WASTEWATER PUMPING STATION EVALUATION AND CAPITAL IMPROVEMENTS PLAN (CIP) REPORT

for the

CITY OF HAVERHILL, MA

AUGUST 2016

WRIGHT-PIERCE
Engineering a Better Environment

CITY HAVERHILL, MASSACHUSETTS

WASTEWATER PUMPING STATION EVALUATION AND CAPITAL IMPROVEMENTS PLAN (CIP) REPORT

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SECTION 1

INTRODUCTION

1.1 BACKGROUND

The City of Haverhill wastewater collection system includes 135 miles of sanitary, 99 miles of storm water, and 51 miles of combined (sanitary sewage and storm water) pipes and 36 pumping stations. Haverhill's wastewater is conveyed to the Water Pollution Abatement Facility (WPAF) for treatment and effluent is ultimately discharged into the Merrimack River. The following is a list of the City's existing wastewater pumping stations:

1. Alvanos Drive
2. Bradford Glen
3. Calewood Drive
4. Carleton Street
5. Clydedale Avenue
6. Coffin Avenue
7. Concordia Courts
8. Danielle Drive
9. Farrwood Drive
10. Ferry Road
11. Fondi Road
12. Golden Hill
13. Hales Landing
14. Hanover Street
15. Hilldale Avenue
16. Hoyt Road
17. Hyatt Avenue
18. Lake Street
19. Main Street
20. Maynard Avenue
21. Millvale
22. Morningside Drive
23. Newton Road
24. North Avenue
25. Pear Tree
26. Peoples Place
27. Rosebud/Ridgeland Heights
28. Rosemont
29. Route 110
30. Russett Hill Road
31. South Cross Road
32. South New Street
33. Srybny Avenue
34. Tamarac Drive
35. Water Treatment Facility
36. Whispering Creek

Figure 1-1 highlights the geographical locations of City's 36 existing wastewater pumping stations.

In order to update its ongoing asset management system and strategically plan for any necessary upgrades/improvements to the existing pumping stations, the City determined that it needed to evaluate these critical wastewater system assets; use the results of such evaluation to decide on needed improvements; update its asset management database; and create a 20-year Capital Improvements Plan (CIP). This asset management effort:

- Collects inventory information for the pump stations
- Documents the existing pumping station conditions
- Develops a basis and criteria used for evaluation
- Recommends improvements for each station
- Provides cost estimates for recommended improvements, and
- Provides an implementation plan (budget and schedule) for recommended station improvements.

It is important to note that the CIP specifically does not include routine, scheduled operation and maintenance (O&M) items (it is assumed that the City's collection system division will continue to plan/budget for and complete these items as part of their ongoing annual O&M program).

1.2 PURPOSE AND APPROACH OF THE PUMPING STATION EVALUATION AND CAPITAL IMPROVEMENTS PLANNING (ASSET MANAGEMENT)

The purpose of this asset management study is to complete an evaluation of the City's existing wastewater pumping stations; update its asset management system database; and ultimately develop a phased Capital Improvements Plan (CIP). The City has performed upgrades to the pump stations on an as needed basis; however, many of the stations have had limited improvements, are approaching the end of their useful life, and require upgrades to address specific safety and regulatory concerns. The resulting CIP provides the City with a system wide cost for meeting the needs of the system as well as a schedule to complete the work. This will allow the City to better plan for the capital needs of the wastewater pump stations.

1.3 SUMMARY REPORT

This report includes five sections. Section 2 describes each pumping station's existing condition. Section 3 outlines and summarizes the results of an in-depth set of evaluations made for each station to establish priorities in terms of asset needs. Section 4 outlines recommendations for each pumping station, and Section 5 outlines the proposed implementation of a 20-year Capital Improvement Plan for the pumping stations.

This report is intended to serve as a key budgeting and scheduling tool for the City to reliably maintain its pumping stations over the next 20 years and beyond.

MassGIS;
City of Haverhill.

Legend

- Water Treatment Facility PS
- Ejector Station
- Flooded Suction
- Submersible Pump
- Vacuum Primed
- WPAF
- Town Line

ATKINSON, NH
PLAISTOW, NH
MERRIMAC
WEST NEWBURY
HAVERHILL
METHUEN
GROVELAND
NORTH ANDOVER
BOXFORD

HILLDALE AVENUE
FONDI ROAD
NORTH AVENUE
TAMARAC DRIVE
ALVANOS DRIVE
ROSEMONT
MAIN STREET
NEWTON ROAD
RUSSETT HILL ROAD
LAKE STREET
VALE STREET
OLIVER STREET
CONCORDIA COURTS
SRYBNY AVENUE
CLYDEDALE AVENUE
PEAR TREE
WHISPERING CREEK
WATER TREATMENT FACILITY
KENOZA LAKE
DANIELLE DRIVE
MORNINGSIDE DRIVE
HANOVER STREET
CARLETON STREET
GOLDEN HILL
MILLVALE
PEOPLES PLACE
ROUTE 110
SOUTH NEW STREET
WPAF
COFFIN AVENUE
ROSEBUD/RIDGELAND HEIGHTS
HYATT AVENUE
MAYNARD AVENUE
BRADFORD GLEN
FERRY ROAD
HALES LANDING
CALEWOOD DRIVE
HOYT ROAD
FARRWOOD DRIVE
SOUTH CROSS ROAD

BRANDY BROW ROAD
CORLISS HILL ROAD
HOMESTEAD STREET
WHITTIER ROAD
INTERSTATE 495
AMESBURY LINE ROAD
EAST BROADWAY
AMESBURY ROAD
THOMPSON ROAD
MILLVALE ROAD
KENOZA STREET
GOODALE STREET
MILL STREET
MAIN STREET
WINTER STREET
WALL STREET
WATER STREET
GROVELAND STREET
SALEM STREET
LAWRENCE ROAD
BROADWAY
RIVER STREET
WASHINGTON STREET
BANK ROAD
NECK ROAD
OXFORD AVENUE
WILLOW AVENUE
KINGSBURY AVENUE
BOXFORD ROAD
HILLSIDE AVENUE
LAKE STREET
NORTH BROADWAY
COACHMANS LANE
BAILEY COURT
WEST LOWELL AVENUE

Merrimack River

N

0 1,750 3,500 7,000 Feet

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WASTEWATER PUMPING STATION EVALUATION AND CAPITAL IMPROVEMENTS PROGRAM
City of Haverhill, MA

PROJ NO:	DATE:	FIGURE:
13497A	7/7/2016	1-1

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Section 2

SECTION 2

EXISTING CONDITIONS

2.1 EXISTING WASTEWATER PUMP STATIONS

The City owns, operates and maintains 36 wastewater pumping stations. As shown in **Table 2-1** below, half of the existing pump stations are at least 20-years old and several are nearing 50 years in age from their original construction date. Table 2-1 provides a summary of the pumping stations in terms of type, capacity, year installed, and standby power capabilities. The types of pumping stations in the Haverhill collection system include submersible (nine); flooded suction (eighteen); ejector station (four); and vacuum prime (five). Wright-Pierce conducted visits to all stations, reviewed Operation and Maintenance data, analyzed City GIS information, and spoke with operators to gather inventory and condition information of each pumping station. Summary information for each pump station is provided in the after Table 2-1. Specific details regarding each station's equipment, visual observations by Wright-Pierce personnel, and condition are included in the Pump Station Inventory forms (one for each station) in **Appendix A**.

TABLE 2-1
PUMP STATIONS SUMMARY

STATION NAME	STATION TYPE	YEAR ONLINE	PUMP DESIGN CAPACITY (GPM)	STANDBY POWER (Y/N)
Alvanos Drive	Ejector Station	1980	20	N
Bradford Glen	Flooded Suction	1989	100	N
Calewood Drive	Flooded Suction	1989	100	N
Carlton Street	Flooded Suction	1972	500	Y
Clydedale Avenue	Vacuum Prime	1992	180	Y
Coffin Avenue	Submersible	1971	100	N
Concordia Courts	Flooded Suction	1996	100	Y
Danielle Drive	Flooded Suction	1997	125	Y
Farrwood Drive	Flooded Suction	2006	500	Y

STATION NAME	STATION TYPE	YEAR ONLINE	PUMP DESIGN CAPACITY (GPM)	STANDBY POWER (Y/N)
Ferry Road	Flooded Suction	1987	125	Y (not functional)
Fondi Road	Submersible	2008	500	Y
Golden Hill	Ejector Station	1987	50	N
Hales Landing	Submersible	2010	125	Y
Hanover Street	Ejector Station	1989	100	N
Hilldale Avenue	Submersible	2010	500	Y
Hoyt Road	Vacuum Prime	2004	125	Y
Hyatt Avenue	Vacuum Prime	1992	100	Y
Lake Street	Submersible	2011	125	Y
Main Street	Submersible	2014	200	Y
Maynard Avenue	Submersible	2007	350	Y
Millvale	Flooded Suction	2002	200	Y
Morningside Drive	Flooded Suction	2001	125	Y
Newton Road	Flooded Suction	2002	350	Y
North Avenue	Flooded Suction	1988	600	N
Pear Tree	Flooded Suction	1997	200	Y
Peoples Place	Flooded Suction	1990	100	N
Rosebud/Ridgeland Heights	Vacuum Prime	2002	100	Y
Rosemont	Submersible	2012	500	Y
Route 110	Flooded Suction	1989	460	Y
Russett Hill	Flooded Suction	1998	100	Y
South Cross Road	Flooded Suction	2001	125	Y
South New Street	Submersible	1957	50	N
Srybny Avenue	Flooded Suction	1988	200	N
Tamarac Drive	Vacuum Prime	2006	100	Y
Water Treatment Facility	Ejector Station	1977	75	Y
Whispering Creek	Flooded Suction	2001	125	Y

2.1.1 Alvanos Drive Pump Station

The Alvanos Drive Pump Station is a pneumatic ejector type station. This pump station currently provides sewer service to the homes along Alvanos Drive. The force main connects to gravity sewer on Rosemont Street and wastewater eventually flows to the Rosemont Street Pump Station. The station includes the following specific components:

- Inlet piping to the station is 8-inch Asbestos Cement pipe.
- A 5-foot diameter wet well.
- Two, pneumatic ejectors, actuated by a pair of air compressors with 1.5 horsepower (HP) motors, capable of pumping 20 gallons per minute (gpm).
- Discharge piping is 4-inch diameter cast iron. After the pipe exits the station, it connects to the buried 4-inch diameter cast iron force main.
- Electrical service is 230 volt, 3 phase.
- Primary level control is a Ross valve; with a high water alarm backup float.

The following conditions were identified during the site inspection of this pump station:

Wet well

- Wet well/receiving chamber was not observed.

Pumps and Operational Notes/Issues

- Odors and noise are not a reported problem at this station
- Pump "ragging/clogging" is not reported to be a problem at this station
- Grease accumulation does not appear to be a problem with this station

Electrical/Instrumentation

- The station has an overall electrical condition of fair to poor.
- The meter, manual transfer switch (MTS), and main disconnect are installed in a manner that makes station operation and maintenance difficult.

Site Observations

- The station is located in front of a residential home; the site is very limited in size.

- The station has a chain-link fence enclosure, with a wooden privacy fence and trees/shrubs that serve as an aesthetic barrier.

2.1.2 Bradford Glen Pump Station

The Bradford Glen Pump Station is a flooded suction type station. This pump station currently provides sewer service to the homes along Twin Brooks Circle and Glen Meadow Road. The force main connects to gravity sewer on South Main Street. The station includes the following specific components:

- GIS indicates that 8-inch PVC pipe serves as the inlet piping for the station.
- A 6-foot diameter wet well.
- Two, 100 gpm pumps with 7.5 HP motors provide wastewater conveyance.
- Discharge piping is 4-inch diameter.
- Electrical service is 240 volt, 3 phase.
- Primary level control is a bubbler system.

The following conditions were identified during the site inspection of this pump station:

Wet well

- No adverse conditions noted

Pumps and Operational Notes/Issues

- Odors and noise are not a reported problem at this station
- Pump "ragging/clogging" is not reported to be a problem at this station
- Grease accumulation appears to be a problem with this station

Electrical/Instrumentation

- The station has an overall electrical condition of good.
- The station does not have a permanent stand-by generator and automatic transfer switch (ATS).

Site Observations

- The station has a chain-link fence enclosure with a padlocked gate.

2.1.3 Calewood Drive Pump Station

The Calewood Drive Pump Station is a flooded suction type station. This pump station currently provides sewer service to the homes along Calewood Drive. The force main connects to gravity sewer on Hyatt Avenue and eventually feeds the Hyatt Avenue pump station. The station includes the following specific components:

- Inlet piping is 8-inch PVC.
- A 6-foot diameter wet well.
- Two, 100 gpm pumps with 3 HP motors provide wastewater conveyance.
- Force main piping is 4-inch diameter PVC.
- Electrical service is 240 volt, 1 phase.
- Primary level control is a bubbler system.

The following conditions were identified during the site inspection of this pump station:

Wet well

- No adverse conditions noted

Pumps and Operational Notes/Issues

- Odors and noise are not a reported problem at this station
- Pump “ragging/clogging” is not reported to be a problem at this station
- Grease accumulation does not appear to be a problem with this station

Electrical/Instrumentation

- The station has an overall electrical condition of good.

Site Observations

- The alarm light is located below the fence, making it hard to see from the street.
- The station has a chain-link fence enclosure with a padlocked gate.

2.1.4 Carleton Street Pump Station

The Carleton Street Pump Station is a flooded suction type station. This pump station currently provides sewer service to the homes along Carleton Street, including the side streets, and several neighborhoods to the east of Carleton Street. The force main connects to gravity sewer on Broadway. The station has been flooded recently and the City is soliciting quotes from vendors to relocate the pump station controls in an above-grade control cabinet. The station includes the following specific components:

- Inlet piping to the station is 8-inch Asbestos Cement pipe.
- A 6-foot diameter wet well.
- Two, 500 gpm pumps with 10 HP motors provide wastewater conveyance.
- Force main piping is 8-inch diameter cast iron pipe.
- Electrical service is 120/208 volt, 3 phase.
- Primary level control is a bubbler system.

The following conditions were identified during the site inspection of this pump station:

Wet well

- No adverse conditions noted

Pumps and Operational Notes/Issues

- Odors and noise are not a reported problem at this station
- Pump “ragging/clogging” is not reported to be a problem at this station
- Grease accumulation does not appear to be a problem with this station

Electrical/Instrumentation

- The pump chamber (drywell) was flooded recently and has been damaged as a result. The City is considering relocating the pump controls above-grade.
- The generator is near the end of its useful life.

Site Observations

- The access area is covered with a gravel material that is in poor condition.
- The station has a chain-link fence enclosure with barbed wire, that is in poor condition.

2.1.5 Clydedale Avenue Pump Station

The Clydedale Avenue Pump Station is a vacuum prime type station. This pump station currently provides sewer service to the homes along King and Caledonia Street, and Rosemary and Clydedale Avenue. The force main connects to gravity sewer on Clydedale Avenue. The station includes the following specific components:

- Inlet piping to the station is 8-inch PVC.
- A 6-foot diameter wet well.
- Two, 180 gpm pumps with 5 HP motors provide wastewater conveyance.
- Force main discharge piping is 4-inch diameter.
- Electrical service is 208 volt, 3 phase.
- Primary level control are floats.

The following conditions were identified during the site inspection of this pump station:

Wet well

- The steel portion of the wet well exhibits significant signs of corrosion.

Pumps and Operational Notes/Issues

- Odors and noise are not a reported problem at this station
- Pump “ragging/clogging” is not reported to be a problem at this station
- Grease accumulation does not appear to be a problem with this station

Electrical/Instrumentation

- The station has an overall electrical condition of good.
- The ventilation system does not appear to meet current requirements.

Site Observations

- The station has a chain-link fence enclosure with a padlocked gate and privacy screens.

2.1.6 Coffin Avenue Pump Station

The Coffin Avenue Pump Station is a submersible type station. This pump station currently provides sewer service to the marina on Coffin Avenue. The force main connects to gravity sewer on Coffin Avenue. The station includes the following specific components:

- Inlet piping to the station is 8-inch PVC.
- A 6-foot diameter wet well.
- Two, 100 gpm pumps.
- Discharge piping is 4-inch diameter ductile iron pipe.
- Electrical service is 240 volt, 1 phase.
- Primary level control is floats.

The following conditions were identified during the site inspection of this pump station:

Wet well

- Located in street (public right-of-way).

Pumps and Operational Notes/Issues

- Odors and noise are not a reported problem at this station
- Pump “ragging/clogging” is not reported to be a problem at this station
- Grease accumulation does not appear to be a problem with this station

Electrical/Instrumentation

- There is no main disconnect installed at this station.

Site Observations

- The station has a chain-link fence enclosure with barb wire and a padlocked gate.
- On-site snow storage is problematic for control panel access.

2.1.7 Concordia Courts Pump Station

The Concordia Courts Pump Station is a flooded suction type station. This pump station currently provides sewer service to the homes along Spinnaker Circle, Genoa Way, and Concordia Drive. The force main connects to gravity sewer on Concordia Drive. The station includes the following specific components:

- Inlet piping to the station is 8-inch PVC.
- A 6-foot diameter wet well.
- Two, 100 gpm pumps with 7.5 HP motors provide wastewater conveyance.
- Force main discharge piping is 4-inch diameter PVC.
- Electrical service is 480 volt, 3 phase.
- Primary level control is ultrasonic; with a backup float for high wet well level alarm.

The following conditions were identified during the site inspection of this pump station:

Wet well

- No adverse conditions noted

Pumps and Operational Notes/Issues

- Odors are reported to be a problem at this station
- Pump “ragging/clogging” is not reported to be a problem at this station
- Grease accumulation does not appear to be a problem with this station

Electrical/Instrumentation

- The station flooded recently and electrical components and controls were replaced.
- The ventilation system does not appear to meet current requirements.
- Enclosures are exhibiting signs of damaging corrosion.

- The automated transfer switch location limits O&M activities.
- Controls are located within the drywell and are vulnerable to flooding.

Site Observations

- The station has a chain-link fence with padlocked gate and privacy hedges.

2.1.8 Danielle Drive Pump Station

The Danielle Drive Pump Station is a flooded suction type station. This pump station currently provides sewer service to a large portion of the west side of the City. The force main connects to gravity sewer on Broadway. The station includes the following specific components:

- Inlet piping to the station is 8-inch PVC.
- A 6-foot diameter wet well.
- Two, 125 gpm pumps with 7.5 HP motors provide wastewater conveyance.
- Force main discharge piping is 4-inch diameter PVC.
- Electrical service is 208 volt, 3 phase.
- Primary level control is a bubbler system.

The following conditions were identified during the site inspection of this pump station:

Wet well

- No adverse conditions noted

Pumps and Operational Notes/Issues

- Odors and noise are not a reported problem at this station
- Pump “ragging/clogging” is reported to be a problem at this station.
- Grease accumulation does not appear to be a problem with this station.
- The current pumps do not have adequate capacity to convey wastewater during wet weather events.

Electrical/Instrumentation

- The station has an overall electrical condition of good.
- The ventilation system does not appear to meet current requirements.

- Controls are located within the drywell and are vulnerable to flooding.
- The generator needs service or replacement.

Site Observations

- The station has a chain-link fence enclosure with padlock

2.1.9 Farrwood Drive Pump Station

The Farrwood Drive Pump Station is a flooded suction type station. This pump station currently provides sewer service to the homes along Farrwood Drive and Sterling Lane. The force main connects to gravity sewer on Boston Road. The station includes the following specific components:

- Inlet piping to the station is 12-inch PVC
- A 8-foot diameter wet well.
- Two, 500 gpm pumps with 20 HP motors provide wastewater conveyance.
- Discharge piping is 8-inch diameter.
- Electrical service is 480 volt, 3 phase.
- Primary level control is a transducer; with backup floats.

The following conditions were identified during the site inspection of this pump station:

Wet well

- No adverse conditions noted

Pumps and Operational Notes/Issues

- Odors and noise are not a reported problem at this station
- Pump “ragging/clogging” is not reported to be a problem at this station
- Grease accumulation is a problem with this station

Electrical/Instrumentation

- The meter is rated for 240V, but the service is 480V.

Site Observations

- The station has a chain-link fence enclosure with a padlock gate.

- This station is proposed to be removed as recommended in the Proposed Sewer Expansion and Existing Collection System plan dated October 2013.

2.1.10 Ferry Road Pump Station

The Ferry Road Pump Station is a flooded suction type station. This pump station currently provides sewer service to the properties along Ferry Road. The force main connects to gravity sewer on Ferry Road. The station includes the following specific components:

- Inlet piping to the station is 8-inch PVC.
- A 6-foot diameter wet well.
- Two, 125 gpm pumps with 1.5 HP motors provide wastewater conveyance.
- Force main discharge piping is 4-inch diameter PVC.
- Electrical service is 208 volt, 3 phase.
- Primary level control is floats.

The following conditions were identified during the site inspection of this pump station:

Wet well

- No adverse conditions noted

Pumps and Operational Notes/Issues

- Odors and noise are not reported to be a problem at this station
- Pump “ragging/clogging” is not reported to be a problem at this station
- Grease accumulation does not appear to be a problem with this station
- A new inlet into the wet well at a lower elevation has reduced the available wet well volume resulting in more frequent start/stop of the pumps.
- Reduced wet well volume increases the likelihood of failure under power failure conditions.

Electrical/Instrumentation

- The generator is non-functional replacement should be considered with a new automatic transfer switch.

Site Observations

- The station has a chain-link fence enclosure with a padlock gate and privacy hedges.

2.1.11 Fondi Road Pump Station

The Fondi Road Pump Station is a submersible type station. This pump station currently provides sewer service to the businesses along Fondi Road. The force main connects to gravity sewer on Hilldale Avenue. The station includes the following specific components:

- Inlet piping to the station is 12-inch PVC.
- A 8-foot diameter wet well.
- Two, 500 gpm pumps with 34 HP motors provide wastewater conveyance.
- Force main discharge piping is 8-inch diameter PVC.
- Electrical service is 480 volt, 3 phase.
- Primary level control is a transducer; with backup floats.

The following conditions were identified during the site inspection of this pump station:

Wet well

- New construction, excellent condition

Pumps and Operational Notes/Issues

- Odors and noise are not reported to be a problem at this station
- Pump “ragging/clogging” is not reported to be a problem at this station
- Grease accumulation does not appear to be a problem with this station

Electrical/Instrumentation

- The station has an overall electrical condition of excellent.

Site Observations

- The station has a chain-link fence enclosure with a padlock gate, privacy screens, site lighting, and a security camera.

2.1.12 Golden Hill Pump Station

The Golden Hill Pump Station is a pneumatic ejector type station. This pump station currently provides sewer service to the homes along Elaine Marie and Patricia Ann Drive. The force main connects to gravity sewer on Golden Hill Avenue. The station includes the following specific components:

- Inlet piping to the station is 4-inch ductile iron.
- Two, pneumatic ejectors, actuated by a pair of air compressors with 5 horsepower (HP) motors, capable of pumping 75 gpm.
- Force main discharge piping is 4-inch diameter PVC.
- Electrical service is 230 volt, 1 phase.
- Primary level control is a Ross valve.

The following conditions were identified during the site inspection of this pump station:

Wet well

- No adverse conditions noted

Pumps and Operational Notes/Issues

- Odors and noise are not reported to be a problem at this station
- Pump "ragging/clogging" is not reported to be a problem at this station
- Grease accumulation does not appear to be a problem with this station

Electrical/Instrumentation

- The station has an overall electrical condition of good.

Site Observations

- Station entrance lid is locked, but site has no fencing or bollards for overall security/safety/protection.

2.1.13 Hales Landing Pump Station

The Hales Landing Pump Station is a submersible type station. This pump station currently provides sewer service to the homes along Groveland Road, Robert Road and Lisa Lane. The force main connects to gravity sewer on Salem Street. The station includes the following specific components:

- Inlet piping to the station is 8-inch PVC.
- A 6-foot diameter wet well.
- Two, 125 gpm pumps with 6.5 HP motors provide wastewater conveyance.
- Force main discharge piping is 4-inch diameter PVC.
- Electrical service is 480 volt, 3 phase.
- Primary level control is a transducer; with backup floats.

The following conditions were identified during the site inspection of this pump station:

Wet well

- Newer construction, excellent condition

Pumps and Operational Notes/Issues

- Odors and noise are not reported to be a problem at this station
- Pump "ragging/clogging" is not reported to be a problem at this station
- Grease accumulation does not appear to be a problem with this station

Electrical/Instrumentation

- The station has an overall electrical condition of excellent.

Site Observations

- The station has a chain-link fence enclosure with a padlock gate.

2.1.14 Hanover Street Pump Station

The Hanover Street Pump Station is a pneumatic ejector type station. This pump station currently provides sewer service to the homes along Hanover and Orange Streets. The force main connects to gravity sewer on Pine Avenue. The station includes the following specific components:

- City GIS indicates the inlet piping to the station is 12-inch PVC.
- Two, pneumatic ejectors, actuated by a pair of air compressors with 5 horsepower (HP) motors, capable of pumping 100 gpm.
- Discharge piping is 4-inch diameter.
- Electrical service is 230 volt, 3 phase.
- Primary level control is a Ross valve.

The following conditions were identified during the site inspection of this pump station:

Wet well

- No adverse conditions noted

Pumps and Operational Notes/Issues

- Odors and noise are not reported to be a problem at this station
- Pump "ragging/clogging" is not reported to be a problem at this station
- Grease accumulation does not appear to be a problem with this station

Electrical/Instrumentation

- The station has an overall electrical condition of good.
- VFDs could be installed to run compressors
- The ventilation system does not appear to meet current requirements.

Site Observations

- The station has a chain-link fence enclosure with a padlock gate, privacy screens, barb wire, and wood fencing.
- Very small footprint

2.1.15 Hilldale Avenue Pump Station

The Hilldale Avenue Pump Station is a submersible type station. This pump station currently provides sewer service to the properties along Hilldale Avenue. The force main connects to gravity sewer on Hilldale Avenue. The station includes the following specific components:

- Inlet piping to the station is 12-inch PVC.
- A 8-foot diameter wet well.
- Two, 500 gpm pumps with 30 HP motors provide wastewater conveyance.
- Force main discharge piping is 8-inch diameter PVC.
- Electrical service is 480 volt, 3 phase.
- Primary level control is a transducer; with backup floats.

The following conditions were identified during the site inspection of this pump station:

Wet well

- New construction, excellent condition

Pumps and Operational Notes/Issues

- Odors and noise are not reported to be a problem at this station
- Pump "ragging/clogging" is not reported to be a problem at this station
- Grease accumulation does not appear to be a problem with this station

Electrical/Instrumentation

- The station has an overall electrical condition of excellent.

Site Observations

- The station has a chain-link fence enclosure with a padlock gate and privacy screen on one side.

2.1.16 Hoyt Road Pump Station

The Hoyt Road Pump Station is a vacuum prime type station. This pump station currently provides sewer service to the homes along Hoyt Road. The force main connects to gravity sewer on Hoyt Road. The station includes the following specific components:

- Inlet piping to the station is 8-inch PVC.
- A 6-foot diameter wet well.
- Two, 125 gpm pumps with 7.5 HP motors provide wastewater conveyance.
- Force main discharge piping is 4-inch diameter ductile iron.
- Electrical service is 240 volt, 1 phase.
- Primary level control is a transducer; with backup floats.

The following conditions were identified during the site inspection of this pump station:

Wet well

- Good condition

Pumps and Operational Notes/Issues

- Odors and noise are not reported to be a problem at this station
- Pump "ragging/clogging" is not reported to be a problem at this station
- Grease accumulation does not appear to be a problem with this station
- The station is impacted by pump priming issues and air leakage of solenoid valves and vacuum pumps.

Electrical/Instrumentation

- The station has an overall electrical condition of good.
- The ventilation system does not appear to meet current requirements.

Site Observations

- The station has a chain-link fence enclosure with a padlock gate, and privacy hedges.

2.1.17 Hyatt Avenue Pump Station

The Hyatt Avenue Pump Station is a vacuum prime type station. This pump station currently provides sewer service to the homes along Hyatt Avenue, Alfred Park, and Calewood Drive. The force main connects to gravity sewer on Hyatt Avenue. The station includes the following specific components:

- Inlet piping to the station is 8-inch unknown material.
- An integral steel wet well.
- Two, 100 gpm pumps with 1.5 HP motors provide wastewater conveyance.
- Discharge piping is 4-inch diameter.
- Electrical service is 240 volt, 1 phase.
- Primary level control is floats.

The following conditions were identified during the site inspection of this pump station:

Wet well

- Heavy corrosion observed.

Pumps and Operational Notes/Issues

- Odors are reported to be a problem at this station
- Pump “ragging/clogging” is reported to be a problem at this station
- Grease accumulation is a problem with this station

Electrical/Instrumentation

- The station has an overall electrical condition of fair.
- Generator is nearing the end of its useful life and reported to be overheating.

Site Observations

- The station has a chain-link fence enclosure with a padlock gate, privacy screens, and hedges.

2.1.18 Lake Street Pump Station

The Lake Street Pump Station is a submersible type station. This pump station currently provides sewer service to the homes along Lake Street. The force main connects to gravity sewer on Lake Street. The station includes the following specific components:

- Inlet piping to the station is 8-inch PVC.
- A 8-foot diameter wet well.
- Two, 125 gpm pumps with 15 HP motors provide wastewater conveyance.
- Discharge piping is 4-inch diameter.
- Electrical service is 240 volt, 1 phase.
- Primary level control is a transducer; with backup floats.

The following conditions were identified during the site inspection of this pump station:

Wet well

- New construction, excellent condition

Pumps and Operational Notes/Issues

- Odors and noise are not reported to be a problem at this station
- Pump "ragging/clogging" is not reported to be a problem at this station
- Grease accumulation does not appear to be a problem with this station

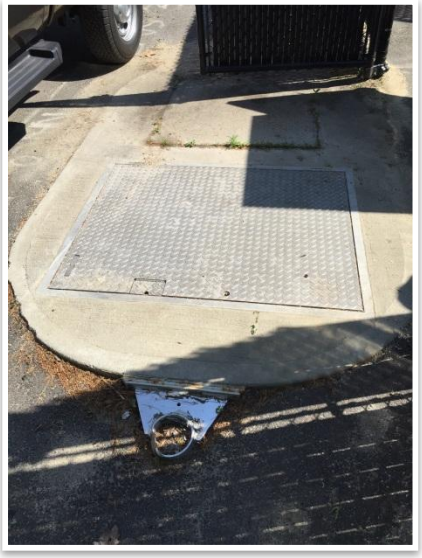
Electrical/Instrumentation

- The station has an overall electrical condition of excellent.

Site Observations

- The station has a chain-link fence enclosure with a padlock gate

2.1.19 Main Street Pump Station



The Main Street Pump Station is a submersible type station. This pump station currently provides sewer service to the state line shopping center and a larger residential service area. The force main connects to gravity sewer on Plaistow Road. The station includes the following specific components:

- Inlet piping to the station is 8-inch PVC.
- A 8-foot diameter wet well.
- Two, 250 gpm pumps with 5 HP motors provide wastewater conveyance.
- Force main discharge piping is 6-inch diameter PVC.
- Electrical service is 208 volt, 3 phase.
- Primary level control is a transducer; with backup floats.

The following conditions were identified during the site inspection of this pump station:

Wet well

- New construction, excellent condition

Pumps and Operational Notes/Issues

- Odors and noise are not reported to be a problem at this station
- Pump "ragging/clogging" is not reported to be a problem at this station
- Grease accumulation does not appear to be a problem with this station

Electrical/Instrumentation

- The station has an overall electrical condition of excellent.
- Only station connected to the WPAF's SCADA system.

Site Observations

- The station has a chain-link fence enclosure with a padlock gate and privacy screens.

2.1.20 Maynard Avenue Pump Station

The Maynard Avenue Pump Station is a submersible type station. This pump station currently provides sewer service to the homes along South Porter Street and Maynard Avenue. The force main connects to the treatment plant. The station includes the following specific components:

- Inlet piping to the station is 8-inch PVC.
- A 6-foot diameter wet well.
- Two, 350 gpm pumps with 5 HP motors provide wastewater conveyance.
- Discharge piping is 4-inch diameter.
- Electrical service is 480 volt, 3 phase.
- Primary level control is a transducer; with backup floats.

The following conditions were identified during the site inspection of this pump station:

Wet well

- Re-purposed wet well, good condition

Pumps and Operational Notes/Issues

- Odors and noise are not reported to be a problem at this station
- Pump "ragging/clogging" is not reported to be a problem at this station
- Grease accumulation does not appear to be a problem with this station

Electrical/Instrumentation

- The station has an overall electrical condition of good.

Site Observations

- The station is within the WPAF site, fenced and gated.

2.1.21 Millvale (Seven Sisters) Pump Station

The Millvale (Seven Sisters) Pump Station is a flooded suction type station. This pump station currently provides sewer service to the homes along Seven Sisters Road. The force main connects to gravity sewer on East Broadway. The station includes the following specific components:

- Inlet piping to the station is 8-inch PVC.
- A 6-foot diameter wet well.
- Two, 200 gpm pumps with 7.5 HP motors provide wastewater conveyance.
- Force main discharge piping is 6-inch diameter PVC.
- Electrical service is 480 volt, 3 phase.
- Primary level control is a transducer; with backup floats.

The following conditions were identified during the site inspection of this pump station:

Wet well

- No adverse conditions noted

Pumps and Operational Notes/Issues

- Odors and noise are not reported to be a problem at this station
- Pump "ragging/clogging" is not reported to be a problem at this station
- Grease accumulation does not appear to be a problem with this station

Electrical/Instrumentation

- The station has an overall electrical condition of excellent.

Site Observations

- The station has a chain-link fence enclosure with a padlock gate, privacy screens, and bushes/trees.

2.1.22 Morningside Drive Pump Station

The Morningside Drive Pump Station is a flooded suction type station. This pump station currently provides sewer service to the homes along Morningside Drive. The force main connects to gravity sewer on Broadway. The station includes the following specific components:

- Inlet piping to the station is 8-inch PVC.
- A 6-foot diameter wet well.
- Two, 125 gpm pumps with 5 HP motors provide wastewater conveyance.
- Force main discharge piping is 4-inch diameter PVC.
- Electrical service is 480 volt, 3 phase.
- Primary level control is a transducer; with backup floats.

The following conditions were identified during the site inspection of this pump station:

Wet well

- No adverse conditions noted

Pumps and Operational Notes/Issues

- Odors and noise are not reported to be a problem at this station
- Pump "ragging/clogging" is not reported to be a problem at this station
- Grease accumulation occurs occasionally.
- Ventilation blower is not properly hooked up to exhaust piping.

Electrical/Instrumentation

- The station has occasional brown-outs.
- The ventilation system does not appear to meet current requirements.
- Existing controls are located below grade and are vulnerable to dry well flooding.

Site Observations

- The station has a chain-link fence enclosure with a padlock gate, privacy screens, and hedges.

2.1.23 Newton Road Pump Station

The Newton Road Pump Station is a flooded suction type station. This pump station currently provides sewer service to the homes along Newton Road. The force main connects to gravity sewer on Gile Street. The station includes the following specific components:

- Inlet piping to the station is 15-inch PVC.
- A 6-foot diameter wet well.
- Two, 350 gpm pumps with 30 HP motors provide wastewater conveyance.
- Discharge piping is 4-inch diameter.
- Electrical service is 480 volt, 3 phase.
- Primary level control is a transducer; with backup floats.

The following conditions were identified during the site inspection of this pump station:

Wet well

- No adverse conditions noted

Pumps and Operational Notes/Issues

- Odors and noise are not reported to be a problem at this station
- Pump “ragging/clogging” is not reported to be a problem at this station
- Grease accumulation does not appear to be a problem with this station

Electrical/Instrumentation

- The ventilation system does not appear to meet current requirements.

Site Observations

- The station has a chain-link fence enclosure with a padlock gate.
- Wooden guard rail protects area as it is located in a fork in the road and has been hit by an automobile previously.

2.1.24 North Avenue Pump Station

The North Avenue Pump Station is a flooded suction type station. This pump station currently provides sewer service to the homes along Northside Court and Brickett Hill Circle. The force main connects to gravity sewer on Northside Court. The station includes the following specific components:

- Inlet piping to the station is 8-inch asbestos cement.
- 8-foot diameter wet well.
- Two, 600 gpm pumps with 15 HP motors provide wastewater conveyance.
- Discharge piping is 6-inch diameter asbestos cement.
- Electrical service is 208 volt, 3 phase.
- Primary level control is ultrasonic; with backup floats.

The following conditions were identified during the site inspection of this pump station:

Wet well

- No adverse conditions noted

Pumps and Operational Notes/Issues

- Odors and noise are not reported to be a problem at this station
- Pump "ragging/clogging" is not reported to be a problem at this station
- Grease accumulation is a problem with this station
- Station has experienced flooding problems

Electrical/Instrumentation

- Existing controls are located below grade and are vulnerable to dry well flooding.
- The ventilation system does not appear to meet current requirements.
- Station is not provided with permanent back-up power.

Site Observations

- The station has a chain-link fence enclosure with a padlock gate. Maintenance staff from a nearby condominium complex has expressed concern regarding illicit access to the site by children circumventing the existing security fencing.

2.1.25 Pear Tree Pump Station

The Pear Tree Pump Station is a flooded suction type station. This pump station currently provides sewer service to the homes along Elliot Street, Russet Hill Road, and Pear Tree Road. The force main connects to gravity sewer on Newton Road. The station includes the following specific components:

- Inlet piping to the station is 8-inch asbestos cement.
- A 6-foot diameter wet well.
- Two, 200 gpm pumps with 5 HP motors provide wastewater conveyance.
- Discharge piping is 4-inch diameter.
- Electrical service is 480 volt, 3 phase.
- Primary level control is a bubbler system.

The following conditions were identified during the site inspection of this pump station:

<u>Wet well</u>

- No adverse conditions noted

<u>Pumps and Operational Notes/Issues</u>

- Odors and noise are not reported to be a problem at this station
- Pump “ragging/clogging” is not reported to be a problem at this station
- Grease accumulation does not appear to be a problem with this station

<u>Electrical/Instrumentation</u>

- Meter is rated 240V, service is 480V.

