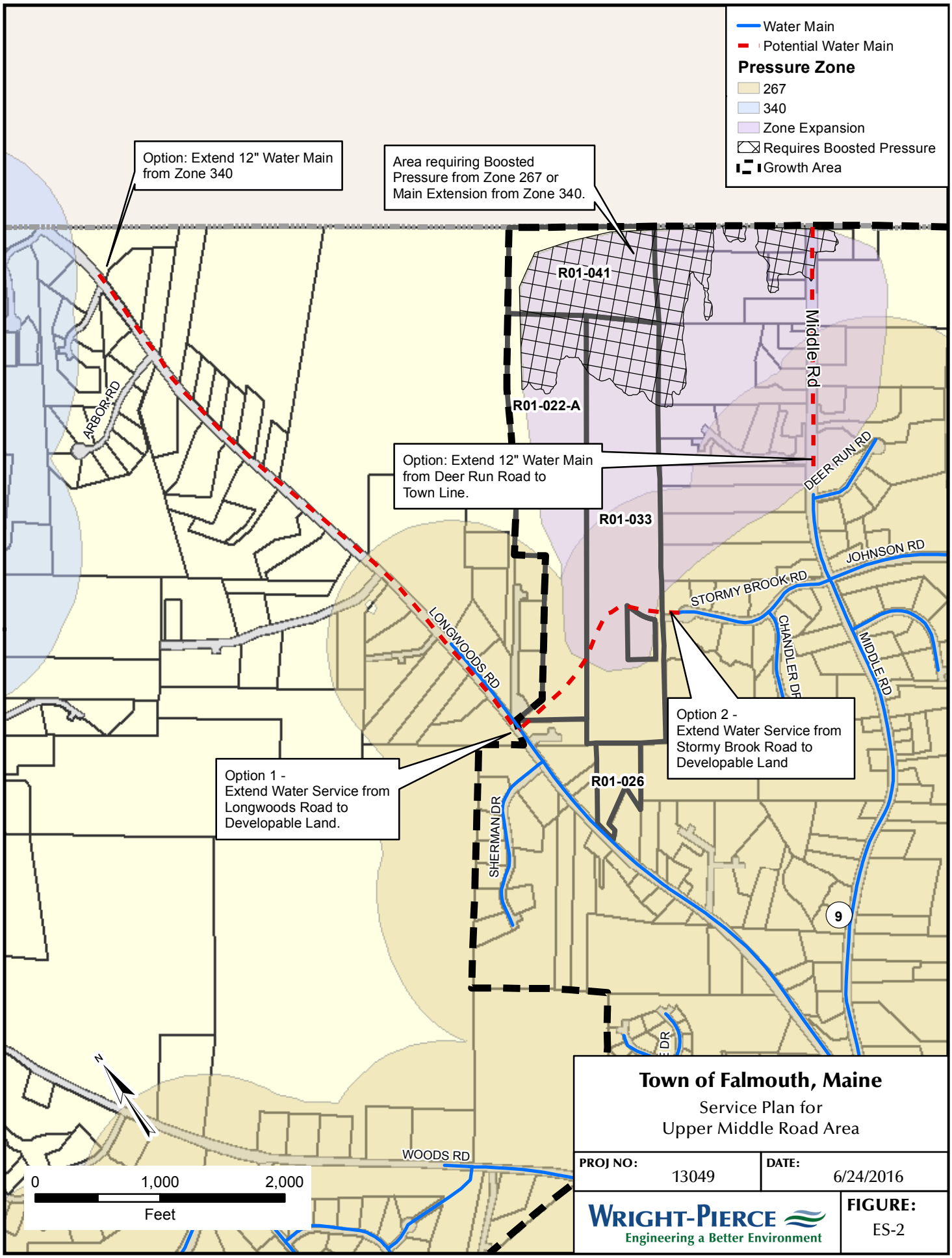
Water Main
Potential Water Main
Pressure Zone
267
340
Zone Expansion
Requires Boosted Pressure
Growth Area
Option: Extend 12" Water Main from Zone 340
Area requiring Boosted Pressure from Zone 267 or Main Extension from Zone 340.
Option: Extend 12" Water Main from Deer Run Road to Town Line.
Option 1 - Extend Water Service from Longwoods Road to Developable Land.
Option 2 - Extend Water Service from Stormy Brook Road to Developable Land
R01-041
R01-022-A
R01-033
R01-026
Middle Rd
DEER RUN RD
JOHNSON RD
STORMY BROOK RD
CHANDLER DR
MIDDLE RD
LONGWOODS RD
SHERMAN DR
ARBOR RD
WOODS RD
9
N
0
1,000
2,000
Feet
Town of Falmouth, Maine
Service Plan for
Upper Middle Road Area
PROJ NO: 13049
DATE: 6/24/2016
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FIGURE: ES-2

SECTION 1
INTRODUCTION

1.1 BACKGROUND

The Town of Falmouth, Maine is a thriving community of over 11,000 residents located just north of Portland Maine. Falmouth is a highly desirable community that attracts significant low density residential development, as well as retail and institutional development.

1.2 APPROACH

In 2013, the Town of Falmouth completed a Comprehensive Plan. Within the plan, the Town has identified designated two primary Growth Areas where future development will be focused. These two areas are: (1) West Falmouth bounded in the south by the City of Portland line and on the west by the Maine Turnpike and, (2) Middle Road corridor and areas to the east of this location extending to Casco Bay.

This water system analysis was completed to evaluate the capacity of the existing system to serve new development within these designated growth areas. The water system assets in Falmouth are owned and operated by the Portland Water District (PWD), a quasi-municipal regional water utility which provides public water to the greater Portland metropolitan area. The District is a non-investing utility not regulated by the Maine Public Utilities Commission (MPUC). The District's policies generally parallel those of the Maine PVC including policies related to main extensions to serve new customers. The primary principle guiding these regulations is that the cost of the water main extensions will be borne the customers requested extension of public water. A customer can be an individual or an entity such as a Town interested in managing or emphasizing development in specific geographic areas.

In 2003, PWD completed a Comprehensive Water System Strategic Plan for their entire service area. Included in this plan, were specific community plans developed for each service community including one for the Town of Falmouth. The 2003 Falmouth plan will be updated with this report to align with the Town's 2013 Comprehensive Plan.

1.3 GOALS AND OBJECTIVES FOR THIS PLAN

The specific goal of the Falmouth water system plan is to review the Town's 2013 Comprehensive Plan and develop a supplement to the plan to serve identified growth areas with public water. The work will include assessing limitations in the existing public water system to meet the Town's objectives for smart development in the designated growth areas. The analysis will also look at those areas not currently served by the existing water system and develop a conceptual water service plan using existing and proposed piping within these areas.

Although it was outside the scope of this study, observations are also made regarding a service plan for extension of the water system in rural areas of the Town of Falmouth. These areas have historically been served by private wells. Some of these private wells are reported to have high concentrations of arsenic, a contaminant of concern which is regulated and controlled in public water systems. This analysis will review options for addressing these areas in the future.

1.4 PRIOR PLANNING INITIATIVES

1.4.1 Portland Water District Comprehensive Water System Supply Plan (2003)

The Portland Water District (PWD) completed a comprehensive water system strategic plan (CWSSP) in 2003, which has since guided decision-making, planning and capital improvements at the district and within each of its service communities. The plan included community specific master plans for each service community in the PWD service area, including the Town of Falmouth.

The 2003 CWSSP plan recommended several capital projects in Falmouth, which have since been completed or have been abandoned by the Portland Water District. The study recommended installation of a 12-inch/16-inch water main with a pressure reducing valve (PRV) from Winn Road to Oakmont Road to improve fire flows. This project was not implemented by the PWD and is no longer part of its infrastructure planning. An upgrade to Winn Road pumping station was also recommended in 2003, but this project has been delayed because of decreases in

water consumption in Falmouth since the study was completed. This project is still planned for the future.

As part of the CWSSP development, a hydraulic model of the water distribution system was developed to simulate and predict behavior of the distribution system. The hydraulic model was obtained from PWD and will be used in this evaluation to predict proper pipe sizes, available fire flows and pressures.

1.4.2 Falmouth Comprehensive Plan (2013)

In 2013, the Town of Falmouth adopted a new comprehensive plan which guides planning objectives in the community. The plan identified specific areas where growth is desired in the community. The Town has decided to focus this study on these areas. New development can be accommodated in the Growth Areas with less impact to Falmouth taxpayers because utilities generally already exist in these areas and development is compact allowing more efficient use of available utilities. The general extent of the Growth Areas has already been mentioned. A more specific, detailed description of the Growth Areas is:

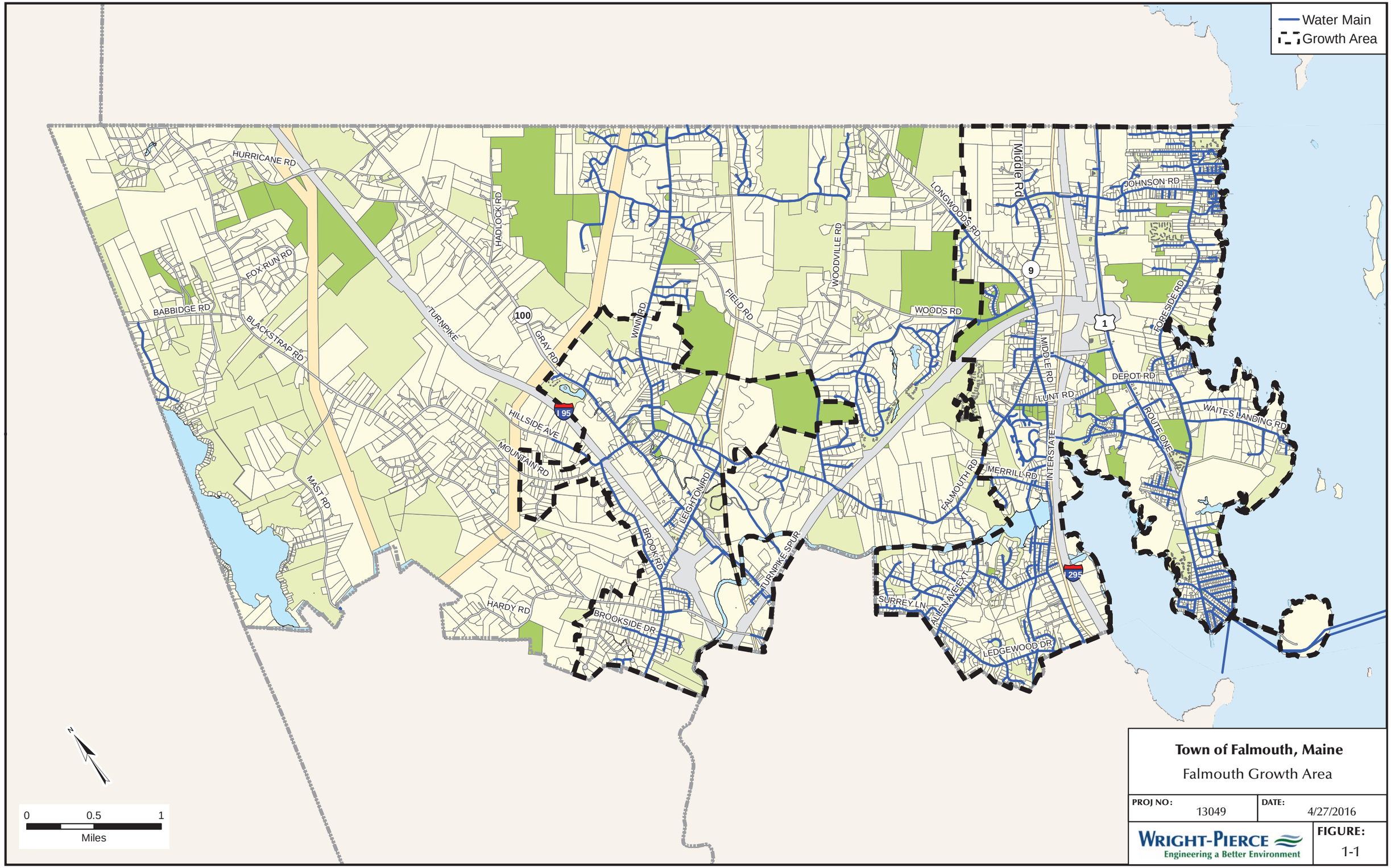
1) The area north of Portland and south of the Presumpscot River; north of the Presumpscot River and along Middle Road, including portions surrounding Falmouth Road and Merrill Road, Woods Road and Longwoods Road; along Route 1 and including the area east of Route 1 along Foreside Road.
2) The area north of Portland and south of the Presumpscot River along the Falmouth Spur; the area along Brook Road and Leighton Road; Route 100 from the Portland town line to the Central Maine Power easement; Falmouth Road, Twin Ponds Drive and Winn Road between Falmouth Road and Paddock Way.