<u>Site Observations</u>

- The station has a chain-link fence enclosure with a padlock gate.

2.1.26 Peoples Place Pump Station

The Peoples Place Pump Station is a flooded suction type station. This pump station currently provides sewer service to the homes along Peoples Place and Meagan's Way. The force main connects to gravity sewer on Carleton Street. The station includes the following specific components:

- Inlet piping to the station is 8-inch PVC.
- A 6-foot diameter wet well.
- Two, 100 gpm pumps with 7.5 HP motors provide wastewater conveyance.
- Force main discharge piping is 4-inch diameter PVC.
- Electrical service is 208 volt, 3 phase.
- Primary level control is a bubbler system.

The following conditions were identified during the site inspection of this pump station:

Wet well

- No adverse conditions noted

Pumps and Operational Notes/Issues

- Odors and noise are not reported to be a problem at this station
- Pump "ragging/clogging" is not reported to be a problem at this station
- Grease accumulation does not appear to be a problem with this station

Electrical/Instrumentation

- The station has an overall electrical condition of excellent.
- Station currently does not have a permanent generator and automatic transfer switch for back-up power.

Site Observations

- The station has a chain-link fence enclosure with a padlock gate, privacy hedges.

2.1.27 Rosebud/Ridgeland Heights Pump Station

The Rosebud/Ridgeland Heights Pump Station is a vacuum prime type station. This pump station currently provides sewer service to the homes along Ridgeland Heights. The force main connects to gravity sewer on Scotland Heights Road. The station includes the following specific components:

- Inlet piping to the station is 8-inch PVC.
- 6-foot diameter wet well.
- Two, 100 gpm pumps with 3 HP motors provide wastewater conveyance.
- Force main discharge piping is 4-inch diameter PVC.
- Electrical service is 240 volt, 1 phase.
- Primary level control is a transducer; with backup floats.

The following conditions were identified during the site inspection of this pump station:

Wet well

- Significant corrosion observed on steel portions of wet well.

Pumps and Operational Notes/Issues

- Odors and noise are not reported to be a problem at this station
- Pump "ragging/clogging" is not reported to be a problem at this station
- Grease accumulation does not appear to be a problem with this station

Electrical/Instrumentation

- The ventilation system does not appear to meet current requirements.

Site Observations

- The station has a chain-link fence enclosure with a padlock gate, privacy screens, and hedges.

2.1.28 Rosemont Pump Station

The Rosemont Pump Station is a submersible type station. This pump station currently provides sewer service to the homes along Merrill and Rosedale Avenue and Rosemont Street. The force main connects to gravity sewer on Rosemont Street. The station includes the following specific components:

- Inlet piping to the station is 12-inch asbestos cement.
- A 8-foot diameter wet well.
- Two, 500 gpm pumps with 15 HP motors provide wastewater conveyance.
- Force main discharge piping is 6-inch diameter cast iron.
- Electrical service is 480 volt, 3 phase.
- Primary level control is a transducer; with backup floats.

The following conditions were identified during the site inspection of this pump station:

Wet well

- New construction, excellent condition

Pumps and Operational Notes/Issues

- Odors and noise are not reported to be a problem at this station
- Pump "ragging/clogging" is not reported to be a problem at this station
- Grease accumulation is a problem with this station, many restaurants.

Electrical/Instrumentation

- The station has an overall electrical condition of excellent.

Site Observations

- The station has a chain-link fence enclosure with a padlock gate, privacy screens.

2.1.29 Route 110 Pump Station

The Route 110 Pump Station is a flooded suction type station. This pump station currently provides sewer service to a large area in the central-west part of the City. The force main connects to gravity sewer on River Street. The station includes the following specific components:

- Inlet piping to the station is 15-inch PVC.
- A 6-foot diameter wet well.
- Two, 460 gpm pumps with 5 HP motors provide wastewater conveyance.
- Force main discharge piping is 6-inch diameter cast iron.
- Electrical service is 208 volt, 3 phase.
- Primary level control is a bubbler system; with backup floats.

The following conditions were identified during the site inspection of this pump station:

Wet well

- No adverse conditions noted

Pumps and Operational Notes/Issues

- Odors and noise are not reported to be a problem at this station
- Pump "ragging/clogging" is not reported to be a problem at this station
- Grease accumulation is a problem with this station
- Existing valves are difficult to operate
- Level control system is not working as required.

Electrical/Instrumentation

- Electrical Cabinet is fairly new.
- The ventilation system does not appear to meet current requirements.
- Existing controls are located below grade and are vulnerable to dry well flooding.

Site Observations

- The station has a chain-link fence enclosure with a padlock gate, privacy screens.
- Electrical Service located outside of the fenced enclosure.

2.1.30 Russett Hill Pump Station

The Russett Hill Pump Station is a flooded suction type station. This pump station currently provides sewer service to the homes along Russett Hill Road. The force main connects to gravity sewer on Russett Hill Road. The station includes the following specific components:

- Inlet piping to the station is 8-inch PVC.
- A 6-foot diameter wet well.
- Two, 100 gpm pumps with 3 HP motors provide wastewater conveyance.
- Force main discharge piping is 4-inch diameter PVC.
- Electrical service is 208 volt, 3 phase.
- Primary level control is a bubbler system.

The following conditions were identified during the site inspection of this pump station:

Wet well

- No adverse conditions noted

Pumps and Operational Notes/Issues

- Odors and noise are not reported to be a problem at this station
- Pump “ragging/clogging” is not reported to be a problem at this station
- Grease accumulation does not appear to be a problem with this station

Electrical/Instrumentation

- The ventilation system does not appear to meet current requirements.
- Control cabinets/enclosures exhibiting degradation from corrosion.

Site Observations

- The station has a chain-link fence enclosure with a padlock gate, privacy fencing.

2.1.31 South Cross Pump Station

The South Cross Road Pump Station is a flooded suction type station. This pump station currently provides sewer service to the homes along Stelyani Drive, Strawberry Lane, Kali Way, Clover Lane, and South Cross Road. The force main connects to gravity sewer on Salem Street. The station includes the following specific components:

- Inlet piping to the station is 8-inch PVC.
- A 6-foot diameter wet well.
- Two, 125 gpm pumps with 10 HP motors provide wastewater conveyance.
- Discharge piping is 4-inch diameter.
- Electrical service is 208 volt, 3 phase.
- Primary level control is a transducer; with backup floats.

The following conditions were identified during the site inspection of this pump station:

Wet well

- New construction, excellent condition

Pumps and Operational Notes/Issues

- Odors and noise are not reported to be a problem at this station
- Pump “ragging/clogging” is not reported to be a problem at this station
- Grease accumulation does not appear to be a problem with this station

Electrical/Instrumentation

- The ventilation system does not appear to meet current requirements.

Site Observations

- The station has a chain-link fence enclosure with a padlock gate, privacy screen.

2.1.32 South New Street Pump Station

The South New Street Pump Station is a submersible type station. This pump station currently provides sewer service to the homes along South New Street. The force main connects to gravity sewer on Front Street. The station will be upgraded in the Summer of 2016 (by the City) with a new wet well, two new submersible pumps, valves, piping, and control panel. The station includes the following specific components:

- Inlet piping to the station is 8-inch asbestos cement.
- Force main discharge piping is 4-inch diameter cast iron.

2.1.33 Srybny Pump Station

The Srybny Avenue Pump Station is a flooded suction type station. This pump station currently provides sewer service to the homes along Srybny Avenue, Country Hollow and Country Hill Lane, and Country Meadow Road. The force main connects to gravity sewer on Hilldale Avenue. The station includes the following specific components:

- Inlet piping to the station is 8-inch vitreous clay.
- A 6-foot diameter wet well.
- Two, 200 gpm pumps with 15 HP motors provide wastewater conveyance.
- Discharge piping is 4-inch diameter cast iron.
- Electrical service is 240 volt, 3 phase.
- Primary level control is a bubbler system.

The following conditions were identified during the site inspection of this pump station:

Wet well

- No adverse conditions noted

Pumps and Operational Notes/Issues

- Odors and noise are not reported to be a problem at this station
- Pump "ragging/clogging" is not reported to be a problem at this station
- Grease accumulation does not appear to be a problem with this station

Electrical/Instrumentation

- The ventilation system does not appear to meet current requirements.
- Existing controls are located below grade and are vulnerable to dry well flooding.

Site Observations

- The station has a chain-link fence enclosure with a padlock gate, privacy hedges.

2.1.34 Tamarac Drive Pump Station

The Tamarac Drive Pump Station is a vacuum prime type station. This pump station currently provides sewer service to the homes along Tamarac Drive. The force main connects to gravity sewer on Tamarac Drive. The station includes the following specific components:

- Inlet piping to the station is 8-inch PVC.
- A 6-foot diameter wet well.
- Two, 100 gpm pumps with 3 HP motors provide wastewater conveyance.
- Force main discharge piping is 4-inch diameter PVC.
- Electrical service is 240 volt, 1 phase.
- Primary level control is a transducer; with backup floats.

The following conditions were identified during the site inspection of this pump station:

Wet well

- Some corrosion present

Pumps and Operational Notes/Issues

- Odors and noise are not reported to be a problem at this station
- Pump "ragging/clogging" is not reported to be a problem at this station
- Grease accumulation does not appear to be a problem with this station

Electrical/Instrumentation

- The ventilation system does not appear to meet current requirements.

Site Observations

- The station has a chain-link fence enclosure with a padlock gate, privacy screens.

2.1.35 Water Treatment Facility Pump Station

The Water Treatment Facility Pump Station is a pneumatic ejector type station. This pump station currently provides sewer service to the City's Water Treatment Facility on Amesbury Road. The force main connects to gravity sewer on Newton Road. The station is going to be demolished and replaced with a new submersible station as part of the Water Treatment Facility Upgrade Project slated to begin construction late in 2016 or early in 2017.

2.1.36 Whispering Creek Pump Station

The Whispering Creek Pump Station is a flooded suction type station. This pump station currently provides sewer service to the homes along Sarah J Circle. The force main connects to gravity sewer on Sarah J Circle. The station includes the following specific components:

- Inlet piping to the station is 8-inch PVC.
- A 6-foot diameter wet well.
- Two, 125 gpm pumps with 7.5 HP motors provide wastewater conveyance.
- Discharge piping is 4-inch diameter.
- Electrical service is 480 volt, 3 phase.
- Primary level control is a transducer; with backup floats.

The following conditions were identified during the site inspection of this pump station:

Wet well

- No adverse conditions noted

Pumps and Operational Notes/Issues

- Odors and noise are not reported to be a problem at this station
- Pump "ragging/clogging" is not reported to be a problem at this station
- Grease accumulation does not appear to be a problem with this station

Electrical/Instrumentation

- The ventilation system does not appear to meet current requirements.
- Existing controls are located below grade and are vulnerable to dry well flooding.
- Existing generator is not reliably capable of providing adequate backup power.

Site Observations

- The station has a chain-link fence enclosure with a padlock gate, privacy screens, and hedges.

2.2 EXISTING INSTRUMENTATION SYSTEMS

The pump control panels are largely the same for most of the stations. Each pump station has a pump control panel for use in manual or automatic control of the pumps, wet well level instruments for use in automatic pump control and for detecting wet well level alarms. Typically, the pump control panels have Hand/Off/Automatic (H-O-A) selector switches for manual or automatic operation of the pumps. The controls are typically hard-wired or PLC based. Most, but not all of the control panels have a three-position duty selector switch for the pumps, allowing the operators to select either pump as the lead pump or to automatically alternate the pumps as the lead pump. The control panels have "run" indicating lights for the pumps and elapsed run-time meters. There are also alarm indicating lights for conditions such as pump overload/failure and high wet well level. A majority of the pump stations have land-line based auto dialers to communicate select pump station alarms to collection system personnel. The stations without auto dialers have either local alarms, such as horns and/or lights, or no means of alarm condition notification.

The City has expressed interest in providing a supervisory control and data acquisition (SCADA) system that would link each pump station to a central point at the WPAF through the use of licensed frequency radio communications. Woodard & Curran (W&C) prepared the Wastewater Collection System SCADA Preliminary Design Report, dated December 2011, that evaluated each pump station, to determine the upgrades necessary and estimated costs to convert the pump stations from leased telephone lines and no remote alarms to radio communications. W&C's report has been attached to this report in **Appendix B**. W&C identified that each of the pump stations fall into two categories, Types 1 – Relay Control Panels and Type 2 – PLC Based Control Panels. W&C's recommendations and cost estimates have been incorporated into our cost estimates for the recommended upgrades at each pump station, refer to **Section 4** and **Appendix C**.

A summary of the pump stations' instrumentation and control systems is presented in **Table 2-2** below.

TABLE 2-2
PUMP STATION INSTRUMENTATION AND CONTROLS

PUMP STATION	INSTRUMENTATION	CONTROLS	COMMUNICATION	TYPE[1]
Alvanos Drive	· Ross Valve is used for automatic pump control based on receiving chamber level · Float switch is used for wet well high level alarm	Pump control panel fabricated by Smith & Loveless	Guard It by Raco alarm dialer	1
Bradford Glen	· Bubbler system is used for automatic pump control based on wet well level	Pump control panel fabricated by Smith & Loveless	None	1
Calewood Drive	· Bubbler system is used for automatic pump control based on wet well level	Pump control panel fabricated by Smith & Loveless	None	1
Carleton Street	· Bubbler system is used for automatic pump control based on wet well level	Pump control panel fabricated by Smith & Loveless	None	1
Clydedale Avenue	· Float switches are used for automatic pump control based on wet well level	Pump control panel fabricated by Smith & Loveless	None	1
Coffin Avenue	· Float switches are used for automatic pump control based on wet well level	Pump control panel fabricated by CSI Controls	None	1
Concordia Courts	· An ultrasonic level transducer is used for automatic pump control based on wet well level · Float switches are used for wet well high level alarms	Pump control panel fabricated by Custom Control Technologies	Guard It by Raco alarm dialer	2
Danielle Drive	· Bubbler system is used for automatic pump control based on wet well level	Pump control panel fabricated by Smith & Loveless	Guard It by Raco alarm dialer	1
Farrwood Drive	· An ultrasonic level transducer is used for automatic pump control based on wet well level · Float switches are used for wet well high level alarms	Pump control panel fabricated by Smith & Loveless	Guard It by Raco alarm dialer	2
Ferry Road	· Float switches are used for automatic pump control based on wet well level	Pump control panel fabricated by Smith & Loveless	Guard It by Raco alarm dialer	1

PUMP STATION	INSTRUMENTATION	CONTROLS	COMMUNICATION	TYPE[1]
Fondi Road	· An ultrasonic level transducer is used for automatic pump control based on wet well level · Float switches are used for wet well high level alarms	Pump control panel fabricated by WAJA Associates	Verbatim by Raco alarm dialer	2
Golden Hill	· Ross Valve is used for automatic pump control based on receiving chamber level	Pump control panel fabricated by Smith & Loveless	Guard It by Raco alarm dialer	1
Hales Landing	· An ultrasonic level transducer is used for automatic pump control based on wet well level · Float switches are used for wet well high level alarms	Pump control panel fabricated by WAJA Associates	Verbatim by Raco alarm dialer	2
Hanover Street	· Ross Valve is used for automatic pump control based on receiving chamber level	Pump control panel fabricated by Smith & Loveless	None	1
Hilldale Avenue	· An ultrasonic level transducer is used for automatic pump control based on wet well level · Float switches are used for wet well high level alarms	Pump control panel fabricated by WAJA Associates	Verbatim by Raco alarm dialer	2
Hoyt Road	· An ultrasonic level transducer is used for automatic pump control based on wet well level · Float switches are used for wet well high level alarms	Pump control panel fabricated by Smith & Loveless	Guard It by Raco alarm dialer	2
Hyatt Avenue	· Float switches are used for automatic pump control based on wet well level	Pump control panel fabricated by Smith & Loveless	None	1
Lake Street	· An ultrasonic level transducer is used for automatic pump control based on wet well level · Float switches are used for wet well high level alarms	Pump control panel fabricated by WAJA Associates	Verbatim by Raco alarm dialer	2

PUMP STATION	INSTRUMENTATION	CONTROLS	COMMUNICATION	TYPE[1]
Main Street	· An ultrasonic level transducer is used for automatic pump control based on wet well level · Float switches are used for wet well high level alarms	· Pump control panel fabricated by WAJA Associates · SCADA control panel by Sheridan Engineering.	Connected to SCADA at WPAF.	-
Maynard Avenue	· An ultrasonic level transducer is used for automatic pump control based on wet well level · Float switches are used for wet well high level alarms	Pump control panel fabricated by WAJA Associates	None	2
Millvale (Seven Sisters)	· An ultrasonic level transducer is used for automatic pump control based on wet well level · Float switches are used for wet well high level alarms	Pump control panel fabricated by Smith & Loveless	Guard It by Raco alarm dialer	2
Morningside Drive	· An ultrasonic level transducer is used for automatic pump control based on wet well level · Float switches are used for wet well high level alarms	Pump control panel fabricated by Smith & Loveless	Guard It by Raco alarm dialer	2
Newton Road	· An ultrasonic level transducer is used for automatic pump control based on wet well level · Float switches are used for wet well high level alarms	Pump control panel fabricated by Smith & Loveless	Guard It by Raco alarm dialer	2
North Avenue	· An ultrasonic level transducer is used for automatic pump control based on wet well level · Float switches are used for wet well high level alarms	Pump control panel fabricated by Smith & Loveless	Guard It by Raco alarm dialer	1
Pear Tree	· Bubbler system is used for automatic pump control based on wet well level	Pump control panel fabricated by Smith & Loveless	Guard It by Raco alarm dialer	1
Peoples Place	· Bubbler system is used for automatic pump control based on wet well level	Pump control panel fabricated by Smith & Loveless	Guard It by Raco alarm dialer	1

PUMP STATION	INSTRUMENTATION	CONTROLS	COMMUNICATION	TYPE[1]
Rosebud/Ridgeland Heights	· An ultrasonic level transducer is used for automatic pump control based on wet well level · Float switches are used for wet well high level alarms	Pump control panel fabricated by Smith & Loveless	Guard It by Raco alarm dialer	2
Rosemont	· An ultrasonic level transducer is used for automatic pump control based on wet well level · Float switches are used for wet well high level alarms	Pump control panel fabricated by WAJA Associates	Verbatim by Raco alarm dialer	2
Route 110	· Bubbler system is used for automatic pump control based on wet well level · Float switch are used for wet well high level alarm	Pump control panel fabricated by Smith & Loveless	Guard It by Raco alarm dialer	1
Russett Hill	· Bubbler system is used for automatic pump control based on wet well level	Pump control panel fabricated by Smith & Loveless	Guard It by Raco alarm dialer	1
South Cross Road	· An ultrasonic level transducer is used for automatic pump control based on wet well level · Float switches are used for wet well high level alarms	Pump control panel fabricated by Smith & Loveless	Guard It by Raco alarm dialer	2
South New Street[2]	· Float switches are used for automatic pump control based on wet well level	· Pump control panel · *A new pump control panel will be provided as part of pump station upgrade planned for 2016*	None	1
Srybny Avenue	· Bubbler system is used for automatic pump control based on wet well level	Pump control panel fabricated by Smith & Loveless	Guard It by Raco alarm dialer	1
Tamarac Drive	· An ultrasonic level transducer is used for automatic pump control based on wet well level · Float switches are used for wet well high level alarms	Pump control panel fabricated by Smith & Loveless	Guard It by Raco alarm dialer	2

PUMP STATION	INSTRUMENTATION	CONTROLS	COMMUNICATION	TYPE[1]
Water Treatment Facility[2]		· Pump control panel · *A new pump control panel will be provided as part of pump station upgrade planned for 2016*	None	1
Whispering Creek	· An ultrasonic level transducer is used for automatic pump control based on wet well level · Float switches are used for wet well high level alarms	Pump control panel fabricated by Smith & Loveless	Guard It by Raco alarm dialer	2

Notes:

1. From the W&C 2011 Report types of existing remote control panels:
   - **Type 1 – Relay Control Panels**
     These older style panels utilize hard wired relay and timer based circuitry. To facilitate radio communications these stations would need to be upgrade to Allen-Bradley type 1100 or 1400 Micrologix PLC controls with Allen-Bradley Operator Interface Terminals (OIT).
   - **Type 2- PLC based Control Panels**
     Although these panels utilize more contemporary Programmable Logic Controllers (PLC), they do not have the Ethernet connectivity required to interface with the Calamp radios recommended in the radio survey report. These sites would need to be retrofitted with Allen-Bradley type 1100 or 1400 PLC. The existing OITs could be retained.
2. South New Street and Water Treatment Facility Pump Stations are planned to be upgraded with PLC based control panels in 2016.

Section 3

WRIGHT-PIERCE
Engineering a Better Environment

SECTION 3

PUMPING STATION EVALUATION

The process of developing a prioritized Capital Improvement Plan required gathering inventory and condition information, which was presented in Chapter 2, as well as information on the risks and consequences of failure. The Wright-Pierce project team gathered considerable information specific for each station based on O&M information provided by the City; field inspections; and interviews with City operations staff (as outlined in Section 2 of this report). An evaluation of each pumping station was then performed based on a specific and relevant technical and other criterion. The criterion was established to provide a uniform approach to the evaluation of each station, as well as provide a repeatable tool for the reassessment of the stations at a later date. Each criterion was assigned a point range to account for the criterion's relative importance in the overall assessment of the station. In each category low scores represent a low likelihood of failure, while the higher end of the range represents a higher priority.

These evaluations were summarized and then scored and tallied. The resulting tally was ranked in order to establish priorities between all thirty-six stations. It should be noted that the rankings are intended to inform and guide the station capital improvement process and should not be considered a definitive decision regarding pumping station priorities. These rankings should be considered in concert with other specific information that has been identified and evaluated for each of the City's existing pumping stations. The final project order should also acknowledge other City programs including coordination with other public works functions such as transportation and availability of funds.

Section 3.1 outlines the criteria developed and used to evaluate each pumping station. Section 3.2 discusses the evaluation of each station in terms of specific criteria, concluding with Table 3.6, that compares the scores for each pumping station.

3.1 EVALUATION CRITERIA

The pumping stations were evaluated, and ranked, based on a number of evaluative criteria. The criteria included the following:

- Condition
- Age
- Rated capacity
- Safety concerns
- Instrumentation and Communications
- Standby power
- Depth within the collection system
- Locational Impacts (environmental & residential impacts, odor, aesthetics, etc.)

3.1.1 Condition of the Station

The overall condition of the station was based on the observations of Wright-Pierce personnel during the site visits which evaluated the following station components:

- Wet well condition
- Dry well condition
- Pump condition
- Piping and valve condition
- Generator condition
- Instrumentation (controls and alarms) condition
- Electrical systems condition
- Site condition (security, access, driveways, parking, bollards, etc.)

Each station was given a score from 1 to 10 based on a composite of all observations of the conditions at each station. The score system is based on the following:

- 1-2 = Excellent condition - Needs to be addressed in 15- 20 years
- 3-4 = Good condition - Needs to be addressed in 10-15 years
- 5-6 = Average condition - Needs to be addressed in 5-10 years

- 7-8 = Poor condition - Needs to be addressed in 0-5 years
- 9-10 = Extremely poor condition - Needs to be addressed immediately

3.1.2 Age of the Station

Wastewater infrastructure has a finite useful life. While condition is a direct indicator of the likelihood of failure, age provides another factor in the ability of the station to perform as intended. As equipment ages, even in the best condition the likelihood of failure as well as the potential to be able to perform corrective maintenance is reduced.

The useful life can vary, but for the purposes of determining which pump station and components may warrant repair or replacement, the following useful life expectancies were used to help identify potential deficiencies. It is understood that these are generalities and often can be exceeded with proactive, preventive maintenance and good care of the pumping station equipment and systems.

- Pumping station mechanical components (pumps, motors, valves, instrumentation, etc.) - 20 years
- Pumping station piping (site and internal piping) - 25 years
- Pumping station structural steel components (dry wells) - 50 years
- Pumping station concrete structural components (wet wells and other structures) – greater than 50 years

Based upon the specific components of each station a composite age score was developed. Each station was given a score from 1 to 10 based on its composite age score. The score was based on the following:

Age (years)	Score
1 to 10	1
11 to 15	2
16 to 20	3
21 to 25	4

26 to 30	5
31 to 35	6
36 to 40	7
41 to 45	8
46 to 50	9
50 plus	10

3.1.3 Rated Capacity

Pump stations within the City's collection system range from a rated capacity of 20 to 600 gpm. The larger the flow rate, the more critical the station within the sewer collection system. Additionally, the higher the capacity, the greater the consequence of failure. Therefore, each station was scored based on their rated capacity on a scale of 1 to 5. The scoring was based on the following:

- 1 = Rated capacity less than or equal to 100gpm
- 2 = Rated capacity between 101 and 199 gpm
- 3 = Rated capacity between 200 and 299 gpm
- 4 = Rated capacity between 300 and 399 gpm
- 5 = Rated capacity 400 gpm and above.

3.1.4 Safety Concerns

Safety issues considered include confined space issues and specific access to the pumping station wet well, dry pit and/or other structures. Worker health and safety is a critical component of a stations ability to reliably and safely meet the service requirements. This was particularly taken into consideration for wet-well, dry-pit (tin-can style) and recessed vacuum prime lift pumping stations. Each station was given a score between 1 and 5. If a station had no safety concerns it was given a score of 1 point. If a station had major safety concerns, such as a dry-pit without a rigid lifeline, it was given a 5.

3.1.5 Instrumentation and Communications

As discussed in Section 2.2, Woodward & Curran (W&C) evaluated the City's Wastewater Collection System Control and Data Acquisition (SCADA) Systems for each pump station in 2011, which categorized each station into two different types, Types 1 and 2. Since the report, the City constructed the Main Street Pump Station in 2014, which is the only station connected to the SCADA system at the WPAF. The City has prioritized the need to upgrade the stations with SCADA and therefore it is appropriate to include in the overall score the need to address the ongoing SCADA system upgrades as part of the CIP prioritization. The SCADA system will allow the City to optimize staffing and reduce the amount of un-monitored pump station failures.

In order for the City to provide a radio information and control network, both types of pump stations require upgrades. Type 1 pump stations require replacement/upgrades to a PLC control and OIT controls and Type 2 pump stations require retrofitting of their existing PLCs, while retaining their OIT. The SCADA Systems report has been attached in Appendix B for reference.

Since the City currently does not have a radio network to link all of the stations alarms and control to a central location and each station requires upgrades, the lack of SCADA connectivity is the same for each station, except the Main Street Pump Station. A majority of the City's pump stations have an auto-dialer that uses land telephone lines to alert operators that there is an alarm condition.

The stations were given a score based on their current ability to communicate and if they have updated PLC/OIT based technology. The scoring was based on the following:

- 0 = Connected to SCADA at WPAF (Main Street Pump Station)
- 1 = Type 2 Pump Station
- 3 = Type 1 Pump Station with an auto-dialer
- 5 = No Autodialer

3.1.6 Standby Power

The majority of the City's wastewater pump stations have local generators or portable generator connections to provide standby power in the event of a power failure. The remaining stations have no ability to provide standby power. Without standby power, the station may cause a sewer system back-up into a City dwelling or business or during an extreme event, a Sanitary Sewer Overflow could occur, which is a violation of the Clean Water Act. The Massachusetts Department of Environmental Protection (MassDEP) requires that all wastewater pumping stations have the means to provide an independent engine/generator type source of electric power or an alternate source of power completely separate and apart from that supplied by the electric utility for emergency operations. The MassDEP regulations do provide and an exception to this requirement for smaller ejector and lift stations, not adjacent to public water supplies, which are able to provide storage (including system storage) for the maximum daily amount of wastewater flow to that station. The stations were given a score based on the ability to provide standby power on a scale of 1 to 5. Scoring is as follows:

- 1 = Generator (1 to 20 years old)
- 2 = Generator (Over 20 years old)
- 3 = Generator has known issues or the station has connection for portable generator
- 4 = No Generator, but small station and there have been no reported issues
- 5 = Generator is needed

3.1.7 Location within the Collection System

The location within the existing collection system of a pump station can also determine its level of priority from one to the other. If there are other pump stations located upstream of a particular pump station, that pump station's service area is larger, thus the number of users and residents that depend on that station increases beyond its immediate service area. Each station was given a score between 1 and 5, based on the number the number of service areas that it serves. If a pump station only serves its own service area, it would receive a score of 1. If there are pump stations upstream (both public and private), the number of service areas were added and it was given a score between 2 and 5.

3.1.8 Locational Impacts

Wright-Pierce considered each pumping station in terms of locational impacts, both residential and environmental. Residential impacts are those that affect the pump station's neighbors, such as aesthetics, odors, noise, and potential for sewer back-ups. Environmental impacts are those that would affect the nearby environment. If a pump station were to fail, resulting in a Sanitary Sewer Overflow, the score reflects the likelihood of raw sewage entering a nearby body of water or other sensitive resource area. Locational impacts were ranked from 1 to 5 (1 being the lowest score/minor impacts and 5 being the highest score/major impacts).

3.2 COMPARISON OF EVALUATION RESULTS

Each of the evaluations detailed above were then totaled to yield an overall score for each pumping station. The scoring system used for the evaluations was developed so that a lower score indicates a better result – the station represents a lower risk/consequence of failure. Conversely, a higher score is intended to indicate a pumping station with greater "needs". As previously noted, this is an informative planning/budgeting tool, but should not be considered a definitive answer concerning prioritizing station needs going forward. The resulting scores can be used to help prioritize the implementation plan (schedule and budget) for the necessary pumping station needs. They have been organized from top to bottom, from least to greatest risk (refer to Table 3-1 below).

Section 4

WRIGHT-PIERCE
Engineering a Better Environment

SECTION 4

PUMP STATION RECOMMENDATIONS

This section of the report details our recommendations, first classified by pump station type and then on an individual basis, and which strategies we recommend the City implement. Section 5 presents the recommended implementation plan, including recommended station improvements, projected total project costs and implementation schedule over the planning period, the next 20 years.

Since each of the City's 36 stations fall into one of four pump station types (submersible, flooded suction, vacuum prime, and ejector), Wright-Pierce has identified a general recommended approach to the capital improvement over the planning period. Additionally, specific aspects of each station were evaluated independently and site specific improvements are characterized through this analysis.

The overall strategy was to identify the likely format of the upgraded/replaced station. In recent years, the City has standardized on submersible pump stations, therefore if any type of existing pump station is recommended for replacement, a submersible type pump station is the type recommended. Submersible pump stations offer benefits to the City, which are not available in the other formats. They include:

- Improved safety – The stations do not require confined space entry for routine operation and maintenance (O&M) procedures.
- Reduced equipment vulnerability –All below grade equipment is designed for immersion. Controls and other electrical equipment is placed above grade. The City has experienced damage to equipment in below grade installations.
- Standardization – Selecting a singular format for equipment allows for simplification of O&M procedures, as well as spare parts. Operator training is simplified as well.
- Proven record for managing wastewater solids – The City has had a good experience with the implementation of these types of pumps their ability to manage solid materials in the wastewater.

The following sections review/discuss the recommendations for each type of pump station within the City's collection system.

4.1 SUBMERSIBLE PUMP STATIONS

The City currently owns and operates ten submersible-type pump stations (Coffin, Fondi, Hales Landing, Hilldale, Lake, Main, Maynard, Rosemont, and South New Street). Six of which were constructed during or after 2007. Two stations, South New Street and Coffin, are over forty-five years old, and are recommended for replacement with new submersible pump stations. South New Street is currently being replaced with a new wet well, pumps, and controls at the time of this report. Coffin flooded during the "Mother's Day Storm" of 2006 and the controls were replaced, however the pumps, valves, and piping are original and need to be replaced.

4.2 FLOODED SUCTION ("TIN-CAN" STYLE) PUMP STATIONS

The City currently owns and operates seventeen flooded suction ("tin-can" style) pump stations (Bradford Glen, Calewood Drive, Carleton Street, Concordia Courts, Danielle Drive, Farrwood Drive, Ferry Road, Millvale, Morningside, Newton Road, North Avenue, Pear Tree, Route 110, Russett Hill, South Cross Road, Srybny Avenue, and Whispering Creek). Half of the pump stations are over twenty years old, but in good condition. Due to new NFPA 820 classifications for below grade dry pits that now rates the space as Class 1, Div. 2, we recommend that all the flooded suction pump stations have the control panels relocated above-grade and located within a concrete pad-mounted stainless steel enclosure, as well as have blowers provide continuous ventilation in the dry-pit. The proposed pump control panel would be PLC based with OIT, capable to connect into the City's proposed radio telemetry network in the future.

If a station is recommended to be replaced within the capital planning timeframe, the recommended replacement will be the City standard submersible type pump station. When a flooded suction station is scheduled for improvements/upgrades in the Capital Improvement Plan (CIP), during the preliminary design phase, testing and inspections will be performed on the dry well (tin-can), as well as the suction and discharge piping. These tests and inspections will provide a more accurate picture of the remaining life expectancy of the existing station, and aid in the decision to rehabilitate in kind or replace the station with a City standard submersible type station.

In order for the City to budget appropriately for those stations that are not recommended to be completely replaced during the capital planning period, a contingency has been included in the event that the testing and inspection results indicate that the station's condition is more critical than originally thought at the time of this evaluation, and is in need of replacement. Contingency costs include, but are not limited to, wet well/valve vault excavation and installation, new pumps, valves, piping, controls, instrumentation, and appurtenances.

4.3 VACUUM PRIME PUMP STATIONS

The City currently owns and operates five vacuum prime pump stations (Clydedale Avenue, Hoyt Road, Hyatt Avenue, Ridgeland Heights, and Tamarac Drive). Two of the stations, Clydedale and Hyatt, are 24 years old, and the other three are 14 years old or less. City operators have indicated that they do not prefer these types of stations, because they have priming issues on occasion, and the operators are exposed "to the elements" when having to work on them.

If this type of station is recommended for replacement within the capital planning timeframe, our recommendation will be to convert the vacuum prime pump station into a submersible type, by reusing the precast wet well located below the dry pit.

In order for the City to budget appropriately for those stations that are not recommended to be converted during the capital planning period, a contingency has been included in the event that the station's condition is more critical than originally thought at the time of this evaluation, and is in need of more serious upgrades. Contingency costs include, but are not limited to wet well conversion, valve vault excavation and installation, new pumps, valves, piping, controls, instrumentation, and appurtenances.

4.4 PNEUMATIC EJECTOR PUMP STATIONS

The City currently owns and operates four pneumatic ejector pump stations (Alvanos Drive, Golden Hill, Hanover Street, and Water Treatment Facility). Alvanos, Hanover, and Golden Hill were all constructed in the 1980's and are nearing the end of their useful life. Water Treatment Facility station is currently slated for demolition and replacement with a new submersible pump station as part of the Water Treatment Facility Upgrades, slated for a construction start date of late 2016 or early 2017.

Replacement parts for pneumatic ejector type stations are becoming increasingly more difficult to come by, as more municipalities have gone away from this type of station. In addition, ejector pump stations are difficult for operators to access the air and receiving chambers located below the machinery chamber. The receiving chambers on all of the ejector type pump stations have never been inspected, and their condition is unknown.

For this evaluation, all ejector stations are recommended to be replaced with the City standard submersible type pump station.

4.5 RECOMMENDATIONS

Specific recommendations for each pump station are summarized below. The pump stations are presented alphabetically.

4.5.1 Alvanos Street Pump Station

Our recommendations for the Alvanos Street Pump Station include the following:

- Replace the ejector station with a new submersible type pump station. The pumps will operate in a Lead - Standby configuration and will be rated for approximately 100 gpm to increase velocity through the existing 4-inch force main. The new pump station will likely need to "fit" within the existing easement.
- Replace the existing ejector station with a new 6-foot diameter precast concrete wet well. During the design phase, the existing collection system or proposed wet well storage volume will be evaluated in order to determine if it has the ability to accommodate a two-hour power outage event at existing and/or future flows. Given the limited site area of this pump station, the City may wish to forgo installing a permanent backup generator and provide accommodations to allow for the hookup of a portable generator. We have not included a generator in our recommended improvements for this station for that reason.
- Pumps/motors should be installed on SS circular slide rail system within the wet well
- Install a separate 6-foot diameter precast concrete valve pit for the pump station check valves and isolation gate valves.
- Install a PLC-based pump station control panel with a touch screen operator interface terminal (OIT). The PLC will automatically control the pumps based on wet well level totalize pump runtimes. Wet well level, equipment status, pump operation setpoints and station alarms will be indicated at the OIT. Manual controls for the pumps shall also be provided. The control panel shall have a pump backup control circuit, using wet well float switches, that functions independently of the PLC.

- The control panel will be NEMA 12 rated painted steel enclosure located within a concrete pad-mounted weatherproof stainless steel enclosure to protect the equipment from damage due to vandalism and the environment
- Install wet well level measurement instruments using a submersible pressure transducer suitable for wastewater and float switches for back-up operation and alarm notification
- Install a new electrical service, main breaker, and electric control panel
- Connect the new pump station to the existing force main. Install an isolation valve and bypass pump connection on the force main adjacent to the pump station.
- Connect pump station monitoring and alarm signals from the new PLC-based control panel to the City's proposed radio telemetry network.

4.5.2 Bradford Glen

Our recommendations for the Bradford Glen Street Pump Station include the following:

- Perform drywell structure and piping inspection and thickness testing.
  - If the results of the dry pit and piping inspections warrant replacement of the flooded suction "tin-can" pump station to a submersible type pump station, refer to the recommendations for the Carleton Street and North Avenue Pump Stations.
- Due to the new NFPA 820 classification of dry pits as Class 1, Div. 2, relocate controls above grade and install a new PLC-based pump station control panel with a touch screen operator interface terminal (OIT). The PLC will automatically control the pumps based on wet well level totalize pump runtimes. Wet well level, equipment status, pump operation setpoints and station alarms will be indicated at the OIT. Manual controls for the pumps shall also be provided. The control panel shall have a pump backup control circuit, using wet well float switches, that functions independently of the PLC
- The control panel will be NEMA 12 rated painted steel enclosure located within a concrete pad-mounted weatherproof stainless steel enclosure to protect the equipment from damage due to vandalism and the environment
- Install wet well level measurement instruments using a submersible pressure transducer suitable for wastewater and float switches for back-up operation and alarm notification.
- Install an 35 kW backup generator and automatic transfer switch
- Connect pump station monitoring and alarm signals from the new PLC-based control panel to the City's proposed radio telemetry network
- Replace pumps and motors.
- Replace valves.
- Safety improvements – provide rigid lifeline on ladder and continuous ventilation.

4.5.3 Calewood Drive

Our recommendations for the Calewood Drive Pump Station include the following:

- Perform drywell structure and piping inspection and thickness testing.
  - If the results of the dry pit and piping inspections warrant replacement of the flooded suction "tin-can" pump station to a submersible type pump station, refer to the recommendations for the Carleton Street and North Avenue Pump Stations.
- Due to the new NFPA 820 classification of dry pits as Class 1, Div. 2, relocate controls above grade and install a new PLC-based pump station control panel with a touch screen

operator interface terminal (OIT). The PLC will automatically control the pumps based on wet well level totalize pump runtimes. Wet well level, equipment status, pump operation setpoints and station alarms will be indicated at the OIT. Manual controls for the pumps shall also be provided. The control panel shall have a pump backup control circuit, using wet well float switches, that functions independently of the PLC

- The control panel will be NEMA 12 rated painted steel enclosure located within a concrete pad-mounted weatherproof stainless steel enclosure to protect the equipment from damage due to vandalism and the environment
- Install wet well level measurement instruments using a submersible pressure transducer suitable for wastewater and float switches for back-up operation and alarm notification.
- Install a 20 kW backup generator and automatic transfer switch
- Connect pump station monitoring and alarm signals from the new PLC-based control panel to the City's proposed radio telemetry network
- Replace pumps and motors.
- Replace valves.
- Safety improvements – provide rigid lifeline on ladder and continuous ventilation.

4.5.4 Carleton Street

The Carleton Street Pump Station's dry pit was recently flooded due to a valve failure. All electrical and control components within the station were damaged and need to be replaced. The dry pit was constructed in 1972, and is nearing the end of its useful life. At the time of this report, the City is actively getting quotes from vendors and contractors to provide and relocate the controls above grade, as well as evaluating whether to replace the station with a submersible type. Our recommendations for the Carleton Street Pump Station include the following:

- Replace the flooded suction "tin-can" pump station with a new submersible type pump station. The pumps will operate in a Lead - Standby configuration and will be rated for approximately 500 gpm.
- Reuse the 6-foot diameter precast concrete wet well; but replace the precast concrete top with a flat top with access hatch.
- Pumps/motors should be installed on SS circular slide rail system within the wet well
- Install a separate 6-foot diameter precast concrete valve pit for the pump station check valves and isolation gate valves.
- Install a PLC-based pump station control panel with a touch screen operator interface terminal (OIT). The PLC will automatically control the pumps based on wet well level totalize pump runtimes. Wet well level, equipment status, pump operation setpoints and station alarms will be indicated at the OIT. Manual controls for the pumps shall also be provided. The control panel shall have a pump backup control circuit, using wet well float switches, that functions independently of the PLC.
- The control panel will be NEMA 12 rated painted steel enclosure located within a concrete pad mounted weatherproof stainless steel enclosure to protect the equipment from damage due to vandalism and the environment
- Install wet well level measurement instruments using a submersible pressure transducer suitable for wastewater and float switches for back-up operation and alarm notification
- Install a new electrical service, main breaker, and electric control panel
- Install a new 33 kW backup generator and automatic transfer switch

- Connect the new pump station to the existing force main. Install an isolation valve and bypass pump connection on the force main adjacent to the pump station.
- Connect pump station monitoring and alarm signals from the new PLC-based control panel to the City's proposed radio telemetry network.
- Install new site security fencing.

4.5.6 Clydedale Avenue

Our recommendations for the Clydedale Avenue Pump Station include the following:

- Retrofit the existing vacuum prime station into a submersible type pump station by removing the dry pit pump skid from the precast concrete wet well. The dry pit will be replaced with a new precast concrete ring section and flat top with access hatch.
- Provide two new submersible pumps that will operate in a Lead - Standby configuration and will be rated for approximately 180 gpm.
- Pumps/motors should be installed on SS circular slide rail system within the wet well
- Install a separate 6-foot diameter precast concrete valve pit for the pump station check valves and isolation gate valves.
- Install a PLC-based pump station control panel with a touch screen operator interface terminal (OIT). The PLC will automatically control the pumps based on wet well level totalize pump runtimes. Wet well level, equipment status, pump operation setpoints and station alarms will be indicated at the OIT. Manual controls for the pumps shall also be provided. The control panel shall have a pump backup control circuit, using wet well float switches, that functions independently of the PLC.
- The control panel will be NEMA 12 rated painted steel enclosure located within a concrete pad-mounted weatherproof stainless steel enclosure to protect the equipment from damage due to vandalism and the environment
- Install wet well level measurement instruments using a submersible pressure transducer suitable for wastewater and float switches for back-up operation and alarm notification
- Connect the new pump station to the existing force main. Install an isolation valve and bypass pump connection on the force main adjacent to the pump station.
- Connect pump station monitoring and alarm signals from the new PLC-based control panel to the City's proposed radio telemetry network.
- Evaluate the need to install a new electrical service, main breaker, and electric control panel.
- Replace the 35 kW backup generator and automatic transfer switch

4.5.7 Coffin Avenue

Our recommendations for the Coffin Avenue Pump Station include the following:

- Provide two new submersible pumps that will operate in a Lead - Standby configuration and will be rated for approximately 180 gpm.
- Pumps/motors should be installed on SS circular slide rail system within the wet well
- Replace concrete top with a new flat top section with a hatch, capable of H20 loading, or with two manhole frames and covers to access the new pumps.
- During the design phase, the existing collection system and wet well storage volume will be evaluated in order to determine if it has the ability to accommodate a two hour power

outage event at existing and/or future flows. Given the limited site area of this pump station, the City may wish to forgo installing a permanent backup generator and provide accommodations to allow for the hookup of a portable generator. We have not included a generator in our recommended improvements for this station for that reason.

- Install a separate 6-foot diameter precast concrete valve pit for the pump station check valves and isolation gate valves.
- Though the controls were replaced in 2006, the existing controls need to be upgraded to a new PLC-based pump station control panel with a touch screen operator interface terminal (OIT) in order to connect to the City's proposed radio telemetry network. The PLC will automatically control the pumps based on wet well level totalize pump runtimes. Wet well level, equipment status, pump operation setpoints and station alarms will be indicated at the OIT. Manual controls for the pumps shall also be provided. The control panel shall have a pump backup control circuit, using wet well float switches, that functions independently of the PLC.
- The control panel will be NEMA 12 rated painted steel enclosure located within a concrete pad mounted weatherproof stainless steel enclosure to protect the equipment from damage due to vandalism and the environment
- Install a dedicated electrical main disconnect.
- Connect pump station monitoring and alarm signals from the new PLC-based control panel to the City's proposed radio telemetry network.

4.5.8 Concordia Courts

Our recommendations for the Concordia Courts Pump Station include the following:

- Perform drywell structure and piping inspection and thickness testing.
  - If the results of the dry pit and piping inspections warrant replacement of the flooded suction "tin-can" pump station to a submersible type pump station, refer to the recommendations for the Carleton Street and North Avenue Pump Stations.
- Due to the new NFPA 820 classification of dry pits as Class 1, Div. 2, relocate the existing PLC-based control panel above grade. The control panel will be located within a concrete pad mounted weatherproof stainless steel enclosure to protect the equipment from damage due to vandalism and the environment
- Retrofit the existing PLC-based control panel with Allen-Bradley Type 1100 or 1400 PLC, the existing OIT's could be retained, to provide Ethernet connectivity to connect the pump station monitoring and alarm signals to the City's proposed radio telemetry network.
- Replace the existing 35 kW backup generator and automatic transfer switch
- Replace pumps and motors.
- Replace valves.
- Safety improvements – provide continuous ventilation.

4.5.9 Danielle Drive

Our recommendations for the Danielle Drive Pump Station include the following:

- Perform drywell structure and piping inspection and thickness testing.
  - If the results of the dry pit and piping inspections warrant replacement of the flooded suction "tin-can" pump station to a submersible type pump station, refer to the recommendations for the Carleton Street and North Avenue Pump Stations.
- Due to the new NFPA 820 classification of dry pits as Class 1, Div. 2, relocate controls above grade and install a new PLC-based pump station control panel with a touch screen operator interface terminal (OIT). The PLC will automatically control the pumps based on wet well level totalize pump runtimes. Wet well level, equipment status, pump operation setpoints and station alarms will be indicated at the OIT. Manual controls for the pumps shall also be provided. The control panel shall have a pump backup control circuit, using wet well float switches, that functions independently of the PLC
- The control panel will be NEMA 12 rated painted steel enclosure located within a concrete pad mounted weatherproof stainless steel enclosure to protect the equipment from damage due to vandalism and the environment
- Install wet well level measurement instruments using a submersible pressure transducer suitable for wastewater and float switches for back-up operation and alarm notification.
- Replace the 30 kW backup generator and automatic transfer switch
- Connect pump station monitoring and alarm signals from the new PLC-based control panel to the City's proposed radio telemetry network
- Replace pumps and motors. Due to capacity issues with this station, during preliminary design, evaluate the need to increase the rated capacity.
- Replace valves.
- Safety improvements – provide rigid lifeline on ladder and continuous ventilation of the dry pit.

4.5.10 Farrwood Drive

Our recommendations for the Farrwood Drive Pump Station include the following:

- Perform drywell structure and piping inspection and thickness testing.
  - If the results of the dry pit and piping inspections warrant replacement of the flooded suction "tin-can" pump station to a submersible type pump station, refer to the recommendations for the Carleton Street and North Avenue Pump Stations.
- Due to the new NFPA 820 classification of dry pits as Class 1, Div. 2, relocate the existing PLC-based control panel above grade. The control panel will be located within a concrete pad-mounted weatherproof stainless steel enclosure to protect the equipment from damage due to vandalism and the environment
- Retrofit the existing PLC-based control panel with Allen-Bradley Type 1100 or 1400 PLC, the existing OIT's could be retained, to provide Ethernet connectivity to connect the pump station monitoring and alarm signals to the City's proposed radio telemetry network.
- Safety improvements – provide continuous ventilation of the dry pit.

4.5.11 Ferry Road

Our recommendations for the Ferry Road Pump Station include the following:

- Perform drywell structure and piping inspection and thickness testing.
  - If the results of the dry pit and piping inspections warrant replacement of the flooded suction "tin-can" pump station to a submersible type pump station, refer to the recommendations for the Carleton Street and North Avenue Pump Stations.
- Due to the new NFPA 820 classification of dry pits as Class 1, Div. 2, relocate controls above grade and install a new PLC-based pump station control panel with a touch screen operator interface terminal (OIT). The PLC will automatically control the pumps based on wet well level totalize pump runtimes. Wet well level, equipment status, pump operation setpoints and station alarms will be indicated at the OIT. Manual controls for the pumps shall also be provided. The control panel shall have a pump backup control circuit, using wet well float switches, that functions independently of the PLC
- The control panel will be NEMA 12 rated painted steel enclosure located within a concrete pad-mounted weatherproof stainless steel enclosure to protect the equipment from damage due to vandalism and the environment
- Install wet well level measurement instruments using a submersible pressure transducer suitable for wastewater and float switches for back-up operation and alarm notification.
- Replace the 9 kW backup generator and automatic transfer switch
- Connect pump station monitoring and alarm signals from the new PLC-based control panel to the City's proposed radio telemetry network
- Replace pumps and motors.
- Replace valves.
- Safety improvements – provide rigid lifeline on ladder and continuous ventilation.

4.5.12 Fondi Road

Our recommendations for the Fondi Road Pump Station include the following:

- Retrofit the existing control panel to provide Ethernet connectivity to connect the pump station monitoring and alarm signals to the City's proposed radio telemetry network.
- Safety improvements - provide fall protection grating on the hatches for the pump station and valve/tank vault.

4.5.13 Golden Hill

Our recommendations for the Golden Hill Pump Station include the following:

- Replace the ejector station with a new submersible type pump station. The pumps will operate in a Lead - Standby configuration and will be rated for approximately 100 gpm to increase velocity through the existing 4-inch force main. The new pump station will likely need to "fit" within the existing easement.
- Replace the existing ejector station with a new 6-foot diameter precast concrete wet well. During the design phase design, the existing collection system or proposed wet well storage volume will be evaluated in order to determine if it has the ability to accommodate a two hour power outage event at existing and/or future flows. Given the limited site area of this pump station, the City may wish to forgo installing a permanent backup generator and provide accommodations to allow for the hookup of a portable generator. We have not included a generator in our recommended improvements for this station for that reason.

- Pumps/motors should be installed on SS circular slide rail system within the wet well
- Install a separate 6-foot diameter precast concrete valve pit for the pump station check valves and isolation gate valves.
- Install a PLC-based pump station control panel with a touch screen operator interface terminal (OIT). The PLC will automatically control the pumps based on wet well level totalize pump runtimes. Wet well level, equipment status, pump operation setpoints and station alarms will be indicated at the OIT. Manual controls for the pumps shall also be provided. The control panel shall have a pump backup control circuit, using wet well float switches, that functions independently of the PLC.
- The control panel will be NEMA 12 rated painted steel enclosure located within a concrete pad-mounted weatherproof stainless steel enclosure to protect the equipment from damage due to vandalism and the environment
- Install wet well level measurement instruments using a submersible pressure transducer suitable for wastewater and float switches for back-up operation and alarm notification
- Install a new electrical service, main breaker, and electric control panel
- Connect the new pump station to the existing force main. Install an isolation valve and bypass pump connection on the force main adjacent to the pump station.
- Connect pump station monitoring and alarm signals from the new PLC-based control panel to the City's proposed radio telemetry network.

4.5.14 Hales Landing

Our recommendations for the Hales Landing Pump Station include the following:

- Retrofit the existing control panel to provide Ethernet connectivity to connect the pump station monitoring and alarm signals to the City's proposed radio telemetry network.

4.5.15 Hanover Street

Our recommendations for the Hanover Street Pump Station include the following:

- Replace the ejector station with a new submersible type pump station. The pumps will operate in a Lead - Standby configuration and will be rated for approximately 100 gpm. The new pump station will likely need to "fit" within the existing easement.
- Replace the existing ejector station with a new 6-foot diameter precast concrete wet well. During the design phase design, the existing collection system or proposed wet well storage volume will be evaluated in order to determine if it has the ability to accommodate a two hour power outage event at existing and/or future flows. Given the limited site area of this pump station, the City may wish to forgo installing a permanent backup generator and provide accommodations to allow for the hookup of a portable generator. We have not included a generator in our recommended improvements for this station for that reason.
- Pumps/motors should be installed on SS circular slide rail system within the wet well
- Install a separate 6-foot diameter precast concrete valve pit for the pump station check valves and isolation gate valves.
- Install a PLC-based pump station control panel with a touch screen operator interface terminal (OIT). The PLC will automatically control the pumps based on wet well level totalize pump runtimes. Wet well level, equipment status, pump operation setpoints and station alarms will be indicated at the OIT. Manual controls for the pumps shall also be

provided. The control panel shall have a pump backup control circuit, using wet well float switches, that functions independently of the PLC.

- The control panel will be NEMA 12 rated painted steel enclosure located within a concrete pad-mounted weatherproof stainless steel enclosure to protect the equipment from damage due to vandalism and the environment
- Install wet well level measurement instruments using a submersible pressure transducer suitable for wastewater and float switches for back-up operation and alarm notification
- Install a new electrical service, main breaker, and electric control panel
- Connect the new pump station to the existing force main. Install an isolation valve and bypass pump connection on the force main adjacent to the pump station.
- Connect pump station monitoring and alarm signals from the new PLC-based control panel to the City's proposed radio telemetry network.

4.5.16 Hilldale Avenue

Our recommendations for the Hilldale Avenue Pump Station include the following:

- Retrofit the existing control panel to provide Ethernet connectivity to connect the pump station monitoring and alarm signals to the City's proposed radio telemetry network.

4.5.17 Hoyt Road

Our recommendations for the Hoyt Road Pump Station include the following:

- Retrofit the existing control panel to provide Ethernet connectivity to connect the pump station monitoring and alarm signals to the City's proposed radio telemetry network.

4.5.18 Hyatt Avenue

Our recommendations for the Hyatt Avenue Pump Station include the following:

- Retrofit the existing vacuum prime station into a submersible type pump station by removing the dry pit pump skid from the precast concrete wet well. The dry pit will be replaced with a new precast concrete ring section and flat top with access hatch.
- Provide two new submersible pumps that will operate in a Lead - Standby configuration and will be rated for approximately 100 gpm.
- Pumps/motors should be installed on SS circular slide rail system within the wet well
- Install a separate 6-foot diameter precast concrete valve pit for the pump station check valves and isolation gate valves.
- Install a PLC-based pump station control panel with a touch screen operator interface terminal (OIT). The PLC will automatically control the pumps based on wet well level totalize pump runtimes. Wet well level, equipment status, pump operation setpoints and station alarms will be indicated at the OIT. Manual controls for the pumps shall also be provided. The control panel shall have a pump backup control circuit, using wet well float switches, that functions independently of the PLC.
- The control panel will be NEMA 12 rated painted steel enclosure located within a concrete pad-mounted weatherproof stainless steel enclosure to protect the equipment from damage due to vandalism and the environment
- Install wet well level measurement instruments using a submersible pressure transducer suitable for wastewater and float switches for back-up operation and alarm notification

- Connect the new pump station to the existing force main. Install an isolation valve and bypass pump connection on the force main adjacent to the pump station.
- Connect pump station monitoring and alarm signals from the new PLC-based control panel to the City's proposed radio telemetry network.
- Evaluate the need to install a new electrical service, main breaker, and electric control panel.
- Replace the 42.5 kW backup generator and automatic transfer switch

4.5.19 Lake Street

Our recommendations for the Lake Street Pump Station include the following:

- Retrofit the existing control panel to provide Ethernet connectivity to connect the pump station monitoring and alarm signals to the City's proposed radio telemetry network.
- Safety Improvements – Provide fall protection under wet well hatch.

4.5.20 Main Street

The Main Street Pump Station was recently completely replaced and is the only station that is connected into the City's SCADA system, therefore there are no recommendations for upgrades or improvements beyond normal operation and maintenance procedures during the 20-year capital planning time period.

4.5.21 Maynard Avenue

Our recommendations for the Maynard Avenue Road Pump Station include the following:

- Retrofit the existing control panel to provide Ethernet connectivity to connect the pump station monitoring and alarm signals to the City's proposed radio telemetry network.
- Safety improvements - provide fall protection grating under the existing wet well

4.5.22 Millvale

Our recommendations for the Millvale Pump Station include the following:

- Perform drywell structure and piping inspection and thickness testing.
  - If the results of the dry pit and piping inspections warrant replacement of the flooded suction "tin-can" pump station to a submersible type pump station, refer to the recommendations for the Carleton Street and North Avenue Pump Stations.
- Due to the new NFPA 820 classification of below grade dry pits as Class 1, Div. 2, relocate the existing PLC-based control panel above grade. The control panel will be located within a concrete pad-mounted weatherproof stainless steel enclosure to protect the equipment from damage due to vandalism and the environment
- Retrofit the existing PLC-based control panel with Allen-Bradley Type 1100 or 1400 PLC, the existing OIT's could be retained, to provide Ethernet connectivity to connect the pump station monitoring and alarm signals to the City's proposed radio telemetry network.
- Safety improvements – provide continuous ventilation of the dry pit.

4.5.23 Morningside Drive

Our recommendations for the Morningside Pump Station include the following:

- Perform drywell structure and piping inspection and thickness testing.
  - If the results of the dry pit and piping inspections warrant replacement of the flooded suction "tin-can" pump station to a submersible type pump station, refer to the recommendations for the Carleton Street and North Avenue Pump Stations.
- Due to the new NFPA 820 classification of below grade dry pits as Class 1, Div. 2, relocate the existing PLC-based control panel above grade. The control panel will be located within a concrete pad mounted weatherproof stainless steel enclosure to protect the equipment from damage due to vandalism and the environment
- Retrofit the existing PLC-based control panel with Allen-Bradley Type 1100 or 1400 PLC, the existing OIT's could be retained, to provide Ethernet connectivity to connect the pump station monitoring and alarm signals to the City's proposed radio telemetry network.
- Contact Power Company to correct brown outs in the area.
- Safety improvements – provide continuous ventilation of the dry pit.

4.5.24 Newton Road

Our recommendations for the Newton Road Pump Station include the following:

- Perform drywell structure and piping inspection and thickness testing.
  - If the results of the dry pit and piping inspections warrant replacement of the flooded suction "tin-can" pump station to a submersible type pump station, refer to the recommendations for the Carleton Street and North Avenue Pump Stations.
- Due to the new NFPA 820 classification of below grade dry pits as Class 1, Div. 2, relocate the existing PLC-based control panel above grade. The control panel will be located within a concrete pad-mounted weatherproof stainless steel enclosure to protect the equipment from damage due to vandalism and the environment
- Retrofit the existing PLC-based control panel with Allen-Bradley Type 1100 or 1400 PLC, the existing OIT's could be retained, to provide Ethernet connectivity to connect the pump station monitoring and alarm signals to the City's proposed radio telemetry network.
- Safety improvements – provide continuous ventilation of the dry pit.

4.5.25 North Avenue

Our recommendations for the North Avenue Pump Station include the following:

- Replace the flooded suction "tin-can" pump station with a new submersible type pump station. The pumps will operate in a Lead - Standby configuration and will be rated for approximately 600 gpm.
- Reuse the 8-foot diameter precast concrete wet well; but replace the precast concrete top with a flat top with access hatch.
- Pumps/motors should be installed on SS circular slide rail system within the wet well
- Install a separate 6-foot diameter precast concrete valve pit for the pump station check valves and isolation gate valves.
- Install a PLC-based pump station control panel with a touch screen operator interface terminal (OIT). The PLC will automatically control the pumps based on wet well level totalize pump runtimes. Wet well level, equipment status, pump operation setpoints and station alarms will be indicated at the OIT. Manual controls for the pumps shall also be provided. The control panel shall have a pump backup control circuit, using wet well float switches, that functions independently of the PLC.
- The control panel will be NEMA 12 rated painted steel enclosure located within a concrete pad mounted weatherproof stainless steel enclosure to protect the equipment from damage due to vandalism and the environment
- Install wet well level measurement instruments using a submersible pressure transducer suitable for wastewater and float switches for back-up operation and alarm notification
- Install a new electrical service, main breaker, and electric control panel
- Install a new 35 kW backup generator and automatic transfer switch
- Connect the new pump station to the existing force main. Install an isolation valve and bypass pump connection on the force main adjacent to the pump station.
- Connect pump station monitoring and alarm signals from the new PLC-based control panel to the City's proposed radio telemetry network.
- Install new site security fencing.

4.5.26 Pear Tree

Our recommendations for the Pear Tree Pump Station include the following:

- Perform drywell structure and piping inspection and thickness testing.
  - If the results of the dry pit and piping inspections warrant replacement of the flooded suction "tin-can" pump station to a submersible type pump station, refer to the recommendations for the Carleton Street and North Avenue Pump Stations.
- Due to the new NFPA 820 classification of below grade dry pits as Class 1, Div. 2, relocate controls above grade and install a new PLC-based pump station control panel with a touch screen operator interface terminal (OIT). The PLC will automatically control the pumps based on wet well level totalize pump runtimes. Wet well level, equipment status, pump operation setpoints and station alarms will be indicated at the OIT. Manual controls for the pumps shall also be provided. The control panel shall have a pump backup control circuit, using wet well float switches, that functions independently of the PLC

- The control panel will be NEMA 12 rated painted steel enclosure located within a concrete pad-mounted weatherproof stainless steel enclosure to protect the equipment from damage due to vandalism and the environment
- Install wet well level measurement instruments using a submersible pressure transducer suitable for wastewater and float switches for back-up operation and alarm notification.
- Connect pump station monitoring and alarm signals from the new PLC-based control panel to the City's proposed radio telemetry network
- Coordinate with Power Company to replace the 240V rated electric meter with one that is rated for 480V.

4.5.27 Peoples Place

Our recommendations for the Peoples Place Pump Station include the following:

- Perform drywell structure and piping inspection and thickness testing.
  - If the results of the dry pit and piping inspections warrant replacement of the flooded suction "tin-can" pump station to a submersible type pump station, refer to the recommendations for the Carleton Street and North Avenue Pump Stations.
- Due to the new NFPA 820 classification of below grade dry pits as Class 1, Div. 2, relocate controls above grade and install a new PLC-based pump station control panel with a touch screen operator interface terminal (OIT). The PLC will automatically control the pumps based on wet well level totalize pump runtimes. Wet well level, equipment status, pump operation setpoints and station alarms will be indicated at the OIT. Manual controls for the pumps shall also be provided. The control panel shall have a pump backup control circuit, using wet well float switches, that functions independently of the PLC
- The control panel will be NEMA 12 rated painted steel enclosure located within a concrete pad-mounted weatherproof stainless steel enclosure to protect the equipment from damage due to vandalism and the environment
- Install wet well level measurement instruments using a submersible pressure transducer suitable for wastewater and float switches for back-up operation and alarm notification.
- Install a new 35 kW backup generator and automatic transfer switch
- Connect pump station monitoring and alarm signals from the new PLC-based control panel to the City's proposed radio telemetry network
- Replace pumps and motors.
- Replace valves.
- Safety improvements – provide rigid lifeline on ladder and continuous ventilation of the dry pit.

4.5.28 Rosebud/Ridgeland Heights

Our recommendations for the Rosebud/Ridgeland Heights Pump Station include the following:

- Retrofit the existing vacuum prime station into a submersible type pump station by removing the dry pit pump skid from the precast concrete wet well. The dry pit will be replaced with a new precast concrete ring section and flat top with access hatch.
- Provide two new submersible pumps that will operate in a Lead - Standby configuration and will be rated for approximately 100 gpm.
- Pumps/motors should be installed on SS circular slide rail system within the wet well
- Install a separate 6-foot diameter precast concrete valve pit for the pump station check valves and isolation gate valves.
- Install a PLC-based pump station control panel with a touch screen operator interface terminal (OIT). The PLC will automatically control the pumps based on wet well level totalize pump runtimes. Wet well level, equipment status, pump operation setpoints and station alarms will be indicated at the OIT. Manual controls for the pumps shall also be provided. The control panel shall have a pump backup control circuit, using wet well float switches, that functions independently of the PLC.
- The control panel will be NEMA 12 rated painted steel enclosure located within a concrete pad-mounted weatherproof stainless steel enclosure to protect the equipment from damage due to vandalism and the environment
- Install wet well level measurement instruments using a submersible pressure transducer suitable for wastewater and float switches for back-up operation and alarm notification
- Connect the new pump station to the existing force main. Install an isolation valve and bypass pump connection on the force main adjacent to the pump station.
- Connect pump station monitoring and alarm signals from the new PLC-based control panel to the City's proposed radio telemetry network.

4.5.29 Rosemont

The recommendations for the Lake Street Pump Station include the following:

- Retrofit the existing control panel to provide Ethernet connectivity to connect the pump station monitoring and alarm signals to the City's proposed radio telemetry network.
- Safety Improvements – Provide fall protection under wet well hatch.

4.5.30 Route 110

Our recommendations for the Route 110 Pump Station include the following:

- Perform drywell structure and piping inspection and thickness testing.
  - If the results of the dry pit and piping inspections warrant replacement of the flooded suction "tin-can" pump station to a submersible type pump station, refer to the recommendations for the Carleton Street and North Avenue Pump Stations.
- Due to the new NFPA 820 classification of below grade dry pits as Class 1, Div. 2, relocate controls above grade and install a new PLC-based pump station control panel with a touch screen operator interface terminal (OIT). The PLC will automatically control the pumps based on wet well level totalize pump runtimes. Wet well level, equipment status, pump operation setpoints and station alarms will be indicated at the OIT. Manual controls for the pumps shall also be provided. The control panel shall have

a pump backup control circuit, using wet well float switches, that functions independently of the PLC

- The control panel will be NEMA 12 rated painted steel enclosure located within a concrete pad-mounted weatherproof stainless steel enclosure to protect the equipment from damage due to vandalism and the environment
- Install wet well level measurement instruments using a submersible pressure transducer suitable for wastewater and float switches for back-up operation and alarm notification.
- Install a new 30 kW backup generator and automatic transfer switch
- Connect pump station monitoring and alarm signals from the new PLC-based control panel to the City's proposed radio telemetry network
- Replace pumps and motors.
- Replace valves except knife gates on suction side, which were recently replaced.
- Extend security fencing to include electrical cabinet.
- Safety improvements – provide continuous ventilation of the dry pit.

4.5.31 Russett Hill

Our recommendations for the Russett Hill Pump Station include the following:

- Perform drywell structure and piping inspection and thickness testing.
  - If the results of the dry pit and piping inspections warrant replacement of the flooded suction "tin-can" pump station to a submersible type pump station, refer to the recommendations for the Carleton Street and North Avenue Pump Stations.
- Due to the new NFPA 820 classification of below grade dry pits as Class 1, Div. 2, relocate controls above grade and install a new PLC-based pump station control panel with a touch screen operator interface terminal (OIT). The PLC will automatically control the pumps based on wet well level totalize pump runtimes. Wet well level, equipment status, pump operation setpoints and station alarms will be indicated at the OIT. Manual controls for the pumps shall also be provided. The control panel shall have a pump backup control circuit, using wet well float switches, that functions independently of the PLC
- The control panel will be NEMA 12 rated painted steel enclosure located within a concrete pad-mounted weatherproof stainless steel enclosure to protect the equipment from damage due to vandalism and the environment
- Install wet well level measurement instruments using a submersible pressure transducer suitable for wastewater and float switches for back-up operation and alarm notification.
- Connect pump station monitoring and alarm signals from the new PLC-based control panel to the City's proposed radio telemetry network
- Paint or replace corroded electrical and generator panels.

4.5.32 South Cross Road

Our recommendations for the South Cross Road Pump Station include the following:

- Due to the new NFPA 820 classification of below grade dry pits as Class 1, Div. 2, relocate the existing PLC-based control panel above grade. The control panel will be located within a concrete pad-mounted weatherproof stainless steel enclosure to protect the equipment from damage due to vandalism and the environment.
- Retrofit the existing PLC-based control panel with Allen-Bradley Type 1100 or 1400 PLC, the existing OIT's could be retained to provide Ethernet connectivity to connect the pump station monitoring and alarm signals to the City's proposed radio telemetry network.
- Safety improvements – provide continuous ventilation of the dry pit.

4.5.33 South New Street

The South New Street Pump Station is planned to be demolished and replaced with a new submersible pump station during the summer of 2016; therefore, there are no other capital upgrades/improvements beyond providing the necessary hardware to connect the pump station onto the City's proposed radio telemetry network.

4.5.34 Srybny Avenue

Our recommendations for the Srybny Avenue Pump Station include the following:

- Perform drywell structure and piping inspection and thickness testing.
  - If the results of the dry pit and piping inspections warrant replacement of the flooded suction "tin-can" pump station to a submersible type pump station, refer to the recommendations for the Carleton Street and North Avenue Pump Stations.
- Due to the new NFPA 820 classification of below grade dry pits as Class 1, Div. 2, relocate controls above grade and install a new PLC-based pump station control panel with a touch screen operator interface terminal (OIT). The PLC will automatically control the pumps based on wet well level totalize pump runtimes. Wet well level, equipment status, pump operation setpoints and station alarms will be indicated at the OIT. Manual controls for the pumps shall also be provided. The control panel shall have a pump backup control circuit, using wet well float switches, that functions independently of the PLC
- The control panel will be NEMA 12 rated painted steel enclosure located within a concrete pad-mounted weatherproof stainless steel enclosure to protect the equipment from damage due to vandalism and the environment
- Install wet well level measurement instruments using a submersible pressure transducer suitable for wastewater and float switches for back-up operation and alarm notification.
- Install a new 50 kW backup generator and automatic transfer switch
- Connect pump station monitoring and alarm signals from the new PLC-based control panel to the City's proposed radio telemetry network
- Replace pumps and motors.
- Replace valves.
- Safety improvements – provide rigid lifeline on ladder and continuous ventilation of the dry pit.

4.5.35 Tamarac Drive

Our recommendations for the Tamarac Drive Pump Station include the following:

- Due to the new NFPA 820 classification of partially below grade dry pits as Class 1, Div. 2, relocate the existing PLC-based control panel above grade. The control panel will be located within a concrete pad-mounted weatherproof stainless steel enclosure to protect the equipment from damage due to vandalism and the environment
- Retrofit the existing PLC-based control panel with Allen-Bradley Type 1100 or 1400 PLC, retaining the existing OIT's, to provide Ethernet connectivity to connect the pump station monitoring and alarm signals to the City's proposed radio telemetry network.
- Safety Improvements – provide continuous ventilation of the dry pit.

4.5.36 Water Treatment Facility

The Water Treatment Facility Pump Station is planned to be demolished and replaced with a new submersible pump station as part of the Water Treatment Facility Upgrades slated to begin construction in late 2016 or early 2017; therefore, there are no other capital upgrades/improvements beyond providing the necessary hardware to connect the pump station onto the City's proposed radio telemetry network.

4.5.37 Whispering Creek

Our recommendations for the Whispering Creek Pump Station include the following:

- Perform drywell structure and piping inspection and thickness testing.
  - If the results of the dry pit and piping inspections warrant replacement of the flooded suction "tin-can" pump station to a submersible type pump station, refer to the recommendations for the Carleton Street and North Avenue Pump Stations.
- Due to the new NFPA 820 classification of below grade dry pits as Class 1, Div. 2, relocate the existing PLC-based control panel above grade. The control panel will be located within a concrete pad-mounted weatherproof stainless steel enclosure to protect the equipment from damage due to vandalism and the environment
- Retrofit the existing PLC-based control panel with Allen-Bradley Type 1100 or 1400 PLC, the existing OIT's could be retained, to provide Ethernet connectivity to connect the pump station monitoring and alarm signals to the City's proposed radio telemetry network.
- Safety improvements – provide continuous ventilation of the dry pit.

Section 5

WRIGHT-PIERCE
Engineering a Better Environment

SECTION 5

IMPLEMENTATION PLAN

5.1 PUMPING STATION RECOMMENDED PLAN

A summary of the recommendations for each pumping station and the engineer's estimate of probable construction costs in today's dollars (June 2016, ENR = 10,337) are presented in the implementation plan (Table 5-1). The implementation plan represents the recommended potential Capital Improvements Plan (CIP) for the City's pump stations for the planning period (through Calendar Year 2036). The estimated costs provided in Table 5-1 are recommended budgetary total project costs (includes construction, contingency, engineering services and other miscellaneous costs/fees). The costs are based upon Wright-Pierce's experience with similar projects and are based on the level of project understanding as of the date of this report. Additionally, the costs provided do not take into account potential conditions that are not known at this time. Some potential items that can increase project costs include contaminated soils and adverse sub-surface conditions, such as bedrock.

The total estimated project cost for the 20-year CIP is approximately $16.9 M. This is a preliminary budget cost estimate and will need to be reviewed and updated annually and/or as needed by the City over the implementation of the program. It is recommended that each project be reassessed prior to finalization of the project design engineering budget as changes will likely occur to the scope of each project over the implementation of the CIP.

The estimated project cost for each pump station project are presented in spreadsheet format and included in Appendix C. These costs sheets provide the basis for the costs calculated for each pumping station in the CIP.

The proposed timing of the improvements in the CIP is based on the Pump Station Evaluation conducted and presented in Chapter 3. The score for each pump station project was used to determine the order in which the projects occur. Based upon our review of the schedule of the projects, the Evaluation Criteria and score matrix developed represents an appropriate process to

order the projects in the CIP. The projects were spread out over the twenty-year planning period. Please note several of the projects significantly exceed the design life of the individual stations. This may require the acceleration of some projects depending on the City's ability to continue to perform O&M on the stations. These are risks the City will need to balance against the benefit of evenly distributed costs.

TABLE 5-1

HAVERHILL PUMP STATION CAPITAL IMPROVEMENTS PLAN

Pumping Station/Equipment		Year: 1 2017	2 2018	3 2019	4 2020	5 2021	6 2022	7 2023	8 2024	9 2025	10 2026	11 2027	12 2028	13 2029	14 2030	15 2031	16 2032	17 2033	18 2034	19 2035	20 2036
Alvanos Drive	$556,000							$556,000													
Replace pump station with submersible; and connect to radio.																					
Bradford Glen	$620,000								$620,000												
Relocate & replace controls; replace pumps & valves; add generator; and connect to radio																					
Calewood Drive	$622,000					$622,000															
Relocate & replace controls; replace pumps & valves; add generator; and connect to radio																					
Carleton Street	$654,000	$654,000																			
Relocate & replace controls; replace pumps, valves & generator; and connect to radio																					
Clydedale Avenue	$583,000									$583,000											
Retrofit station to submersible; new PLC controls; replace generator; and connect to radio.																					
Coffin Avenue	$573,000				$573,000																
New Submersible Station; complete																					
Concordia Courts	$619,000																$619,000				
Relocate & retrofit control panel; replace pumps, valves & generator; and connect to radio.																					
Danielle Drive	$640,000													$640,000							
Relocate & replace controls; replace pumps, valves; add generator; and connect to radio.																					
Farrwood Drive	$693,000																			$693,000	
Relocate & retrofit control panel, connect to radio.																					
Ferry Road	$612,000					$612,000															
Relocate & replace controls; replace pumps, valves & generator; and connect to radio.																					
Fondi Road	$84,000																			$84,000	
Retrofit control panel and connect to radio.																					
Golden Hill	$556,000											$556,000									
Replace pump station with submersible; connect to radio																					
Hales Landing	$46,000																				$46,000
Retrofit control panel and connect to radio.																					
Hanover Street	$556,000						$556,000														
Replace pump station with submersible; connect to radio.																					
Hilldale Avenue	$56,000																				$56,000
Retrofit control panel and connect to radio.																					
Hoyt Road	$591,000																				$591,000
Retrofit control panel and connect to radio.																					
Hyatt Avenue	$604,000										$604,000										
Retrofit station to submersible; new PLC controls; replace generator; and connect to radio.																					
Lake Street	$84,000																				$84,000
Retrofit control panel and connect to radio.																					
Main Street	$0																				
No recommendations during planning period.																					