A map of the Growth Area is shown in Figure 1-1.

1.4.3 Wright-Pierce Sewer Master Plan (2016)

In 2015, the Town of Falmouth retained Wright-Pierce to develop a Sewer Master Plan for the West Falmouth Growth Area. The goal of the plan was to evaluate the potential for sewered growth in West Falmouth. A concept plan to sewer this area and conduct an evaluation of the impacts on the existing sewer infrastructure were a component of the evaluation. The evaluation looked at the Growth Area in West Falmouth outlined in the 2013 Comprehensive Plan, reviewed the proposed zoning within these areas, and developed projected wastewater flow estimates to extend the sewer system under future development conditions.

Flow estimates from the Sewer Master Plan will be utilized in this study to estimate future water demands within the Growth Areas under future development conditions. Further discussion on water use demands will be included in Section 3.



Town of Falmouth, Maine

Falmouth Growth Area

PROJ NO:	DATE:
13049	4/27/2016

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FIGURE: 1-1

SECTION 2
EXISTING WATER INFRASTRUCTURE

2.1 BACKGROUND

The water system assets in Falmouth are owned and operated by the Portland Water District (PWD). In addition to Falmouth, the PWD currently supplies water to ten other communities from its source of supply at the Sebago Lake Water Treatment Facility (SLWTF) in Standish, Maine.

2.2 PORTLAND WATER DISTRICT ASSETS IN FALMOUTH

2.2.1 Service Zones

The PWD service area is broken into six service 'zones', determined by the topography and storage tanks elevations. Geographic areas currently served by the PWD within the Town of Falmouth fall into one of three service zones. These zones are designated as Zones 267, 340 and 407. Each service zone is identified by a numerical value which corresponds to the operating pressure in the service zone. For example, Zone 267 operates on a pressure gradient equivalent to El. 267 mean sea level (msl).

Zone 267 is the largest of all of PWD's service zones. Water flows by gravity from the SLWTF into Zone 267 where it is then pumped to three higher services zones, including Zones 340 and 407. The majority of Falmouth's water system is served by Zone 267. Zone 340 includes the portion of the water system along Brook Road, Winn Road, the western most portion of the water system on Route 100, Eureka Road, Cavendish Way, Paddock Way, and Inverness, Muirfield and Woodville Roads. A small area along Lakeside Drive is served from Zone 407.

Figure 2-1 shows the extent of Zones the service zones within Falmouth. The West Falmouth Growth Area is served by both the Zone 267 and Zone 340 as shown in this figure.

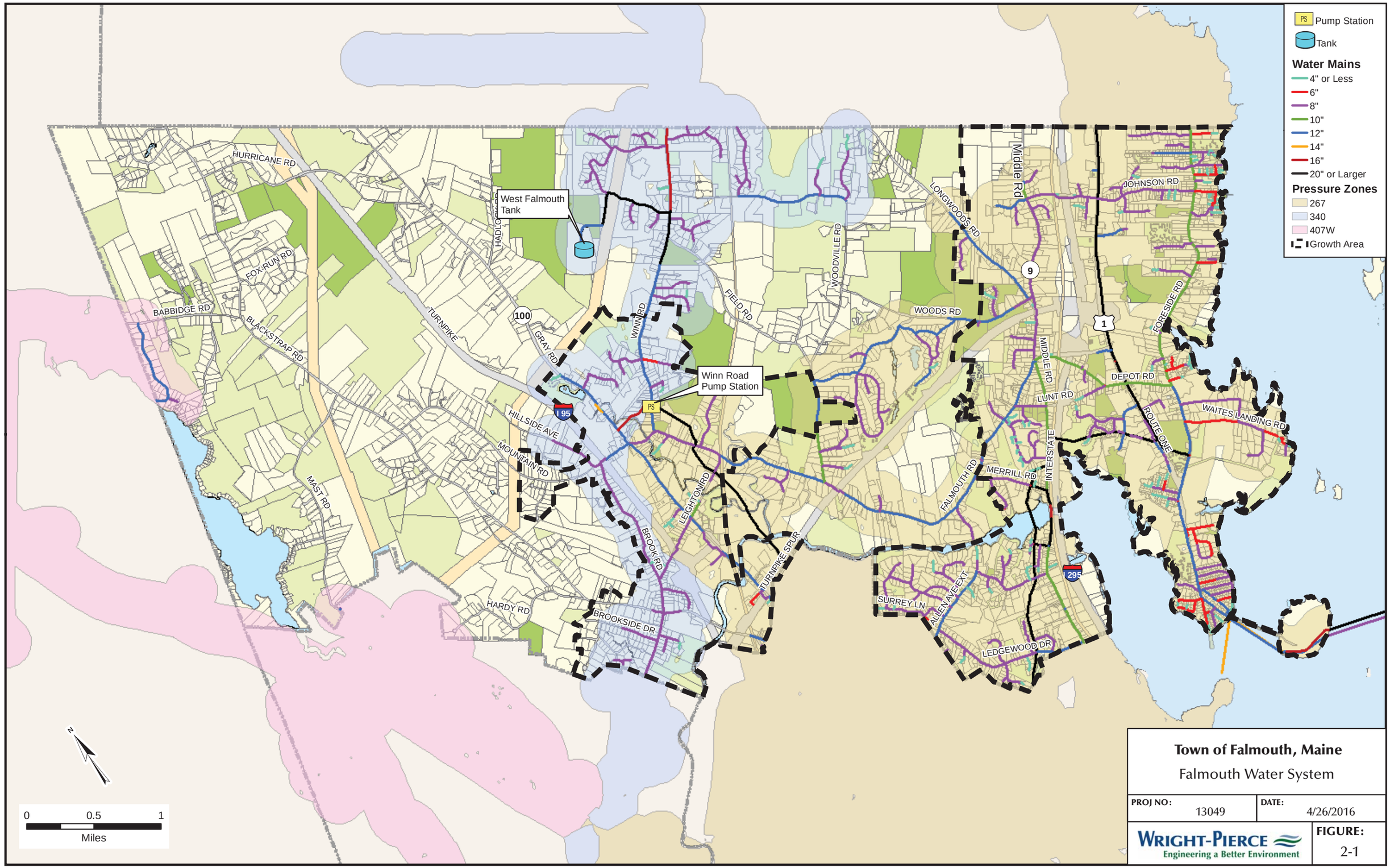
PS Pump Station
Tank
Water Mains
4" or Less
6"
8"
10"
12"
14"
16"
20" or Larger
Pressure Zones
267
340
407W
Growth Area
West Falmouth Tank
Winn Road Pump Station
PS
HURRICANE RD
FOX RUN RD
BABBIDGE RD
BLACKSTRAP RD
TURNPIKE
HADLOCK RD
100
GRAY RD
WINN RD
FIELD RD
WOODVILLE RD
LONGWOODS RD
Middle Rd
WOODS RD
9
1
JOHNSON RD
FORESIDE RD
DEPOT RD
LUNT RD
MIDDLE RD
WAITES LANDING RD
ROUTE ONE
I 95
HILLSIDE AVE
MOUNTAIN RD
MAST RD
LEIGHTON RD
BROOK RD
HARDY RD
BROOKSIDE DR
TURNPIKE SPUR
FALMOUTH RD
MERRILL RD
INTERSTATE
295
SURREY LN
ALLEN AVE EXT
LEDGEWOOD DR
N
0
0.5
1
Miles
Town of Falmouth, Maine
Falmouth Water System
PROJ NO: 13049
DATE: 4/26/2016
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FIGURE: 2-1

Much of West Falmouth is not served by public water because the area is more rural and has relatively high ground surface elevations. Adequate pressure would not be available from any of the current service areas.

2.2.2 Distribution Mains

There is approximately 83 miles of water distribution mains in the Town of Falmouth ranging in size from 1-inch up to 36-inch. 36-inch and 20-inch pipe enter the town system from Portland and feed Falmouth at Winn Road and Route 1. The primary spines of Falmouth's water system are located as follows:

- A 20-inch diameter water main on US Route 1 extending from Lunt Road to the Falmouth/Cumberland town line.
- A 12-inch diameter water main runs along Falmouth Road, Woods Road, Woodlands Drive, Pinehurst Lane and Woodville Road to the west of town.
- Route 100 and Brook Road are fed by a combination of 8-inch and 12-inch diameter water mains.
- 12-inch, 16-inch and 20-inch diameter water mains make up the spine along Winn Road from the Winn Road Pump Station extending northerly to the West Falmouth Tank and beyond into Cumberland.

All other areas of Town served by the PWD consist of small diameter local mains from 1-inch to 12-inch in diameter. The small diameter mains, up to 4-inch in diameter, serve mainly side street and residential locations and do not provide fire protection. These areas are targeted for small mains because there is no intent to extend or loop these mains in the future for hydraulic purposes or for firefighting. The smaller mains are normally extensions from larger diameter mains. Figure 2-1 shows the extent of Falmouth's water system.

2.2.3 West Falmouth Water Storage Tank

The West Falmouth Water Storage Tank, located in the central part of Zone 340, is a 100-foot diameter, 42-feet high, concrete tank with a total capacity of approximately 3.0 million gallons. There is no storage within Zone 267 in the Town of Falmouth.

2.2.4 Winn Road Pump Station

The Winn Road Pump Station draws water from Zone 267 to serve Zone 340 and is operated based on the water levels in the West Falmouth Water Storage Tank. The station was constructed in the 1980's. Included within the station are two, 75-horsepower pumps with space and connections available for a third pump. The design capacity of the pumps is approximately 800 gallons per minute (gpm). The pumps are not typically run simultaneously.

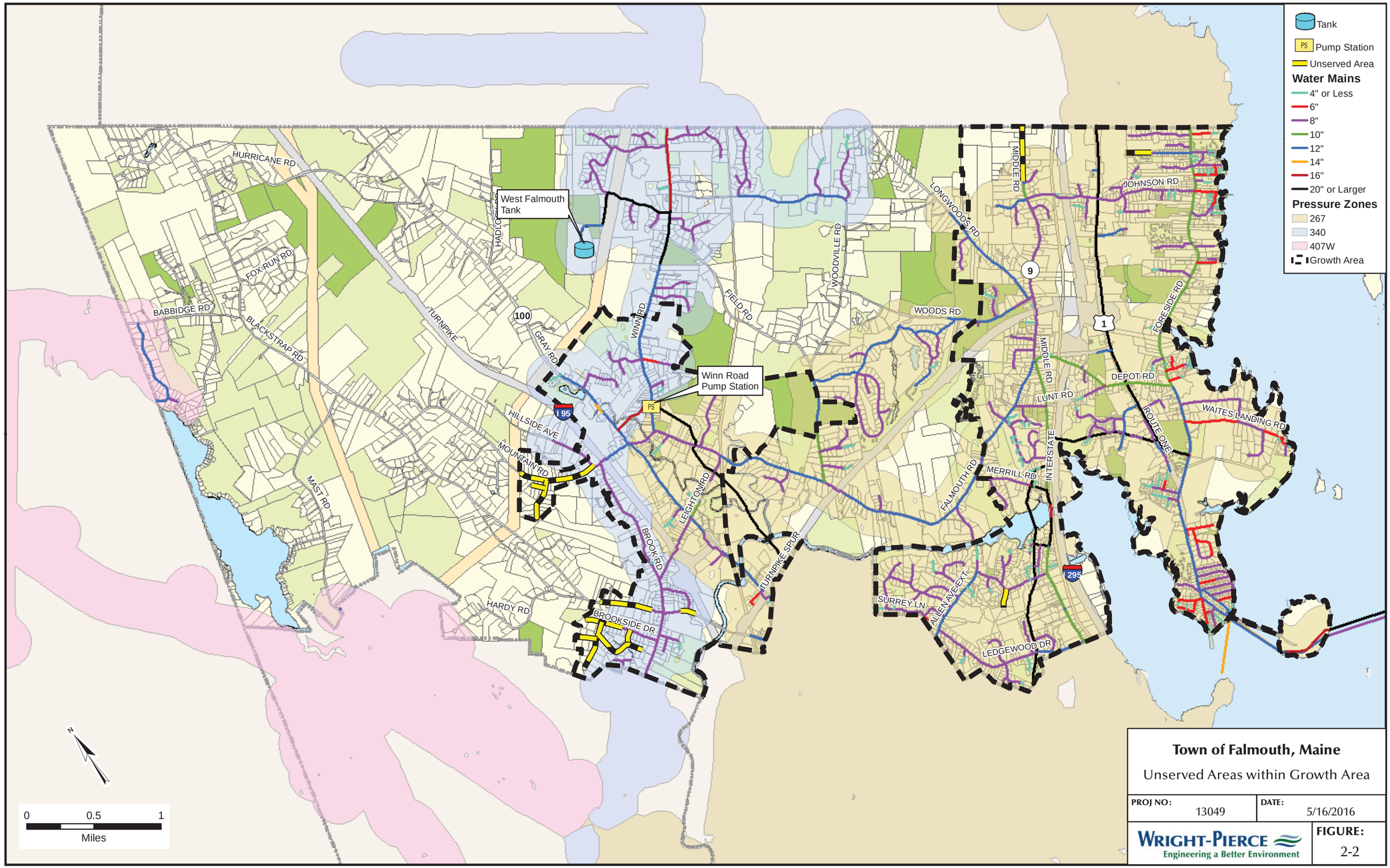
The 2003 CWSSP reported that the Winn Road Pumping Station was marginally sized at the time to meet projected demands in Zone 340 in the future. However, since the CWSSP report was completed, demands have decreased enough in the zone and so that the station is adequately sized for current demands. The study originally predicted that water consumption in Falmouth would increase to 2.8 million gallons per day (MGD) in year 2020. The District now reports that consumption trends in Falmouth have risen less dramatically through year 2015. This decrease is likely a result of water conservation. This trend is consistent with other medium and large water utilities in the State of Maine.