TABLE 5-1

HAVERHILL PUMP STATION CAPITAL IMPROVEMENTS PLAN

Pumping Station/Equipment		Year:	1 2017	2 2018	3 2019	4 2020	5 2021	6 2022	7 2023	8 2024	9 2025	10 2026	11 2027	12 2028	13 2029	14 2030	15 2031	16 2032	17 2033	18 2034	19 2035	20 2036
Maynard avenue	$53,000																			$53,000	
Retrofit control panel and connect to radio.																					
Millvale/Seven Sisters	$555,000																		$555,000		
Relocate & retrofit control panel; connect to radio.																					
Morningside	$570,000																		$570,000		
Relocate & retrofit control panel; connect to radio.																					
Newton Road	$703,000																$703,000				
Relocate & retrofit control panel; connect to radio.																					
North Ave	$654,000			$654,000																	
Replace pump station with submersible; and connect to radio.																					
Peartree	$574,000																$574,000				
Relocate & replace controls; connect to radio																					
Peoples Place	$635,000														$635,000						
Relocate & replace controls; replace pumps & valves; add generator; and connect to radio																					
Rosebud/Ridgeland Heights	$601,000																			$601,000	
Retrofit station to submersible; new PLC controls; replace generator; and connect to radio.																					
Rosemont	$64,000																		$64,000		
Retrofit control panel and connect to radio.																					
Route 110	$657,000		$657,000																		
Relocate & replace controls; replace pumps, valves, and generator; and connect to radio																					
Russett Hill	$581,000																$581,000				
Relocate & replace controls; connect to radio																					
South Cross Road	$583,000																			$583,000	
Relocate & retrofit control panel; connect to radio.																					
South New Street	$37,000	$37,000																			
Retrofit control panel and connect to radio.																					
Srybny Avenue	$681,000													$681,000							
Relocate & replace controls; replace pumps, valves; add generator; and connect to radio																					
Tamarac	$601,000																				$601,000
Relocate & retrofit controls; connect to radio.																					
Water Treatment*	0*	0*																			
Retrofit control panel and connect to radio.																					
*Project Costs are within Water Plant Uprade																					
Whispering Creek	$569,000																	$569,000			
Relocate & retrofit control panel; connect to radio.																					
	Total for Year	$ 691,000.00	$657,000	$654,000	$573,000	$1,234,000	$556,000	$556,000	$620,000	$583,000	$604,000	$556,000	$681,000	$640,000	$635,000	$1,858,000	$1,188,000	$1,189,000	$601,000	$1,413,000	$1,378,000
	Total CIP	$16,867,000																			
	Average CIP Per Year	$843,400																			

NOTES

1. All costs presented as June 2016 dollars (ENR CCI 10337)

Appendix A

WRIGHT-PIERCE
Engineering a Better Environment

City of Haverhill, MA

Wastewater Pump Station Inventory

Alvanos Drive	
Location: 20 Alvanos Drive	
Coordinates:	42.80444843 -71.10406499
Elevation, ft (NAVD88):	51.6
Distance from WPAF, miles	3.6
General Pump Station Information:	
Year Constructed:	1980
Station Type:	Ejector Station
No. of Pumps:	2
Design Capacity, gpm:	20
Design TDH, ft:	19
Pump Speed, rpm:	735
Motor Hp:	1.5
Drive Type:	Constant
Pump Manufacturer/Model#:	Smith & Loveless/9LF
Pump Inlet/Outlet Diameter	4"/4"
Station Inlet Piping Size/Material	8" AC
Force Main Discharge Size/Material	4" CI
Clogging Issues (Y/N)	N
Wetwell Size:	Receiving Chamber
Corrosion: (Y/N)	N
Odor Issues: (Y/N)	N
Grease Accumulation: (Y/N)	N
Generator : (Y/N)	**N**

Controls Information:	
Pump Controls	
Type: (PLC/RLL/MFG Control)	MFG Control
Manufacturer:	Smith & Loveless
Model No.:	D21-7154-30
Control Scenario:	Alternating Lead/Lag Based on Level Setpoints
Pump Control Panel	
Enclosure: (Size/NEMA/Material)	NEMA 1
Condition:	Fair
Location:	Machinery Chamber
Alarming	Land-Line (RACO)
Level Controls	
Type:	Ross Valve
Backup Level Controls:	Float for High Alarm

HVAC/Mechanical Information:	
Heating:	Unit Heater
Location:	Machinery Chamber
Make/Model/Age:	
Size, kW:	
Dehumidification:	Unit Heater
Location:	Machinery Chamber
Make/Model/Age:	
Ventilation:	N/A
Location:	
Make/Model/Age:	
Size, kW:	
NEMA Space Rating:	
Confined Space Entry: (Y/N)	

Additional Comments:

Instrumentation:

HVAC/Ventilation:

None.

Building Structures:

N/A

Exterior Site Conditions:

Very tight site located in front of a house.

Security Measures:

Chain-link fence enclosure with wooden privacy fence and trees.

General:

One compressor has been replaced.

Motors have been rebuilt twice.

Ross Valves have been changed out.

There are oil leaks in the compressors.

Pods have never been opened and inspected.

Ross Valves have been changed out.

HAVERHILL, MA PUMP STATION ELECTRICAL SURVEY

NAME:	Alvanos Drive								
TYPE:	Submersible ☐			Ejector X		Suction Lift ☐			
SERVICE:	OH X	UG ☐	XFMR:	Pole ☐	Pad ☐	KVA		Pole#	Riser
Notes:	Meter not accessible, MTS does not have required working clearance.								
METER:	Utility	National Grid		Voltage	240V 3 phase	Rating		#	11361906
DISCONNECT:	CB X	DS ☐, Fused? ☐		Voltage	240V 3 phase	Rating			
MTS :	Manfr.	Cutler Hammer		Voltage	240V 3 phase	Rating		Poles	3 poles for gen recept.
DISTRBTION:									Age
MCC ☐	Mains:			Voltage		Rating		Sections	
Dist Panel ☐	Mains:			Voltage		Rating		#Ckt	
Light Xfmr ☐				Voltage		Rating		KVA	
Light Panel X	Mains:			Voltage		Rating		#Ckt	
Notes:	Main CB to the Pump Control Panel, Lighting Distribution within Pump Control Panel								
GENERATOR:	KW/KVA	N/A		Voltage	230V 3 phase	Rating			
Diesel ☐	Mnfr/Model					Age			
NG ☐	Tank								
LP ☐	Notes								
PUMP 1:	HP	1.5		Voltage	230V 3 phase	FLA			
Starter:	VFD ☐					Disc Rating			
	FVNR X	ESTOP ☐							
	RVSS ☐	LCS ☐							
PUMP 2:	HP	1.5		Voltage	230V 3 phase	FLA			
Starter:	VFD ☐					Disc Rating			
	FVNR X	ESTOP ☐							
	RVSS ☐	LCS ☐							

DEFICIENCIES/CODE ISSUES:

Backboard supporting electrical equipment is corroded. Station Fair to poor condition, priority 3 on the towns list.

Meter was not accessible, open breaker spaces at panel. MTS does not have the required working clearance, nor main disconnect ahead of the MTS to protect MTS

City of Haverhill, MA

Wastewater Pump Station Inventory

Bradford Glen	
Location: 30 Twin Brooks Circle	
Coordinates:	42.76142056 -71.09406082
Elevation, ft (NAVD88):	35.2
Distance from WPAF, miles	1.6
General Pump Station Information:	
Year Constructed:	1989
Station Type:	Flooded Suction
No. of Pumps:	2
Design Capacity, gpm:	100
Design TDH, ft:	72
Pump Speed, rpm:	1760
Motor Hp:	7.5
Drive Type:	Constant
Pump Manufacturer/Model#:	Smith & Loveless/4B2A
Pump Inlet/Outlet Diameter	4"/4"
Station Inlet Piping Size/Material	12" PVC
Force Main Discharge Size/Material	8" PVC
Clogging Issues (Y/N)	N, rarely
Wetwell Size:	6' Dia. Manhole
Corrosion: (Y/N)	N, rarely
Odor Issues: (Y/N)	N, rarely
Grease Accumulation: (Y/N)	Y
Generator : (Y/N)	N

Controls Information:	
Pump Controls	
Type: (PLC/RLL/MFG Control)	MFG Control
Manufacturer:	Smith & Loveless
Model No.:	C08-8252-30
Control Scenario:	Alternating Lead/Lag Based on Level Setpoints
Pump Control Panel	
Enclosure: (Size/NEMA/Material)	NEMA 1
Condition:	Good
Location:	Dry Pit
Alarming	Horn and Light Only
Level Controls	
Type:	Bubbler
Backup Level Controls:	None

HVAC/Mechanical Information:	
Heating:	Unit Heater
Location:	Dry Pit
Make/Model/Age:	N/A
Size, kW:	
Dehumidification (Y/N)	Y
Make/Model/Age:	N/A
Ventilation:	Blower
Location:	Dry Pit
Make/Model/Age:	Dayton/7L277-4C0444
Size, kW:	185 Watts
NEMA Space Rating:	
Confined Space Entry: (Y/N)	Y

Additional Comments:

Instrumentation:

HVAC/Ventilation:

Building Structures:

Exterior Site Conditions:

Gravel is fairly uniform with slight overgrowth of grass/weeds and fallen pines needles.

Security Measures:

Fence enclosure with padlocked gate.

General:

No visible leaks, interior of dry pit is in good condition.

Operators indicated that the check valves clog on occasion. There is normally a thick blanket of grease accumulation in the wet well. Chemicals are added periodically for grease control.

The pumps have the original mechanical seals.

HAVERHILL, MA PUMP STATION ELECTRICAL SURVEY

NAME:	Bradford Glen											
TYPE:	Submersible ☐			Dry-Pit X			Suction Lift ☐			Vacuum Prime ☐		
SERVICE:	OH ☐	UG X	XFMR:	Pole ☐	Pad X		KVA		Pole#	N/A		
Notes:	Transformer within site fence.											
METER:	Utility	National Grid		Voltage	240, 1Ph, 3W		Rating	200A	#			
DISCONNECT:	CB X	DS ☐, Fused? ☐		Voltage	240, 1Ph, 3W		Rating	100A				
MTS :	Manfr.	Eaton		Voltage	240, 1Ph, 3W		Rating	100A	Poles	2		
DISTRBTION:												Age
MCC ☐	Mains:			Voltage			Rating		Sections			
Dist Panel ☐	Mains:			Voltage			Rating		#Ckt			
Light Xfmr ☐				Voltage			Rating		KVA			
Light Panel ☐	Mains:			Voltage			Rating		#Ckt			
Notes:	Steelamn Rotary, single to 3-phase converter. Generator receptacle.											
GENERATOR:	KW/KVA	N/A		Voltage			Rating					
Diesel ☐	Mnfr/Model						Age					
NG ☐	Tank											
LP ☐	Notes											
PUMP 1:	HP	7.5		Voltage	240, 3Ph		FLA	22A				
Starter:	VFD ☐						Disc Rating					
	FVNR X	ESTOP ☐		Starter located in Pump Control Panel								
	RVSS ☐	LCS ☐										
PUMP 2:	HP	7.5		Voltage	240, 3Ph		FLA	22A				
Starter:	VFD ☐						Disc Rating					
	FVNR X	ESTOP ☐		Starter located in Pump Control Panel								
	RVSS ☐	LCS ☐										
DEFICIENCIES/CODE ISSUES: None observed.												

City of Haverhill, MA

Wastewater Pump Station Inventory

Calewood Drive	
Location: 7 Calewood Drive	
Coordinates:	42.75545857 -71.07459986
Elevation, ft (NAVD88):	130.7
Distance from WPAF, miles	0.8
General Pump Station Information:	
Year Constructed:	1989
Station Type:	Flooded Suction
No. of Pumps:	2
Design Capacity, gpm:	100
Design TDH, ft:	35
Pump Speed, rpm:	1170
Motor Hp:	3
Drive Type:	VFD, as soft starts.
Pump Manufacturer/Model#:	Smith & Loveless/4B2
Pump Inlet/Outlet Diameter	4"/4"
Station Inlet Piping Size/Material	8" PVC
Force Main Discharge Size/Material	4" PVC
Clogging Issues (Y/N)	N
Wetwell Size:	6' Dia. Manhole
Corrosion: (Y/N)	N
Odor Issues: (Y/N)	N
Grease Accumulation: (Y/N)	N
Generator : (Y/N)	N

Controls Information:	
Pump Controls	
Type: (PLC/RLL/MFG Control)	MFG Control
Manufacturer:	Smith & Loveless
Model No.:	C08-8235-30
Control Scenario:	Alternating Lead/Lag Based on Level Setpoints
Pump Control Panel	
Enclosure: (Size/NEMA/Material)	NEMA 1
Condition:	Good
Location:	Dry Pit
Alarming	Light
Level Controls	
Type:	Bubbler
Backup Level Controls:	None

HVAC/Mechanical Information:	
Heating:	Unit Heater
Location:	Dry Pit
Make/Model/Age:	
Size, kW:	
Dehumidification (Y/N):	Y
Location:	Dry Pit
Make/Model/Age:	
Ventilation:	Blower
Location:	Dry Pit
Make/Model/Age:	S&L
Size, kW:	
NEMA Space Rating:	
Confined Space Entry: (Y/N)	

Additional Comments:

Instrumentation:

HVAC/Ventilation:

Building Structures:

Exterior Site Conditions:

Security Measures:

Fenced enclosure with padlocked gate, with privacy screens and hedges.

General:

Alarm light is located below fence level, making it difficult to see from street.

Operators indicated that the station has minimal issues, and when it does it is due to electrical.

They requested that an alarm system be added to the station.

HAVERHILL, MA PUMP STATION ELECTRICAL SURVEY

NAME:	Calewood Drive											
TYPE:	Submersible ☐			Dry-Pit X			Suction Lift ☐			Vacuum Prime ☐		
SERVICE:	OH ☐	UG X	XFMR:	Pole ☐	Pad X		KVA		Pole#	N/A		
Notes:	Transformer in grass next to fence.											
METER:	Utility	National Grid		Voltage	240, 1Ph, 3W		Rating	200A	#	80402675		
DISCONNECT:	CB ☐	DS X, Fused? ☐		Voltage	240, 1Ph, 3W		Rating					
ATS/MTS :	Manfr.	N/A		Voltage			Rating		Poles			
DISTRBTION:												Age
MCC ☐	Mains:			Voltage			Rating		Sections			
Dist Panel ☐	Mains:			Voltage			Rating		#Ckt			
Light Xfmr ☐				Voltage			Rating		KVA			
Light Panel ☐	Mains:			Voltage			Rating		#Ckt			
Notes:	Generator Receptacle with disconnect.											
GENERATOR:	KW/KVA	N/A		Voltage			Rating					
Diesel ☐	Mnfr/Model						Age					
NG ☐	Tank											
LP ☐	Notes											
PUMP 1:	HP	3		Voltage	240, 3Ph		FLA	9.6A				
Starter:	VFD X						Disc Rating					
	FVNR ☐	ESTOP ☐		VFD located in Pump Control Panel								
	RVSS ☐	LCS ☐										
PUMP 2:	HP	3		Voltage	240, 3Ph		FLA	9.6A				
Starter:	VFD X						Disc Rating					
	FVNR ☐	ESTOP ☐		VFD located in Pump Control Panel								
	RVSS ☐	LCS ☐										

DEFICIENCIES/CODE ISSUES: Consdier MTS to prevent simultaneous line/generator power feeds.

City of Haverhill, MA

Wastewater Pump Station Inventory

Carleton Street	
Location: 129 Carleton Street	
Coordinates:	42.78054692 -71.11157617
Elevation, ft (NAVD88):	105.5
Distance from WPAF, miles	2.8
General Pump Station Information:	
Year Constructed:	1972
Station Type:	Flooded Suction
No. of Pumps:	2
Design Capacity, gpm:	500
Design TDH, ft:	49
Pump Speed, rpm:	1760
Motor Hp:	10
Drive Type:	Constant
Pump Manufacturer/Model#:	Smith & Loveless/4B2A
Pump Inlet/Outlet Diameter	4"/4"
Station Inlet Piping Size/Material	8" AC
Force Main Discharge Size/Material	8" CI
Clogging Issues (Y/N)	N
Wetwell Size:	6' Dia. Manhole
Corrosion: (Y/N)	N
Odor Issues: (Y/N)	N
Grease Accumulation: (Y/N)	N
Generator : (Y/N)	Y

Controls Information:	
Pump Controls	
Type: (PLC/RLL/MFG Control)	MFG Control
Manufacturer:	Smith & Loveless
Model No.:	JD1, JD2
Control Scenario:	Alternating Lead/Lag Based on Level Setpoints
Pump Control Panel	
Enclosure: (Size/NEMA/Material)	NEMA 1
Condition:	Damanged due to flooding.
Location:	Dry Pit
Alarming	
Level Controls	
Type:	Bubbler
Backup Level Controls:	None

HVAC/Mechanical Information:	
Heating:	
Location:	
Make/Model/Age:	
Size, kW:	
Dehumidification:	
Location:	
Make/Model/Age:	
Ventilation:	
Location:	
Make/Model/Age:	
Size, kW:	
NEMA Space Rating:	
Confined Space Entry: (Y/N)	

Additional Comments:

Instrumentation:

HVAC/Ventilation:

Building Structures:

Exterior Site Conditions:

Gravel coverage is in poor condition.

Security Measures:

Chainlink fence with bar wire. Barb wire has slack, rusted, and has sections missing.

General:

Dry Pit was previously flooded due to a valve failure. All electrical and controls were damaged during the flood. The pump station is currently operating with one pump.

Dry Pit was not entered during the site visit due to hazardous conditions.

HAVERHILL, MA PUMP STATION ELECTRICAL SURVEY

NAME:	Carleton Street								
TYPE:	Submersible ☐			Dry-Pit X		Suction Lift ☐		Vacuum Prime ☐	
SERVICE:	OH X	UG ☐	XFMR:	Pole X	Pad ☐	KVA		Pole#	16
Notes:	Transformers accross the street.								
METER:	Utility	National Grid		Voltage	120/208, 3Ph, 4W	Rating	200A	#	98631130
DISCONNECT:	CB ☐	DS X, Fused? ☐		Voltage	120/208, 3Ph, 4W	Rating	100A		
ATS :	Manfr.	Cutler-Hammer		Voltage	120/208, 3Ph, 4W	Rating	100A	Poles	3
DISTRBTION:									Age
MCC ☐	Mains:			Voltage		Rating		Sections	
Dist Panel ☐	Mains:			Voltage		Rating		#Ckt	
Light Xfmr ☐				Voltage		Rating		KVA	
Light Panel ☐	Mains:			Voltage		Rating		#Ckt	
Notes:	Located in dry well. No entry due to flooded dry well.								
GENERATOR:	KW/KVA	33/41		Voltage	120/208, 3Ph, 4W	Rating			
Diesel X	Mnfr/Model		Kohler			Age	1992		
NG ☐	Tank	Belly Tank							
LP ☐	Notes								
PUMP 1:	HP	10		Voltage	208, 3Ph	FLA			
Starter:	VFD ☐					Disc Rating			
	FVNR X	ESTOP ☐							
	RVSS ☐	LCS ☐							
PUMP 2:	HP	10		Voltage	208, 3Ph	FLA			
Starter:	VFD ☐					Disc Rating			
	FVNR X	ESTOP ☐							
	RVSS ☐	LCS ☐							

DEFICIENCIES/CODE ISSUES: Dry well is flooding. Corroded generator housing. Inadequate splicing in junction box.

Flexible conduits laying on ground.

City of Haverhill, MA

Wastewater Pump Station Inventory

Clydedale Avenue	
Location: 89 Clydedale Avenue	
Coordinates:	42.7964181 -71.09429941
Elevation, ft (NAVD88):	34.9
Distance from WPAF, miles	2.9
General Pump Station Information:	
Year Constructed:	1992
Station Type:	Vacuum Prime
No. of Pumps:	2
Design Capacity, gpm:	180
Design TDH, ft:	43
Pump Speed, rpm:	1200
Motor Hp:	5
Drive Type:	Constant
Pump Manufacturer/Model#:	Smith & Loveless/4B2B
Pump Inlet/Outlet Diameter	4"/4"
Station Inlet Piping Size/Material	8" PVC
Force Main Discharge Size/Material	4" Unk.
Clogging Issues (Y/N)	N
Wetwell Size:	5' Dia. Manhole (Below)
Corrosion: (Y/N)	N
Odor Issues: (Y/N)	N
Grease Accumulation: (Y/N)	N
Generator : (Y/N)	Y

Controls Information:	
Pump Controls	
Type: (PLC/RLL/MFG Control)	MFG Control
Manufacturer:	Smith & Loveless
Model No.:	C14-1729-30
Control Scenario:	Alternating Lead/Lag Based on Level Setpoints
Pump Control Panel	
Enclosure: (Size/NEMA/Material)	NEMA 1
Condition:	Good
Location:	Dry Pit
Alarming	None
Level Controls	
Type:	Floats
Backup Level Controls:	None

HVAC/Mechanical Information:	
Heating:	Unit Heater
Location:	Dry Pit
Make/Model/Age:	
Size, kW:	
Dehumidification (Y/N):	N
Location:	
Make/Model/Age:	
Ventilation:	Blower
Location:	Dry Pit
Make/Model/Age:	Dayton/1TDR3
Size, kW:	
NEMA Space Rating:	
Confined Space Entry: (Y/N)	

Additional Comments:

Instrumentation:

HVAC/Ventilation:

Building Structures:

Steel portion of wet well, above precast conc., is severely corroded.

Exterior Site Conditions:

Concrete pavement has overgrowth of weeds and grass.

Security Measures:

Fence enclosure with padlocked gate, with privacy screens.

General:

Operators recently replaced check valves.

Gate valve has some issues, may require replacement

Coating failure on piping and valves.

Operators would like a remote alarm installed.

HAVERHILL, MA PUMP STATION ELECTRICAL SURVEY

NAME:	Clydedale Avenue								
TYPE:	Submersible ☐		Dry-Pit ☐		Suction Lift X		Vacuum Prime		
SERVICE:	OH ☐	UG X	XFMR:	Pole ☐	Pad ☐	KVA		Pole#	
Notes:	Fed from nearby riser pole								
METER:	Utility	National Grid	Voltage	208/120V, 3ph, Y	Rating		#		
DISCONNECT:	CB X	DS ☐, Fused? ☐	Voltage	208/120V, 3ph, Y	Rating	100 amp			
ATS :	Manfr.	Onan	Voltage	208/120V, 3ph, Y	Rating	125 amp	Poles	3	
DISTRBTION:									Age
MCC ☐	Mains:		Voltage		Rating		Sections		1992
Dist Panel X	Mains:		Voltage	208/120V, 3ph, Y	Rating		#Ckt		
Light Xfmr ☐			Voltage		Rating		KVA		
Light Panel ☐	Mains:		Voltage		Rating		#Ckt		
Notes:									
GENERATOR:	KW/KVA	35/44	Voltage	208V, 3ph, Wye	Rating	125 amps, with 225 amp Breaker			
Diesel ☐	Mnfr/Model	Onan			Age	1992			
NG X	Tank								
LP ☐	Notes								
PUMP 1:	HP	5	Voltage	208V, 3ph,	FLA	16.4 amps			
Starter:	VFD ☐				Disc Rating				
	FVNR X	ESTOP ☐							
	RVSS ☐	LCS ☐							
PUMP 2:	HP	5	Voltage	208V, 3ph,	FLA	16.4 amps			
Starter:	VFD ☐				Disc Rating				
	FVNR X	ESTOP ☐							
	RVSS ☐	LCS ☐							

DEFICIENCIES/CODE ISSUES:

No Issues, station is in fair condition. Station may require ventilation for dry pit pumps to maintain classification, as it is partially below grade.

City of Haverhill, MA

Wastewater Pump Station Inventory

Coffin Avenue	
Location:	
Coordinates:	42.76699901 -71.0338011
Elevation, ft (NAVD88):	10.9
Distance from WPAF, miles	1.5
General Pump Station Information:	
Year Constructed:	1971
Station Type:	Submersible
No. of Pumps:	2
Design Capacity, gpm:	100
Design TDH, ft:	Unknown
Pump Speed, rpm:	Unknown
Motor Hp:	Unknown
Drive Type:	Constant
Pump Manufacturer/Model#:	Unknown
Pump Inlet/Outlet Diameter	/4"
Station Inlet Piping Size/Material	8" PVC
Force Main Discharge Size/Material	6" DI
Clogging Issues (Y/N)	N
Wetwell Size:	6' Dia. Manhole
Corrosion: (Y/N)	N
Odor Issues: (Y/N)	N
Grease Accumulation: (Y/N)	N
Generator : (Y/N)	N

Controls Information:	
Pump Controls	
Type: (PLC/RLL/MFG Control)	
Manufacturer:	
Model No.:	
Control Scenario:	Alternating Lead/Lag Based on Level Setpoints
Pump Control Panel	
Enclosure: (Size/NEMA/Material)	
Condition:	
Location:	
Alarming	Light and Horn
Level Controls	
Type:	Floats
Backup Level Controls:	None

HVAC/Mechanical Information:	
Heating:	N/A
Location:	
Make/Model/Age:	
Size, kW:	
Dehumidification (Y/N):	N/A
Location:	
Make/Model/Age:	
Ventilation:	N/A
Location:	
Make/Model/Age:	
Size, kW:	
NEMA Space Rating:	
Confined Space Entry: (Y/N)	Y

Additional Comments:

Instrumentation:

HVAC/Ventilation:

Building Structures:

Exterior Site Conditions:

Wet well located in street; Control Panel located on the side of road.

Plowed snow from neighbors can be an issue with access to control panel.

Security Measures:

Control panel is located within fence enclosure with barb wire, and padlocked gate.

General:

Control panel was redone in March 2010; however nothing has been done on the wet well side.

There has been no issue with the pumps in recent years.

Operators would like the pumps replaced due to age and to upgrade alarms.

Existing information was very limited.

HAVERHILL, MA PUMP STATION ELECTRICAL SURVEY

NAME:	Coffin Avenue								
TYPE:	Submersible X			Dry-Pit ☐		Suction Lift ☐		Vacuum Prime ☐	
SERVICE:	OH X	UG ☐	XFMR:	Pole X	Pad ☐	KVA		Pole#	268-10
Notes:	Transformers accross the street.								
METER:	Utility	National Grid		Voltage	240, 1Ph, 3W	Rating	200A	#	98787743
DISCONNECT:	CB ☐	DS ☐, Fused? ☐		Voltage		Rating	N/A		
ATS :	Manfr.	N/A		Voltage		Rating		Poles	
DISTRBTION:									Age
MCC ☐	Mains:			Voltage		Rating		Sections	
Dist Panel ☐	Mains:			Voltage		Rating		#Ckt	
Light Xfmr ☐				Voltage		Rating		KVA	
Light Panel X	Mains:	60A		Voltage	240, 1Ph, 3W	Rating	100A	#Ckt	6	2004
Notes:									
GENERATOR:	KW/KVA	N/A		Voltage		Rating			
Diesel ☐	Mnfr/Model					Age			
NG ☐	Tank								
LP ☐	Notes								
PUMP 1:	HP	3		Voltage	240, 1Ph	FLA	23A		
Starter:	VFD ☐					Disc Rating			
	FVNR X	ESTOP ☐		Starter located in Pump Control Panel					
	RVSS ☐	LCS ☐							
PUMP 2:	HP	3		Voltage	240, 1Ph	FLA	23A		
Starter:	VFD ☐					Disc Rating			
	FVNR X	ESTOP ☐		Starter located in Pump Control Panel					
	RVSS ☐	LCS ☐							

DEFICIENCIES/CODE ISSUES: No main disconnect.

City of Haverhill, MA

Wastewater Pump Station Inventory

Concordia Courts	
Location: 5 Spinnaker Circle	
Coordinates:	42.80261139 -71.10175694
Elevation, ft (NAVD88):	46.7
Distance from WPAF, miles	3.5
General Pump Station Information:	
Year Constructed:	1996
Station Type:	Flooded Suction
No. of Pumps:	2
Design Capacity, gpm:	100
Design TDH, ft:	70
Pump Speed, rpm:	1760
Motor Hp:	7.5
Drive Type:	Constant
Pump Manufacturer/Model#:	Smith & Loveless/4B2A
Pump Inlet/Outlet Diameter	4"/4"
Station Inlet Piping Size/Material	8" PVC
Force Main Discharge Size/Material	4" PVC
Clogging Issues (Y/N)	N
Wetwell Size:	6' Dia. Manhole
Corrosion: (Y/N)	N
Odor Issues: (Y/N)	Y, sometimes
Grease Accumulation: (Y/N)	N
Generator : (Y/N)	Y

Controls Information:	
Pump Controls	
Type: (PLC/RLL/MFG Control)	PLC
Manufacturer:	Custom Control Technologies
Model No.:	
Control Scenario:	Alternating Lead/Lag Based on Level Setpoints
Pump Control Panel	
Enclosure: (Size/NEMA/Material)	NEMA 3R
Condition:	Good
Location:	Dry Pit
Alarming	Autodialer
Level Controls	
Type:	Ultrasonic
Backup Level Controls:	Floats

HVAC/Mechanical Information:	
Heating:	Unit Heater
Location:	Dry Pit
Make/Model/Age:	Red Stone
Size, kW:	
Dehumidification (Y/N):	Y
Location:	Dry Pit
Make/Model/Age:	
Ventilation:	Blower
Location:	Dry Pit
Make/Model/Age:	Dayton
Size, kW:	
NEMA Space Rating:	
Confined Space Entry: (Y/N)	

Additional Comments:

Instrumentation:

HVAC/Ventilation:

Building Structures:

Exterior Site Conditions:

Gravel with some overgrowth of grass and weeds.

Security Measures:

Fence enclosure with padlocked gate and privacy hedges.

General:

Controls were all replaced due to flooding, about five or so years ago.

Paint/Coating failing on pumps and piping.

HAVERHILL, MA PUMP STATION ELECTRICAL SURVEY

NAME:	Concordia Courts								
TYPE:	Submersible ☐			Dry-Pit X			Suction Lift ☐		
SERVICE:	OH ☐	UG X	XFMR:	Pole ☐	Pad X	KVA	150	Pole#	
Notes:	150 KVA near by, within subdivision								
METER:	Utility	National Grid		Voltage	480/277V, 3ph, Y	Rating		#	86964206
DISCONNECT:	CB ☐	DS X, Fused? ☐		Voltage	480/277V, 3ph, Y	Rating	Not-Listed		
ATS :	Manfr.	Kohler		Voltage	480/277V, 3ph, Y	Rating		Poles	
DISTRBTION:	Some Corrosion on ATS								Age
MCC ☐	Mains:			Voltage		Rating		Sections	1996
Dist Panel X	Mains:			Voltage	480V 1 phase	Rating		#Ckt	
Light Xfmr X				Voltage	480/240V 1 phase	Rating		KVA	7.5
Light Panel X	Mains:	Small panel		Voltage	240V 1 phase	Rating		#Ckt	
Notes:	Dist. Panel under 7.5 kva transformer								
GENERATOR:	KW/KVA	35 kw		Voltage	480/277V, 3ph, Y	Rating	71 amps		
Diesel ☐	Mnfr/Model		Kohler			Age	1996		
NG X	Tank								
LP ☐	Notes								
PUMP 1:	HP	7.5		Voltage	460 3 ph	FLA			
Starter:	VFD ☐					Disc Rating			
	FVNR X	ESTOP ☐							
	RVSS ☐	LCS ☐							
PUMP 2:	HP	7.5		Voltage	460 3 ph	FLA			
Starter:	VFD ☐					Disc Rating			
	FVNR X	ESTOP ☐							
	RVSS ☐	LCS ☐							

DEFICIENCIES/CODE ISSUES:

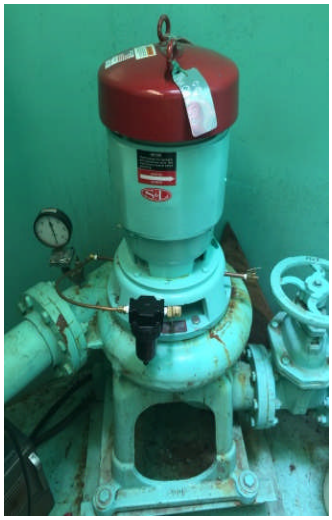
The pump station dry pit may require ventilation to maintain non classification per NFPA 820 as the station is located underground. ATS panel and main disconnect was corroded on exterior.

Some corrosion on Generator Exterior ad the ATS exterior. ATS does not have adequate working clearance.

City of Haverhill, MA

Wastewater Pump Station Inventory

Danielle Drive	
Location: 34 Danielle Drive	
Coordinates:	42.78654233 -71.13770657
Elevation, ft (NAVD88):	132.2
Distance from WPAF, miles	4.2
General Pump Station Information:	
Year Constructed:	1997
Station Type:	Flooded Suction
No. of Pumps:	2
Design Capacity, gpm:	125
Design TDH, ft:	51
Pump Speed, rpm:	1760
Motor Hp:	7.5
Drive Type:	Constant
Pump Manufacturer/Model#:	Smith & Loveless/4B2A
Pump Inlet/Outlet Diameter	4"/4"
Station Inlet Piping Size/Material	8" PVC
Force Main Discharge Size/Material	4" PVC
Clogging Issues (Y/N)	Y, see notes.
Wetwell Size:	6' Dia. Wet Well
Corrosion: (Y/N)	N
Odor Issues: (Y/N)	N
Grease Accumulation: (Y/N)	N
Generator : (Y/N)	Y



Controls Information:	
Pump Controls	
Type: (PLC/RLL/MFG Control)	MFG Control
Manufacturer:	Smith & Loveless
Model No.:	B08-84530-30
Control Scenario:	Alternating Lead/Lag Based on Level Setpoints
Pump Control Panel	
Enclosure: (Size/NEMA/Material)	NEMA 1
Condition:	Good
Location:	Dry Pit
Alarming	Autodialer
Level Controls	
Type:	Bubbler
Backup Level Controls:	None

HVAC/Mechanical Information:	
Heating:	Unit Heater
Location:	Dry Pit
Make/Model/Age:	Lakewood/Model 792/AA
Size, kW:	
Dehumidification (Y/N):	Y
Location:	Dry Pit
Make/Model/Age:	
Ventilation:	Blower
Location:	Dry Pit
Make/Model/Age:	Dayton/4C44A
Size, kW:	
NEMA Space Rating:	
Confined Space Entry: (Y/N)	

Additional Comments:

Instrumentation:

HVAC/Ventilation:

Building Structures:

Exterior Site Conditions:

Gravel in good condition; minor weed growth.

Security Measures:

Fence enclosure with padlock gate and privacy screens.

General:

Have clogging issues with non-dispersables; X-Pellers installed.

Capacity issues with the station. During normal operation one pump can keep up; however extra flow from new developments and during rain events, and the station has a difficult time keeping up. If the power goes off, and the generator doesn't turn on, it takes approximately 3 hours to catch up.

Operators recommended that the pump station be upgraded with bigger capacity pumps (400gpm?).

HAVERHILL, MA PUMP STATION ELECTRICAL SURVEY

NAME:	Danielle Drive								
TYPE:	Submersible ☐			Dry-Pit X		Suction Lift ☐			
SERVICE:	OH ☐	UG X	XFMR:	Pole ☐	Pad ☐	KVA	75	Pole#	
Notes:									
METER:	Utility	National Grid		Voltage	208/120V 3 ph Y	Rating		#	12741037
DISCONNECT:	CB ☐	DS X , Fused?		Voltage	208/120V 3 ph Y	Rating	100 amp		
ATS :	Manfr.	Olympian		Voltage	208/120V 3 ph Y	Rating	200 amp	Poles	3
DISTRBTION:									Age
MCC ☐	Mains:			Voltage		Rating		Sections	
Dist Panel ☐	Mains:			Voltage	208/120V 3 ph Y	Rating		#Ckt	
Light Xfmr ☐				Voltage		Rating		KVA	
Light Panel ☐	Mains:			Voltage		Rating		#Ckt	
Notes:	Bubble System, Distribution in PCP. Generator has had some issues.								
GENERATOR:	KW/KVA	30/50		Voltage	208/120V 3 ph Y	Rating	139 amp output, 125 amp Main		
Diesel ☐	Mnfr/Model		Generac			Age	1997		
NG X	Tank								
LP ☐	Notes								
PUMP 1:	HP	7.5		Voltage	208V, 3 phase	FLA	22		
Starter:	VFD ☐					Disc Rating			
	FVNR X	ESTOP ☐							
	RVSS ☐	LCS ☐							
PUMP 2:	HP	7.5		Voltage	208V, 3 phase	FLA	22		
Starter:	VFD ☐					Disc Rating			
	FVNR X	ESTOP ☐							
	RVSS ☐	LCS ☐							

DEFICIENCIES/CODE ISSUES:

Generator has had issues, Station is a priority 3 on the Town's priority list.

No code issues are visible, however the pump station dry pit may require ventilation to maintain non classification per NFPA 820 as the station is located underground.

Some corrosion on Fuel and Exhaust Piping.