The Winn Road Station will be impacted if additional water-use occurs within the West Falmouth Growth Area. However, because these impacts are expected to be small, the Portland Water District has indicated they would be responsible for any impacts to this facility driven by additional demands occurring in Zone 340. However, as a non-investing utility, the District can opt to make acceptance of new infrastructure contingent on proposed development funding improvements to the pumping station.

2.2.5 Areas Not Served by Public Water in Falmouth

2.2.5.1 Growth Area

Figure 2-2 shows the current public streets with and without public water located within the Growth Area. As can be seen in the figure, there are limited areas that are not served by public water. Extending service to these areas will be discussed in more detail in Section 3 of this report.



Town of Falmouth, Maine

Unserved Areas within Growth Area

PROJ NO:	DATE:
13049	5/16/2016

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FIGURE: 2-2

2.2.5.2 Rural Area

Even though it is outside the scope of this study, large areas in West Falmouth are not served by public water. Much of the area east of Highland Lake has high ground surface elevations and is rural. These locations are mainly served by private groundwater wells. The Town does not have any documented transient or non-community water sources registered with the State of Maine. These types of well supplies serve hotels, camps, trailer parks and other larger users.

2.3 PORTLAND WATER DISTRICT SYSTEM

2.3.1 2003 Demand Projections

An estimate of future water-use is needed to understand how projected growth in water use will impact infrastructure in Falmouth. Our methodology retains demand projections made in the Town's 2003 Comprehensive Water System Strategic Plan (CWSSP) by Camp, Dresser and McKee (CDM). The District acknowledges these predictions are somewhat conservative, but continues to rely on these estimates for its own internal planning purposes until its next planning cycle is initiated. On this basis, we have retained these values for our updated analysis. This demand projection extended out to year 2020. In addition, demands from future development within the Growth Area were estimated to supplement this earlier information. The time to reach build-out conditions is not known and will be dependent on the Town's zoning ordinance, growth of the local economy, availability of property, future development needs and other factors.

The 2020 average-day demand (ADD) demand projection the 2003 Comprehensive Water System Strategic Plan was estimated to be approximately 2.8 MGD for the Town of Falmouth. The average-day demand is the amount of water used in a calendar year divided by the number of days in a year.

Similarly, the projected maximum-day demand (MDD) and peak-hour demand (PHD) were estimated for year 2020 in the Town of Falmouth from system wide projections contained in the report for Zones 267 and 340. The maximum-day demand is the day on which the highest water use was recorded during that year. The peak-hour demand is the single hour in the year when the highest water use occurred. These values will be used to test the capacity of the distribution piping to meet the project growth needs in the Growth Areas. The projected demands from this earlier report are shown in Table 2-1.

TABLE 2-1
FUTURE 2020 WATER SYSTEM DEMANDS

2020 Average Day Demand[1]	2.8 MGD
2020 Maximum Day Demand[2]	4.6 MGD
2020 Peak Hour Demand[2]	7.0 MGD

[1]2020 ADD demand from 2003 CWSSP Report
[2]2020 MDD & PH demand estimated based on percentage of Falmouth demand in Zones 267 and 340.

2.3.2 Revised Demand Projections based on 2016 Growth Area Wastewater Study

Potential future development will to some extent be constrained by the wastewater capacity of the remaining, undeveloped building lots within the Growth Area. An evaluation of build-out conditions allowed by the proposed zoning within the Growth Area in Falmouth was analyzed by Wright-Pierce in the 2016 report entitled, "West Falmouth Sewer Master Plan for the Town of Falmouth, Maine." In this report, West Falmouth, designated as the portion of the Growth Area west of Interstate 295, was evaluated for zoning, lot size, and the potential for subdivision based on land area and buildable land.

Average-day water use demands were generated based on estimates of wastewater loads generated for build-out conditions in the Growth Area as shown in Table 2-2.

TABLE 2-2
WASTEWATER LOAD PROJECTIONS (WEST FALMOUTH)

Average Daily Flow, Lunt Road Sewer PS (West Falmouth)	162 gpm*
Additional Average Daily Flow (based on Build-out)	238 gpm
Total Average Daily Sewer Load (West Falmouth)	400 gpm

*gpm = gallons per minute

Water demands are assumed to be one-third higher than the wastewater loads due to irrigation, filling of swimming pools and other water uses that do not produce wastewater flows. Under this assumption, the additional average-day water demand at build-out was estimated to be 316 gpm. Metered consumption records by the PWD from Falmouth water customers indicate that the future 2020 water demands projected in the CWSSP are very conservative. However, the water system analysis herein will be conducted under these conditions consistent with the Districts internal planning approach. Additional demand within the Growth Area, listed in Table 2-2, is assumed to be accounted-for in the 2020 projections.

2.3.3 Portland Water District Hydraulic Model

Water systems are analyzed, planned and designed primarily through the application of basic hydraulic principles. A computerized hydraulic model of a water system aids in assessing the condition and adequacy of current infrastructure under existing and projected demands and to guide future improvement recommendations.

A computer hydraulic model of the Portland Water District's (PWD) service area was obtained from PWD constructed using the Innovyze H_2O Map hydraulic modeling platform. The model was assumed to be calibrated and no additional calibration was performed.

A model is made up of a schematic of the piping network. The schematic is a drawing of the piping system in which pipes are represented as "links" (lines), and pipe intersections and changes in pipe size or materials are represented as "nodes" (points). Supply sources and storage facilities are represented as pipes connected to only one system node. Characteristics of the water

system, such as water supply sources, pumps, tanks, valves and pipe (diameter, length, C-value), ground elevation at pipe intersections and total system demand are the primary inputs to the model. For a specified demand condition, the model generates pressures, hydraulic gradeline elevations and available flows at each node; and flows, pipe velocities and head losses for each pipe.

The model was used to simulate impacts to PWDs water system when the projected demands are incorporated into the model. Our findings from this analysis are discussed in Section 3 of this report.

SECTION 3
DISTRIBUTION SYSTEM EVALUATION

3.1 PURPOSE AND SCOPE OF SYSTEM ANALYSIS

The purpose of the system analysis is to assess the hydraulic adequacy of the Town's water system and its ability to satisfy projected demand conditions within the designated Growth Areas. The evaluation focused on the following distribution system hydraulics as follows:

- Maximum and minimum system pressures
- Adequate fire flows
- Reliable service

Several stress conditions were simulated using the hydraulic model under existing and projected demand conditions. Stress conditions are used for this analysis were:

- **Peak-Hour Demands on Maximum Day** - Under peak-hour conditions, a water system is considered adequate if a minimum pressure of 35-40 psi can be provided at ground level to the entire service area. The Portland Water District uses 40 psi as its standard. When possible, we recommend that systems be designed to provide 35 psi to the second story of a building (i.e., 15 feet above ground elevation). We recognize that this is not always practical or possible. For purposes of this study, our evaluation will consider pressure at ground level. The PWD requires limited service requirements for all customers with expected delivery pressures below 40 psi.
- **Maximum-Day Demands Plus Coincident Fire Flow Requirements** - Under maximum-day plus fire flow demand conditions, a system must be capable of providing the needed fire flow, while maintaining a minimum residual pressure of 20 psi coincidental throughout the distribution system. Pressure must be maintained above 20 psi for public health purposes to prevent contamination form be drawn into the pressurized water mains from surrounding soil. This is also the minimum pressure

required by the Maine Public Utilities Commission before a low service agreement is required with the impacted customer.

3.2 HYDRAULICS

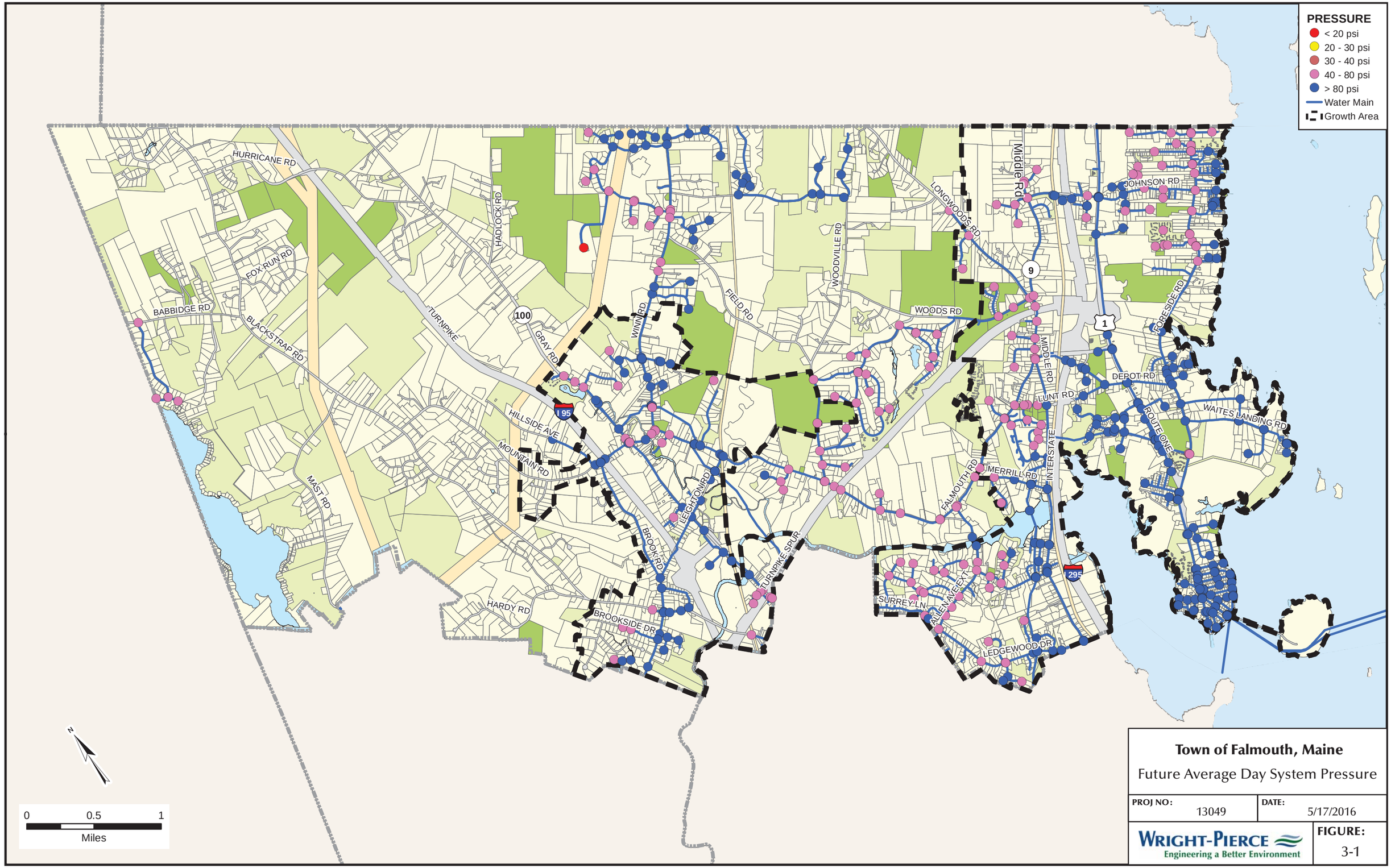
3.2.1 Water System Pressure

A water system should be designed to accommodate a range of pressures within minimum and maximum guidelines. Low pressures lead to customer complaints and restrict available flows for firefighting. Higher pressures can lead to increased water loss from existing pipe leaks, during hydrant flow testing, and from other sources of lost water in the system.