City of Haverhill, MA

Wastewater Pump Station Inventory

Farrwood Drive	
Location: 1346 Boston Road	
Coordinates:	42.73863482 -71.11197785
Elevation, ft (NAVD88):	40.3
Distance from WPAF, miles	3.0
General Pump Station Information:	
Year Constructed:	2006
Station Type:	Flooded Suction
No. of Pumps:	2
Design Capacity, gpm:	500
Design TDH, ft:	72.5
Pump Speed, rpm:	1800
Motor Hp:	20
Drive Type:	Constant
Pump Manufacturer/Model#:	Smith & Loveless/4C2
Pump Inlet/Outlet Diameter	8"/8"
Station Inlet Piping Size/Material	12" PVC
Force Main Discharge Size/Material	Unk
Clogging Issues (Y/N)	N
Wetwell Size:	8' Dia. Manhole
Corrosion: (Y/N)	N
Odor Issues: (Y/N)	N
Grease Accumulation: (Y/N)	N
Generator : (Y/N)	Y

Controls Information:	
Pump Controls	
Type: (PLC/RLL/MFG Control)	MFG Control
Manufacturer:	Smith & Loveless
Model No.:	B08-8513-30
Control Scenario:	Alternating Lead/Lag Based on Level Setpoints
Pump Control Panel	
Enclosure: (Size/NEMA/Material)	NEMA 1
Condition:	Good
Location:	Dry Pit
Alarming	Autodialer, Light, and Alarm
Level Controls	
Type:	Transducer
Backup Level Controls:	Floats

HVAC/Mechanical Information:	
Heating:	Unit Heater
Location:	Dry Pit
Make/Model/Age:	
Size, kW:	
Dehumidification (Y/N):	Y
Location:	Dry Pit
Make/Model/Age:	
Ventilation:	Blower
Location:	Dry Pit
Make/Model/Age:	Dayton
Size, kW:	
NEMA Space Rating:	
Confined Space Entry: (Y/N)	

Additional Comments:

Instrumentation:

HVAC/Ventilation:

Building Structures:

Exterior Site Conditions:

Gravel/stone within enclosure; lots of weeds/grass growth within stone.

Security Measures:

Fenced enclosure with padlocked gate.

General:

Mice issues in generator.

Pump Station with the worst grease issues. The City has vac trucks take out grease on occasion.
Issues with the sewer pipes conveying flow to the wet well, however the pumps are in good condition.

There is a potential to eliminate this station based on the Proposed Sewer Expansion and Existing Collection System Plan dated October 2013 prepared by CDM.

HAVERHILL, MA PUMP STATION ELECTRICAL SURVEY

NAME:	Farrwood Drive								
TYPE:	Submersible ☐			Dry-Pit X		Suction Lift ☐		Vacuum Prime ☐	
SERVICE:	OH ☐	UG X	XFMR:	Pole X	Pad ☐	KVA		Pole#	VZ68.5
Notes:	Transformers on pole adjacent to site.								
METER:	Utility	National Grid		Voltage	480/277, 3Ph, 4W	Rating	200A	#	82226842
DISCONNECT:	CB X	DS ☐, Fused? ☐		Voltage	480/277, 3Ph, 4W	Rating	100A		
ATS :	Manfr.	ASCO		Voltage	480/277, 3Ph, 4W	Rating	150A	Poles	3
DISTRBTION:									Age
MCC ☐	Mains:			Voltage		Rating		Sections	
Dist Panel ☐	Mains:			Voltage		Rating		#Ckt	
Light Xfmr ☐				Voltage		Rating		KVA	
Light Panel ☐	Mains:			Voltage		Rating		#Ckt	
Notes:									
GENERATOR:	KW/KVA	60/75		Voltage	480/277, 3Ph, 4W	Rating	100A Generator Breaker		
Diesel ☐	Mnfr/Model	Kohler				Age	2006		
NG X	Tank								
LP ☐	Notes								
PUMP 1:	HP	20		Voltage	480, 3Ph	FLA	24A		
Starter:	VFD ☐					Disc Rating			
	FVNR X	ESTOP ☐		Starter located in Pump Control Panel					
	RVSS ☐	LCS ☐							
PUMP 2:	HP	20		Voltage	480, 3Ph	FLA	24A		
Starter:	VFD ☐					Disc Rating			
	FVNR X	ESTOP ☐		Starter located in Pump Control Panel					
	RVSS ☐	LCS ☐							

DEFICIENCIES/CODE ISSUES: Meter is rated 240V, yet service is 480V.

City of Haverhill, MA

Wastewater Pump Station Inventory

Ferry Road	
Location: 145 Ferry Road	
Coordinates:	42.75184104 -71.1094643
Elevation, ft (NAVD88):	86.8
Distance from WPAF, miles	2.5
General Pump Station Information:	
Year Constructed:	1987
Station Type:	Flooded Suction
No. of Pumps:	2
Design Capacity, gpm:	125
Design TDH, ft:	15.4
Pump Speed, rpm:	875
Motor Hp:	1.5
Drive Type:	Constant
Pump Manufacturer/Model#:	Smith & Loveless/4B2A
Pump Inlet/Outlet Diameter	4"/4"
Station Inlet Piping Size/Material	8" PVC
Force Main Discharge Size/Material	4" PVC
Clogging Issues (Y/N)	N
Wetwell Size:	6' Dia. Manhole
Corrosion: (Y/N)	N
Odor Issues: (Y/N)	N
Grease Accumulation: (Y/N)	N
Generator : (Y/N)	Y, but does not work.

Controls Information:	
Pump Controls	
Type: (PLC/RLL/MFG Control)	MFG Control
Manufacturer:	Smith & Loveless
Model No.:	D08-8169-30 29A9
Control Scenario:	Alternating Lead/Lag Based on Level Setpoints
Pump Control Panel	
Enclosure: (Size/NEMA/Material)	NEMA 1
Condition:	Good
Location:	Dry Pit
Alarming	Autodialer
Level Controls	
Type:	Floats
Backup Level Controls:	None

HVAC/Mechanical Information:	
Heating:	Unit Heater
Location:	Dry Pit
Make/Model/Age:	
Size, kW:	
Dehumidification (Y/N):	Y
Location:	Dry Pit
Make/Model/Age:	
Ventilation:	Blower
Location:	Dry Pit
Make/Model/Age:	
Size, kW:	
NEMA Space Rating:	
Confined Space Entry: (Y/N)	

Additional Comments:

Instrumentation:

HVAC/Ventilation:

Building Structures:

Exterior Site Conditions:

Pavement and grass areas are in fair condition.

Security Measures:

Fenced enclosure with padlock gate and privacy hedges on two sides.

General:

Generator is not operational.

There are some capacity issues at the station due to newly installed sewer with an invert that is low in wet well, reducing the wet well volume; and reducing the retention time. Run time for the pumps has now decreased.

A willow tree in the area hits power lines, resulting in frequent power failures. Due to the new sewer invert location, there will be a sanitary sewer overflow before there is a high wet well alarm.

Pumps and valves are in fair condition, everything works, only age issues. Pumps seals have been changed out once or twice.

HAVERHILL, MA PUMP STATION ELECTRICAL SURVEY

NAME:	Ferry Road								
TYPE:	Submersible ☐			Dry-Pit X		Suction Lift ☐		Vacuum Prime ☐	
SERVICE:	OH X	UG ☐	XFMR:	Pole X	Pad ☐	KVA		Pole#	16-50
Notes:	Transformer located across drainage ditch.								
METER:	Utility	National Grid		Voltage	120/208, 3Ph, 4W	Rating	200A	#	76468297
DISCONNECT:	CB ☐	DS X, Fused? ☐		Voltage	120/208, 3Ph, 4W	Rating	100A		
ATS/MTS :	Manfr.	N/A		Voltage		Rating		Poles	
DISTRBTION:									Age
MCC ☐	Mains:			Voltage		Rating		Sections	
Dist Panel ☐	Mains:			Voltage		Rating		#Ckt	
Light Xfmr ☐				Voltage		Rating		KVA	
Light Panel ☐	Mains:			Voltage		Rating		#Ckt	
Notes:									
GENERATOR:	KW/KVA	9/11.25		Voltage	120/208, 3Ph, 4W	Rating			
Diesel X	Mnfr/Model		Winpower			Age	1987		
NG ☐	Tank	Belly Tank							
LP ☐	Notes	Generator is not functioning.							
PUMP 1:	HP	1.5		Voltage	208, 3Ph	FLA	6.9		
Starter:	VFD ☐					Disc Rating			
	FVNR X	ESTOP ☐		Starter located in Pump Control Panel					
	RVSS ☐	LCS ☐							
PUMP 2:	HP	1.5		Voltage	208, 3Ph	FLA	6.9		
Starter:	VFD ☐					Disc Rating			
	FVNR X	ESTOP ☐		Starter located in Pump Control Panel					
	RVSS ☐	LCS ☐							

DEFICIENCIES/CODE ISSUES: Generator is corroded and no longer functioning.

City of Haverhill, MA

Wastewater Pump Station Inventory

Fondi Road	
Location: 62 Fondi Road	
Coordinates:	42.8100945 -71.11359311
Elevation, ft (NAVD88):	61.3
Distance from WPAF, miles	4.2
General Pump Station Information:	
Year Constructed:	2008
Station Type:	Submersible
No. of Pumps:	2
Design Capacity, gpm:	500
Design TDH, ft:	
Pump Speed, rpm:	1755
Motor Hp:	34
Drive Type:	Constant with Soft Starts
Pump Manufacturer/Model#:	Flygt/NP3171HT
Pump Inlet/Outlet Diameter	/4"
Station Inlet Piping Size/Material	12" PVC
Force Main Discharge Size/Material	8" PVC
Clogging Issues (Y/N)	N
Wetwell Size:	8' Dia. Manhole
Corrosion: (Y/N)	N
Odor Issues: (Y/N)	N
Grease Accumulation: (Y/N)	N
Generator : (Y/N)	Y

Controls Information:	
Pump Controls	
Type: (PLC/RLL/MFG Control)	PLC
Manufacturer:	WAJA Associates
Model No.:	5247W
Control Scenario:	Alternating Lead/Lag Based on Level Setpoints
Pump Control Panel	
Enclosure: (Size/NEMA/Material)	NEMA 3R
Condition:	Excellent
Location:	Outdoors
Alarming	
Level Controls	
Type:	Transducer
Backup Level Controls:	Floats

HVAC/Mechanical Information:	
Heating:	None
Location:	
Make/Model/Age:	
Size, kW:	
Dehumidification (Y/N):	N/A
Location:	
Make/Model/Age:	
Ventilation:	N/A
Location:	
Make/Model/Age:	
Size, kW:	
NEMA Space Rating:	
Confined Space Entry: (Y/N)	Y

Additional Comments:

Instrumentation:

HVAC/Ventilation:

Building Structures:

Wet Well is new and in excellent condition.

Valve/Tank Vault is in excellent condition, but has some standing water.

Exterior Site Conditions:

Site is in excellent condition.

Security Measures:

Fenced enclosure with padlocked gate and privacy screens and site lighting. Security camera mounted on site lighting is monitored by the Business Owner.

General:

Station was designed for future expansion/development in the area.

There is currently 50 hours on the pumps and they serve one building.

There is also a valve and bladder tank vault that is in good condition.

No fall protection on both valve/tank and wet well hatches.

HAVERHILL, MA PUMP STATION ELECTRICAL SURVEY

NAME:	Fondi Road								
TYPE:	Submersible X			Dry-Pit ☐		Suction Lift ☐			
SERVICE:	OH ☐	UG X	XFMR:	Pole ☐	Pad X	KVA	75	Pole#	
Notes:	Control Cabinet 2007-8 Construction								
METER:	Utility	National Grid		Voltage	480/277 3ph, Y	Rating	200amp	#	75727512
DISCONNECT:	CB X	DS ☐, Fused? ☐		Voltage	480/277 3ph, Y	Rating	200amp		
ATS :	Manfr.	Kohler		Voltage	480/277 3ph, Y	Rating	Not listed	Poles	3P
DISTRBTION:									Age
MCC ☐	Mains:			Voltage		Rating		Sections	2008
Dist Panel X	Mains:			Voltage	480/277 3ph, Y	Rating	250amp	#Ckt	
Light Xfmr X				Voltage	480/240	Rating	15	KVA	
Light Panel X	Mains:	Main CB		Voltage	240 1 phase	Rating		#Ckt	
Notes:	Security cameras on site.								
GENERATOR:	KW/KVA	50 kw		Voltage	480/277 3ph, Y	Rating	71 amps		
Diesel ☐	Mnfr/Model		Kohler			Age			
NG X	Tank								
LP ☐	Notes	Good Condition, only 8 years old.							
PUMP 1:	HP	15		Voltage	460V, 3ph	FLA			
Starter:	VFD ☐					Disc Rating			
	FVNR ☐	ESTOP ☐							
	RVSS X	LCS ☐							
PUMP 2:	HP	15		Voltage	460V, 3ph	FLA			
Starter:	VFD ☐					Disc Rating			
	FVNR ☐	ESTOP ☐							
	RVSS X	LCS ☐							

DEFICIENCIES/CODE ISSUES:

Generally the condition of the station is very good.

City of Haverhill, MA

Wastewater Pump Station Inventory

Golden Hill	
Location: 7 Patricia Ann Drive	
Coordinates:	42.77502734 -71.05311899
Elevation, ft (NAVD88):	129.4
Distance from WPAF, miles	1.0
General Pump Station Information:	
Year Constructed:	1987
Station Type:	Ejector Station
No. of Pumps:	2
Design Capacity, gpm:	75
Design TDH, ft:	50
Pump Speed, rpm:	730
Motor Hp:	5
Drive Type:	Constant
Pump Manufacturer/Model#:	Smith & Loveless/9LK-5
Pump Inlet/Outlet Diameter	4"/4"
Station Inlet Piping Size/Material	4" DI
Force Main Discharge Size/Material	4" PVC
Clogging Issues (Y/N)	N
Wetwell Size:	Receiving Chamber
Corrosion: (Y/N)	N
Odor Issues: (Y/N)	N
Grease Accumulation: (Y/N)	N
Generator : (Y/N)	N

Controls Information:	
Pump Controls	
Type: (PLC/RLL/MFG Control)	MFG Control
Manufacturer:	Smith & Loveless
Model No.:	C21-7186-30
Control Scenario:	Alternating Lead/Lag Based on Level Setpoints
Pump Control Panel	
Enclosure: (Size/NEMA/Material)	NEMA 1
Condition:	Good
Location:	Machinary Chamber
Alarming	Autodialer and Light
Level Controls	
Type:	Ross Valve
Backup Level Controls:	None

HVAC/Mechanical Information:	
Heating:	Unit Heater
Location:	Machinery Chamber
Make/Model/Age:	
Size, kW:	
Dehumidification (Y/N):	N
Location:	
Make/Model/Age:	
Ventilation:	N/A
Location:	
Make/Model/Age:	
Size, kW:	
NEMA Space Rating:	
Confined Space Entry: (Y/N)	

Additional Comments:

Instrumentation:

HVAC/Ventilation:

Building Structures:

Exterior Site Conditions:

Neatly manicured lawn.

Security Measures:

Station is locked.

No fencing or bollards for protection.

General:

Station has no issues, except that the compressors are old, similar to the other ejector stations. The condition of the receiving chambers are unknown.

As long as replacement parts are available, the Operators are okay with ejector stations.

HAVERHILL, MA PUMP STATION ELECTRICAL SURVEY

NAME:	Golden Hill								
TYPE:	Submersible ☐			Dry-Pit ☐		Ejector X			
SERVICE:	OH☐	UG X	XFMR:	Pole☐	Pad☐	KVA		Pole#	
Notes:	Residential Area								
METER:	Utility	Nat. Grid		Voltage	240V, 1 phase	Rating	200 amps	#	98744991
DISCONNECT:	CB X	DS☐, Fused?☐		Voltage	240V, 1 phase	Rating	100 amps, 2 pole		
ATS :	Manfr.	N/A		Voltage		Rating		Poles	
DISTRBTION:	Within the Pump Control Panel.								Age
MCC☐	Mains:			Voltage		Rating		Sections	1987
Dist Panel X	Mains:	X		Voltage	240V, 1 phase	Rating	100 amps	#Ckt	
Light Xfmr☐				Voltage		Rating		KVA	
Light Panel☐	Mains:			Voltage		Rating		#Ckt	
Notes:	Distribution Within the Control Panel.								
GENERATOR:	KW/KVA	N/A		Voltage		Rating			
Diesel☐	Mnfr/Model					Age			
NG☐	Tank								
LP☐	Notes								
PUMP 1:	HP	5		Voltage	230V, 1 phase	FLA			
Starter:	VFD☐					Disc Rating			
	FVNR X	ESTOP☐							
	RVSS☐	LCS☐							
PUMP 2:	HP	5		Voltage	230V, 1 phase	FLA			
Starter:	VFD☐					Disc Rating			
	FVNR X	ESTOP☐							
	RVSS☐	LCS☐							

DEFICIENCIES/CODE ISSUES: No Operational Issues Reported. Panel has a 3 foot front clearance.

In fair condition, no ventilation is needed as lower level sealed and station is above grade.

City of Haverhill, MA

Wastewater Pump Station Inventory

Hales Landing	
Location: 80 Groveland Road	
Coordinates:	42.7519004 -71.05223491
Elevation, ft (NAVD88):	87.7
Distance from WPAF, miles	0.8
General Pump Station Information:	
Year Constructed:	2010
Station Type:	Submersible
No. of Pumps:	2
Design Capacity, gpm:	125
Design TDH, ft:	
Pump Speed, rpm:	
Motor Hp:	6.5
Drive Type:	Constant
Pump Manufacturer/Model#:	ITT Flygt/NP3102-257 SH
Pump Inlet/Outlet Diameter	/3"
Station Inlet Piping Size/Material	8" PVC
Force Main Discharge Size/Material	4" PVC
Clogging Issues (Y/N)	N
Wetwell Size:	6' Dia. Manhole
Corrosion: (Y/N)	N
Odor Issues: (Y/N)	N
Grease Accumulation: (Y/N)	N
Generator : (Y/N)	Y

Controls Information:	
Pump Controls	
Type: (PLC/RLL/MFG Control)	PLC
Manufacturer:	WAJA Associates
Model No.:	90542
Control Scenario:	Alternating Lead/Lag Based on Level Setpoints
Pump Control Panel	
Enclosure: (Size/NEMA/Material)	NEMA 3R
Condition:	Excellent
Location:	Outdoors
Alarming	Autodialer
Level Controls	
Type:	Transducer
Backup Level Controls:	Floats

HVAC/Mechanical Information:	
Heating:	N/A
Location:	
Make/Model/Age:	
Size, kW:	
Dehumidification (Y/N):	N/A
Location:	
Make/Model/Age:	
Ventilation:	N/A
Location:	
Make/Model/Age:	
Size, kW:	
NEMA Space Rating:	
Confined Space Entry: (Y/N)	Y

Additional Comments:

Instrumentation:

HVAC/Ventilation:

Building Structures:

Exterior Site Conditions:

Asphalt drive is in good condition.

Gravel around station is in good condition.

Security Measures:

Fenced enclosure with padlocked gate.

General:

Pump Station has the Flygt Mix-Flush System on the pump discharge.

HAVERHILL, MA PUMP STATION ELECTRICAL SURVEY

NAME:	Hales Landing								
TYPE:	Submersible X			Dry-Pit ☐		Suction Lift ☐		Vacuum Prime ☐	
SERVICE:	OH X	UG ☐	XFMR:	Pole X	Pad ☐	KVA		Pole#	13
Notes:	Transformers accross the street.								
METER:	Utility	National Grid		Voltage	277/480, 3Ph, 4W	Rating	200A	#	4827809
DISCONNECT:	CB X	DS ☐, Fused? ☐		Voltage	277/480, 3Ph, 4W	Rating	100A		
ATS :	Manfr.	Kohler		Voltage	277/480, 3Ph, 4W	Rating	100A	Poles	3
DISTRBTION:									Age
MCC ☐	Mains:			Voltage		Rating		Sections	
Dist Panel ☐	Mains:			Voltage		Rating		#Ckt	
Light Xfmr X				Voltage	480:120/240	Rating		KVA	15 2009
Light Panel X	Mains:	80A		Voltage		Rating	100A	#Ckt	12 2009
Notes:									
GENERATOR:	KW/KVA	30/38		Voltage	277/480, 3Ph, 4W	Rating			
Diesel ☐	Mnfr/Model		Kohler			Age	2009		
NG X	Tank								
LP ☐	Notes								
PUMP 1:	HP	6.5		Voltage	480, 3Ph	FLA	8.2A		
Starter:	VFD ☐					Disc Rating			
	FVNR X	ESTOP ☐		Starter located in Pump Control Panel					
	RVSS ☐	LCS ☐							
PUMP 2:	HP	6.5		Voltage	480, 3Ph	FLA	8.2A		
Starter:	VFD ☐					Disc Rating			
	FVNR X	ESTOP ☐		Starter located in Pump Control Panel					
	RVSS ☐	LCS ☐							

DEFICIENCIES/CODE ISSUES: None observed.

City of Haverhill, MA

Wastewater Pump Station Inventory

Hanover Street	
Location:	
Coordinates:	42.78661756 -71.10026225
Elevation, ft (NAVD88):	122.4
Distance from WPAF, miles	2.6
General Pump Station Information:	
Year Constructed:	1989
Station Type:	Ejector Station
No. of Pumps:	2
Design Capacity, gpm:	100
Design TDH, ft:	34
Pump Speed, rpm:	730
Motor Hp:	5
Drive Type:	Constant
Pump Manufacturer/Model#:	Smith & Loveless/9LK
Pump Inlet/Outlet Diameter	4"/4"
Station Inlet Piping Size/Material	12" PVC
Force Main Discharge Size/Material	12" Unk.
Clogging Issues (Y/N)	N
Wetwell Size:	Receiving Chamber
Corrosion: (Y/N)	N
Odor Issues: (Y/N)	N
Grease Accumulation: (Y/N)	N
Generator : (Y/N)	N

Controls Information:	
Pump Controls	
Type: (PLC/RLL/MFG Control)	MFG Control
Manufacturer:	Smith & Loveless
Model No.:	21-7196
Control Scenario:	Alternating Lead/Lag Based on Level Setpoints
Pump Control Panel	
Enclosure: (Size/NEMA/Material)	NEMA 1
Condition:	Good
Location:	Machinery Chamber
Alarming	None
Level Controls	
Type:	Ross Valve
Backup Level Controls:	None

HVAC/Mechanical Information:	
Heating:	Unit Heater
Location:	Machinery Chamber
Make/Model/Age:	
Size, kW:	
Dehumidification (Y/N):	N/A
Location:	
Make/Model/Age:	
Ventilation:	None
Location:	
Make/Model/Age:	
Size, kW:	
NEMA Space Rating:	
Confined Space Entry: (Y/N)	

Additional Comments:

Instrumentation:

HVAC/Ventilation:

Building Structures:

Small shed to house step down transformer and electrical panel.

Exterior Site Conditions:

Very small footprint; located adjacent to residential property and homeowner's shed.

Security Measures:

Fence enclosure with barb wire on two sides, with faux evergreen privacy screening. The other two sides, adjacent to residential property, have wood fencing.

General:

Overall in fair condition with minimal issues.

Internal equipment should be upgrade due to age.

HAVERHILL, MA PUMP STATION ELECTRICAL SURVEY

NAME:	Hanover Street								
TYPE:	Submersible ☐			Dry-Pit ☐		Ejector X			
SERVICE:	OH☐	UG X	XFMR:	Pole☐	Pad☐	KVA		Pole#	
Notes:	Single Phase Service converts to 3 phase with use of convertor.								
METER:	Utility	National Grid		Voltage	240V 1 phase	Rating		#	93922828
DISCONNECT:	CB☐	DS X, Fused?☐		Voltage	240V 1 phase	Rating	Not Listed		
MTS/ATS :	Manfr.	N/A		Voltage		Rating		Poles	
DISTRBTION:	Post Converter, Pump Control Panel is 240 3 phase, with 50 amp local disconnect in housing,								Age
MCC☐	Mains:			Voltage		Rating		Sections	
Dist Panel X	Mains:	In PCP		Voltage	240V 3 phase	Rating	100 amp	#Ckt	Main
Light Xfmr☐				Voltage		Rating		KVA	
Light Panel X	Mains:			Voltage	240V 1ph	Rating		#Ckt	
Notes:	Lighting panel in building powers converter.								
GENERATOR:	KW/KVA	N/A		Voltage		Rating			
Diesel☐	Mnfr/Model					Age			
NG☐	Tank								
LP☐	Notes								
PUMP 1:	HP	5		Voltage	230V 3 phase	FLA			
Starter:	VFD☐					Disc Rating			
	FVNR X	ESTOP☐							
	RVSS☐	LCS☐							
PUMP 2:	HP	5		Voltage	230V 3 phase	FLA			
Starter:	VFD☐					Disc Rating			
	FVNR X	ESTOP☐							
	RVSS☐	LCS☐							

DEFICIENCIES/CODE ISSUES:

House that houses power distribtuion is in need of Repair, A VFD for each pump should be considered in lieu of convertor

City of Haverhill, MA

Wastewater Pump Station Inventory

Hilldale Avenue	
Location: 1451 Hilldale Avenue	
Coordinates:	42.81768617 -71.11592157
Elevation, ft (NAVD88):	66.0
Distance from WPAF, miles	4.7
General Pump Station Information:	
Year Constructed:	2010
Station Type:	Submersible
No. of Pumps:	2
Design Capacity, gpm:	500
Design TDH, ft:	
Pump Speed, rpm:	
Motor Hp:	30
Drive Type:	
Pump Manufacturer/Model#:	Flygt/NP3171
Pump Inlet/Outlet Diameter	/4"
Station Inlet Piping Size/Material	12" PVC
Force Main Discharge Size/Material	8" PVC
Clogging Issues (Y/N)	N
Wetwell Size:	8' Dia. Wet Well
Corrosion: (Y/N)	N
Odor Issues: (Y/N)	N
Grease Accumulation: (Y/N)	N
Generator : (Y/N)	Y

Controls Information:	
Pump Controls	
Type: (PLC/RLL/MFG Control)	PLC
Manufacturer:	WAJA Associates
Model No.:	91050
Control Scenario:	Alternating Lead/Lag Based on Level Setpoints
Pump Control Panel	
Enclosure: (Size/NEMA/Material)	NEMA 3R
Condition:	Excellent
Location:	Outdoors
Alarming	Autodialer
Level Controls	
Type:	Transducer
Backup Level Controls:	Floats

HVAC/Mechanical Information:	
Heating:	
Location:	
Make/Model/Age:	
Size, kW:	
Dehumidification (Y/N):	
Location:	
Make/Model/Age:	
Ventilation:	
Location:	
Make/Model/Age:	
Size, kW:	
NEMA Space Rating:	
Confined Space Entry: (Y/N)	

Additional Comments:

Instrumentation:

HVAC/Ventilation:

Building Structures:

Exterior Site Conditions:

Security Measures:

Fence enclosure with padlocked gate and privacy screen on one side.

General:

Pump Station was designed for future development; oversized for current needs.

HAVERHILL, MA PUMP STATION ELECTRICAL SURVEY

NAME:	Hilldale Avenue								
TYPE:	Submersible X			Dry-Pit ☐		Suction Lift ☐			
SERVICE:	OH X	UG ☐	XFMR:	Pole ☐	Pad ☐	KVA		Pole#	
Notes:	Waja Control Panel Built in 2010								
METER:	Utility	Unitil		Voltage	480/277 3ph, Y	Rating	200amp	#	28891975
DISCONNECT:	CB X	DS ☐, Fused? ☐		Voltage	480/277 3ph, Y	Rating	100 amp, Square D		
ATS :	Manfr.	Kohler		Voltage	480/277 3ph, Y	Rating		Poles	3
DISTRBTION:									Age
MCC ☐	Mains:			Voltage		Rating		Sections	2010
Dist Panel X	Mains:			Voltage	480/277 3ph, Y	Rating	100Amp	#Ckt	
Light Xfmr X				Voltage	480/240V	Rating	7.5	KVA	Mini Power Zone
Light Panel X	Mains:			Voltage		Rating		#Ckt	
Notes:	Oversized pumps in prep for new businesses.								
GENERATOR:	KW/KVA	42kw		Voltage	480/277 3ph, Y	Rating	63 amp output		
Diesel ☐	Mnfr/Model		Kohler 45REZG			Age	2010		
NG X	Tank								
LP ☐	Notes								
PUMP 1:	HP	30		Voltage	460V, 3ph	FLA	38		
Starter:	VFD ☐					Disc Rating			
	FVNR ☐	ESTOP ☐							
	RVSS X	LCS ☐							
PUMP 2:	HP	30		Voltage	460V, 3ph	FLA	38		
Starter:	VFD ☐					Disc Rating			
	FVNR ☐	ESTOP ☐							
	RVSS X	LCS ☐							

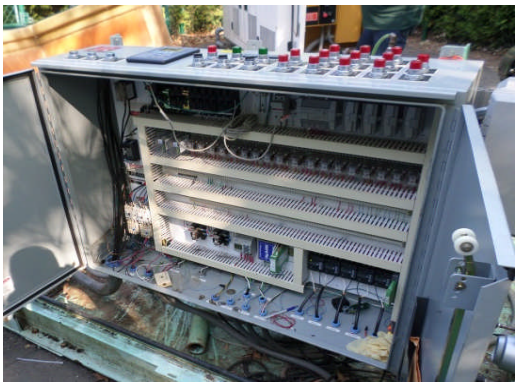
DEFICIENCIES/CODE ISSUES:

Generally the condition of the station is very good. No code violations were noticed.

City of Haverhill, MA

Wastewater Pump Station Inventory

Hoyt Road	
Location: 160 Hoyt Road	
Coordinates:	42.7453704 -71.07847934
Elevation, ft (NAVD88):	120.5
Distance from WPAF, miles	1.4
General Pump Station Information:	
Year Constructed:	2004
Station Type:	Vacuum Prime
No. of Pumps:	2
Design Capacity, gpm:	125
Design TDH, ft:	68
Pump Speed, rpm:	1800
Motor Hp:	7.5
Drive Type:	Constant
Pump Manufacturer/Model#:	Smith & Loveless/4B2X
Pump Inlet/Outlet Diameter	4"/4"
Station Inlet Piping Size/Material	8" PVC
Force Main Discharge Size/Material	4" DI
Clogging Issues (Y/N)	N
Wetwell Size:	6' Dia. Manhole
Corrosion: (Y/N)	N
Odor Issues: (Y/N)	N
Grease Accumulation: (Y/N)	N
Generator : (Y/N)	Y



Controls Information:	
Pump Controls	
Type: (PLC/RLL/MFG Control)	MFG Control
Manufacturer:	Smith & Loveless
Model No.:	B16-7495-30
Control Scenario:	Alternating Lead/Lag Based on Level Setpoints
Pump Control Panel	
Enclosure: (Size/NEMA/Material)	NEMA 3R
Condition:	Good
Location:	Dry Pit
Alarming	Autodialer
Level Controls	
Type:	Transducer
Backup Level Controls:	Floats

HVAC/Mechanical Information:	
Heating:	Unit Heater
Location:	Dry Pit
Make/Model/Age:	
Size, kW:	0.5
Dehumidification (Y/N):	N
Location:	
Make/Model/Age:	
Ventilation:	N
Location:	
Make/Model/Age:	
Size, kW:	
NEMA Space Rating:	
Confined Space Entry: (Y/N)	

Additional Comments:

Instrumentation:

HVAC/Ventilation:

Building Structures:

Precast concrete wet well is in good condition.

Exterior Site Conditions:

Pavement is in good condition.

Security Measures:

Fence enclosure with padlocked gate and privacy hedges.

General:

Operators indicated that this station has priming issues; leakage of air in solenoids and vacuum pumps.

No visible leaks in piping and valves. Coating failing on Pump No. 1 and some piping.

Lichen growth on enclosure and exterior of generator.

HAVERHILL, MA PUMP STATION ELECTRICAL SURVEY

NAME:	Hoyt Road													
TYPE:	Submersible ☐			Dry-Pit ☐			Suction Lift ☐			Vacuum Prime X				
SERVICE:	OH ☐	UG X	XFMR:	Pole ☐	Pad X		KVA		Pole#	N/A				
Notes:	Transformer in grass next to fence.													
METER:	Utility	National Grid		Voltage	240, 1Ph, 3W		Rating	200A	#	92796896				
DISCONNECT:	CB X	DS ☐, Fused? ☐		Voltage	240, 1Ph, 3W		Rating	200A						
ATS :	Manfr.	ASCO		Voltage	240, 1Ph, 3W		Rating	200A	Poles	2				
DISTRBTION:													Age	
MCC ☐	Mains:			Voltage			Rating		Sections					
Dist Panel ☐	Mains:			Voltage			Rating		#Ckt					
Light Xfmr ☐				Voltage			Rating		KVA					
Light Panel X	Mains:			Voltage	120/240		Rating		#Ckt	30			2004	
Notes:	Add-A-Phase, single to 3-phase converter.													
GENERATOR:	KW/KVA	42.5/42.5		Voltage	240, 1Ph, 3W		Rating							
Diesel ☐	Mnfr/Model		Olympian				Age	2004						
NG X	Tank													
LP ☐	Notes													
PUMP 1:	HP	7.5		Voltage	240, 3Ph		FLA	22A						
Starter:	VFD ☐						Disc Rating							
	FVNR X	ESTOP ☐		Starter located in Pump Control Panel										
	RVSS ☐	LCS ☐												
PUMP 2:	HP	7.5		Voltage	240, 3Ph		FLA	22A						
Starter:	VFD ☐						Disc Rating							
	FVNR X	ESTOP ☐		Starter located in Pump Control Panel										
	RVSS ☐	LCS ☐												
DEFICIENCIES/CODE ISSUES: None observed.														

City of Haverhill, MA

Wastewater Pump Station Inventory

Hyatt Avenue	
Location: 54 Hyatt Avenue	
Coordinates:	42.75721295 -71.0784712
Elevation, ft (NAVD88):	137.4
Distance from WPAF, miles	0.9
General Pump Station Information:	
Year Constructed:	1992
Station Type:	Vacuum Prime
No. of Pumps:	2
Design Capacity, gpm:	100
Design TDH, ft:	12.5
Pump Speed, rpm:	875
Motor Hp:	1.5
Drive Type:	VFD
Pump Manufacturer/Model#:	Smith & Loveless/4B2B
Pump Inlet/Outlet Diameter	4"/4"
Station Inlet Piping Size/Material	8" Unk
Force Main Discharge Size/Material	0" Unk
Clogging Issues (Y/N)	Y, periodically
Wetwell Size:	Integral Steel Wet Well
Corrosion: (Y/N)	Y, wet well side
Odor Issues: (Y/N)	Y
Grease Accumulation: (Y/N)	Y
Generator : (Y/N)	Y

Controls Information:	
Pump Controls	
Type: (PLC/RLL/MFG Control)	MFG Control
Manufacturer:	Smith & Loveless
Model No.:	C14-1735-30
Control Scenario:	Alternating Lead/Lag Based on Level Setpoints
Pump Control Panel	
Enclosure: (Size/NEMA/Material)	NEMA 1
Condition:	Fair
Location:	Dry Pit
Alarming	Light
Level Controls	
Type:	Floats
Backup Level Controls:	None

HVAC/Mechanical Information:	
Heating:	Unit Heater
Location:	Dry Pit
Make/Model/Age:	
Size, kW:	
Dehumidification (Y/N):	N
Location:	
Make/Model/Age:	
Ventilation:	Blower
Location:	Dry Pit
Make/Model/Age:	Smith & Loveless
Size, kW:	
NEMA Space Rating:	
Confined Space Entry: (Y/N)	

Additional Comments:

Instrumentation:

HVAC/Ventilation:

Building Structures:

Integral steel wet well is extremely corroded.

Exterior Site Conditions:

Some debris and weeds, but ground is mostly level and in decent shape.

Security Measures:

Fence enclosure and padlocked gate with privacy screens and hedges.

General:

One pump has been replaced (red cap), could not find a date on label.

Operators have changed out one check valve; and the other may need to be replaced.

Station has had odor issues in the past; currently place a rag with perfume over wet well vent to mask odors

HAVERHILL, MA PUMP STATION ELECTRICAL SURVEY

NAME:	Hyatt Ave								
TYPE:	Submersible ☐		Dry-Pit ☐		Suction Lift ☐		Vacuum Prime X		
SERVICE:	OH ☐	UG X	XFMR:	Pole X	Pad ☐	KVA		Pole#	6
Notes:	Transformer located 100ft down street.								
METER:	Utility	National Grid	Voltage	240, 1Ph, 3W	Rating	200A	#	76461161	
DISCONNECT:	CB X	DS ☐, Fused? ☐	Voltage	240, 1Ph, 3W	Rating	70A			
ATS :	Manfr.	Cummins	Voltage	240, 1Ph, 3W	Rating	70A	Poles	2	
DISTRBTION:									Age
MCC ☐	Mains:		Voltage		Rating		Sections		
Dist Panel ☐	Mains:		Voltage		Rating		#Ckt		
Light Xfmr ☐			Voltage		Rating		KVA		
Light Panel X	Mains:		Voltage	120/240	Rating	125A	#Ckt	12	1992
Notes:	Add-A-Phase, single to 3-phase converter.								
GENERATOR:	KW/KVA	13/13	Voltage	240, 1Ph, 3W	Rating				
Diesel ☐	Mnfr/Model	Cummins			Age	1992			
NG X	Tank								
LP ☐	Notes	Overheating/Battery Changes							
PUMP 1:	HP	2	Voltage	240, 3Ph	FLA	7.5			
Starter:	VFD ☐				Disc Rating				
	FVNR X	ESTOP ☐	Starter located in Pump Control Panel						
	RVSS ☐	LCS ☐							
PUMP 2:	HP	2	Voltage	240, 3Ph	FLA	7.5			
Starter:	VFD ☐				Disc Rating				
	FVNR X	ESTOP ☐	Starter located in Pump Control Panel						
	RVSS ☐	LCS ☐							

DEFICIENCIES/CODE ISSUES: Moderate corrosion of equipment/generator.

City of Haverhill, MA

Wastewater Pump Station Inventory

Lake Street	
Location: 492 Lake Street	
Coordinates:	42.79674301 -71.13690562
Elevation, ft (NAVD88):	145.7
Distance from WPAF, miles	4.5
General Pump Station Information:	
Year Constructed:	2011
Station Type:	Submersible
No. of Pumps:	2
Design Capacity, gpm:	125
Design TDH, ft:	
Pump Speed, rpm:	
Motor Hp:	15
Drive Type:	VFD
Pump Manufacturer/Model#:	Flygt/NP3153.091-465MT
Pump Inlet/Outlet Diameter	/4"
Station Inlet Piping Size/Material	8" PVC
Force Main Discharge Size/Material	6" & 12" PVC
Clogging Issues (Y/N)	N
Wetwell Size:	8' Dia. Manhole
Corrosion: (Y/N)	N
Odor Issues: (Y/N)	N
Grease Accumulation: (Y/N)	N
Generator : (Y/N)	Y

Controls Information:	
Pump Controls	
Type: (PLC/RLL/MFG Control)	PLC
Manufacturer:	WAJA Associates
Model No.:	100962
Control Scenario:	Alternating Lead/Lag Based on Level Setpoints
Pump Control Panel	
Enclosure: (Size/NEMA/Material)	NEMA 3R
Condition:	Excellent
Location:	Outdoors
Alarming	Autodialer
Level Controls	
Type:	Transducer
Backup Level Controls:	Floats

HVAC/Mechanical Information:	
Heating:	
Location:	
Make/Model/Age:	
Size, kW:	
Dehumidification (Y/N):	
Location:	
Make/Model/Age:	
Ventilation:	
Location:	
Make/Model/Age:	
Size, kW:	
NEMA Space Rating:	
Confined Space Entry: (Y/N)	

Additional Comments:

Instrumentation:

HVAC/Ventilation:

Building Structures:

Exterior Site Conditions:

Pavement looks new.

Security Measures:

Fence enclosure with padlocked gate.

General:

Identical to Hilldale and Fondi Stations.

Serves approximately four houses.

No fall protection on wet well hatch.

HAVERHILL, MA PUMP STATION ELECTRICAL SURVEY

NAME:	Lake Street								
TYPE:	Submersible X			Dry-Pit ☐		Suction Lift ☐			
SERVICE:	OH ☐	UG X	XFMR:	Pole ☐	Pad ☐	KVA		Pole#	
Notes:									
METER:	Utility	National Grid		Voltage	240/120 1phase	Rating	200 amp	#	44483066
DISCONNECT:	CB X	DS ☐, Fused? ☐		Voltage	240/120 1phase	Rating	200 amp, Square D		
ATS :	Manfr.	Kohler		Voltage	240/120 1phase	Rating	200 amp	Poles	2
DISTRBTION:									Age
MCC ☐	Mains:			Voltage		Rating		Sections	2010
Dist Panel X	Mains:			Voltage	240/120 1phase	Rating	250 amp	#Ckt	
Light Xfmr ☐				Voltage		Rating		KVA	
Light Panel ☐	Mains:			Voltage		Rating		#Ckt	
Notes:									
GENERATOR:	KW/KVA	50 kw/50 kva		Voltage	240/120 1phase	Rating	208 amps		
Diesel ☐	Mnfr/Model		Kohler 50REZG			Age	2010		
NG ☐	Tank								
LP X	Notes	Propane Tank Complete with Regulator							
PUMP 1:	HP	15		Voltage	230 1 phase	FLA	39		
Starter:	VFD X					Disc Rating			
	FVNR ☐	ESTOP ☐							
	RVSS ☐	LCS ☐							
PUMP 2:	HP	15		Voltage	230 1 phase	FLA	39		
Starter:	VFD X					Disc Rating			
	FVNR ☐	ESTOP ☐							
	RVSS ☐	LCS ☐							

DEFICIENCIES/CODE ISSUES:

Generally the condition of the station is very good.

City of Haverhill, MA

Wastewater Pump Station Inventory

Main Street	
Location: 1033 Main Street	
Coordinates:	42.80432896 -71.09989857
Elevation, ft (NAVD88):	78.6
Distance from WPAF, miles	3.5
General Pump Station Information:	
Year Constructed:	2014
Station Type:	Submersible
No. of Pumps:	2
Design Capacity, gpm:	250 (200)
Design TDH, ft:	35
Pump Speed, rpm:	1720
Motor Hp:	5
Drive Type:	Constant
Pump Manufacturer/Model#:	Flygt/NP3102MT
Pump Inlet/Outlet Diameter	/4"
Station Inlet Piping Size/Material	8" PVC
Force Main Discharge Size/Material	6" PVC
Clogging Issues (Y/N)	N
Wetwell Size:	Precast Wet/Valve Pit
Corrosion: (Y/N)	N
Odor Issues: (Y/N)	N
Grease Accumulation: (Y/N)	N
Generator : (Y/N)	Y

Controls Information:	
Pump Controls	
Type: (PLC/RLL/MFG Control)	PLC
Manufacturer:	Sheridan Engineering (SCADA) & WAJA Assoc. (Pump)
Model No.:	Sheridan - 3229 & WAJA - 120874
Control Scenario:	Alternating Lead/Lag Based on Level Setpoints
Pump Control Panel	
Enclosure: (Size/NEMA/Material)	NEMA 3R
Condition:	Excellent
Location:	Outdoors
Alarming	Autodialer
Level Controls	
Type:	Transducer
Backup Level Controls:	Floats

HVAC/Mechanical Information:	
Heating:	
Location:	
Make/Model/Age:	
Size, kW:	
Dehumidification (Y/N):	
Location:	
Make/Model/Age:	
Ventilation:	
Location:	
Make/Model/Age:	
Size, kW:	
NEMA Space Rating:	
Confined Space Entry: (Y/N)	

Additional Comments:

Instrumentation:

HVAC/Ventilation:

Building Structures:

Exterior Site Conditions:

Good condition

Security Measures:

Fence enclosure with padlocked gate and privary screens.

General:

Operators indicate SCADA issues, random alarms go off.

Crane pedestal was damaged over the winter by a plow.

HAVERHILL, MA PUMP STATION ELECTRICAL SURVEY

NAME:	Main Street								
TYPE:	Submersible X		Dry-Pit ☐		Suction Lift ☐				
SERVICE:	OH ☐	UG X	XFMR:	Pole	Pad ☐	KVA	3-10	Pole#	Riser
Notes:	From Utility pole across the street								
METER:	Utility	National Grid	Voltage	208/120V, 3ph, Y	Rating		#	55111721	
DISCONNECT:	CB X	DS ☐, Fused? ☐	Voltage	208/120V, 3ph, Y	Rating				
ATS :	Manfr.	Cummins	Voltage	208/120V, 3ph, Y	Rating		Poles	3	
DISTRBTION:									Age
MCC ☐	Mains:	Not listed	Voltage	208/120V, 3ph, Y	Rating		Sections		
Dist Panel	Mains:		Voltage		Rating		#Ckt		
Light Xfmr ☐	N/A		Voltage		Rating		KVA		
Light Panel X	Mains:		Voltage		Rating		#Ckt		
Notes:									
GENERATOR:	KW/KVA	35kw	Voltage	208/120V, 3ph, Y	Rating	See Photo			
Diesel ☐	Mnfr/Model	Onan Cummins			Age	2014			
NG X	Tank								
LP ☐	Notes								
PUMP 1:	HP	5	Voltage	208 3 phase	FLA	15 amps			
Starter:	VFD ☐				Disc Rating				
	FVNR ☐	ESTOP ☐							
	RVSS X	LCS ☐							
PUMP 2:	HP	5	Voltage	208 3 phase	FLA	15 amps			
Starter:	VFD ☐				Disc Rating				
	FVNR ☐	ESTOP ☐							
	RVSS X	LCS ☐							

DEFICIENCIES/CODE ISSUES:

Station is a Wright Pierce Design and installed in 2014 fairly new and in great condition.

City of Haverhill, MA

Wastewater Pump Station Inventory

Maynard Avenue	
Location: 40 South Porter Street	
Coordinates:	42.75985526 -71.06121286
Elevation, ft (NAVD88):	25.0
Distance from WPAF, miles	0.1
General Pump Station Information:	
Year Constructed:	2007
Station Type:	Submersible
No. of Pumps:	2
Design Capacity, gpm:	350
Design TDH, ft:	35
Pump Speed, rpm:	1715
Motor Hp:	5
Drive Type:	Constant
Pump Manufacturer/Model#:	Flygt/CP3102-435
Pump Inlet/Outlet Diameter	/4"
Station Inlet Piping Size/Material	8" Unk
Force Main Discharge Size/Material	Unk
Clogging Issues (Y/N)	N
Wetwell Size:	N/A
Corrosion: (Y/N)	N
Odor Issues: (Y/N)	N
Grease Accumulation: (Y/N)	N
Generator : (Y/N)	Y, WPAF generator

Controls Information:	
Pump Controls	
Type: (PLC/RLL/MFG Control)	MFG Control
Manufacturer:	WAJA Associates
Model No.:	
Control Scenario:	Alternating Lead/Lag Based on Level Setpoints
Pump Control Panel	
Enclosure: (Size/NEMA/Material)	NEMA 4X
Condition:	Good
Location:	Outdoors
Alarming	None
Level Controls	
Type:	Transducer
Backup Level Controls:	Floats

HVAC/Mechanical Information:	
Heating:	
Location:	
Make/Model/Age:	
Size, kW:	
Dehumidification (Y/N):	
Location:	
Make/Model/Age:	
Ventilation:	
Location:	
Make/Model/Age:	
Size, kW:	
NEMA Space Rating:	
Confined Space Entry: (Y/N)	

Additional Comments:

Instrumentation:

HVAC/Ventilation:

Building Structures:

Wet Well was a repurposed dry well; concrete looks to be in good condition.

Exterior Site Conditions:

Located in a grassy area within the WPAF site.

Security Measures:

Located within the fenced and gated property of the WPAF.

General:

No fall protection on wet well hatch.

HAVERHILL, MA PUMP STATION ELECTRICAL SURVEY

NAME:	Maynard Ave (@WPAF)											
TYPE:	Submersible X			Dry-Pit ☐			Suction Lift ☐			Vacuum Prime ☐		
SERVICE:	OH ☐	UG ☐	XFMR:	Pole ☐	Pad ☐		KVA		Pole#			
Notes:	Electrical fed from treatment plant.											
METER:	Utility	N/A		Voltage			Rating		#			
DISCONNECT:	CB X	DS ☐, Fused? ☐		Voltage	277/480, 3Ph, 4W		Rating	100A				
ATS/MTS :	Manfr.	N/A		Voltage			Rating		Poles			
DISTRBTION:												Age
MCC ☐	Mains:			Voltage			Rating		Sections			
Dist Panel ☐	Mains:			Voltage			Rating		#Ckt			
Light Xfmr ☐				Voltage			Rating		KVA			
Light Panel ☐	Mains:			Voltage			Rating		#Ckt			
Notes:												
GENERATOR:	KW/KVA	N/A		Voltage			Rating					
Diesel ☐	Mnfr/Model						Age					
NG ☐	Tank											
LP ☐	Notes											
PUMP 1:	HP	5		Voltage	480, 3Ph		FLA	6.7A				
Starter:	VFD ☐						Disc Rating					
	FVNR X	ESTOP ☐		Starter located in Pump Control Panel								
	RVSS ☐	LCS ☐										
PUMP 2:	HP	5		Voltage	480, 3Ph		FLA	6.7A				
Starter:	VFD ☐						Disc Rating					
	FVNR X	ESTOP ☐		Starter located in Pump Control Panel								
	RVSS ☐	LCS ☐										

DEFICIENCIES/CODE ISSUES: None observed.

City of Haverhill, MA

Wastewater Pump Station Inventory

Millvale (Seven Sisters)	
Location: 1 Seven Sister Road	
Coordinates:	42.77124596 -71.03927514
Elevation, ft (NAVD88):	37.0
Distance from WPAF, miles	1.3
General Pump Station Information:	
Year Constructed:	2002
Station Type:	Flooded Suction
No. of Pumps:	2
Design Capacity, gpm:	200
Design TDH, ft:	35
Pump Speed, rpm:	1170
Motor Hp:	7.5
Drive Type:	Constant
Pump Manufacturer/Model#:	Smith & Loveless/4B2
Pump Inlet/Outlet Diameter	6"/6"
Station Inlet Piping Size/Material	8" PVC
Force Main Discharge Size/Material	6" PVC
Clogging Issues (Y/N)	N
Wetwell Size:	6' Dia. Manhole
Corrosion: (Y/N)	N
Odor Issues: (Y/N)	N
Grease Accumulation: (Y/N)	N
Generator : (Y/N)	Y

Controls Information:	
Pump Controls	
Type: (PLC/RLL/MFG Control)	MFG Control
Manufacturer:	Smith & Loveless
Model No.:	B08-8493--30
Control Scenario:	Alternating Lead/Lag Based on Level Setpoints
Pump Control Panel	
Enclosure: (Size/NEMA/Material)	NEMA 3R
Condition:	Good
Location:	Dry Pit
Alarming	Autodialer
Level Controls	
Type:	Transducer
Backup Level Controls:	Floats

HVAC/Mechanical Information:	
Heating:	Unit Heater
Location:	Dry Pit
Make/Model/Age:	
Size, kW:	
Dehumidification (Y/N):	Y
Location:	Dry Pit
Make/Model/Age:	
Ventilation:	Blower
Location:	Dry Pit
Make/Model/Age:	Dayton
Size, kW:	
NEMA Space Rating:	
Confined Space Entry: (Y/N)	

Additional Comments:

Instrumentation:

HVAC/Ventilation:

Building Structures:

Exterior Site Conditions:

Gravel is in good condition.

Security Measures:

Fenced enclosure with padlocked gate and privacy screens and bushes/trees.

General:

Some float support corrosion issues in wet well, but supports have been replaced.

HAVERHILL, MA PUMP STATION ELECTRICAL SURVEY

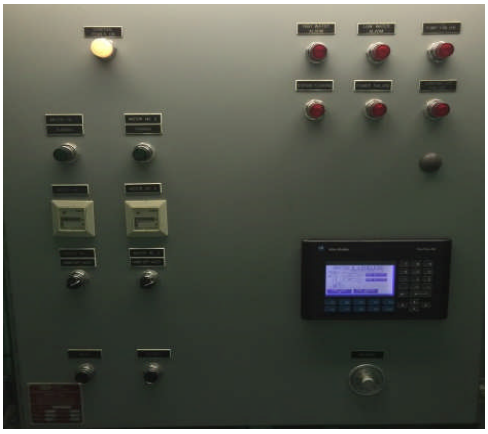
NAME:	Millvale (Seven Sisters)													
TYPE:	Submersible ☐			Dry-Pit X			Suction Lift ☐			Vacuum Prime ☐				
SERVICE:	OH ☐	UG X	XFMR:	Pole ☐	Pad X		KVA			Pole#	N/A			
Notes:	Behind pines adjacent to site.													
METER:	Utility	National Grid		Voltage	277/480, 3Ph, 4W		Rating	200A		#	25055490			
DISCONNECT:	CB ☐	DS X, Fused? ☐		Voltage	277/480, 3Ph, 4W		Rating	100A						
ATS :	Manfr.	ASCO		Voltage	277/480, 3Ph, 4W		Rating	100A		Poles	3			
DISTRBTION:														Age
MCC ☐	Mains:			Voltage			Rating			Sections				
Dist Panel ☐	Mains:			Voltage			Rating			#Ckt				
Light Xfmr ☐				Voltage			Rating			KVA				
Light Panel ☐	Mains:			Voltage			Rating			#Ckt				
Notes:														
GENERATOR:	KW/KVA	50/62.5		Voltage	277/480, 3Ph, 4W		Rating	100A Generator Breaker						
Diesel ☐	Mnfr/Model		Olympian				Age	2002						
NG X	Tank													
LP ☐	Notes													
PUMP 1:	HP	7.5		Voltage	480, 3Ph		FLA	10.6						
Starter:	VFD ☐						Disc Rating							
	FVNR X	ESTOP ☐		Starter located in Pump Control Panel										
	RVSS ☐	LCS ☐												
PUMP 2:	HP	7.5		Voltage	480, 3Ph		FLA	10.6						
Starter:	VFD ☐						Disc Rating							
	FVNR X	ESTOP ☐		Starter located in Pump Control Panel										
	RVSS ☐	LCS ☐												

DEFICIENCIES/CODE ISSUES: None observed.

City of Haverhill, MA

Wastewater Pump Station Inventory

Morningside	
Location: 1 Morningside Drive	
Coordinates:	42.78697198 -71.12778697
Elevation, ft (NAVD88):	61.1
Distance from WPAF, miles	3.8
General Pump Station Information:	
Year Constructed:	2001
Station Type:	Flooded Suction
No. of Pumps:	2
Design Capacity, gpm:	125
Design TDH, ft:	30
Pump Speed, rpm:	1170
Motor Hp:	5
Drive Type:	Constant
Pump Manufacturer/Model#:	Smith & Loveless/4B2A
Pump Inlet/Outlet Diameter	4"/4"
Station Inlet Piping Size/Material	8" PVC
Force Main Discharge Size/Material	6" PVC
Clogging Issues (Y/N)	N
Wetwell Size:	6' Dia. Manhole
Corrosion: (Y/N)	N
Odor Issues: (Y/N)	N
Grease Accumulation: (Y/N)	Minimal
Generator : (Y/N)	Y



Controls Information:	
Pump Controls	
Type: (PLC/RLL/MFG Control)	MFG Control
Manufacturer:	Smith & Loveless
Model No.:	B08-8472-30
Control Scenario:	Alternating Lead/Lag Based on Level Setpoints
Pump Control Panel	
Enclosure: (Size/NEMA/Material)	NEMA 1
Condition:	Good
Location:	Dry Pit
Alarming	Autodialer
Level Controls	
Type:	Transducer
Backup Level Controls:	Floats

HVAC/Mechanical Information:	
Heating:	Unit Heater
Location:	Dry Pit
Make/Model/Age:	Dayton
Size, kW:	
Dehumidification (Y/N):	Y
Location:	Dry Pit
Make/Model/Age:	Dayton
Ventilation:	Blower
Location:	Dry Pit
Make/Model/Age:	
Size, kW:	
NEMA Space Rating:	
Confined Space Entry: (Y/N)	Y

Additional Comments:

Instrumentation:

HVAC/Ventilation:

Building Structures:

Exterior Site Conditions:

Pavement and driveway are in good condition.

Security Measures:

Fence enclosure with padlocked gate, privacy screens, and hedges on three sides.

General:

Blower is not properly connected to exhaust piping.

Minor coating failure on piping, valves, and pumps.

HAVERHILL, MA PUMP STATION ELECTRICAL SURVEY

NAME:	Morningside Drive									
TYPE:	Submersible ☐			Dry-Pit X			Suction Lift ☐			
SERVICE:	OH ☐	UG X	XFMR:	Pole X	Pad ☐		KVA		Pole#	From Riser Pole #5
Notes:	Frequent Brownouts on Hot days, Generator is frequently told to come on.									
METER:	Utility	National Grid		Voltage	480V 3 ph.		Rating	200 amps	#	62158067
DISCONNECT:	CB ☐	DS X, Fused? ☐		Voltage	480V 3 ph.		Rating	100 amps		
ATS :	Manfr.	ASCO		Voltage	480V 3 ph.		Rating		Poles	3
DISTRBTION:										Age
MCC ☐	Mains:			Voltage			Rating		Sections	2001
Dist Panel ☐	Mains:			Voltage			Rating		#Ckt	
Light Xfmr X				Voltage	480/120		Rating	5	KVA	
Light Panel ☐	Mains:			Voltage			Rating		#Ckt	
Notes:										
GENERATOR:	KW/KVA	60/75		Voltage	480/277 3 ph, Y		Rating	90 amp output		
Diesel ☐	Mnfr/Model		Olympian				Age	2001		
NG X	Tank									
LP ☐	Notes									
PUMP 1:	HP	5		Voltage	460 3 ph		FLA	7.4		
Starter:	VFD ☐						Disc Rating			
	FVNR X	ESTOP ☐								
	RVSS ☐	LCS ☐								
PUMP 2:	HP	5		Voltage	460 3 ph		FLA	7.4		
Starter:	VFD ☐						Disc Rating			
	FVNR X	ESTOP ☐								
	RVSS ☐	LCS ☐								

DEFICIENCIES/CODE ISSUES:

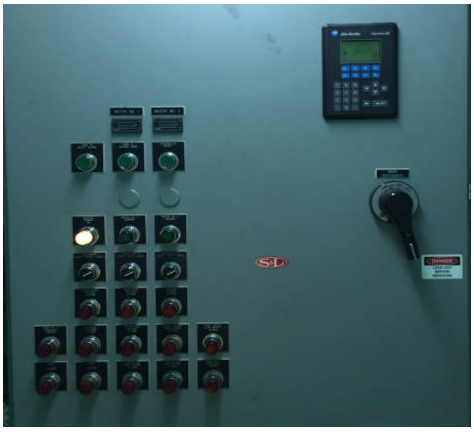
Frequent Brown-outs on Hot Days. Some conduits broken due to expansion and contraction at Dry Pit Hatch.

No code issues are visible, however the pump station dry pit may require ventilation to maintain non classification per NFPA 820 as the station is located underground. Station is considered a Priority 2 on Towns Priority list.

City of Haverhill, MA

Wastewater Pump Station Inventory

Newton Road	
Location: 201 Newton Road	
Coordinates:	42.80166775 -71.06617888
Elevation, ft (NAVD88):	112.8
Distance from WPAF, miles	2.8
General Pump Station Information:	
Year Constructed:	2002
Station Type:	Flooded Suction
No. of Pumps:	2
Design Capacity, gpm:	350
Design TDH, ft:	100
Pump Speed, rpm:	1760
Motor Hp:	30
Drive Type:	Constant
Pump Manufacturer/Model#:	Smith & Loveless/4C3
Pump Inlet/Outlet Diameter	6"/6"
Station Inlet Piping Size/Material	15" PVC
Force Main Discharge Size/Material	0" Unk
Clogging Issues (Y/N)	N
Wetwell Size:	6' Dia. Wet Well
Corrosion: (Y/N)	N
Odor Issues: (Y/N)	N
Grease Accumulation: (Y/N)	N
Generator : (Y/N)	Y



Controls Information:	
Pump Controls	
Type: (PLC/RLL/MFG Control)	MFG Control
Manufacturer:	Smith & Loveless
Model No.:	B08-8489-30
Control Scenario:	Alternating Lead/Lag Based on Level Setpoints
Pump Control Panel	
Enclosure: (Size/NEMA/Material)	NEMA 3R
Condition:	Good
Location:	Dry Pit
Alarming	Autodialer
Level Controls	
Type:	Transducer
Backup Level Controls:	Floats

HVAC/Mechanical Information:	
Heating:	Unit Heater
Location:	Dry Pit
Make/Model/Age:	Lakewood/Model 792/S
Size, kW:	750-1500 watts
Dehumidification (Y/N):	Y
Location:	Dry Pit
Make/Model/Age:	GE 40 Pint
Ventilation:	Blower
Location:	Blower
Make/Model/Age:	Dayton
Size, kW:	
NEMA Space Rating:	
Confined Space Entry: (Y/N)	

Additional Comments:

Instrumentation:

HVAC/Ventilation:

Building Structures:

Exterior Site Conditions:

Good condition.

Security Measures:

Fence enclosure with padlocked gate.

Located in fork in road; generator has been previously hit by an automobile, there is a wooden guard rail in place.

General:

Station is fairly newer and doesn't have many problems.

Generator also has minimal problems.

HAVERHILL, MA PUMP STATION ELECTRICAL SURVEY

NAME:	Newton Road							
TYPE:	Submersible ☐		Dry-Pit X		Suction Lift ☐		Vacuum Prime ☐	
SERVICE:	OH ☐	UG X	XFMR:	Pole X	Pad ☐	KVA	Pole#	24
Notes:	Transformers 50ft down the street.							
METER:	Utility	National Grid	Voltage	277/480, 3Ph, 4W	Rating	200A	#	46968884
DISCONNECT:	CB ☐	DS X, Fused? ☐	Voltage	277/480, 3Ph, 4W	Rating	200A		
ATS :	Manfr.	ASCO	Voltage	277/480, 3Ph, 4W	Rating	150A	Poles	3
DISTRBTION:								Age
MCC ☐	Mains:		Voltage		Rating		Sections	
Dist Panel ☐	Mains:		Voltage		Rating		#Ckt	
Light Xfmr ☐			Voltage		Rating		KVA	
Light Panel ☐	Mains:		Voltage		Rating		#Ckt	
Notes:								
GENERATOR:	KW/KVA	100/125	Voltage	277/480, 3Ph, 4W	Rating	150A Generator Breaker		
Diesel ☐	Mnfr/Model	Olympian			Age	2001		
NG X	Tank							
LP ☐	Notes							
PUMP 1:	HP	30	Voltage	480, 3Ph	FLA	35		
Starter:	VFD ☐				Disc Rating			
	FVNR X	ESTOP ☐	Starter located in Pump Control Panel					
	RVSS ☐	LCS ☐						
PUMP 2:	HP	30	Voltage	480, 3Ph	FLA	35		
Starter:	VFD ☐				Disc Rating			
	FVNR X	ESTOP ☐	Starter located in Pump Control Panel					
	RVSS ☐	LCS ☐						

DEFICIENCIES/CODE ISSUES: None observed.

City of Haverhill, MA

Wastewater Pump Station Inventory

North Avenue	
Location: North Side Court, Building B	
Coordinates:	42.80801623 -71.09204041
Elevation, ft (NAVD88):	79.0
Distance from WPAF, miles	3.5
General Pump Station Information:	
Year Constructed:	1988
Station Type:	Flooded Suction
No. of Pumps:	2
Design Capacity, gpm:	600
Design TDH, ft:	51.21
Pump Speed, rpm:	1760
Motor Hp:	15
Drive Type:	Constant
Pump Manufacturer/Model#:	Smith & Loveless/4B2A
Pump Inlet/Outlet Diameter	6"/6"
Station Inlet Piping Size/Material	8" AC
Force Main Discharge Size/Material	6" AC
Clogging Issues (Y/N)	N
Wetwell Size:	8' Dia. Manhole
Corrosion: (Y/N)	N
Odor Issues: (Y/N)	N
Grease Accumulation: (Y/N)	Y
Generator : (Y/N)	N

Controls Information:	
Pump Controls	
Type: (PLC/RLL/MFG Control)	MFG Control
Manufacturer:	Smith & Loveless
Model No.:	29A11 D08-8194-30
Control Scenario:	Alternating Lead/Lag Based on Level Setpoints
Pump Control Panel	
Enclosure: (Size/NEMA/Material)	NEMA 1
Condition:	Dry Pit
Location:	Fair
Alarming	Autodialer
Level Controls	
Type:	Ultrasonic
Backup Level Controls:	Floats

HVAC/Mechanical Information:	
Heating:	Unit Heater
Location:	Dry Pit
Make/Model/Age:	Red Stone
Size, kW:	1300-1500 watts
Dehumidification (Y/N):	Y
Location:	Dry Pit
Make/Model/Age:	Oasis
Ventilation:	Blower
Location:	Dry Pit
Make/Model/Age:	Dayton/4C444A
Size, kW:	0.185
NEMA Space Rating:	
Confined Space Entry: (Y/N)	

Additional Comments:

Instrumentation:

HVAC/Ventilation:

Building Structures:

Floor of dry pit may be corroded - feels soft underfoot.

Exterior Site Conditions:

Grass.

Security Measures:

Fence enclosure with padlocked gate.

Maintenance from the Condo complained that children were getting underneath the gate and into the enclosure.

General:

When the station loses power; overflows quickly; services a lot of condos.

Gate valves have been changed recently on the effluent side of the pumps.

Pumps need to be redone/replaced.

Water on floor; could be an issue with dehumidifier, sump pump was working at the time.

HAVERHILL, MA PUMP STATION ELECTRICAL SURVEY

NAME:	North Avenue								
TYPE:	Submersible ☐			Dry-Pit X		Suction Lift ☐			
SERVICE:	OH ☐	UG X	XFMR:	Pole ☐	Pad ☐	KVA		Pole#	
Notes:									
METER:	Utility	National Grid		Voltage	208/120V, 3ph, Y	Rating		#	84861531
DISCONNECT:	CB X	DS ☐, Fused? ☐		Voltage	208/120V, 3ph, Y	Rating	100 amps		
MTS :	Manfr.			Voltage	208/120V, 3ph, Y	Rating	100 amps	Poles	3 poles
DISTRBTION:	Manual transfer switch anf Generator Receptacle used for back-up power								Age
MCC ☐	Mains:			Voltage		Rating		Sections	1987
Dist Panel ☐	Mains:			Voltage		Rating		#Ckt	
Light Xfmr ☐				Voltage		Rating		KVA	
Light Panel X	Mains:			Voltage	208/120V, 3ph, Y	Rating		#Ckt	
Notes:	Lighting Panel Distribution are part of the Pump Control Panel within the dry pit.								
GENERATOR:	KW/KVA	N/A		Voltage		Rating			
Diesel ☐	Mnfr/Model					Age			
NG ☐	Tank								
LP ☐	Notes								
PUMP 1:	HP	15		Voltage	208V, 3ph	FLA	37.4 amps		
Starter:	VFD ☐					Disc Rating			
	FVNR X	ESTOP ☐							
	RVSS ☐	LCS ☐							
PUMP 2:	HP	15		Voltage	208V, 3ph	FLA	37.4 amps		
Starter:	VFD ☐					Disc Rating			
	FVNR X	ESTOP ☐							
	RVSS ☐	LCS ☐							

DEFICIENCIES/CODE ISSUES:

Floods quickly upon loss of power. Generator Recommended. Fair to poor condition in dry pit, some corrosion.

No code issues are visible, however the pump station dry pit may require ventilation to maintain non classification per NFPA 820 as the station is located underground.

City of Haverhill, MA

Wastewater Pump Station Inventory

Peartree	
Location: 84 Elliot Street	
Coordinates:	42.79821359 -71.05102294
Elevation, ft (NAVD88):	167.2
Distance from WPAF, miles	2.6
General Pump Station Information:	
Year Constructed:	1997
Station Type:	Flooded Suction
No. of Pumps:	2
Design Capacity, gpm:	200
Design TDH, ft:	44
Pump Speed, rpm:	1170
Motor Hp:	5
Drive Type:	Constant
Pump Manufacturer/Model#:	Smith & Loveless/4B2A
Pump Inlet/Outlet Diameter	4"/4"
Station Inlet Piping Size/Material	8" AC
Force Main Discharge Size/Material	12" PVC
Clogging Issues (Y/N)	N
Wetwell Size:	6' Dia. Manhole
Corrosion: (Y/N)	N
Odor Issues: (Y/N)	N
Grease Accumulation: (Y/N)	N
Generator : (Y/N)	Y

Controls Information:	
Pump Controls	
Type: (PLC/RLL/MFG Control)	MFG Control
Manufacturer:	Smith & Loveless
Model No.:	B08-8435-30
Control Scenario:	Alternating Lead/Lag Based on Level Setpoints
Pump Control Panel	
Enclosure: (Size/NEMA/Material)	NEMA 1
Condition:	Good
Location:	Dry Pit
Alarming	Autodialer
Level Controls	
Type:	Bubbler
Backup Level Controls:	None

HVAC/Mechanical Information:	
Heating:	Unit Heater
Location:	Dry Pit
Make/Model/Age:	
Size, kW:	
Dehumidification (Y/N):	Y
Location:	Dry Pit
Make/Model/Age:	Dayton
Ventilation:	Blower
Location:	Dry Pit
Make/Model/Age:	Dayton
Size, kW:	
NEMA Space Rating:	
Confined Space Entry: (Y/N)	

Additional Comments:

Instrumentation:

HVAC/Ventilation:

Building Structures:

Exterior Site Conditions:

Security Measures:

Fence enclosure with padlocked gate.

General:

Station is in pretty good shape.

Some coating failure on the pumps.

HAVERHILL, MA PUMP STATION ELECTRICAL SURVEY

NAME:	Peartree													
TYPE:	Submersible ☐			Dry-Pit X			Suction Lift ☐			Vacuum Prime ☐				
SERVICE:	OH ☐	UG X	XFMR:	Pole ☐	Pad X		KVA			Pole#	292-10			
Notes:	Transformers across the street.													
METER:	Utility	National Grid		Voltage	277/480, 3Ph, 4W		Rating	200A		#	76347920			
DISCONNECT:	CB ☐	DS X, Fused? ☐		Voltage	277/480, 3Ph, 4W		Rating	100A						
ATS :	Manfr.	Kohler		Voltage	277/480, 3Ph, 4W		Rating	100A		Poles	3			
DISTRBTION:														Age
MCC ☐	Mains:			Voltage			Rating			Sections				
Dist Panel ☐	Mains:			Voltage			Rating			#Ckt				
Light Xfmr ☐				Voltage			Rating			KVA				
Light Panel ☐	Mains:			Voltage			Rating			#Ckt				
Notes:														
GENERATOR:	KW/KVA	35/44		Voltage	277/480, 3Ph, 4W		Rating	100A Generator Breaker						
Diesel ☐	Mnfr/Model		Kohler				Age	2010						
NG X	Tank													
LP ☐	Notes	New alternator 2010												
PUMP 1:	HP	5		Voltage	480, 3Ph		FLA	8						
Starter:	VFD ☐						Disc Rating							
	FVNR X	ESTOP ☐		Starter located in Pump Control Panel										
	RVSS ☐	LCS ☐												
PUMP 2:	HP	5		Voltage	480, 3Ph		FLA	8						
Starter:	VFD ☐						Disc Rating							
	FVNR X	ESTOP ☐		Starter located in Pump Control Panel										
	RVSS ☐	LCS ☐												

DEFICIENCIES/CODE ISSUES: Meter rated 240V, service is 480V. Minor service corrosion.

City of Haverhill, MA

Wastewater Pump Station Inventory

Peoples Place	
Location: 33 Peoples Place	
Coordinates:	42.77832628 -71.11436925
Elevation, ft (NAVD88):	66.8
Distance from WPAF, miles	2.9
General Pump Station Information:	
Year Constructed:	1990
Station Type:	Flooded Suction
No. of Pumps:	2
Design Capacity, gpm:	100
Design TDH, ft:	N/A
Pump Speed, rpm:	1750
Motor Hp:	7.5
Drive Type:	Constant
Pump Manufacturer/Model#:	Smith & Loveless
Pump Inlet/Outlet Diameter	4"/4"
Station Inlet Piping Size/Material	8" PVC
Force Main Discharge Size/Material	4" PVC
Clogging Issues (Y/N)	N
Wetwell Size:	6' Dia. Manhole
Corrosion: (Y/N)	N
Odor Issues: (Y/N)	N
Grease Accumulation: (Y/N)	N
Generator : (Y/N)	N

Controls Information:	
Pump Controls	
Type: (PLC/RLL/MFG Control)	MFG Control
Manufacturer:	Smith & Loveless
Model No.:	08-8339-S
Control Scenario:	Alternating Lead/Lag Based on Level Setpoints
Pump Control Panel	
Enclosure: (Size/NEMA/Material)	NEMA 1
Condition:	Good
Location:	Dry Pit
Alarming	Autodialer
Level Controls	
Type:	Bubbler
Backup Level Controls:	None

HVAC/Mechanical Information:	
Heating:	
Location:	
Make/Model/Age:	
Size, kW:	
Dehumidification (Y/N):	
Location:	
Make/Model/Age:	
Ventilation:	
Location:	
Make/Model/Age:	
Size, kW:	
NEMA Space Rating:	
Confined Space Entry: (Y/N)	

Additional Comments:

Instrumentation:

New alarm system done about ten years ago. Alarm is the same as Concordia.

HVAC/Ventilation:

Some corrosion on blower.

Building Structures:

Exterior Site Conditions:

Security Measures:

Fenced enclosure with padlocked gate, and privacy hedges.

General:

Pumps and valves are in decent shape.

Operators would like a generator.

Could not find any record information on this station.

HAVERHILL, MA PUMP STATION ELECTRICAL SURVEY

NAME:	Peoples Place											
TYPE:	Submersible ☐			Dry-Pit X			Suction Lift ☐			Vacuum Prime ☐		
SERVICE:	OH ☐	UG X	XFMR:	Pole ☐	Pad X		KVA		Pole#	N/A		
Notes:	Transformer in grass adjacent to site.											
METER:	Utility	National Grid		Voltage	208/120, 3Ph, 4W		Rating	200A	#	25106524		
DISCONNECT:	CB X	DS ☐, Fused? ☐		Voltage	208/120, 3Ph, 4W		Rating	100A				
MTS :	Manfr.	Eaton		Voltage	208/120, 3Ph, 4W		Rating	100A	Poles	3		
DISTRBTION:												Age
MCC ☐	Mains:			Voltage			Rating		Sections			
Dist Panel ☐	Mains:			Voltage			Rating		#Ckt			
Light Xfmr ☐				Voltage			Rating		KVA			
Light Panel ☐	Mains:			Voltage			Rating		#Ckt			
Notes:	Generator pigtail.											
GENERATOR:	KW/KVA	N/A		Voltage			Rating					
Diesel ☐	Mnfr/Model						Age					
NG ☐	Tank											
LP ☐	Notes											
PUMP 1:	HP	7.5		Voltage	208, 3Ph		FLA	24.8				
Starter:	VFD ☐						Disc Rating					
	FVNR X	ESTOP ☐		Starter located in Pump Control Panel								
	RVSS ☐	LCS ☐										
PUMP 2:	HP	7.5		Voltage	208, 3Ph		FLA	24.8				
Starter:	VFD ☐						Disc Rating					
	FVNR X	ESTOP ☐		Starter located in Pump Control Panel								
	RVSS ☐	LCS ☐										

DEFICIENCIES/CODE ISSUES: None observed.