Variations in customer demand, topography, and proximity to pumping facilities and sources of supply will cause water pressure to vary around the service area. In general, when customer demands increase, pressure will decrease. Areas with higher elevations typically have lower pressures.

PWD has set a goal of maintaining a minimum system pressure of 40 psi during peak-hour demand (PHD) at ground level throughout the service area. During a maximum day demand (MDD) with coincidental fire flow, a minimum of 20 psi should be maintained throughout the system as previously described.

Falmouth's system was reviewed under future average-day, maximum-day and peak-hour system conditions. Figure 3-1 is a color coded map showing the predicted system pressures under future average-day demands assuming that all the projected flows at build-out have occurred within the Growth Areas. Pressures throughout Falmouth's system are generally adequate. As is typical of most systems, isolated areas of low pressure exist in the immediate vicinity of the storage tank or at the terminus of dead end mains on hills. A single location was found to have pressure below 40 psi under peak-hour conditions. This is at the end of St. Andrew's Circle where the terminus of the water main sits at a higher elevation than the surrounding areas.



Town of Falmouth, Maine

Future Average Day System Pressure

PROJ NO:	DATE:
13049	5/17/2016

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FIGURE: 3-1

In summary, full build-out conditions within the Growth Areas will not create negative impacts to service pressures anywhere in Falmouth.

3.2.2 Fire Flow Requirements

The adequate fire protection is a valuable asset for a community. Guidelines for fire flow requirements are provided by the Insurance Services Office (ISO). ISO is an insurance service organization responsible for evaluating and classifying communities for insurance rating purposes.

The Insurance Services Office (ISO) conducts an assessment of fire protection in a given community roughly every 10 years. The effort culminates in a report issuing each Town in a Districts service territory a Public Protection Classification (PPC). This classification assigns a value ranging from 0 to 10 to classify the level of fire protection in a given community. Class 1 represents exemplary fire protection and a Class 10 represents a system that does not meet minimum fire protection criteria. Development of the classification is quite complex considering a variety of factors. The three primary factors effecting the classifications are:

- **Fire Alarm and Communication Systems** - This factor includes an assessment of community's ability to handle and dispatch fire alarms. This task accounts for 10 percent of a community's rating.
- **Fire Department** - This factor accounts for 50% of the total classification and focuses on such factors as distribution of engine companies and fire stations, pumping capacity, reserve apparatus, training and staffing issues.
- **Water Supply System** - The water supply accounts for 40% of a community's classification. Factors affecting the rating include hydrant flow capacity, hydrant inspection protocols, condition of hydrants and other factors.

ISO locations for Falmouth, provided in PWD's 2003 Comprehensive Water System Strategic Plan, were used to evaluate fire flows as part of this study. Locations and required fire flows are listed in Table 3-2.

Specific fire protection requirements at a given locale vary with the physical characteristics of a building. The required fire flows are based on the worst case premise in a general location using the following factors: (1) materials of construction, (2) its occupancy use, (3) proximity to other structures, (4) height and size of building, (5) the existence of fire walls and, (6) presence or absence of sprinklers, as well as other factors. Specific buildings may have required fire flows as high as 12,000 gpm. Table 3-1 shows typical fire flow requirements for various building types and uses. This data will be used to assess the adequacy of the available fire flows at select locations throughout the distribution system. Actual fire flow requirements will be used at specific locations tested by ISO.

TABLE 3-1
TYPICAL FIRE FLOW REQUIREMENTS

Land-Use or Building Type	Range of Required Fire Flows
Single and Two Family Dwellings	
Over 100 feet building separation	500 gpm
31 to 100 feet building separation	700 gpm
11 to 30 feet building separation	1,000 gpm
10 feet or less building separation	1,500 gpm
Multiple Family Residential Complexes	1,000 to 3,000 gpm
Average Density Commercial	1,500 to 2,500 gpm
High Value Commercial	2,500 to 3,500 gpm
Light Industrial	2,000 to 3,500 gpm
Heavy Industrial	2,500 to 3,500 gpm

Municipal fire insurance ratings are based partially on a water utility's ability to provide needed fire flows up to a maximum flow of 3,500 gpm. The ISO requirement of 3,500 gpm was the criteria used for all non-residential land uses. This is the largest fire flow that the ISO recognizes as necessary for any system to be required to provide. If a specific building has a required fire flow greater than 3,500 gpm, than the community's fire rating will only be based on the water system's ability to provide 3,500 gpm.

Table 3-2 lists the results of the model simulations of the available fire flows under future maximum-day demand, including full build-out demands within Growth Areas, for fourteen ISO

tested locations throughout the Town of Falmouth. ISO test locations are shown in Figure 3-2. The available flows were then compared to the required flows reported by the ISO.

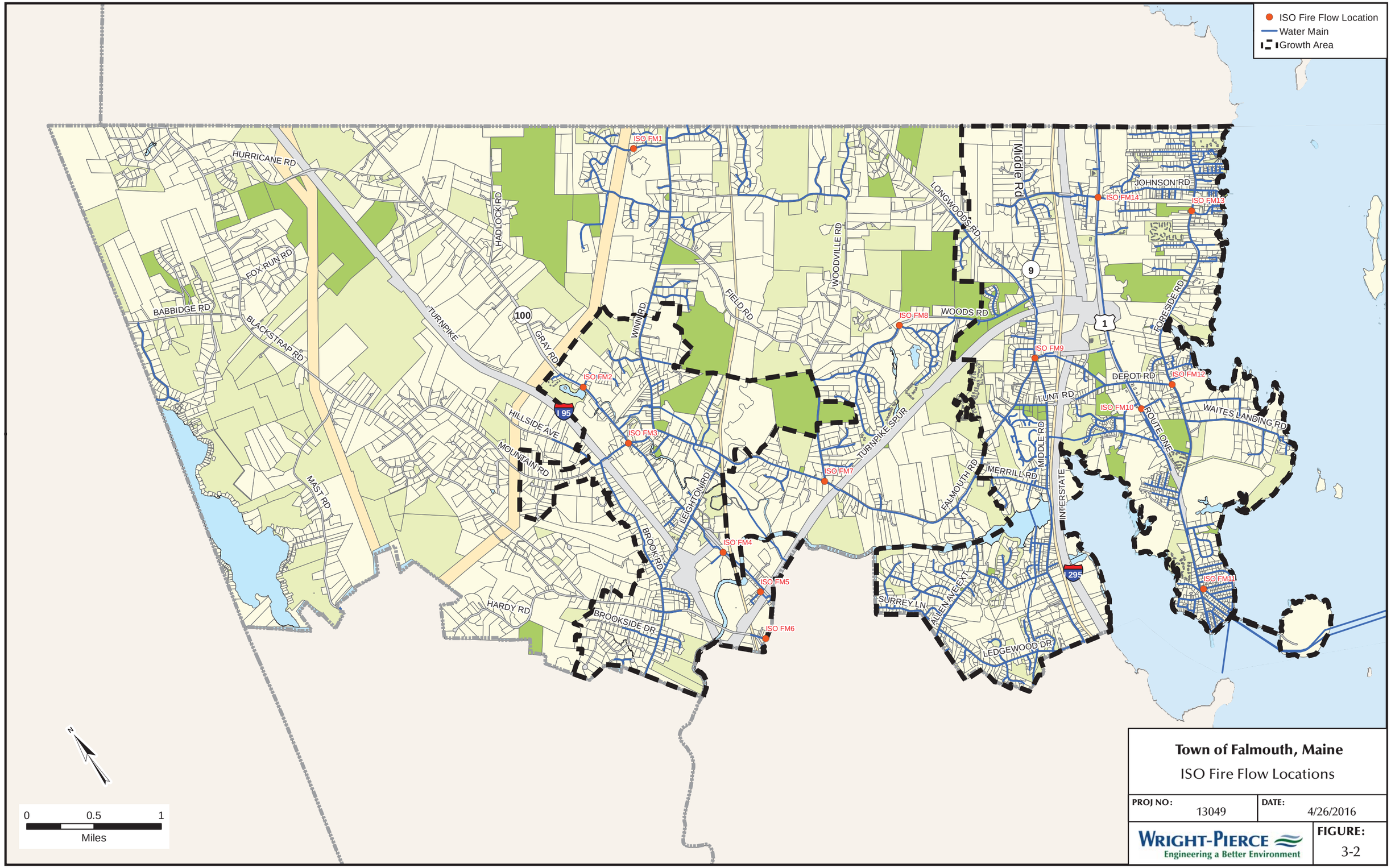

ISO Fire Flow Location
Water Main
Growth Area
ISO FM1
ISO FM2
ISO FM3
ISO FM4
ISO FM5
ISO FM6
ISO FM7
ISO FM8
ISO FM9
ISO FM10
ISO FM11
ISO FM12
ISO FM13
ISO FM14
HURRICANE RD
BABBIDGE RD
FOX RUN RD
BLACKSTRAP RD
TURNPIKE
HADLOCK RD
GRAY RD
HILLSIDE AVE
MOUNTAIN RD
MAST RD
WINN RD
FIELD RD
WOODVILLE RD
LEIGHTON RD
BROOK RD
BROOKSIDE DR
HARDY RD
LONGWOODS RD
WOODS RD
TURNPIKE SPUR
Middle Rd
MIDDLE RD
FALMOUTH RD
MERRILL RD
SURREY LN
ALLEN AVE EXT
LEDGEWOOD DR
INTERSTATE
LUNT RD
DEPOT RD
FORESIDE RD
JOHNSON RD
ROUTE ONE
WAITES LANDING RD
100
95
9
1
295
N
0
0.5
1
Miles
Town of Falmouth, Maine
ISO Fire Flow Locations
PROJ NO: 13049
DATE: 4/26/2016
WRIGHT-PIERCE
Engineering a Better Environment
FIGURE: 3-2

TABLE 3-2
AVAILABLE FIRE FLOWS AT ISO TEST LOCATIONS IN THE DISTRIBUTION SYSTEM UNDER PROJECTED MAXIMUM-DAY DEMANDS

Location #	Flow Location	Estimated Available Fire Flow[2] (gpm)	Required Fire Flow[1] (gpm)	Test Location	Adequate (Yes/No)
FM1	Inverness Rd @ Constitutional Dr	3,200	500	Rural Area	Yes
FM2	Gray Rd @ Eastern Ave	850	2,000	Growth Area	**No**
FM3	Mountain Rd @ Gray Rd	>3,500	2,250	Growth Area	Yes
FM4	Gray Rd @ N. Portland Business Park	3,300	2,250	Growth Area	Yes
FM5	Gray Rd @ Robert St	>3,500	3,000	Growth Area	Yes
FM6	Blackstrap Rd @ Lambert St	>3,500	2,500	Growth Area	Yes
FM7	Falmouth Rd @ Woodville Rd	2,200	2,250	Rural Area	Yes[3]
FM8	Woodlands Dr @ Oakmont Dr	1,400	3,500	Rural Area	**No**
FM9	Middle Rd @ Buckmum Rd	>3,500	1,500	Growth Area	Yes
FM10	US Rte. 1 @ Fundy Rd	>3,500	3,500	Growth Area	Yes
FM11	Whitney Ave @ Phillips Rd	1,850	1,000	Growth Area	Yes
FM12	Foreside Rd @ Depot Rd	>3,500	3,500	Growth Area	Yes
FM13	Foreside Rd @ Ramsdell Rd	1,600	2,000	Growth Area	**No**
FM14	US Rte. 1 @ Johnson Rd	>3,500	2,500	Growth Area	Yes

Notes:
[1]Locations and required flow as noted in PWD's 2003 CWSSP Tables 5-7 and 5-12.
[2]Flow capacity based on minimum system pressure of 20 psi. Model results rounded to the nearest 50 gpm.
[3]The available fire flow was found to be just below the required flow, for this reason, ISO FM7 is considered adequate.