City of Haverhill, MA

Wastewater Pump Station Inventory

Ridgeland Heights/Rosebud/Ridgecrest	
Location: 15 Ridgeland Heights	
Coordinates:	42.76558022 -71.13698466
Elevation, ft (NAVD88):	136.4
Distance from WPAF, miles	3.8
General Pump Station Information:	
Year Constructed:	2002
Station Type:	Vacuum Prime
No. of Pumps:	2
Design Capacity, gpm:	100
Design TDH, ft:	35
Pump Speed, rpm:	1200
Motor Hp:	3
Drive Type:	Constant
Pump Manufacturer/Model#:	Smith & Loveless/4B2B
Pump Inlet/Outlet Diameter	4"/4"
Station Inlet Piping Size/Material	8" PVC
Force Main Discharge Size/Material	4" PVC
Clogging Issues (Y/N)	N
Wetwell Size:	6' Dia.
Corrosion: (Y/N)	N
Odor Issues: (Y/N)	N
Grease Accumulation: (Y/N)	N
Generator : (Y/N)	Y

Controls Information:	
Pump Controls	
Type: (PLC/RLL/MFG Control)	MFG Control
Manufacturer:	Smith & Loveless
Model No.:	B14-02074-30
Control Scenario:	Alternating Lead/Lag Based on Level Setpoints
Pump Control Panel	
Enclosure: (Size/NEMA/Material)	NEMA 1
Condition:	Good
Location:	Dry Pit
Alarming	Autodialer
Level Controls	
Type:	Transducer
Backup Level Controls:	Floats

HVAC/Mechanical Information:	
Heating:	Unit Heater
Location:	Dry Pit
Make/Model/Age:	Red Stone
Size, kW:	1300-1500 watts
Dehumidification (Y/N):	N
Location:	
Make/Model/Age:	
Ventilation:	Blower
Location:	Dry Pit
Make/Model/Age:	
Size, kW:	
NEMA Space Rating:	
Confined Space Entry: (Y/N)	

Additional Comments:

Instrumentation:

HVAC/Ventilation:

Building Structures:

Steel on wetwell side has heavy corrosion.

Exterior Site Conditions:

Site paving is in good condition.

Security Measures:

Fence enclosure with padlocked gate and privacy screens and hedges.

General:

Station serves four houses.

Had issues with pipes freezing inside the enclosure; thermostat was adjusted.

HAVERHILL, MA PUMP STATION ELECTRICAL SURVEY

NAME:	Rosebud / Ridgeline Heights								
TYPE:	Submersible ☐		Dry-Pit ☐		Suction Lift ☐		Vacuum Prime X		
SERVICE:	OH ☐	UG X	XFMR:	Pole ☐	Pad X	KVA		Pole#	N/A
Notes:	Transformer in grass next to fence.								
METER:	Utility	National Grid	Voltage	240, 1Ph, 3W	Rating	200A	#	46163373	
DISCONNECT:	CB X	DS ☐, Fused? ☐	Voltage	240, 1Ph, 3W	Rating	200A			
ATS :	Manfr.	ASCO	Voltage	240, 1Ph, 3W	Rating	400A	Poles	2	
DISTRBTION:									Age
MCC ☐	Mains:		Voltage		Rating		Sections		
Dist Panel ☐	Mains:		Voltage		Rating		#Ckt		
Light Xfmr ☐			Voltage		Rating		KVA		
Light Panel ☐	Mains:		Voltage		Rating		#Ckt		
Notes:									
GENERATOR:	KW/KVA	42.5/42.5	Voltage	240, 1Ph, 3W	Rating	250A Generator Breaker			
Diesel ☐	Mnfr/Model	Olympian			Age	2002			
NG X	Tank								
LP ☐	Notes								
PUMP 1:	HP	3	Voltage	240, 1Ph, 3W	FLA	18			
Starter:	VFD ☐				Disc Rating				
	FVNR X	ESTOP ☐	Starter located in Pump Control Panel						
	RVSS ☐	LCS ☐							
PUMP 2:	HP	3	Voltage	240, 1Ph, 3W	FLA	18			
Starter:	VFD ☐				Disc Rating				
	FVNR X	ESTOP ☐	Starter located in Pump Control Panel						
	RVSS ☐	LCS ☐							

DEFICIENCIES/CODE ISSUES: None observed.

City of Haverhill, MA

Wastewater Pump Station Inventory

Rosemont	
Location: 133 Rosemont Street	
Coordinates:	42.80534728 -71.10865081
Elevation, ft (NAVD88):	31.5
Distance from WPAF, miles	3.8
General Pump Station Information:	
Year Constructed:	2012
Station Type:	Submersible
No. of Pumps:	2
Design Capacity, gpm:	500
Design TDH, ft:	N/A
Pump Speed, rpm:	1755
Motor Hp:	15
Drive Type:	Soft Starts
Pump Manufacturer/Model#:	Flygt/NP 3153 HT
Pump Inlet/Outlet Diameter	/4"
Station Inlet Piping Size/Material	12" AC
Force Main Discharge Size/Material	6" CI
Clogging Issues (Y/N)	N
Wetwell Size:	8' Dia. Manhole
Corrosion: (Y/N)	N
Odor Issues: (Y/N)	N
Grease Accumulation: (Y/N)	Y
Generator : (Y/N)	Y

Controls Information:	
Pump Controls	
Type: (PLC/RLL/MFG Control)	PLC
Manufacturer:	WAJA Associates
Model No.:	80366
Control Scenario:	Alternating Lead/Lag Based on Level Setpoints
Pump Control Panel	
Enclosure: (Size/NEMA/Material)	NEMA 3R
Condition:	Excellent
Location:	Outdoors
Alarming	Autodialer
Level Controls	
Type:	Transducer
Backup Level Controls:	Floats

HVAC/Mechanical Information:	
Heating:	Unit Heater
Location:	Enclosure
Make/Model/Age:	
Size, kW:	
Dehumidification (Y/N):	N
Location:	
Make/Model/Age:	
Ventilation:	Fan
Location:	Enclosure
Make/Model/Age:	
Size, kW:	
NEMA Space Rating:	
Confined Space Entry: (Y/N)	

Additional Comments:

Instrumentation:

HVAC/Ventilation:

Building Structures:

Exterior Site Conditions:

Site pavement is in good condition.

Truck turnoff/drive is narrow and no guard rails or bollards to protect driving off into creek below.

Security Measures:

Fence enclosure with padlocked gate and privacy screens.

General:

No fall protection under hatch to wet well.

Lots of restaurants in service area; had transducer issues due to grease, but calls have been minimized since f

flushing out the wet well.

HAVERHILL, MA PUMP STATION ELECTRICAL SURVEY

NAME:	Rosemont								
TYPE:	Submersible X			Dry-Pit ☐		Suction Lift ☐			
SERVICE:	OH X	UG ☐	XFMR:	Pole ☐	Pad ☐	KVA		Pole#	
Notes:									
METER:	Utility			Voltage	480/277 3 phase Y	Rating	200 amp	#	97400966
DISCONNECT:	CB X	DS ☐, Fused? ☐		Voltage	480/277 3 phase Y	Rating	100 amp		
ATS :	Manfr.	Kohler		Voltage	480/277 3 phase Y	Rating	Not listed	Poles	3
DISTRBTION:									Age
MCC ☐	Mains:			Voltage		Rating		Sections	2010
Dist Panel ☐	Mains:			Voltage		Rating		#Ckt	
Light Xfmr X				Voltage	480/240V 1 ph	Rating	36 amps	KVA	15
Light Panel X	Mains:			Voltage	240/1 phase	Rating		#Ckt	
Notes:	Waja Built Pump Control Panel								
GENERATOR:	KW/KVA	30 kw		Voltage	480/277V 3phase	Rating	See Photo, 50 amp output		
Diesel ☐	Mnfr/Model		Kohler 4PY75			Age	2010		
NG X	Tank								
LP ☐	Notes								
PUMP 1:	HP	15		Voltage	480V 3phase	FLA	19 amps		
Starter:	VFD ☐					Disc Rating			
	FVNR ☐	ESTOP ☐							
	RVSS X	LCS ☐							
PUMP 2:	HP	15		Voltage		FLA	19 amps		
Starter:	VFD ☐					Disc Rating			
	FVNR ☐	ESTOP ☐							
	RVSS X	LCS ☐							

DEFICIENCIES/CODE ISSUES:

Station is in very good condition, station was installed in 2010. No code violations were noted.

City of Haverhill, MA

Wastewater Pump Station Inventory

Route 110	
Location: 1156 River Street	
Coordinates:	42.77502891 -71.12899075
Elevation, ft (NAVD88):	25.7
Distance from WPAF, miles	3.5
General Pump Station Information:	
Year Constructed:	1989
Station Type:	Flooded Suction
No. of Pumps:	2
Design Capacity, gpm:	460
Design TDH, ft:	21
Pump Speed, rpm:	1170
Motor Hp:	5
Drive Type:	Constant
Pump Manufacturer/Model#:	Smith & Loveless/4B2A
Pump Inlet/Outlet Diameter	8x6"/6"
Station Inlet Piping Size/Material	15" PVC
Force Main Discharge Size/Material	6" DI
Clogging Issues (Y/N)	N
Wetwell Size:	6' Dia. Manhole
Corrosion: (Y/N)	N
Odor Issues: (Y/N)	N
Grease Accumulation: (Y/N)	Y
Generator : (Y/N)	Y

Controls Information:	
Pump Controls	
Type: (PLC/RLL/MFG Control)	MFG Control
Manufacturer:	Smith & Loveless
Model No.:	C08-8301-30
Control Scenario:	Alternating Lead/Lag Based on Level Setpoints
Pump Control Panel	
Enclosure: (Size/NEMA/Material)	NEMA 12
Condition:	
Location:	
Alarming	Autodialer
Level Controls	
Type:	Bubbler
Backup Level Controls:	Float (High Water Alarm)

HVAC/Mechanical Information:	
Heating:	Unit Heater
Location:	Dry Pit
Make/Model/Age:	
Size, kW:	
Dehumidification (Y/N):	Y
Location:	Dry Pit
Make/Model/Age:	Oasis
Ventilation:	Blower
Location:	Dry Pit
Make/Model/Age:	
Size, kW:	
NEMA Space Rating:	
Confined Space Entry: (Y/N)	

Additional Comments:

Instrumentation:

HVAC/Ventilation:

Building Structures:

Exterior Site Conditions:

Pavement mostly in good conditon; some frost heaves/rooting issues in some areas.

Driveway is in good condition.

Security Measures:

Fence enclosure with padlocked gate and privacy screens.

Electrical Service located outside of fence enclosure.

General:

Knife gates on suction side were recently replaced. Other valves need replacement

Only pump station with an additional tank on bubbler system, like a bladder tank.

Due to the bladder tank, there is issues with the bubbler system.

The service area has an I/I issue.

Higher priority station due to rehab/control upgrade required.

HAVERHILL, MA PUMP STATION ELECTRICAL SURVEY

NAME:	Route 110							
TYPE:	Submersible ☐		Dry-Pit X		Suction Lift ☐		Vacuum Prime ☐	
SERVICE:	OH X	UG ☐	XFMR:	Pole X	Pad ☐	KVA	Pole#	126-1
Notes:	Transformer across the street.							
METER:	Utility	National Grid	Voltage	120/208, 3Ph, 4W	Rating	200A	#	34201739
DISCONNECT:	CB ☐	DS ☐, Fused? ☐	Voltage	120/208, 3Ph, 4W	Rating	No access to electrical cabinet		
ATS/MTS :	Manfr.		Voltage		Rating		Poles	
DISTRBTION:								Age
MCC ☐	Mains:		Voltage		Rating		Sections	
Dist Panel ☐	Mains:		Voltage		Rating		#Ckt	
Light Xfmr ☐			Voltage		Rating		KVA	
Light Panel ☐	Mains:		Voltage		Rating		#Ckt	
Notes:	No access to electrical cabinet (key not available).							
GENERATOR:	KW/KVA	30/37.5	Voltage	120/208, 3Ph, 4W	Rating	110A Generator Breaker		
Diesel X	Mnfr/Model	Cummins			Age	1989		
NG ☐	Tank							
LP ☐	Notes							
PUMP 1:	HP	5	Voltage	208, 3Ph	FLA	16.7		
Starter:	VFD ☐				Disc Rating			
	FVNR X	ESTOP ☐						
	RVSS ☐	LCS ☐						
PUMP 2:	HP	5	Voltage	208, 3Ph	FLA	16.7		
Starter:	VFD ☐				Disc Rating			
	FVNR X	ESTOP ☐						
	RVSS ☐	LCS ☐						

DEFICIENCIES/CODE ISSUES: None observed.

City of Haverhill, MA

Wastewater Pump Station Inventory

Russett Hill	
Location: 77 Russett Hill Road	
Coordinates:	42.80097451 -71.04622072
Elevation, ft (NAVD88):	157.9
Distance from WPAF, miles	2.8
General Pump Station Information:	
Year Constructed:	1998
Station Type:	Flooded Suction
No. of Pumps:	2
Design Capacity, gpm:	100
Design TDH, ft:	35
Pump Speed, rpm:	1200
Motor Hp:	3
Drive Type:	Constant
Pump Manufacturer/Model#:	Smith & Loveless/4B2A
Pump Inlet/Outlet Diameter	4"/4"
Station Inlet Piping Size/Material	8" PVC
Force Main Discharge Size/Material	4" PVC
Clogging Issues (Y/N)	N
Wetwell Size:	6' Dia. Wet Well
Corrosion: (Y/N)	N
Odor Issues: (Y/N)	N
Grease Accumulation: (Y/N)	N
Generator : (Y/N)	Y

Controls Information:	
Pump Controls	
Type: (PLC/RLL/MFG Control)	MFG Control
Manufacturer:	Smith & Loveless
Model No.:	08-8459-C
Control Scenario:	Alternating Lead/Lag Based on Level Setpoints
Pump Control Panel	
Enclosure: (Size/NEMA/Material)	NEMA 1
Condition:	Good
Location:	
Alarming	Autodialer
Level Controls	
Type:	Bubbler
Backup Level Controls:	None

HVAC/Mechanical Information:	
Heating:	Unit Heater
Location:	Dry Pit
Make/Model/Age:	Lakewood
Size, kW:	
Dehumidification (Y/N):	Y
Location:	Dry Pit
Make/Model/Age:	
Ventilation:	Blower
Location:	Dry Pit
Make/Model/Age:	
Size, kW:	
NEMA Space Rating:	
Confined Space Entry: (Y/N)	

Additional Comments:

Instrumentation:

HVAC/Ventilation:

Building Structures:

Exterior Site Conditions:

Stone area within fence is decent condition; some weed growth and uneven areas.

Security Measures:

Fence enclosure with privacy fencing. Fencing camoflages station quite well.

General:

Exterior electrical panels and generator have corrosion/rust on exterior.

Air bubbler system was redone approximately five years ago.

Station is in good condition, though it needs backup floats.

HAVERHILL, MA PUMP STATION ELECTRICAL SURVEY

NAME:	Russett Hill								
TYPE:	Submersible ☐			Dry-Pit X			Suction Lift ☐		Vacuum Prime ☐
SERVICE:	OH ☐	UG X	XFMR:	Pole ☐	Pad X	KVA		Pole#	N/A
Notes:	Transformer on site within fence.								
METER:	Utility	National Grid		Voltage	208/120, 3Ph, 4W	Rating	200A	#	94462863
DISCONNECT:	CB ☐	DS X, Fused? ☐		Voltage	208/120, 3Ph, 4W	Rating	100A		
ATS :	Manfr.	Zenith		Voltage	208/120, 3Ph, 4W	Rating	100A	Poles	3
DISTRBTION:									Age
MCC ☐	Mains:			Voltage		Rating		Sections	
Dist Panel ☐	Mains:			Voltage		Rating		#Ckt	
Light Xfmr ☐				Voltage		Rating		KVA	
Light Panel ☐	Mains:			Voltage		Rating		#Ckt	
Notes:									
GENERATOR:	KW/KVA	19/24		Voltage	208/120, 3Ph, 4W	Rating	100A Generator Breaker		
Diesel ☐	Mnfr/Model	Kohler				Age	1998		
NG X	Tank								
LP ☐	Notes								
PUMP 1:	HP	3		Voltage	208, 3Ph	FLA	10.6A		
Starter:	VFD ☐					Disc Rating			
	FVNR X	ESTOP ☐		Starter located in Pump Control Panel					
	RVSS ☐	LCS ☐							
PUMP 2:	HP	3		Voltage	208, 3Ph	FLA	10.6A		
Starter:	VFD ☐					Disc Rating			
	FVNR X	ESTOP ☐		Starter located in Pump Control Panel					
	RVSS ☐	LCS ☐							

DEFICIENCIES/CODE ISSUES: Moderate corrosion on equipment/ generator enclosures.

City of Haverhill, MA

Wastewater Pump Station Inventory

South Cross Road	
Location: 41 South Cross Road	
Coordinates:	42.7475916 -71.05570224
Elevation, ft (NAVD88):	69.9
Distance from WPAF, miles	1.0
General Pump Station Information:	
Year Constructed:	2001
Station Type:	Flooded Suction
No. of Pumps:	2
Design Capacity, gpm:	125
Design TDH, ft:	85.6
Pump Speed, rpm:	1760
Motor Hp:	10
Drive Type:	Constant
Pump Manufacturer/Model#:	Smith & Loveless/4B2A
Pump Inlet/Outlet Diameter	4"/4"
Station Inlet Piping Size/Material	8" PVC
Force Main Discharge Size/Material	Unk
Clogging Issues (Y/N)	N
Wetwell Size:	6' Dia. Manhole
Corrosion: (Y/N)	N
Odor Issues: (Y/N)	N
Grease Accumulation: (Y/N)	N
Generator : (Y/N)	Y

Controls Information:	
Pump Controls	
Type: (PLC/RLL/MFG Control)	MFG Control
Manufacturer:	Smith & Loveless
Model No.:	B08-8465-30
Control Scenario:	Alternating Lead/Lag Based on Level Setpoints
Pump Control Panel	
Enclosure: (Size/NEMA/Material)	NEMA 1
Condition:	Good
Location:	Dry Pit
Alarming	Autodialer
Level Controls	
Type:	Transducer
Backup Level Controls:	Floats

HVAC/Mechanical Information:	
Heating:	Unit Heater
Location:	Dry Pit
Make/Model/Age:	Lakewood
Size, kW:	
Dehumidification (Y/N):	Y
Location:	Dry Pit
Make/Model/Age:	2013
Ventilation:	Blower
Location:	Dry Pit
Make/Model/Age:	Dayton
Size, kW:	
NEMA Space Rating:	
Confined Space Entry: (Y/N)	

Additional Comments:

Instrumentation:

HVAC/Ventilation:

Building Structures:

Exterior Site Conditions:

Site and pavement in good condition. Grassed areas around station need to be mowed.

Security Measures:

General:

Fence enclosure with padlocked gate and privacy screen.

Grease is controlled due to high invert in, which creates turbulance in the wet well.

HAVERHILL, MA PUMP STATION ELECTRICAL SURVEY

NAME:	South Cross Road								
TYPE:	Submersible ☐		Dry-Pit X		Suction Lift ☐		Vacuum Prime ☐		
SERVICE:	OH ☐	UG X XFMR:	Pole X	Pad ☐	KVA		Pole#	6	
Notes:	Transformer across the street.								
METER:	Utility	National Grid	Voltage	277/480, 3Ph, 4W	Rating	200A	#	99050361	
DISCONNECT:	CB ☐	DS X, Fused? ☐	Voltage	277/480, 3Ph, 4W	Rating	100A			
ATS :	Manfr.	ASCO	Voltage	277/480, 3Ph, 4W	Rating	150A	Poles	3	
DISTRBTION:									Age
MCC ☐	Mains:		Voltage		Rating		Sections		
Dist Panel ☐	Mains:		Voltage		Rating		#Ckt		
Light Xfmr X			Voltage	480:120/240	Rating		KVA	3	2001
Light Panel X	Mains:	25A	Voltage	120/240	Rating		#Ckt	8	2001
Notes:									
GENERATOR:	KW/KVA	30/37.5	Voltage	277/480, 3Ph, 4W	Rating	150A Generator Breaker			
Diesel ☐	Mnfr/Model	Olympian			Age	1998			
NG X	Tank								
LP ☐	Notes								
PUMP 1:	HP	10	Voltage	480, 3Ph	FLA	12.5A			
Starter:	VFD ☐				Disc Rating				
	FVNR X	ESTOP ☐	Starter located in Pump Control Panel						
	RVSS ☐	LCS ☐							
PUMP 2:	HP	10	Voltage	480, 3Ph	FLA	12.5A			
Starter:	VFD ☐				Disc Rating				
	FVNR X	ESTOP ☐	Starter located in Pump Control Panel						
	RVSS ☐	LCS ☐							

DEFICIENCIES/CODE ISSUES: None observed.

City of Haverhill, MA

Wastewater Pump Station Inventory

South New Street	
Location: 1 South New Street	
Coordinates:	42.76620203 -71.08856742
Elevation, ft (NAVD88):	59.8
Distance from WPAF, miles	1.4
General Pump Station Information:	
Year Constructed:	1957
Station Type:	Submersible
No. of Pumps:	1
Design Capacity, gpm:	50
Design TDH, ft:	
Pump Speed, rpm:	
Motor Hp:	
Drive Type:	Constant
Pump Manufacturer/Model#:	
Pump Inlet/Outlet Diameter	/4"
Station Inlet Piping Size/Material	8" AC
Force Main Discharge Size/Material	4" CI
Clogging Issues (Y/N)	N
Wetwell Size:	
Corrosion: (Y/N)	Y
Odor Issues: (Y/N)	N
Grease Accumulation: (Y/N)	N
Generator : (Y/N)	N

Controls Information:	
Pump Controls	
Type: (PLC/RLL/MFG Control)	
Manufacturer:	
Model No.:	
Control Scenario:	
Pump Control Panel	
Enclosure: (Size/NEMA/Material)	
Condition:	
Location:	
Alarming	
Level Controls	
Type:	Floats
Backup Level Controls:	None

HVAC/Mechanical Information:	
Heating:	
Location:	
Make/Model/Age:	
Size, kW:	
Dehumidification (Y/N):	
Location:	
Make/Model/Age:	
Ventilation:	
Location:	
Make/Model/Age:	
Size, kW:	
NEMA Space Rating:	
Confined Space Entry: (Y/N)	

Additional Comments:

Instrumentation:

HVAC/Ventilation:

Building Structures:

Exterior Site Conditions:

Security Measures:

General:

City to replace pump station with new wet well, with two new submersible pumps, valves, piping, and control panel. Construction to take place Summer 2016.

HAVERHILL, MA PUMP STATION ELECTRICAL SURVEY

NAME:	South New Street							
TYPE:	Submersible X		Dry-Pit ☐		Suction Lift ☐		Vacuum Prime ☐	
SERVICE:	OH X	UG ☐	XFMR:	Pole X	Pad ☐	KVA	Pole#	585
Notes:	Transformer not located.							
METER:	Utility	National Grid	Voltage	240, 1Ph, 3W	Rating	200A	#	19277221
DISCONNECT:	CB ☐	DS ☐, Fused? ☐	Voltage		Rating	N/A		
ATS/MTS :	Manfr.	N/A	Voltage		Rating		Poles	
DISTRBTION:								Age
MCC ☐	Mains:		Voltage		Rating		Sections	
Dist Panel ☐	Mains:		Voltage		Rating		#Ckt	
Light Xfmr ☐			Voltage		Rating		KVA	
Light Panel X	Mains:		Voltage	240, 1Ph, 3W	Rating		#Ckt	1957
Notes:								
GENERATOR:	KW/KVA	N/A	Voltage		Rating			
Diesel ☐	Mnfr/Model				Age			
NG ☐	Tank							
LP ☐	Notes							
PUMP 1:	HP	1.5	Voltage	240, 1Ph	FLA	10A		
Starter:	VFD ☐				Disc Rating			
	FVNR X	ESTOP ☐	Starter located in Pump Control Panel					
	RVSS ☐	LCS ☐						
PUMP 2:	HP	N/A	Voltage		FLA			
Starter:	VFD ☐				Disc Rating			
	VFD ☐	ESTOP ☐						
	RVSS ☐	LCS ☐						

DEFICIENCIES/CODE ISSUES: No main disconnect, eqiupment in non-weatherproof wooden enclosure. Work order for station upgrade issued to contractor.

City of Haverhill, MA

Wastewater Pump Station Inventory

Srybny Avenue	
Location: 13 Srybny Avenue	
Coordinates:	42.79946019 -71.11727735
Elevation, ft (NAVD88):	114.1
Distance from WPAF, miles	3.8
General Pump Station Information:	
Year Constructed:	1988
Station Type:	Flooded Suction
No. of Pumps:	2
Design Capacity, gpm:	200
Design TDH, ft:	40
Pump Speed, rpm:	1760
Motor Hp:	15
Drive Type:	Constant
Pump Manufacturer/Model#:	Smith & Loveless/4B2
Pump Inlet/Outlet Diameter	4"/4"
Station Inlet Piping Size/Material	8" VC
Force Main Discharge Size/Material	8" CI
Clogging Issues (Y/N)	N
Wetwell Size:	6' Dia. Manhole
Corrosion: (Y/N)	N
Odor Issues: (Y/N)	N
Grease Accumulation: (Y/N)	N
Generator : (Y/N)	N

Controls Information:	
Pump Controls	
Type: (PLC/RLL/MFG Control)	MFG Control
Manufacturer:	Smith & Loveless
Model No.:	08-8205
Control Scenario:	Alternating Lead/Lag Based on Level Setpoints
Pump Control Panel	
Enclosure: (Size/NEMA/Material)	NEMA 1
Condition:	Good
Location:	Dry Pit
Alarming	Autodialer
Level Controls	
Type:	Bubbler
Backup Level Controls:	None

HVAC/Mechanical Information:	
Heating:	Unit Heater
Location:	Dry Pit
Make/Model/Age:	
Size, kW:	1300-1500 watts
Dehumidification (Y/N):	Y
Location:	Dry Pit
Make/Model/Age:	Comfort Aire
Ventilation:	Blower
Location:	Dry Pit
Make/Model/Age:	Dayton/4C444A
Size, kW:	
NEMA Space Rating:	
Confined Space Entry: (Y/N)	

Additional Comments:

Instrumentation:

HVAC/Ventilation:

Building Structures:

Exterior Site Conditions:

Stone with fallen leaves and sticks.

Security Measures:

Fence enclosure with padlocked gate and privacy hedges.

General:

Original pumps and motors; perform just basic maintenance.

Station is in decent shape.

HAVERHILL, MA PUMP STATION ELECTRICAL SURVEY

NAME:	Srybny Avenue								
TYPE:	Submersible ☐		Dry-Pit X		Suction Lift ☐				
SERVICE:	OH ☐	UG X	XFMR:	Pole ☐	Pad ☐	KVA		Pole#	
Notes:	Old Shed on pedestal with distribution								
METER:	Utility	National Grid	Voltage	240V 3 phase	Rating	200 amp	#	76306935	
DISCONNECT:	CB ☐	DS X, Fused? ☐	Voltage	240V 3 phase	Rating	60 amps, ITE			
MTS :	Manfr.	ITE	Voltage	240V 3 phase	Rating	200A	Poles	3 pole, with gen. recept	
DISTRBTION:	3 Individual Transfomers for Instrumentation. 120V Distibution in Pump Control Panel								Age
MCC ☐	Mains:		Voltage		Rating		Sections		Old
Dist Panel ☐	Mains:		Voltage		Rating		#Ckt		
Light Xfmr (3)	3 Individual Transfomers.		Voltage	240/24 VAC	Rating	0.5	KVA	Each	
Light Panel ☐	Mains:		Voltage		Rating		#Ckt		
Notes:	Bubbler System								
GENERATOR:	KW/KVA	N/A	Voltage		Rating				
Diesel ☐	Mnfr/Model				Age				
NG ☐	Tank								
LP ☐	Notes								
PUMP 1:	HP	5	Voltage	230V 3 phase	FLA	15 amps			
Starter:	VFD ☐				Disc Rating				
	FVNR X	ESTOP ☐							
	RVSS ☐	LCS ☐							
PUMP 2:	HP	5	Voltage	230V 3 phase	FLA	15 amps			
Starter:	VFD ☐				Disc Rating				
	FVNR X	ESTOP ☐							
	RVSS ☐	LCS ☐							

DEFICIENCIES/CODE ISSUES:

No code issues are visible, however the pump station dry pit may require ventilation to maintain non classification per NFPA 820 as the station is located underground. Station is considered a Priority 3 on Towns Priority list.

City of Haverhill, MA

Wastewater Pump Station Inventory

Tamarac	
Location: 9 Tamarac Drive	
Coordinates:	42.79946053 -71.07522992
Elevation, ft (NAVD88):	218.5
Distance from WPAF, miles	2.7
General Pump Station Information:	
Year Constructed:	2006
Station Type:	Vacuum Prime
No. of Pumps:	2
Design Capacity, gpm:	100
Design TDH, ft:	25
Pump Speed, rpm:	1160
Motor Hp:	3
Drive Type:	Constant
Pump Manufacturer/Model#:	Smith & Loveless/4B2B
Pump Inlet/Outlet Diameter	4"/4"
Station Inlet Piping Size/Material	8" PVC
Force Main Discharge Size/Material	4" PVC
Clogging Issues (Y/N)	N
Wetwell Size:	6' Dia. Steel
Corrosion: (Y/N)	N
Odor Issues: (Y/N)	N
Grease Accumulation: (Y/N)	N
Generator : (Y/N)	Y

Controls Information:	
Pump Controls	
Type: (PLC/RLL/MFG Control)	MFG Control
Manufacturer:	Smith & Loveless
Model No.:	
Control Scenario:	Alternating Lead/Lag Based on Level Setpoints
Pump Control Panel	
Enclosure: (Size/NEMA/Material)	
Condition:	Good
Location:	Dry Pit
Alarming	Autodialer
Level Controls	
Type:	Transducer
Backup Level Controls:	Floats

HVAC/Mechanical Information:	
Heating:	Unit Heater
Location:	Dry Pit
Make/Model/Age:	
Size, kW:	
Dehumidification (Y/N):	Y
Location:	Dry Pit
Make/Model/Age:	Whirlpool
Ventilation:	Blower
Location:	Dry Pit
Make/Model/Age:	Dayton/4C447
Size, kW:	
NEMA Space Rating:	
Confined Space Entry: (Y/N)	

Additional Comments:

Instrumentation:

HVAC/Ventilation:

Building Structures:

Some corrosion in wet well.

Exterior Site Conditions:

Good condition.

Security Measures:

Fence enclosure with padlocked gate and privacy screens.

General:

Serves approximately 10 houses.

Newness glitches have been rectified.

Control panel is located in a tough spot to get at the check valves.

HAVERHILL, MA PUMP STATION ELECTRICAL SURVEY

NAME:	Tamarac								
TYPE:	Submersible ☐			Dry-Pit ☐		Suction Lift X		(Vacuum Prime)	
SERVICE:	OH☐	UG X	XFMR:	Pole☐	Pad☐	KVA		Pole#	
Notes:									
METER:	Utility	National Grid		Voltage	240V 1 phase	Rating	200 amps	#	5105667
DISCONNECT:	CB X	DS☐, Fused?☐		Voltage	240V 1 phase	Rating	200 amps		
ATS :	Manfr.	Kohler		Voltage	240V 1 phase	Rating	200 amp	Poles	2
DISTRBTION:									Age
MCC☐	Mains:			Voltage		Rating		Sections	2006
Dist Panel☐	Mains:			Voltage		Rating		#Ckt	
Light Xfmr☐				Voltage		Rating		KVA	
Light Panel X	Mains:	200 Amp CB		Voltage	240V 1 phase	Rating	200 amps	#Ckt	
Notes:	Main and Lighting Panel are combined. 60 amp panel connects to Station Control Panel								
GENERATOR:	KW/KVA	15/16.2		Voltage	240V 1 phase	Rating	61 amps		
Diesel☐	Mnfr/Model		Kohler 15RYG			Age	2005		
NG X	Tank								
LP☐	Notes	Good Condition							
PUMP 1:	HP	3		Voltage	240V 1 phase	FLA	10. 2 amps		
Starter:	VFD☐					Disc Rating			
	FVNR X	ESTOP☐		Joint Control Panel					
	RVSS☐	LCS☐							
PUMP 2:	HP	3		Voltage	240V 1 phase	FLA	10. 2 amps		
Starter:	VFD☐					Disc Rating			
	FVNR X	ESTOP☐		Joint Control Panel					
	RVSS☐	LCS☐							

DEFICIENCIES/CODE ISSUES:

No code issues are visible, however the pump station may require ventilation to maintain non classification per NFPA 820 as the station is located partially underground.

City of Haverhill, MA

Wastewater Pump Station Inventory

Water Treatment	
Location: 131 Amesbury Road	
Coordinates:	
Elevation, ft (NAVD88):	
Distance from WPAF, miles	
General Pump Station Information:	
Year Constructed:	1977
Station Type:	Ejector Station
No. of Pumps:	2
Design Capacity, gpm:	75
Design TDH, ft:	90.5
Pump Speed, rpm:	N/A
Motor Hp:	N/A
Drive Type:	Constant
Pump Manufacturer/Model#:	Clow
Pump Inlet/Outlet Diameter	
Station Inlet Piping Size/Material	N/A
Force Main Discharge Size/Material	0" Unk
Clogging Issues (Y/N)	
Wetwell Size:	
Corrosion: (Y/N)	
Odor Issues: (Y/N)	
Grease Accumulation: (Y/N)	
Generator : (Y/N)	

Controls Information:	
Pump Controls	
Type: (PLC/RLL/MFG Control)	
Manufacturer:	
Model No.:	
Control Scenario:	
Pump Control Panel	
Enclosure: (Size/NEMA/Material)	
Condition:	
Location:	
Alarming	
Level Controls	
Type:	
Backup Level Controls:	

HVAC/Mechanical Information:	
Heating:	
Location:	
Make/Model/Age:	
Size, kW:	
Dehumidification (Y/N):	
Location:	
Make/Model/Age:	
Ventilation:	
Location:	
Make/Model/Age:	
Size, kW:	
NEMA Space Rating:	
Confined Space Entry: (Y/N)	

Additional Comments:

Instrumentation:

HVAC/Ventilation:

Building Structures:

Exterior Site Conditions:

Security Measures:

General:

Station to be demolished and replaced with a new submersible station, as part of the Water Treatment Plant Upgrades.

City of Haverhill, MA

Wastewater Pump Station Inventory

Whispering Creek	
Location: 39 Sarah J. Circle	
Coordinates:	42.79056901 -71.13267658
Elevation, ft (NAVD88):	148.5
Distance from WPAF, miles	4.1
General Pump Station Information:	
Year Constructed:	2001
Station Type:	Flooded Suction
No. of Pumps:	2
Design Capacity, gpm:	125
Design TDH, ft:	52
Pump Speed, rpm:	1760
Motor Hp:	7.5
Drive Type:	Constant
Pump Manufacturer/Model#:	Smith & Loveless/4B2A
Pump Inlet/Outlet Diameter	4"/4"
Station Inlet Piping Size/Material	8" PVC
Force Main Discharge Size/Material	Unk
Clogging Issues (Y/N)	N
Wetwell Size:	6' Dia. Manhole
Corrosion: (Y/N)	N
Odor Issues: (Y/N)	N
Grease Accumulation: (Y/N)	N
Generator : (Y/N)	Y

Controls Information:	
Pump Controls	
Type: (PLC/RLL/MFG Control)	MFG Control
Manufacturer:	Smith & Loveless
Model No.:	B08-8472-20
Control Scenario:	Alternating Lead/Lag Based on Level Setpoints
Pump Control Panel	
Enclosure: (Size/NEMA/Material)	NEMA 1
Condition:	
Location:	
Alarming	
Level Controls	Autodialer
Type:	Transducer
Backup Level Controls:	Floats

HVAC/Mechanical Information:	
Heating:	Unit Heater
Location:	Dry Pit
Make/Model/Age:	Lakewood/Model 792/AA
Size, kW:	1300-1500 watts
Dehumidification (Y/N):	Y
Location:	Dry Pit
Make/Model/Age:	GE 40 Pint
Ventilation:	Blower
Location:	Dry Pit
Make/Model/Age:	Dayton/1TDR7
Size, kW:	1/12 HP
NEMA Space Rating:	
Confined Space Entry: (Y/N)	

Additional Comments:

Instrumentation:

HVAC/Ventilation:

Building Structures:

Exterior Site Conditions:

Site pavement in good condition.

Security Measures:

Fence enclosure with padlocked gate and privacy screens and hedges.

General:

Small service area; similar to Morningside.

Float tree had corrodded in wet well and needed to be replaced, like at Millvale.

Some pest issues in generator. Transfer switch has an error light on.

HAVERHILL, MA PUMP STATION ELECTRICAL SURVEY

NAME:	Whispering Creek								
TYPE:	Submersible ☐			Dry-Pit X		Suction Lift ☐			
SERVICE:	OH ☐	UG X	XFMR:	Pole ☐	Pad X	KVA	75	Pole#	
Notes:									
METER:	Utility	National Grid		Voltage	480/277 3ph Y	Rating		#	86964254 (Per photo)
DISCONNECT:	CB ☐	DS X , Fused X		Voltage	480/277 3ph Y	Rating	200 amps, 100amp fuse?		
ATS :	Manfr.	ASCO		Voltage	480/277 3ph Y	Rating	100 amp	Poles	3
DISTRBTION:	Located in Pump Control Panel in the Dry Well.								Age
MCC ☐	Mains:			Voltage		Rating		Sections	2001
Dist Panel ☐	Mains:			Voltage		Rating		#Ckt	
Light Xfmr X				Voltage	480/240 1 phase	Rating	5	KVA	
Light Panel ☐	Mains:			Voltage		Rating		#Ckt	
Notes:									
GENERATOR:	KW/KVA	42.5/53.5		Voltage	480/277 3ph Y	Rating	80 amp Main Breaker		
Diesel ☐	Mnfr/Model		Olympian			Age	2001		
NG X	Tank								
LP ☐	Notes	Mice in generator							
PUMP 1:	HP	7.5		Voltage	460 3ph	FLA	9.6		
Starter:	VFD ☐					Disc Rating			
	FVNR X	ESTOP ☐							
	RVSS ☐	LCS ☐							
PUMP 2:	HP	7.5		Voltage	460 3ph	FLA	9.6		
Starter:	VFD ☐					Disc Rating			
	FVNR X	ESTOP ☐							
	RVSS ☐	LCS ☐							

DEFICIENCIES/CODE ISSUES:

Some conduits are broken due to contraction and expansion at the Dry Well Hatch. Mice in Generator.