The available fire flows shown in the Table 3-2 differ from the ISO test results because of varying pumping rates, system demands and tank elevations during the testing periods. In addition, the available fire flows shown in Table 3-2 reflect a minimum 20 psi residual pressure in all areas of the distribution system which can be predicted within a model simulation but not during a field flow test conducted by the ISO.

Normal field and ISO testing procedures do not take in account pressures in the distribution system other than at a test hydrant. In areas with varying topography, it is often hydrants other than the flow hydrant that control available fire flow volumes.

In summary, the Falmouth distribution system is hydraulically strong with excellent fire flows in most areas of the distribution system. There are no impacts to the available fire flows at Growth Area build-out conditions anywhere within the Town of Falmouth.

The following improvements will increase available fire flows at the three "inadequate" ISO Test Locations:

- **ISO Test designation FM2** – FM2 is located on a dead-end 12-inch main and is served from Zone 267. The PWD replaced an outdated 8-inch cast iron main on Gray Road feeding a 12-inch ductile iron dead end main to this location in 2015. This low flow location has been corrected and now meets standards.
- **ISO Test designation FM8** – The 2003 CWSSP proposed improvements to correct this flow deficiency including the installation of a 16-inch main on Woodsville Road from Winn Road to Woods Road, on Woods Road from Woodsville Road to Woodlands Drive and on Woodlands Drive from Woods Road to Oakmont Drive. In addition, this would include the installation of a pressure reducing valve at Woodsville Road and Birkdale Drive. Conversations with the PWD indicate that this improvement will not proceed because of its singular value of improving only one test location and its associated cost which is estimated at $2,000,000. However, if a redundant loop between Zone 340 and Zone 267 may have value to the PWD and could be an option to supply the Upper Middle Road area, discussed later in the report. If this strategy is

selected to supply the Middle Road and the value of this pipeline to the PWD should be revisited.

- **ISO Test designation FM13** – FM13 is located along Foreside Road near Johnson Road on a 10-inch cement-lined cast iron main. An improvement to correct the flow deficiency would require replacement of approximately 3,900 linear feet of existing 8-inch main along Johnson Road with new 12-inch ductile iron main. The District is planning to upgrade this water main as part of its routine water main renewal program at no cost to the Town of Falmouth.

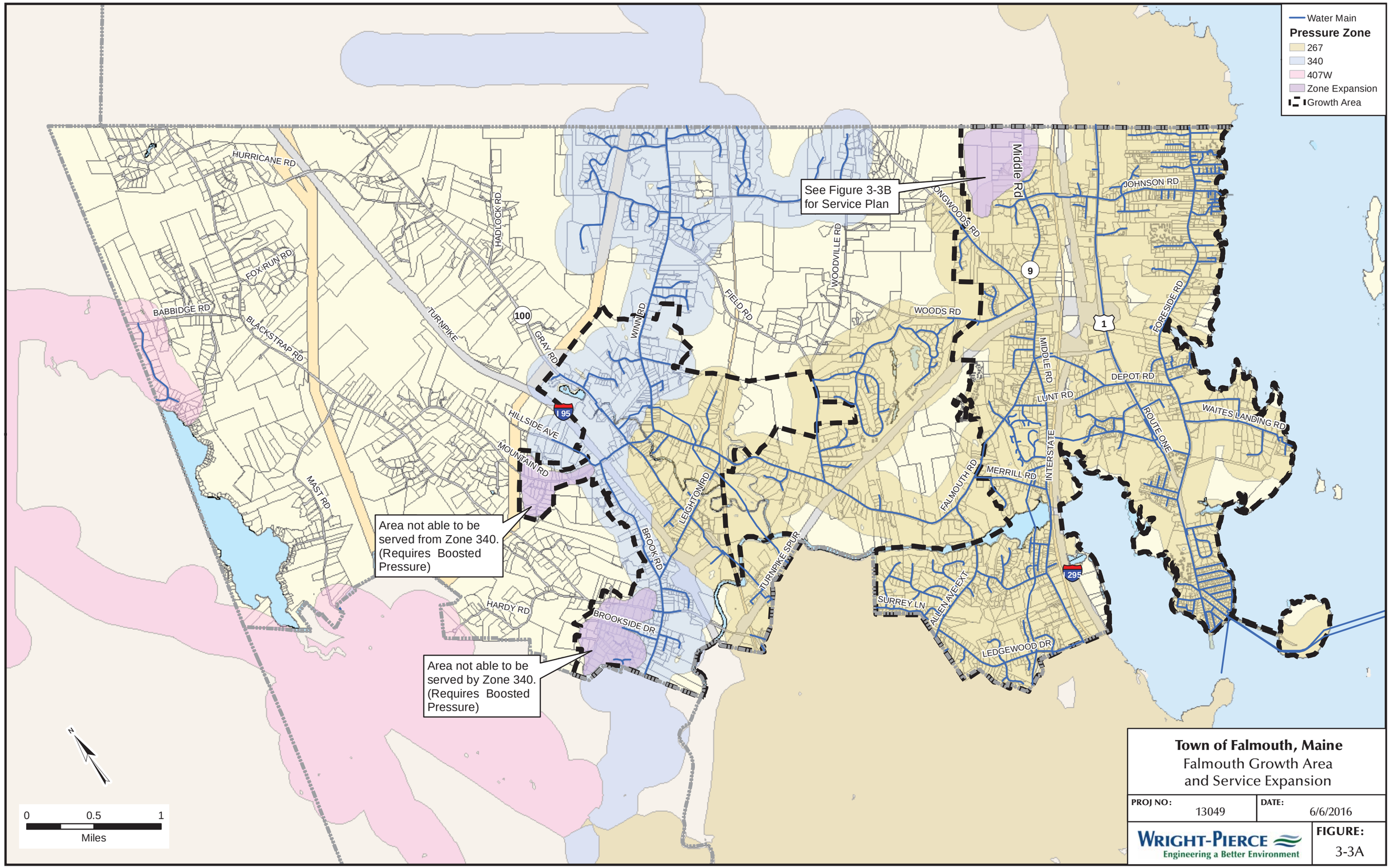
3.2.3 Service Expansion

The Growth Area of Falmouth, as identified in the Town's 2013 Comprehensive Plan, was evaluated for future expansion of the water distribution system. Service plans to extend public water to specific areas currently without service within the Growth Areas are discussed in the following sections and shown in Figure 3-3A.

3.2.3.1 Middle Road Area

In general, most of Zone 267 Growth Area can be served with adequate pressure. Expansion of the system would include an infill of 8-inch and 12-inch water mains based on PWD's water main extension guidelines. One exception to this assessment is the Middle Road area near the Cumberland town line.

Middle Road is currently served by Zone 267, which terminates at the intersection of Deer Run Road in Falmouth. The Town of Cumberland is extending service down Middle Road from the north to the Cumberland-Falmouth town line near this location, which will leave a gap between the town line and Deer Run Road. The Portland Water District was consulted and may have interest in a structural pipe loop in this area of the distribution system; therefore local users could be obligated to pay only a portion of the cost of a main extension in this area.


Water Main
Pressure Zone
267
340
407W
Zone Expansion
Growth Area
See Figure 3-3B for Service Plan
Area not able to be served from Zone 340. (Requires Boosted Pressure)
Area not able to be served by Zone 340. (Requires Boosted Pressure)
HURRICANE RD
FOX RUN RD
BABBIDGE RD
BLACKSTRAP RD
MAST RD
HADLOCK RD
TURNPIKE
100
GRAY RD
WINN RD
FIELD RD
WOODVILLE RD
HILLSIDE AVE
I 95
MOUNTAIN RD
BROOK RD
HARDY RD
BROOKSIDE DR
LEIGHTON RD
TURNPIKE SPUR
ONGWOODS RD
WOODS RD
Middle Rd
9
1
JOHNSON RD
FORESIDE RD
DEPOT RD
LUNT RD
MIDDLE RD
WAITES LANDING RD
ROUTE ONE
FALMOUTH RD
MERRILL RD
INTERSTATE
295
SURREY LN
ALLEN AVE EXT
LEDGEWOOD DR
N
0
0.5
1
Miles
Town of Falmouth, Maine
Falmouth Growth Area and Service Expansion
PROJ NO: 13049
DATE: 6/6/2016
WRIGHT-PIERCE
Engineering a Better Environment
FIGURE: 3-3A

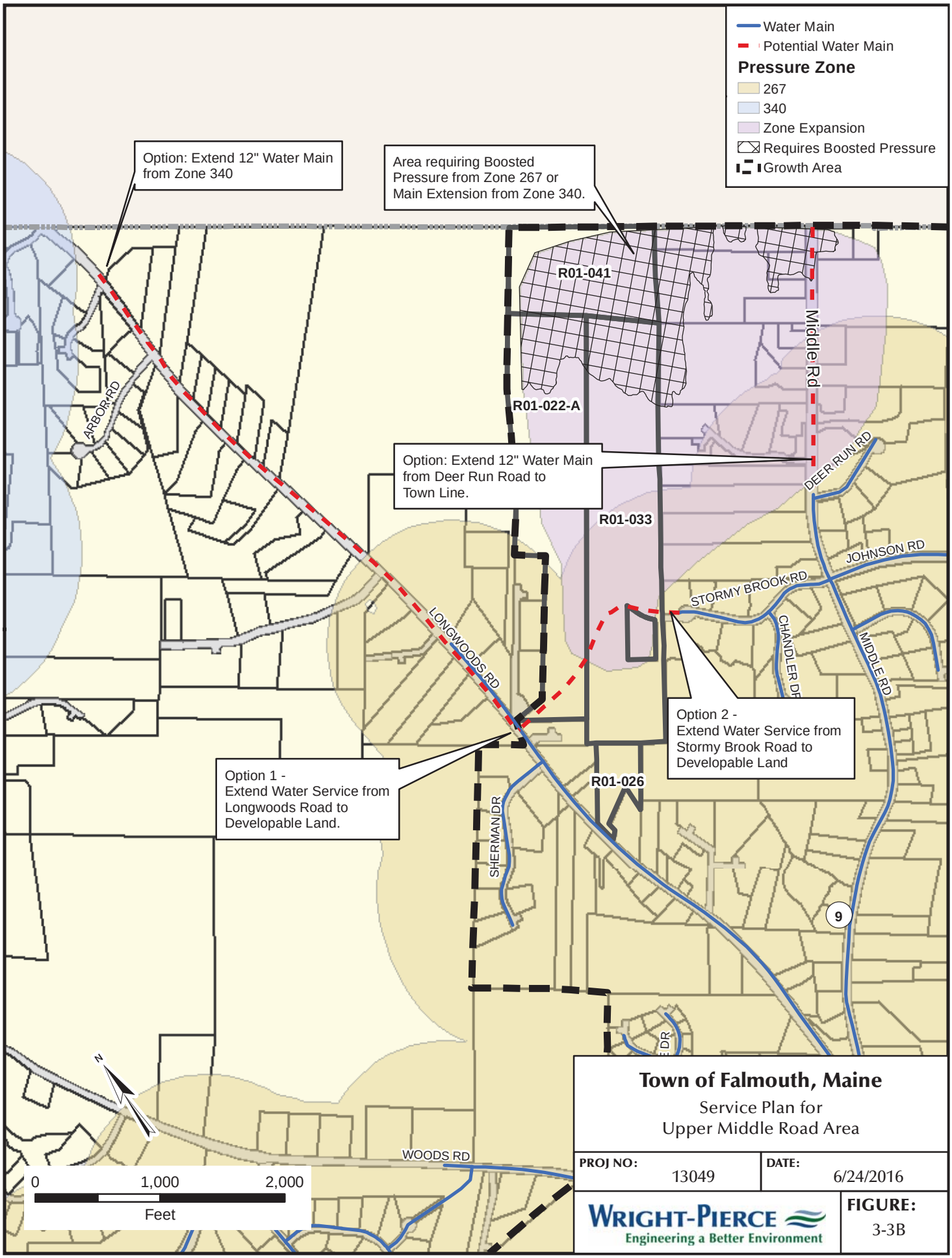
Based on ground surface elevations near the Cumberland-Falmouth town line on Middle Road, pressures cannot be maintained above 40 psi under PWD system conditions if service is extended from Zone 267 through this entire unserved area. However, most of the length of Middle Road can be served as shown in Figure 3-3B with a new 12-inch water main while maintaining operating pressures above PWDs 40 psi. The new water main would be about 3,000 in length and is estimated to cost approximately $750,000.

Figure 3-3B also shows locations with ground surface elevations too high to be served by the local Zone 267. This includes all areas with ground surface elevations greater than El. 170 msl. This area is depicted in Figure 3-3B. Extension of service to this high elevation area, could be accomplished in one of two ways:

- Extend a high pressure main down Longwoods Road from Zone 340
- Serve the area from Zone 267 and boost pressure with a local pumping station if high elevation areas near the town line require service.

The first approach would require a new 12-inch main extending a distance of about 1.5 miles from the termination Zone 340 near the Falmouth-Cumberland town line into the development zone as shown in Figure 3-3B. Access through private property easements would be required to access the undeveloped land in this location. The approximate cost for this project would be $1,400,000.

Alternatively, pressure could be elevated from Zone 267 with a local booster pumping station to serve any planned development in this area. Several undeveloped lots are present abutting Middle Road in this area. It is possible to serve most of this development area without boosting pressure except for high elevation areas along the Cumberland town line (See Figure 3-3B). Large areas of this development zone can be supplied without boosting pressure from Zone 267 through a 12-inch main extension from either Longwoods Road or Stormy Brook Road as shown in Figure 3-3B.


Water Main
Potential Water Main
Pressure Zone
267
340
Zone Expansion
Requires Boosted Pressure
Growth Area
Option: Extend 12" Water Main from Zone 340
Area requiring Boosted Pressure from Zone 267 or Main Extension from Zone 340.
R01-041
R01-022-A
Middle Rd
ARBOR RD
Option: Extend 12" Water Main from Deer Run Road to Town Line.
DEER RUN RD
R01-033
JOHNSON RD
STORMY BROOK RD
LONGWOODS RD
CHANDLER DR
MIDDLE RD
Option 2 - Extend Water Service from Stormy Brook Road to Developable Land
Option 1 - Extend Water Service from Longwoods Road to Developable Land.
R01-026
SHERMAN DR
9
WOODS RD
N
0
1,000
2,000
Feet
Town of Falmouth, Maine
Service Plan for
Upper Middle Road Area
PROJ NO:
13049
DATE:
6/24/2016
WRIGHT-PIERCE
Engineering a Better Environment
FIGURE:
3-3B

A more detailed study is needed to develop a service plan for this area if this option is desired. The PWDs policy towards installation of booster pumping stations is discussed later in the report. This approach will be less costly then extending a new water main from Zone 340. The estimated cost for a booster pumping station is approximately $500,000 for a buried capsule style station.

3.2.3.2 Western Boundary of Zone 340

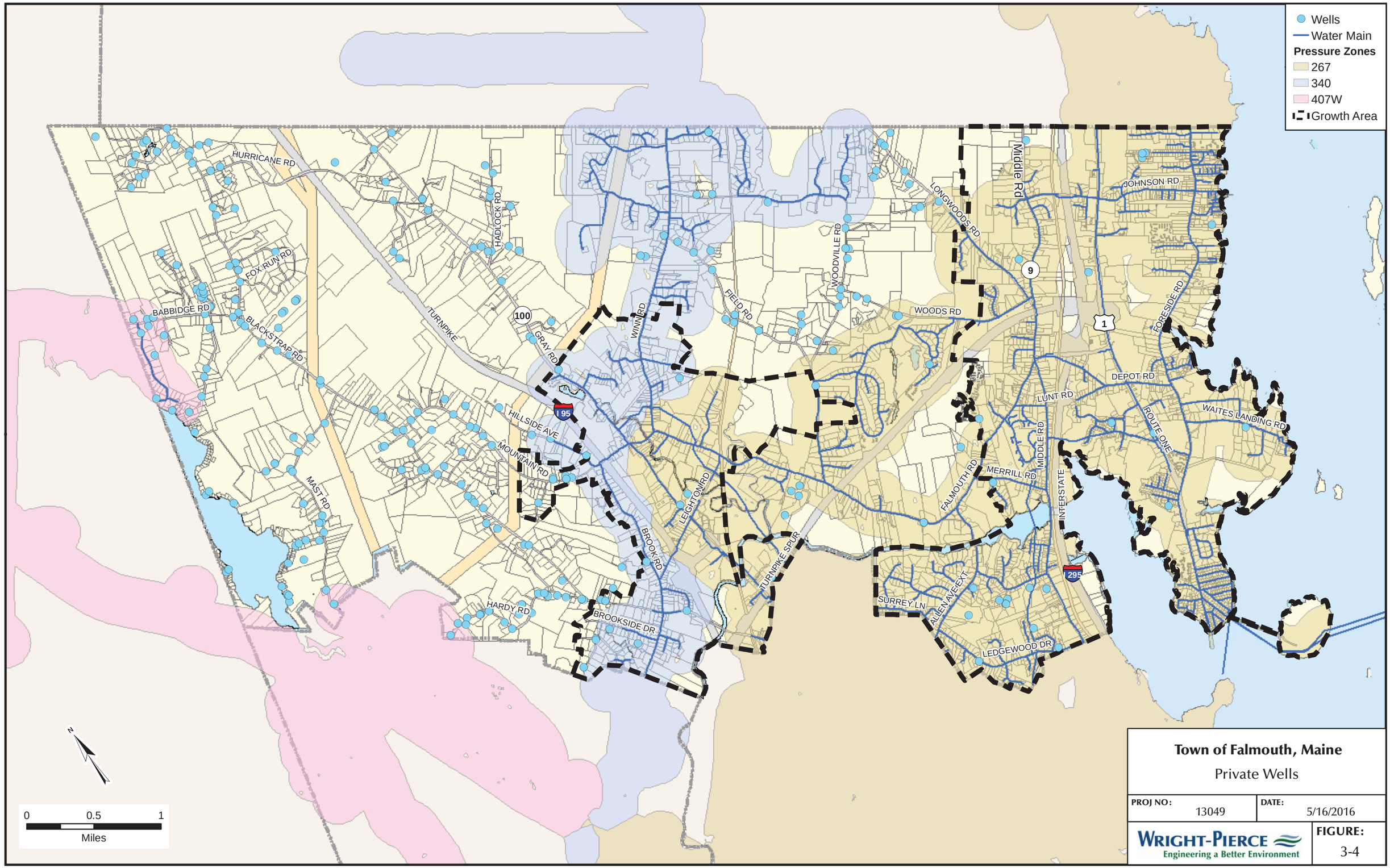
The majority of the Growth Area that lies within Zone 340 can be served with local main extensions. However, locations along the western most boundary, including Mountain Road and Susan Lane, were found to be unserviceable because of high elevations. If served by Zone 340, these areas will have inadequate pressures and will require service with a booster pumping station.

Under peak-hour system conditions, pressures along upper Indian Way, Balsam Lane and Brookside Drive were also predicted to have service pressures below 40 psi. Under normal average-day conditions, most of these areas could be served from the current pressure zone. However, when the system is stressed under peak-hour conditions, pressures dropped below 40 psi and will not meet PWDs minimum standards.

Section 3.2.3.4 of this report discusses PWD's approach to addressing areas like this where low pressures exist.

3.2.3.3 Other Dead Ends and Private Streets

As shown if Figure 2-2, there are just a few other public ways that lie within the Growth Area that are not currently served by the existing water system. Underwood Road and Thistle Lane are roadways in Falmouth that are either partially served by water mains or have no public water and are currently served by private wells. Both streets can be served by Zone 267 with main extensions. This is confirmed by Figure 3-4 which shows an overlay of private water wells documented by the Maine Department of Health and Human Services (DHHS) in the Town of Falmouth.



Town of Falmouth, Maine

Private Wells

PROJ NO:	DATE:
13049	5/16/2016

WRIGHT-PIERCE
Engineering a Better Environment

FIGURE: 3-4

3.2.3.4 PWD Policies for Service Extension to Low Pressure Areas

The Portland Water District has standard policies for extension of service to low pressure areas, such as the upper Mountain Road and the upper Brookside Drive. Both of these locations are within the designated Growth Area but have high ground surface elevations. The District cannot provide adequate pressure (minimum pressure of 40 psi) from Zone 340 service area. Several options exist to extend public water to these designated areas:

- **Option 1 – Installation of a Booster Pumping Station Owned by the Portland Water District** – For substantial developments, normally at least 50 residential lots or more, the District allows for installation of a booster pumping station. The station would be owned and operated by the PWD and boost pressure to the end of these two streets where operating pressures are predicted to be too low.
- **Option 2 – Installation of Individual Private Booster Pumping Stations** – The District could extend service to the homes on each of these streets using a limited service agreement in accordance PWD Standards. Limited service agreements are a contract between the utility and homeowner acknowledging limited service on low pressure (below 40 psi). The agreements normally include a stipulation for the homeowner to provide a private, residential booster pumping stations in the home to elevate pressure from the public utility.
- **Option 3 – Installation of a Shared Private Booster Pumping Station** – The homeowners could agree to construct a private booster pumping station that is owned and maintained collectively by the homeowners to boost pressure. The advantage of a larger private station is economy of scale and the possibility of relocating this equipment outside private homes. This is typically only allowed by the PWD for service to a single customer such as a condominium development.
- **Option 4 – PWD would Provide Service from a Newly Created High Service Area –** The District's 2003 CWSSP master plan recognized the need to create a new high service area in West Falmouth, if public water is requested in this location. This new service zone would be created to serve the area east of Highland Lake and would operate on a pressure gradeline of El. 500-550 feet msl. Water would be supplied to this

zone from a booster station to be constructed to draw suction from either the PWD's 340 or 407 Zones.

If public water is desired in the future, it is recommended that homeowners in these two locations within the Growth Area reach out to the PWD to develop an acceptable service plan.

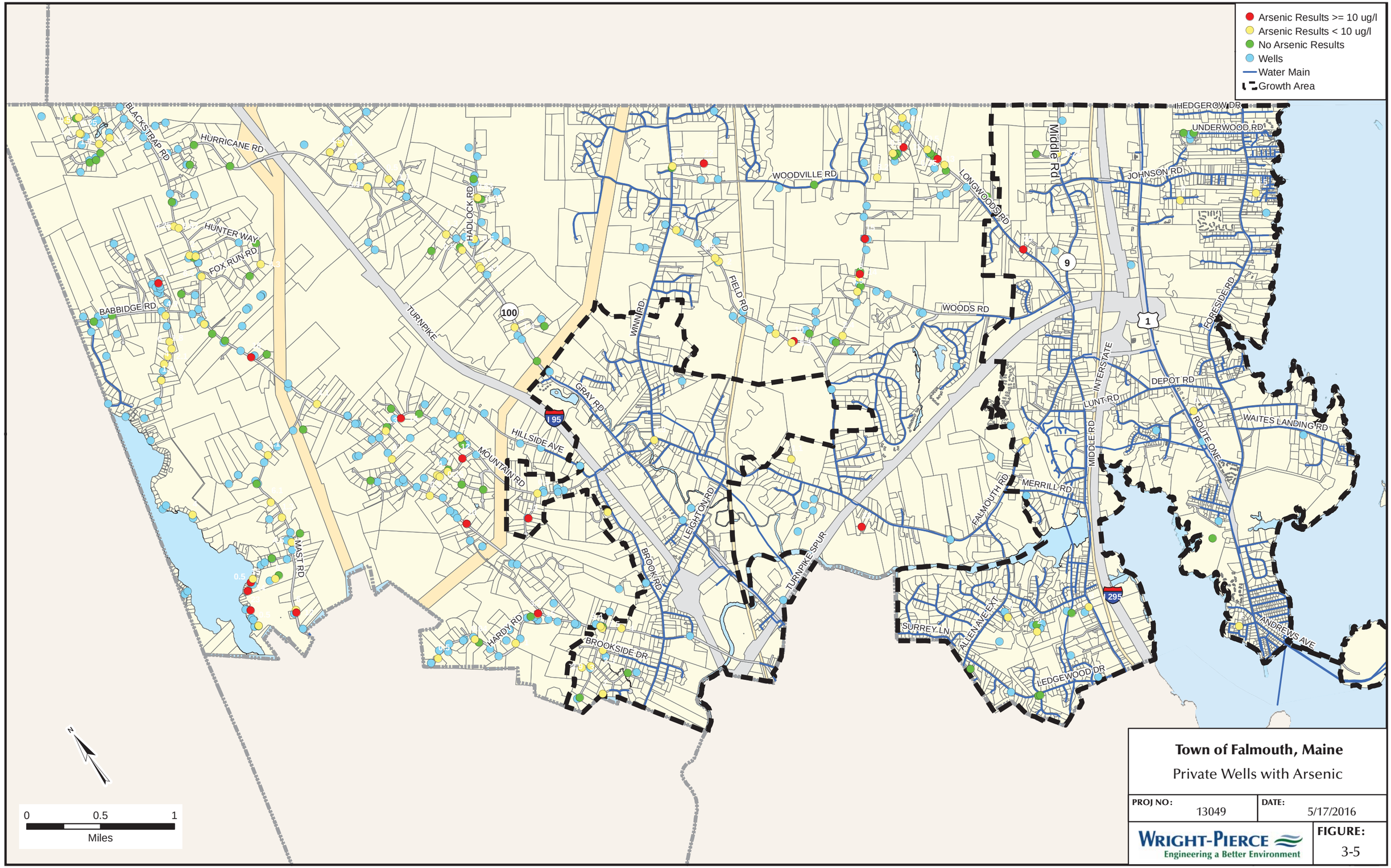
3.2.4 Town Wide Needs

3.2.4.1 Rural Portion of Route 100 Corridor

Route 100 is currently served off of Zone 267. A hydraulic model simulation of an extension beyond the Growth Area shows that Route 100, including locations at higher elevations near the Route 100/Hadlock Road intersection will not be serviceable from Zone 267 due to high ground surface elevations. If in the future, a new high service zone is created to serve the public in the area east of Highland Lake and if public water is desired in this area, it is recommended that this rural section of Route 100 become part of this new zone to provide adequate service and pressure to customers.

3.2.4.2 Arsenic in Private Wells

Some private wells in Falmouth are reported to have high concentrations of arsenic, above the maximum contaminant level (MCL) of 10 micrograms per liter (ug/l). Arsenic is a contaminant of concern for public health purposes, which is regulated and controlled in public water systems. The type of bedrock geology in Falmouth suggests that arsenic is likely present in many wells. The State of Maine, through the Center for Disease Control (CDC), and the Maine Geological Survey (MGS) were contacted as part of this study. The CDC led a study to collect and document arsenic prevalence in private wells around the State of Maine to understand the breadth and impacts to public health. The study area included Falmouth. Figure 3-5 shows data that was collected and highlights those wells tested with arsenic levels greater than 10 ug/l. As can be seen in Figure 3-5, there are a handful of wells in which arsenic levels have been tested above 10 ug/l throughout the Town.



Town of Falmouth, Maine

Private Wells with Arsenic

PROJ NO:	DATE:
13049	5/17/2016

WRIGHT-PIERCE
Engineering a Better Environment

FIGURE: 3-5

There does not appear to be widespread arsenic concentrations above the public health standard in Falmouth. Normally, isolated residential exceedances are best and most cost-effectively handled through use of point–of-use treatment systems acquired, installed, and maintained by homeowners.

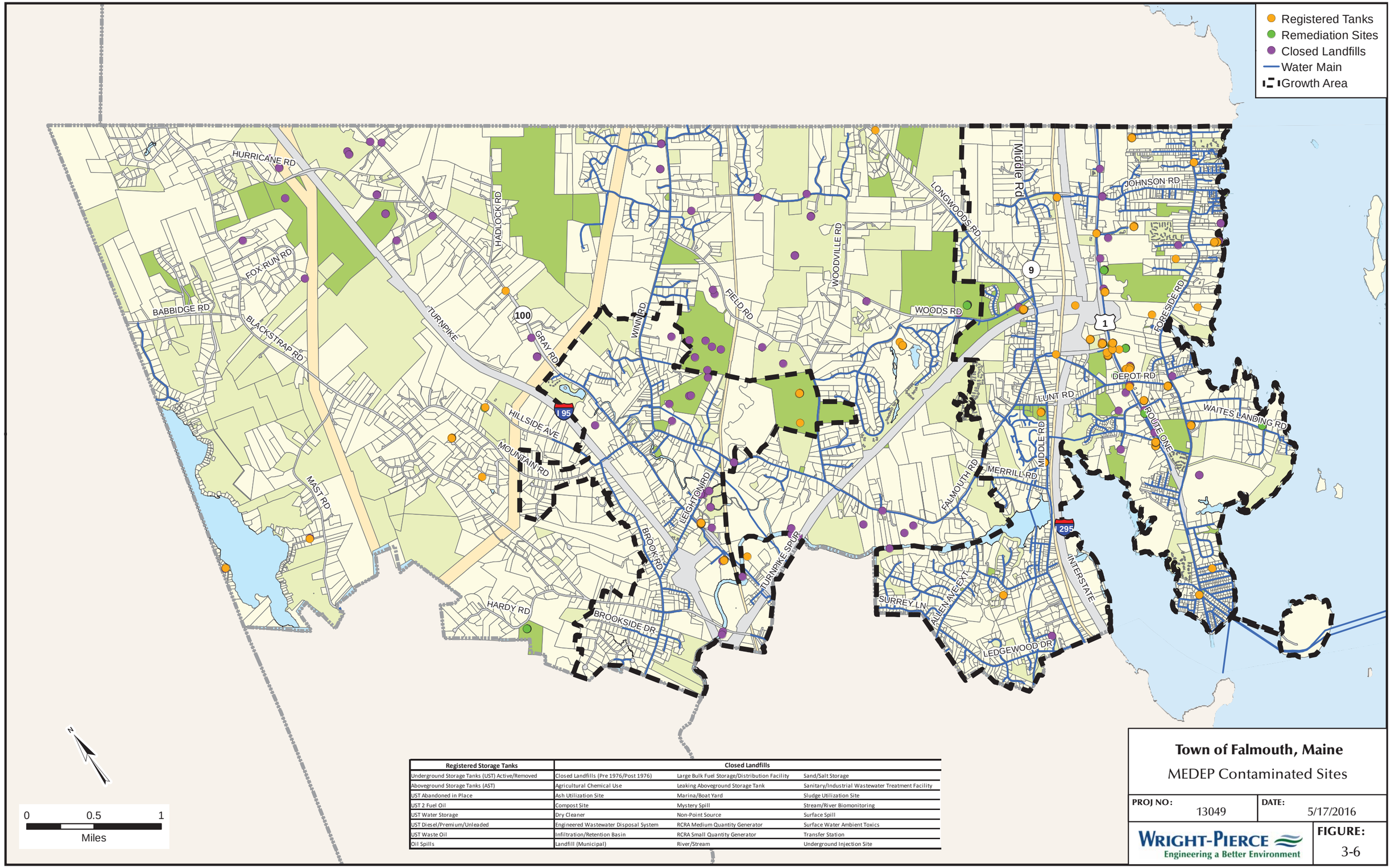
If large numbers of homeowners collectively wish to pursue a public water option to address any arsenic issues by extension of the water system, this group of homeowners would be obligated to pay the cost of the main extension in accordance with the PWDs policy for extension of public mains.

3.2.4.3 Groundwater Contamination

Figure 3-6 shows registered contamination sites on file with the Maine Department of Environmental Protection (MEDEP). State law requires registration of any source of contamination introduced to the environment. These sites were reviewed as part of this study to understand if any substantive threat to private wells in or outside of the designated Growth Areas was present within the geographic boundaries of the Town of Falmouth. If contamination existed, extension of the public water system to protect residents with private well supplies may make sense.

The categories of contamination shown on the map include:

- **Remediation Sites** – These are mostly chemical spills which required clean-up or remediation.
- **Registered Tanks** – These are typically buried gas or residential heating oil tanks. Many have been removed, but are listed in the database nonetheless.
- **"Closed Landfills"** – In addition to municipal landfills, MEDEP groups sites registered for agriculture chemical use, ash utilization, subsurface wastewater disposal systems, sludge utilization sites and underground injection sites, amongst others, under the general category of 'closed landfills'. The majority of these sites appear to include utilization for agronomic purposes such as herbicide spraying.



Registered Storage Tanks	Closed Landfills		
Underground Storage Tanks (UST) Active/Removed	Closed Landfills (Pre 1976/Post 1976)	Large Bulk Fuel Storage/Distribution Facility	Sand/Salt Storage
Aboveground Storage Tanks (AST)	Agricultural Chemical Use	Leaking Aboveground Storage Tank	Sanitary/Industrial Wastewater Treatment Facility
UST Abandoned in Place	Ash Utilization Site	Marina/Boat Yard	Sludge Utilization Site
UST 2 Fuel Oil	Compost Site	Mystery Spill	Stream/River Biomonitoring
UST Water Storage	Dry Cleaner	Non-Point Source	Surface Spill
UST Diesel/Premium/Unleaded	Engineered Wastewater Disposal System	RCRA Medium Quantity Generator	Surface Water Ambient Toxics
UST Waste Oil	Infiltration/Retention Basin	RCRA Small Quantity Generator	Transfer Station
Oil Spills	Landfill (Municipal)	River/Stream	Underground Injection Site

Town of Falmouth, Maine

MEDEP Contaminated Sites

PROJ NO:	DATE:
13049	5/17/2016

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Engineering a Better Environment

FIGURE: 3-6

The data in Figure 3-5 illustrates two points: (1) Groundwater contamination is not widespread in Falmouth warranting extension of public water service and (2) The reported events are not severe and likely driven by reporting requirements not widespread contamination events.

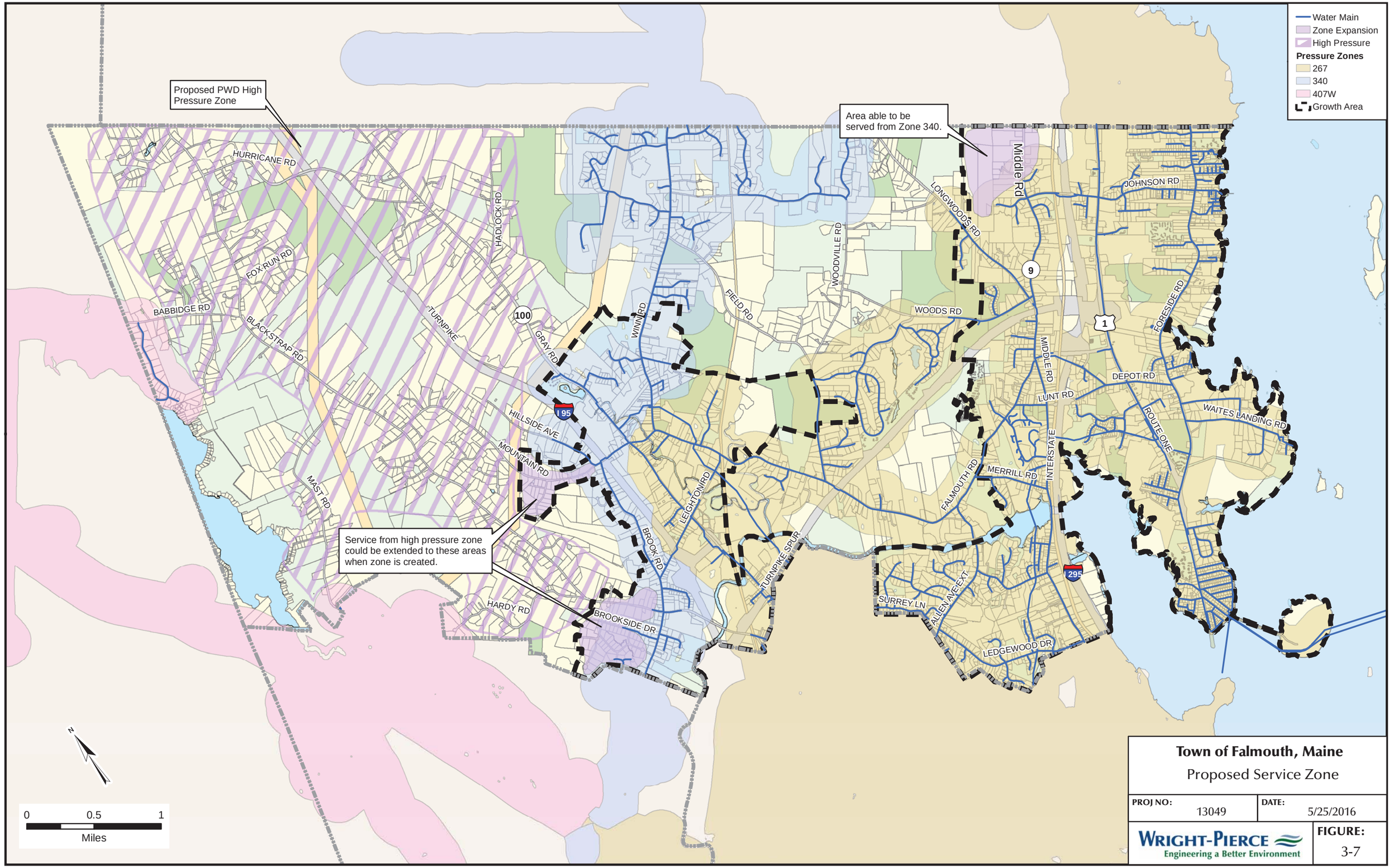
3.2.4.4 Proposed Service Area

As discussed in section 3.2.3.4 above, a review of topography in the western most area of the Town of Falmouth indicates high elevations, which are not able to be served from the existing water system pressure zones. If the Town were interested in expanding their water system to provide service those areas in the future, it is recommended that a new pressure zone be developed. Development of a new zone would require a pump station, new storage tank and distribution mains sized appropriately based on PWD's expansion policy. Figure 3-7 shows the proposed service area.

3.2.4.5 System Consolidation

Maine has many small transient and non-transient public water systems that are regulated by the State of Maine Drinking Water Program (DWP). Hotels, resorts, restaurants, day care facilities, sporting camps, trailer parks often have regulated water supplies.

A check of the State of Maine Public Water System database was made as part of this study. There are no public water systems in the Town of Falmouth, other than the Portland Water District. Therefore, this is not an external driver to extend water service outside of the designated growth areas in Falmouth.


Proposed PWD High Pressure Zone
Area able to be served from Zone 340.
Service from high pressure zone could be extended to these areas when zone is created.
Water Main
Zone Expansion
High Pressure
Pressure Zones
267
340
407W
Growth Area
HURRICANE RD
FOX RUN RD
BABBIDGE RD
BLACKSTRAP RD
TURNPIKE
HADLOCK RD
100
GRAY RD
WINN RD
FIELD RD
WOODVILLE RD
LONGWOODS RD
Middle Rd
WOODS RD
9
1
JOHNSON RD
FORESIDE RD
DEPOT RD
LUNT RD
MIDDLE RD
WAITES LANDING RD
ROUTE ONE
I 95
HILLSIDE AVE
MOUNTAIN RD
MAST RD
LEIGHTON RD
BROOK RD
FALMOUTH RD
MERRILL RD
INTERSTATE
TURNPIKE SPUR
295
SURREY LN
ALLEN AVE EXT
LEDGEWOOD DR
HARDY RD
BROOKSIDE DR
N
0
0.5
1
Miles
Town of Falmouth, Maine
Proposed Service Zone
PROJ NO:
13049
DATE:
5/25/2016
WRIGHT-PIERCE
Engineering a Better Environment
FIGURE:
3-7

SECTION 4
FINDING AND CONCLUSIONS

4.1 FINDINGS AND CONCLUSIONS

The following findings and conclusions were reached regarding public water service in the Growth Areas in Falmouth:

- **Capacity to Serve** – The Portland Water District has the supply and hydraulic capacity to meet the future needs in each growth area. In some instances, new water mains and booster pumping stations will be required to meet the Portland Water Districts pressure requirements.
- **Fire Protection** – Existing fire protection in Falmouth will not be compromised if future development were to occur within the designated Growth Areas. Presently, there are two deficient fire flow locations that do not meet ISO requirements in the Growth Area. Pipe replacement recommendations are included herein if the PWD or Town of Falmouth wish to improve available fire flows at these two locations. These flow locations are deficient under current conditions and are not impacted substantially by proposed development flows in the Growth Areas.
- **Unserved Areas within the Growth Areas** – Three primary areas within the designated Growth Areas are not served by public water. These areas are generally described as follows:
  - Middle Road between the intersection of Deer Run Road and the Cumberland town line
  - Upper Mountain Road area
  - Upper Brookside Drive area

  All three of these areas have ground surface elevations that are too high to provide adequate pressure from the adjacent PWD pressure zone. Strategies to extend public water to these areas using booster pumping stations are included in the report.

Remaining areas not served by public water within the growth zones is very limited, consisting primarily of local dead-end streets. In these areas, water is supplied by private wells. These remaining areas can all be provided adequate pressure from the PWD water distribution system if public water is desired without the need for additional pumping.

- **Middle Road Area** – The Middle Road area is of interest to the Town because of a planned road improvement project in this area and interest expressed by area homeowners and developers. Two specific strategies were identified to extend water to developable land in the Middle Road area. The ground surface topography may require a booster pumping station to elevate pressure from the local 267 Zone to serve all the developable land in this area. Other options include extension of a high pressure water main down Longwoods Drive from the PWDs Zone 340 high service area.

  The ground surface topography will require a booster pumping station to elevate pressure to serve all the developable land in this area. Abutting properties on Middle Road itself can be served by extending a water main from the terminus of the system near Deer Run Road.

  A specific water service plan should be developed for the undeveloped lots before any water mains are extended in this area, if the Town is interested in constructing new infrastructure in advance of development. A suggested action plan for serving this area is discussed below.

4.2 ACTION ITEMS

4.2.1 Middle Road Development

A more detailed action plan to serve the Middle Road area is suggested in advance of the development drivers in this large area. The undeveloped parcels should be developed in a logical, organized manner such that ownership of the new infrastructure meets both PWD's objectives

and the Town's objectives for the area. One approach would be to make the regional plan a condition of approval for the first development project in the area. The plan would establish:

- Location and size of mains within the region
- Fire flow requirements based on the type of structures proposed
- Need and location for booster pumping stations
- Private or public ownership of water mains
- Cost basis for the improvements

4.3 CLOSING AND ACKNOWLEDGEMENTS

In closing, we wish to thank the team members for their contributions to this study. The collaboration of all team members and the peer review process created by the Town was invaluable in guiding the recommendations developed herein. Special thanks to:

Theo H.B.M Holtwijk – Falmouth Director of Long Range Planning
Gordon Johnson, P.E. – Portland Water District
Nathan Poore – Town Manager, Town of Falmouth

Appendix A

PWD Water Main Extension Policies

APPENDIX A
PORTLAND WATER DISTRICT POLICIES ON EXTENSION OF PUBLIC WATER SYSTEM

A.1 PORTLAND WATER DISTRICT WATER MAIN EXTENSION POLICIES

The Portland Water District has very specific policies regarding extension of water mains that the Town of Falmouth may wish to incorporate into its planning process. A brief summary of these rules follows.

A.1.1 Financial Contribution by the Portland Water District in Falmouth

The Town of Falmouth would be responsible for paying 100% of the costs related to extension of a water main requested to serve new development in a Growth Area in Falmouth. This PWD policy is consistent with Chapter 63 of the Maine Public Utilities Commission regulations which dictate funding for main extensions. The exception to this rule is when the PWD specifies a pipe size greater than 12-inch diameter in an effort to accommodate the future capacity needs of the water system.

The Portland Water PWD did not identify any specific needs in Falmouth driving investment in the existing piping system.

A.1.1.1 Projects Eligible for a PWD Financial Contribution

The PWD would specify the main size for a water main extension submitted by a proponent in the Town of Falmouth for acceptance into the PWD water distribution system. If the PWD specifies a size 16-inch or greater and the Project proponent feels that the project requiring the extension does not require a main of the specified size to meet the project's domestic and fire protection needs, the Project proponent may petition the PWD to make a financial contribution to the Project proponent to cover the material costs added due to the main upsize.

The PWD will not be a funding partner unless a pipe greater than 12-inches is required as described below. Pipes this large are not likely since the PWD has not expressed strategic interest in Falmouth and most of the development projects envisioned will be local and limited.

A.1.2 Limits of Water Main Extensions

A project requiring a main extension in Falmouth to a parcel that does not have deeded frontage on a right-of- way containing a PWD water main will be responsible for installing a new water main extension to the parcel to be served. The length of the extension from the nearest main to the parcel to be served is defined within this policy.

A water main extension is typically required when a parcel seeking a water service line does not have deeded frontage on a right-of-way containing a public water main. Such water main would need to be installed within a PWD right-of-way along a line approved by the PWD according to PWD's design guidelines and established utility practice. The limits of the water main extension include a starting point at the nearest PWD water main and a terminus at a point within the right-of-way and adjacent to the parcel would be defined as follows:

- If a building exists on the parcel at the time of the main installation, the main shall terminate at a point even with the center of the building to be served.

- If no building exists on the parcel at the time of the main installation, the main shall terminate at a point even with the center of the parcel to be served.

If extensions are proposed which result in lengthy dead-ends or an improperly developed water system with significant gaps between water mains, the PWD has some discretion to request a customized installation. Examples include subdivisions with multiple entrances, developments with parallel mains (the PWD may require mains within cross streets to "grid" the mains) or developments with proximity to other parcels (the PWD may require an extension to support looping of the system).

A.1.3 Exceptions to Main Extension Requirement

The District policies have two exceptions to the main extension regulations described as follows.

- If a parcel has deeded frontage on a right-of-way containing a water main but the main does not extend to the parcel as required under this policy; and where both the PWD and project proponent agree that there is no potential for further development or extension of the right-of-way beyond its existing limits, the PWD may allow an exception to the requirement of a water main extension to the limits noted in this policy. It may instead allow a water service line to extend from the existing water main - through the existing right-of-way - to the parcel seeking service.

  A request for an exception to the water main extension requirement must be made by the Project proponent and the decision to approve the exception will be at the sole discretion of the PWD. The PWD may require the owner of the parcel avoiding the extension to sign a Future Main Extension Agreement to ensure that if a water main extension is required in the future, the parcel owner will be responsible for paying for their proportionate share of the extension at that future time.

- If a parcel seeking water service does not have deeded frontage on a right-of-way containing a water main and where both the PWD and Project proponent agree that a water main extension from an existing water main to a point as defined in this policy is either undesirable or infeasible, the PWD may allow an exception to the requirement of a water main extension to the limits noted in this policy. It may instead allow a water service line to extend from an existing water main - through an easement of an abutting parcel- to the parcel seeking service.

  A request for an exception to the water main extension requirement must be made by the Project proponent and the decision to approve the exception will be at the sole discretion of the PWD. The PWD may require the owner of the parcel avoiding the extension to sign a Future Main Extension Agreement to ensure that if a water main extension is required in the

future, the parcel owner will be responsible for paying for their proportionate share of the extension at that future time. A copy of the private easement must be provided to the PWD prior to the installation of a service line under this exception

A.1.4 Water Main Sizing

A project proponent installing a water main extension to provide water service to a new parcel will ultimately transfer ownership and maintenance responsibility of the water main to the PWD. Specifying the size for the water main extension is a responsibility of the PWD's. The guidelines that the PWD uses to determine the main size are noted in this policy.

A.1.4.1 Criteria for Determining Water Main Size

A water main extension is typically required when a parcel seeking a water service line does not have deeded frontage on a right-of-way containing a public water main. The size of the water main shall be determined by the PWD in the study or design phase of a project, when possible.

The PWD uses the following general guidelines when determining the water main size for an extension:

1. 16-inch diameter and greater: Water main extensions requiring pipes of this size will be specified in industrial areas where the need is required by the Project proponent or when the PWD requires an increase in capacity to serve the needs of future extensions that may be located beyond the limits of the project seeking service. At the request of the Project proponent, the PWD will make a determination on whether to contribute towards the material cost difference between 12-inch diameter pipe and the pipe specified by the PWD (if specified for future growth). The conditions for this payment are noted in the "PWD Financial Contribution to Main Extensions" policy.

2. 12-inch diameter: The PWD will specify this pipe size in areas of industrial or commercial development or in significant rights-of-way that are deemed necessary to support the domestic and fire protection needs of the water system.

3. 8-inch diameter: The PWD will specify this pipe size in areas of residential development where normal domestic and fire protection needs are expected to be encountered.

4. 4-inch diameter: The PWD will specify this pipe size in areas of residential development where domestic water needs are limited and where existing and future fire protection needs are not expected.

2-inch diameter and less: The PWD does not typically specify pipe of this size, but may require it in areas of very short extensions where water quality concerns could be encountered

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