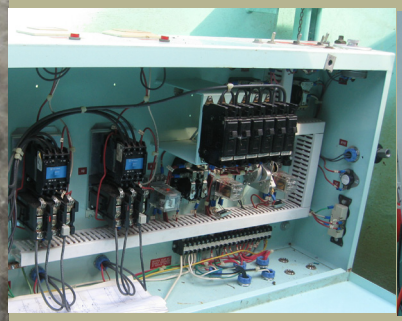
Good to fair condition. Station is a Priority 2 on the Town Priority List. If non classification is to be maintaing in dry pit, then vertilation is required per NFPA 820.

Appendix B

WRIGHT-PIERCE
Engineering a Better Environment

Wastewater Collection System SCADA Preliminary Design

REPORT



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City of Haverhill, MA
December 2011

TABLE OF CONTENTS

1. SUMMARY

The intent of this report is to summarize control system related information gathered during a survey of the City's wastewater pump stations and during discussions and meetings with City staff. The information has been used to develop a budget summary that the City can use for planning control system upgrades. The intended plan is to convert the wastewater stations from leased telephone lines to licensed frequency radio communications. Radio communications will allow continuous, reliable collection of data and alarms to a computer based Supervisory Control and Data Acquisition (SCADA) computer node located at the Wastewater Treatment Plant (WWTP). The SCADA node will provide several operational advantages over the City's existing system, including historical logging of data and alarms, accurate and reliable alarm notification, and remote access into the control system via internet connected devices such as computers, iPad, iPhone, and Droid phones.

The existing remote station control panels fall into three types:

- **Type 1 – Relay control panels**
  These older style panels utilize hard wired relay and timer based circuitry. To facilitate radio communications these stations would need to be upgraded to Allen-Bradley type 1100 or 1400 MicroLogix PLC controls with Allen-Bradley Operator Interface Terminals (OIT).
- **Type 2 – PLC based control panels**
  Although these panels utilize more contemporary Programmable Logic Controllers (PLC), they do not have the Ethernet connectivity required to interface with the Calamp radios recommended in the radio survey report. These sites would need to be retrofitted with Allen-Bradley type 1100 or 1400 PLC. The existing OITs could be retained.
- **Type 3 – No existing controls**
  The three water tank sites need to be utilized as radio repeater locations, and consequently they require the installation of PLC control panels. The radio master and associated SCADA computer will be located at the WWTP. The radio master equipment could be installed in an existing control room panel.

In order to facilitate reliable alarm handling and equipment status indication, all stations should be configured with standardized PLC and OIT programming code. Typical equipment status may include, but would not be limited to, pump run, pump HOA in auto, pump HOA in hand, ATS in normal, ATS in emergency, and generator run. Typical alarms may include, but would not be limited to, pump fault, high-high float level, surge suppressor fail, station flooding, generator fault, pump VFD fault, and loss of communication.

The City has indicated that remote control of equipment or process setpoints via radio communications is not required for any station at this time. However, expansion capacity will be included which will allow these features to be added at a later time.

The remote station alarm dialers and associated phone lines would be removed. All alarms will be communicated back to the WWTP via radio.

Submersible level transmitters with backup float controls would be installed at all pump stations. The new transmitters and floats would be protected (per code) by intrinsic barriers.

2. STATION LIST

2.1 TYPE 1: OLDER STYLE PROPRIETARY PANELS BASED ON HARD WIRED RELAY AND TIMER BASED CIRCUITRY

Station	Description	Comments
Coffin Avenue	Submersible	Small fenced in area little room for new panel; No generator; Low profile antenna is preferred because of residential neighbors.
Golden Hill	Ejector station	Located on Patricia Ann Drive; Underground electrical; No generator.
Pear Tree	Flooded suction	Located on Elliot Street; generator with transfer switch; Bubbler level system.
Russet Hill	Flooded suction	Generator with transfer switch; Bubbler level system.
North Avenue	Flooded suction	Generator to be installed in future; manual transfer switch existing.
Clydesdale	Vacuum prime	Generator with transfer switch.
Alvanos	Ejector station	No generator.
Srybny	Flooded suction	No generator; Bubbler system.
Hanover	Ejector station	Underground electrical; No generator.
Peoples Place	Flooded suction	No generator; Manual transfer switch for future generator; bubbler level system.
Carleton Street	Flooded suction	Generator with transfer switch; Bubbler level system.
Danielle Drive	Flooded suction	Generator with transfer switch; Bubbler level system.
Route 110	Flooded suction	Bubbler level system; Generator with transfer switch; Raco Chatterbox autodialer.
Ferry Road	Flooded suction	Generator with transfer switch; Bubbler level system.
Bradford Glen	Flooded suction	Located on Glen Meadow Lane; Bubbler level system; No generator.

Station	Description	Comments
Hyatt Avenue	Vacuum prime	Generator with transfer switch; One VFD used as a soft start.
Calewood	Flooded suction	No generator; Bubbler system with mercury switches; One VFD used as a soft start.

2.2 TYPE 2: PLC BASED PANELS WITH OIT

Station	Description	Comments
Millvale	Flooded suction	Located on Seven Sisters Road; Generator with transfer switch.
Newton Road	Flooded suction	Generator with transfer switch.
Tamarac Drive	Ejector station	Two VFDs; Generator with transfer switch.
Concordia	Flooded suction	Located on Spinnaker Circle; Generator with transfer switch
Rosemont	Concrete pad mounted outdoor enclosure	Generator with transfer switch; Two 2 VFDs used as soft starts.
Upper Hilldale	Concrete pad mounted outdoor enclosure	Generator with transfer switch; Two soft starts.
Fondi Road	Concrete pad mounted outdoor enclosure	Generator with transfer switch.
Morningside	Flooded suction	Generator with transfer switch.
Whispering Creek	Flooded suction	Located on Sarah J Circle; Generator with transfer switch.
Lake	Concrete pad mounted outdoor enclosure	Generator with transfer switch; Two VFDs.
Rosebud	Vacuum prime	Located on Ridgeland Heights Road; Generator with transfer switch.
Farrwood Drive	Flooded suction	Generator with transfer switch.
Hoyt Road	Concrete pad mounted outdoor enclosure	Generator with transfer switch; Phase converter (creates 3rd phase).
South Cross Road	Flooded suction	Generator with transfer switch.
Hales Landing	Concrete pad mounted outdoor enclosure	Located on Groveland Road; Generator with transfer switch.

2.3 TYPE 3: WATER TANK REPEATER SITES AND WASTEWATER TREATMENT PLANT

Station	Description	Comments
Ward Hill Tank	Repeater site	Install radio repeater panel inside vault
West Meadow Hill Tank	Repeater site	Install radio repeater panel inside vault
Gale Hill Tank	Repeater site	No power at site; No existing controls. Install radio repeater panel inside vault
WWTP	Radio master	Install master radio and PLC in existing panel in control room

The following sites are not included in this survey, but are included in the radio path study:

- 1035 Main Street
- South New Street

3. RADIO SURVEY REPORT

85 Lafayette Road - P.O. Box 5192 - Salisbury, MA 01952
Office: (978) 465-7932 | Fax: (978) 462-8980 | web: www.tcscommunications.com

November 22, 2011

Woodard & Curran Engineering
980 Washington Street
Suite 325N
Dedham, MA 02026
Attn: Gary Alders

Project: City of Haverhill Massachusetts, Wastewater Department

Scope: Wireless communications propagation study for SCADA

Dear Gary,

TCS Communications has completed the wireless communications evaluation requested by Woodard & Curran Engineering and the City of Haverhill, to evaluate the wastewater system infrastructure for the purpose of implementing SCADA communications from the Wastewater treatment plant to associated remote facilities.

Information provided in this report is intended to assist Woodard & Curran and the City of Haverhill in determining the feasibility, performance, equipment specifications, installation details, and budgetary cost to design and implement the appropriate wireless communication technology for the proposed SCADA network.

A total of 40 locations were evaluated as part of this study, including the wastewater treatment plant, 36 remote wastewater pumping stations, and 3 City water tanks at West Meadow Hill, Ward Hill and Gale Hill, which were considered as possible repeater stations for the network.

In preparing for this study, it was understood that some of the locations may vary as part of the future build out, that not all locations would necessarily be included in the SCADA communications network, and that there were 13 locations that were equipped with PLC's.

This was taken into consideration while performing the field test to verify that the radio equipment used to perform the field test was configured to emulate the proposed system as closely as practical, and would provide reliable wireless coverage throughout the entire service

area for the 13 locations identified in the “Phase 1” build out, in addition to any of the remaining stations that may be integrated to the SCADA communications network in the future.

Prior to performing the field test, information provided to TCS by Woodard and Curran and the City including GPS coordinates, City infrastructure availability, and a general overview of the site conditions enabled us to prepare a series of preliminary RF propagation maps, terrain path profiles, and USGS topographical maps; utilizing RF CAD wireless propagation and Delorme TOPO USA topographical software to predict the performance of the radio paths based on the various wireless communications technologies available for SCADA communications.

The primary objective was to identify the most appropriate wireless communications technology that would provide reliable wireless coverage to all locations.

Based on this, preliminary research consisted of evaluating the coverage area with RF CAD propagation analysis software and evaluating the availability of frequency spectrum allocated by the FCC for the purpose of wireless data communications, including SCADA. The frequency spectrum included in this research was on the VHF 150-174 MHz, VHF 217-220 MHz, UHF 450-470 MHz and unlicensed 902-928 MHz spread spectrum.

Results from the RF CAD study suggested that a wireless solution operating on the licensed VHF 217-220 MHz spectrum provided sufficient spectrum availability, and would achieve the desired performance results in consideration of the geographical size of the system coverage area, and the challenging / hilly topography that exists throughout the Haverhill area.

A spreadsheet is included with this report, which provides a summary of the signal strength measurements with the mobile antenna from each facility referenced to the wastewater plant and the 3 water tanks. The spreadsheet also provides a summary of the radio equipment, antennas, cables, etc., along with a brief description of the installation requirements.

Digital photographs for each facility are provided for location reference in section (6) of the electronic copy of the report on the USB flash drive.

Recommendations provided on the spreadsheet for the type of antenna, cable length, specific antenna mounting locations, approximate antenna elevation and type of mounting structure should be considered as a guideline and not necessarily the final design.

These references may be subject to change based on an engineering review at each facility to determine the most practical type of installation.

Test Equipment Utilized for the Study

- **Sitesafe RF CAD 2.3, Wireless Communications Propagation Software**

RF CAD software utilized to calculate the loss of each RF path and illustrate propagation coverage areas based on variables such as frequency of operation, transmitter output power, receiver sensitivity, antenna type & gain and elevation above sea level and above grade

These RF CAD maps provided a preliminary overview in evaluating the configuration options as required developing the wireless network that provided the highest degree of performance

- **Delorme Earthmate 12 Channel DGPS Receiver & Topo North America Map Software**

The GPS receiver provides a specific location reference to each site in the system, utilizing the US Government operated DGPS satellite network. Typical accuracy for the commercial GPS network is to within 2-5 meters. Topo software integrated with the GPS provides map location references and highly accurate elevation information, which was used in conjunction with RF CAD to prepare the propagation analysis

- **CalAmp Viper SC-200 licensed IP modem / router, operating on the 217-220 MHz band**

The Viper radio used for the field test includes several diagnostic tools that were used to measure RSSI (Received signal strength indication), data quality, antenna performance, and spectrum analysis. The Viper radio is recommended for the Haverhill system application

The mobile Viper was configured to “ping” the master Viper by sending diagnostics data packets and measuring responses from the West Meadow tank, Ward Hill tank, Gale Hill tank, and the Wastewater treatment plant

- **Hewlett Packard G4 mobile computer, Windows 7, operating the following software:**

- **Viper web utility and remote diagnostics software**
- **Sitesafe RFCAD v 2.3**
- **Delorme Topo North America**
- **Antennas:**

WWTP & Tanks: Comtelco BS220XL3-C 3.0db gain, 215-225 MHz fiberglass omnidirectional mounted on the City’s bucket truck, to an elevation of 60 feet above grade

Mobile Antenna: Antenna Specialist ASP-7455 3.0 dB gain omnidirectional mobile antenna on the roof of the vehicle at 7' AGL.

Yagi Antenna: Comtelco Y3323A-B 6.0db gain Yagi antenna 215-225 MHz

The Yagi antenna was used for testing when poor signal strength measurements were experienced with the mobile antenna

Test Procedure

Field Test Date:	October 5th, 6th, and 7th, 2011
Weather Conditions:	Sunny, 60-70°F
Foliage Conditions:	Early fall conditions, approximately 75% foliage remaining
Interference:	None detected on the test frequency during the field study
Test Frequency:	217.275 MHz

1- GPS coordinates

Verified accuracy of the GPS coordinates, site elevation, and structure elevations at each location with GPS receiver and TOPO USA software, making corrections as necessary

2- RF CAD Propagation analysis/preliminary engineering

Prior to performing the field test, preliminary engineering included preparing RF CAD propagation and Delorme topographical maps utilizing GPS coordinates.

RF CAD maps assisted in calculating the projected coverage considering the existing system infrastructure, and for reviewing alternative configurations that would achieve the desired results, comparing different frequency bands available for SCADA communications, including UHF (450-470 MHz), VHF (150-174 MHz) VHF (217-220 MHz) and 900 MHz spread spectrum /unlicensed technologies.

Upon completing the field study, a final version of the RF CAD map was prepared to illustrate the recommended configuration for the radio network. The final radio network configuration may deviate from the map based on the final construction design. Example: The MTU will be located at the wastewater treatment plant, and will utilize the 3 water tank sites for store and forward repeaters to the destination remotes. The recommended paths may change based on final RSSI measurements once the permanent antennas have been installed.

3- Field Study

- Configured (2) Viper SC-200 IP radio modems. One for mobile use, interfaced to the mobile computer to measure signal strength from the second unit at the WWTP/Tanks.
- Visited each remote location, recording GPS and noted site conditions
- Measured & documented average received signal strength relative to the WWTP and tank site(s) with measurements observed at various points around the property
- Site reviewed for installation requirements, performance results and concerns
- Digital photographs were taken for future reference

RF CAD & Site Survey References

RF CAD Propagation Maps:

The performance of typical wireless data communications equipment used for these types of systems require a minimum signal strength to provide reliable performance.

Signal strength is rated in "-dbm" or "decibels per meter" with an operating range of between –55dbm to –105dbm. Most manufacturers recommend that the network should be designed to allow for a "minimum fade margin" of at least 10db to compensate for typical conditions where radio signals fade, a 20db or greater fade margin is preferred for maintaining high reliability

The following RF CAD color chart is a description of predicted signal strength vs. results

COLOR	SIGNAL STRENGTH	RESULTS
RED	-50/-70dbm	Very Strong Signal, 30+db fade margin
ORANGE	-70/-80dbm	Strong Signal, 20 to 30db fade margin
YELLOW	-80/-90dbm	Good Signal, 10 to 20db fade margin
GREEN	-90/-100dbm	Fair to Marginal, 0 to 10db fade margin
BLUE	-100dbm +	Weak & Unreliable, high error rate
NO COLOR	No signal	No communications expected

Path Profiles:

Top	(Left) RSSI output, measured at transmitter
	(Right) RSSI level at destination receiver
Bottom	(Left) Elevation above ground elevation at remote site
	(Right) Elevation above ground for receiving site, typically the master or repeaters.

Site Survey / field test results:

Green:	Signal strength strong and very reliable, better than -80dbm
Yellow:	Signal strength strong and still reliable, better than -90dbm
Purple:	Signal fair, marginal performance, between -90dbm & -100dbm
Red:	Weak signal, unreliable performance, signal below -100dbm

Summary

- The radio system we are recommending would be based on an FCC licensed wireless technology, operating on the VHF 217-220 Megahertz frequency spectrum, and would be standardized around the CalAmp model Viper SC-200 IP modem / router

- An FCC license will be required for the proposed system

  It is recommended that the application requesting the appropriate frequency be prepared and submitted to an FCC certified frequency coordinator to verify availability and to secure the frequency prior to final system design and construction. Typically, it requires between 45 to 60 days to complete the licensing process

- The polling master for the system will be located at the wastewater treatment plant. The radio network will require the 3 water tank sites, which would be utilized as store and forward repeaters to provide coverage to the remote stations throughout the entire system area

- Field testing from the 3 tanks and the wastewater plant were based on temporarily installing the antenna on a bucket truck, to an elevation of 60 feet above grade. Omnidirectional antennas would be utilized at the WWTP and tanks, with various different mounting options that could be considered

- All 3 tanks are of concrete construction and are similar in size and elevation. The tanks do not have climbing ladders or permanent fixtures that could be used for installing antennas. No electrical power is currently available at the Gale Hill tank, which is required for the proposed radio network. Power is available at the Gale Hill vault (Water), which is approximately 510 linear feet down the hill from the Gale Hill tank. If solar power is a consideration for the Gale Hill tank, due to the continuous operation of a repeater radio, the solar power supply source should be sized accordingly to provide a continuous duty cycle power cycle rating of 1.5 amps current draw at 24VDC. The Viper radio operates at voltages from minimum 10VDC to maximum 30VDC

  The West Meadow Hill and Ward Hill tanks currently have omnidirectional antennas mounted on top of the tanks, using heavy duty tripod stands for the Water Department SCADA system. The existing tripod mounts are designed to accommodate only one antenna, and will not support installing the additional antenna that would be required for the Wastewater radio system

- Some options for consideration to install antennas at the tank sites include:

  - Installing a 60 foot tower, braced to the side of the tanks or guyed
  - Installing a 60 foot free standing tower next to the tank but not attached to the tank
  - Installing a 60 foot wooden utility pole next to the tank
  - Installing a 60 foot free standing aluminum pole or multi-antenna style monopole

- The City is currently reviewing various options to upgrade its existing citywide voice communications systems for the DPW, Water and Wastewater Departments, which also includes a requirement to comply with the FCC's narrow banding mandate for January 1st, 2013

- Discussions of these options included the probable necessity of installing the appropriate towers and/or poles as necessary at the tank sites to complete the coverage requirements for the voice communications networks. It may be appropriate to recommend that the departments consider combining resources to install the necessary structures at the tank sites to allow for sufficient tower space and equipment shelter to install multiple antennas and radio equipment

- The Viper radio to PLC communications interface may be configured in either an RS232 serial or Ethernet protocol. The Ethernet protocol is highly recommended by the manufacturer (CalAmp) for full utilization of the Viper functionality, to establish efficient primary and redundant routing paths with minimal airtime contention when implemented in a "multiple repeater" environment, which will be required for the Haverhill network

- Remote stations may utilize various types of antennas depending on the type of station, aesthetic and vandalism concerns, and RSSI performance measured from the site survey

  The antenna and installation would be determined by whether the facility is a building, which would qualify for the typical rigid conduit with weather head attached to the building with either a Yagi directional or unity gain fiberglass omnidirectional base antenna as dictated by signal strength and site conditions. The stations that measured with weaker signals or only had one available path would use the Yagi antenna

  If the facility is an outdoor NEMA RTU control cabinet or underground can, these types of stations could utilize a mobile style antenna mounted on top of the cabinet or on the Polyphaser lightning surge arrestor box. The ASPH7455 3db gain mobile antenna recommended for top-of-cabinet mounting is approximately 27" length on the 217-220 MHz frequency range. Use of the mobile style antennas at these stations is subject to the availability of sufficient signal strength for reliable results. Cable length and mount would vary depending on whether the PLC and radio are installed above ground in a cabinet, or below ground inside the base of the can

With any wireless communications system, it is not possible to provide a guarantee of 100% communications, for 100% of the time.

The potential for system interruptions can occur periodically affected by interference sources, including some of the following examples:

- **Future FCC authorized licensees, co-channel or adjacent channel**

- **New construction of obstacles and/or structures that may severely impact radio paths**

- **Significant growth of foliage in the radio paths**

- **Electrical generation, transformers, motors, or other interference sources**

The system design specifications are based on the manufacturer's recommendations for minimum fade margins, designed to provide a compensation for typical radio system performance variations, including changes in weather conditions, seasonal effects, (foliage conditions) and minor interference.

This concludes the report.

Sincerely;
Dean A. Marengi
Dean A. Marengi
Vice President

Haverhill Wastewater 220 MHz Radio Path Study

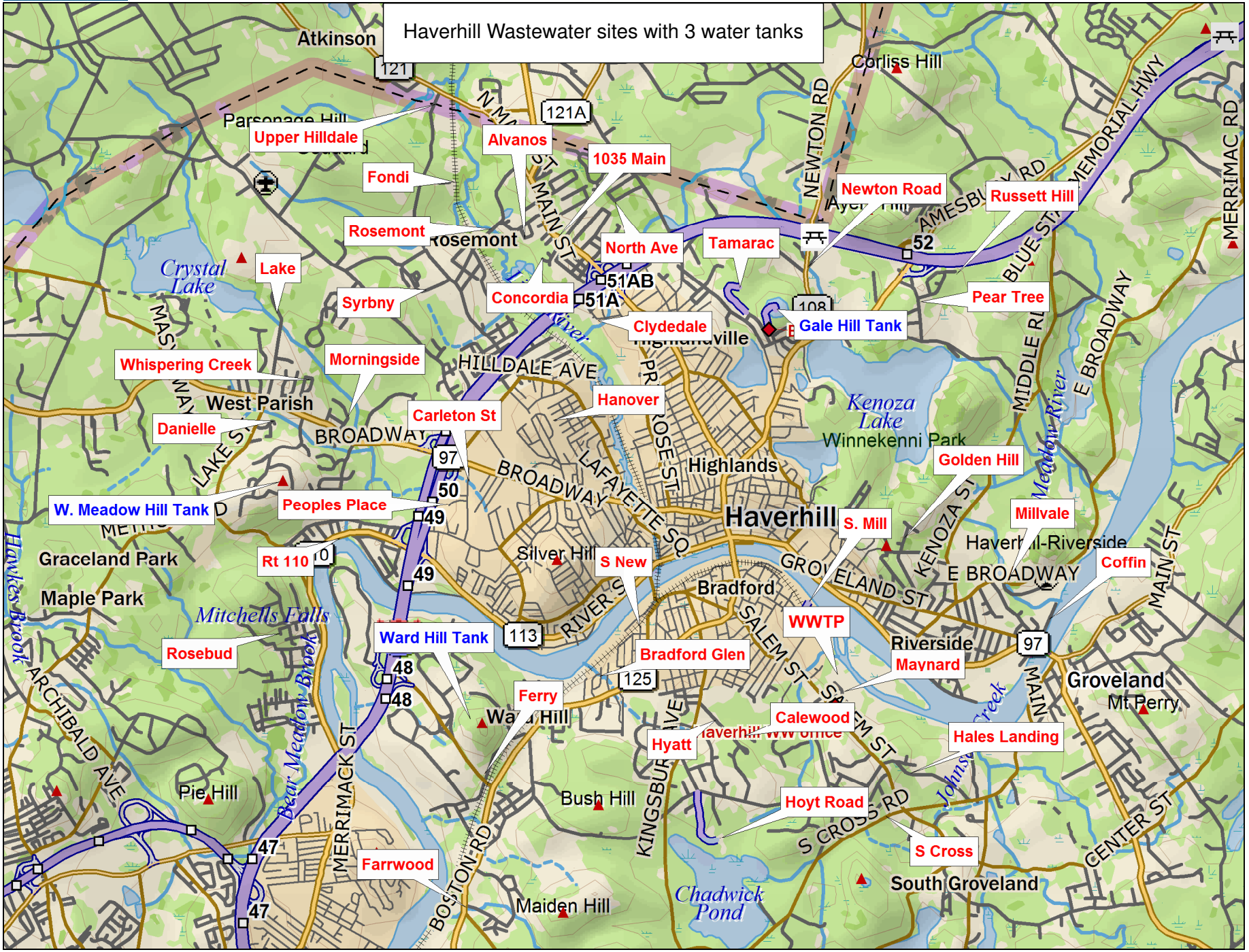
October 5-7 2011 Weather / Clear 60-70, Full Foliage

Site Name	Latitude	Longitude	AMSL'	Structure	Antenna	Ant. El	Cable	Length	WWTP RSSI -dbm	W.M RSSI -dbm	W.H RSSI -dbm	G.H. RSSI -dbm	Description / Comments / Suggested Installations
1035 Main St.	42-48-17	71-05-58	80	Cabinet	ASPH7455	10	K794	17	DNT	-81	-82	-73	Outdoor cabinet (may be relocated), mobile antenna acceptable, best to Gale Hill
Alvanos	42-48-16	71-06-15	54	Can	ASPH7455	10	K794	17	DNT	-79	-83	-80	Shallow can, mobile antenna on conduit mounted to back panel near red light, to West Meadow
Bradford Glen	42-45-41	71-05-39	28	Can	ASPH7455	10	K794	17	DNT	-81	-74	DNT	Deep can, mobile antenna on conduit to existing pole near red light, to Ward Hill
Calewood	42-45-20	71-04.29	125	Can	ASPH7455	10	K794	17	-82	-90	-91	-80	Deep can, mobile antenna on conduit attached post next to can, to Gale Hill
Carleton St.	42-46-50	71-06-42	105	Can	ASPH7455	10	K794	17	DNT	-67	-73	DNT	Deep can, mobile antenna on existing utility pole near red light, or install new pole, to West Meadow
Clydedale	42-47-47	71-05-39	43	Can	Y3323A-B	10	400	30	DNT	-86	-86	-86	Shallow can, Yagi antenna on conduit attached to cabinet, signal similar to all 3 tanks
Coffin Ave.	42-46-01	71-02-02	0	Submersable	Y3323A-B	10	400	30	-82	-99	-98	-89	Submersable, Yagi antenna on pole next to cabinet, or conduit attached to back panel, best to WWTP
Concordia	42-48-09	71-06-06	46	Can	ASPH7455	10	K794	17	DNT	-75	-87	-84	Deep can, mobile antenna attached to wooden back panel, best to West Meadow
Danielle Dr.	42-47-11	71-08-16	123	Can	ASPH7455	10	K794	17	DNT	-64	-91	DNT	Deep can, mobile antenna on conduit attached to the wooden post near red light, best to West Meadow
Farrwood Drive	42-44-19	71-06-43	48	Can	ASPH7455	10	K794	17	DNT	-84	-74	DNT	Deep can, mobile antenna on conduit attached to existing back panel, best to Ward Hill
Fondi Road	42-48-36	71-06-49	61	Cabinet	Y3323A-B	10	400	30	DNT	-99	-93	-79	Outdoor cabinet, Yagi antenna on conduit attached to the cabinet, best to Gale Hill
Ferry Rd.	42-45-06	71-06-34	98	Can	ASPH7455	10	K794	17	DNT	-80	-63	DNT	Deep can, mobile antenna on existing pole or back panel, best to Ward Hill
Golden Hill	42-46-30	71-03-12	124	Can	Y3323A-B	10	400	30	-86	-96	-98	-89	Shallow can, (No fence-residential area) Yagi antenna on pole or post, best to WWTP or Gale Hill
Hanover	42-47-12	71-06-01	124	Can	Y3323A-B	10	400	30	DNT	-81	-89	DNT	Shallow can, Yagi on conduit 5 feet above the peak of white building, best to West Meadow
Hyatt Ave	42-45-25	71-04-43	133	Can	ASPH7455	10	K794	17	-93	-77	-86	-83	Shallow can, mobile antenna on top of cabinet or post, best to West Meadow
Lake	42-47-50	71-08-14	156	Cabinet	ASPH7455	10	K794	17	DNT	-77	-80	DNT	Outdoor cabinet, mobile antenna on top of cabinet, best to West Meadow
Hales Landing	42-45-06	71-03-08	91	Cabinet	Y3323A-B	10	400	30	-84	-101	0	-88	Outdoor cabinet, Yagi antenna on conduit attached to side of cabinet, best to WWTP
Hoyt Road	42-44-43	71-04-41	115	Cabinet	Y3323A-B	15	400	30	-101	-100	-96	-89	Vacuum station, Yagi on conduit attached to cabinet, 15' elevation, best to Gale Hill
Maynard	42-45-36	71-03-40	22	Cabinet	None	None	None	None	DNT	DNT	DNT	DNT	Cabinet, located on the plant premises, on plant fiber connection? If radio, direct to plant, mobile antenna
Millvale	42-46-16	71-02-21	33	Can	Y3323A-B	10	400	30	-78	-97	-92	-88	Deep can, Yagi on conduit attached to cabinet, best to WWTP
Morningside	42-47-13	71-07-40	59	Can	ASPH7455	10	K794	17	DNT	-71	-72	DNT	Deep can, mobile antenna attached to back panel, equipment at base of can? Best to W Meadow
Newton Rd.	42-48-06	71-03-58	112	Can	ASPH7455	10	K794	17	DNT	-103	-97	-64	Deep can, mobile antenna attached to back panel, best to Gale Hill
North Ave.	42-48-29	71-05-31	78	Can	ASPH7455	10	K794	17	DNT	-80	-89	-81	Deep can, mobile antenna on top of existing cabinet next to can, best to West Meadow
Pear Tree	42-47-53	71-03-04	171	Can	ASPH7455	10	K794	17	DNT	-103	-102	-79	Deep can, mobile antenna attached to back panel, best to Gale Hill
Peoples Place	42-46-42	71-06-52	63	Can	ASPH7455	10	K794	17	DNT	-71	-73	DNT	Deep can, mobile antenna on conduit or post, best to West Meadow
Rosebud	42-45-56	71-08-13	125	Can	ASPH7455	10	K794	17	DNT	-80	-59	DNT	Shallow can, mobile antenna on conduit attached to back panel, best to Ward Hill
Rosemont	42-48-19	71-06-31	35	Cabinet	Y3323A-B	10	400	30	DNT	-88	-89	-82	Cabinet, Yai antenna on conduit attached to side of cabinet, best to Gale Hill
Rt.110	42-46-30	71-07-44	25	Can	ASPH7455	10	K794	17	DNT	-66	-60	DNT	Deep can, mobile antenna on conduit or post, best to Ward Hill
Russett Hill	42-48-03	71-02-46	156	Can	ASPH7455	10	K794	17	DNT	-98	-103	-78	Deep can, mobile antenna attached to back panel, best to Gale Hill
S. Mill Street	42-46-08	71-03-57	0	Building	Y3323A-B	40	400	75	DNT	-99	-102	DNT	Building, currently on 900 MHz radio to plant. If on new radio network, Yagi on conduit, direct to WWTP
S. New	42-45-58	71-05-19	44	Submersable	ASPH7455	10	K794	17	DNT	-95	-85	-73	Submersable, mobile antenna on conduit off back panel, best to Gale Hill
S. Cross Rd	42-44-51	71-03-21	82	Can	Y3323A-B	10	400	30	-85	0	0	-96	Deep can, Yagi on conduit attached to back panel, best to WWTP
Syrbny	42-47-58	71-07-02	110	Can	Y3323A-B	10	400	30	DNT	-86	-94	-79	Deep can, Yagi antenna on conduit attached to back side of wood shed, best to Gale Hill
Tamarac Drive	42-47-58	71-04-31	232	Can	ASPH7455	10	K794	17	DNT	-79	-88	-51	Shallow can, mobile antenna attached to back panel, best to Gale Hill
Upper Hilldale	42-49-04	71-06-57	61	Cabinet	Y3323A-B	10	400	30	DNT	-86	-88	-77	Cabinet, Yagi antenna on conduit attached to the side of cabinet, best to Gale Hill
WWTP / MTU	42-45-42	71-03-44	19	Building	BSL220XL3	60	400	75	MTU	-91	-93	-85	Building, 3db omni antenna 20 feet above the roof over the control room on tower or conduit, TBD
Whispering Creek	42-47-26	71-07-58	125	Can	ASPH7455	10	K794	17	DNT	-65	-72	DNT	Deep can, mobile antenna on conduit attached to back panel, best to West Meadow
Gale Hill Tank	42-47-51	71-04-13	297	Tank	BSL220XL3	60	600	100	DNT		-73	-	Tank, Install 60 foot tower or pole next to tank & vault, no electrical power
Ward Hill Tank	42-45-26	71-06-41	236	Tank	BSL220XL3	60	600	100	DNT		-	DNT	Tank, Install 60 foot tower or pole next to tank & vault
West Meadow Hill Tank	42-46-50	71-08-13	278	Tank	BSL220XL3	60	600	100	DNT	-		DNT	Tank, Install 60 foot tower or pole next to tank & vault

Phase 1 stations

Strong signal
Good signal
Fair signal
Poor signal

DNT = Did not test
Signal strength measurements referenced to mobile antenna at 7 feet AGL
WWTP = Wastewater treatment plant
W.M. = West Meadow Hill tank
W.H. = Ward Hill tank
G.H. = Gale Hill tank



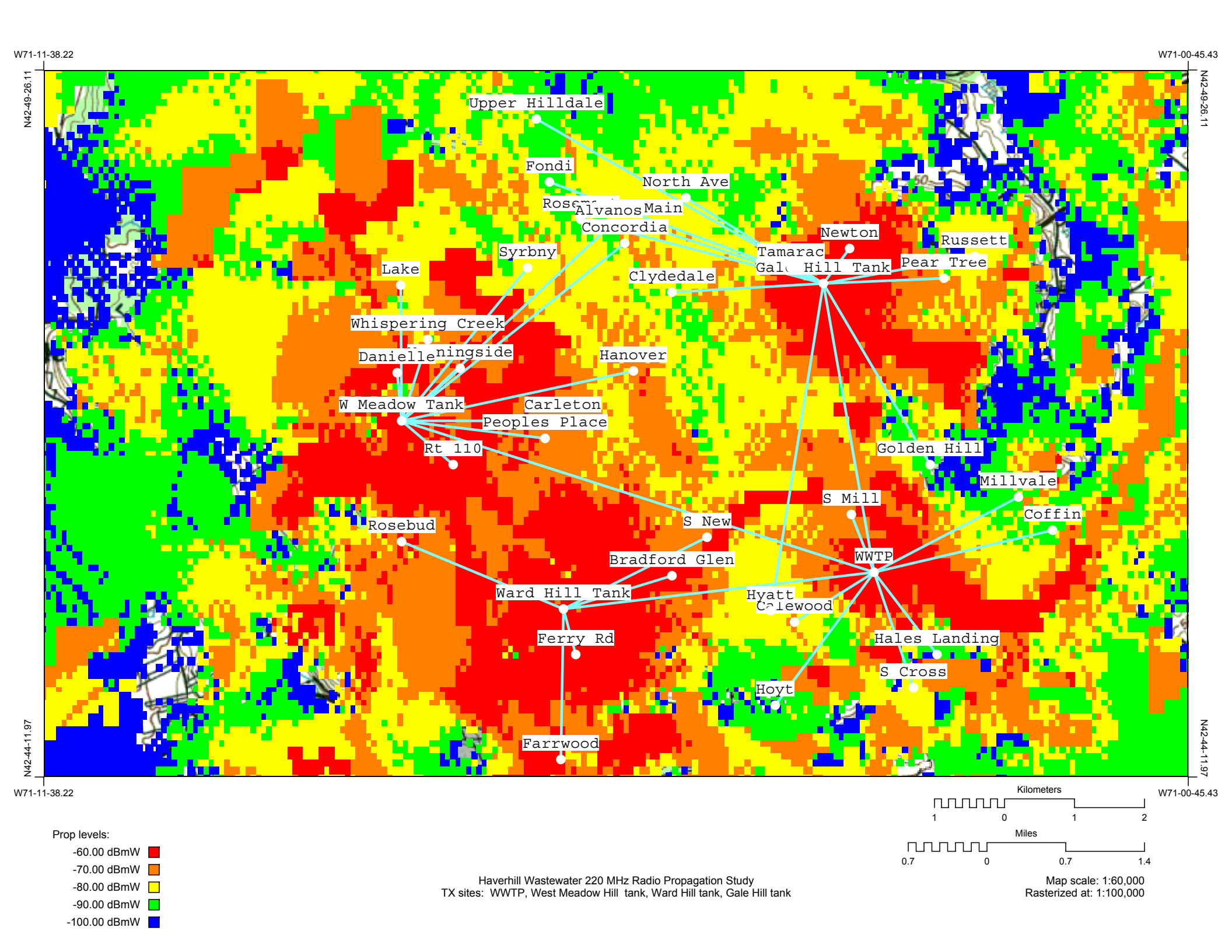
TN

MN (15.1°W)

Scale 1 : 56,250

1" = 4,687.5 ft

Data Zoom 11-0



Haverhill Wastewater 220 MHz Radio Propagation Study
TX sites: WWTP, West Meadow Hill tank, Ward Hill tank, Gale Hill tank

Map scale: 1:60,000
Rasterized at: 1:100,000

Viper SC ™

IP ROUTER FOR LICENSED SPECTRUM

136-174 MHZ | 215-240 MHZ | 406-512 MHZ | 928-960 MHZ

Versatile, Secure Communications with MultiSpeed Functionality

This robust communications link for VHF, UHF & MAS licensed networks features an internal web browser with a familiar interface for IT and network administrators to set up and view device information, configure network parameters and deploy unit upgrades from any location. Using a Software Defined Radio, Viper SC is programmable for 50, 25, 12.5, or 6.25 kHz channels.

Each Viper SC features single device store and forward and route redundancy for extended range and easy network expansion. With advanced diagnostic capabilities, over the air firmware upgrades, channel migration and RoHS compliance, you can bet your investment today is protected well into the future.

MultiSpeed operation allows each remote Viper SC to communicate to a Viper SC Base Station at the fastest speed supported by a given signal strength. MultiSpeed operation results in an adaptive network which is optimized for performance and reliability.

Experience *The Advantage*

- Up to 128 kbps at 50 kHz channel
- Easily configured in bridge or router mode
- Advanced security and encryption designed to meet FIPS 140-2 requirements
- 1-10 Watts continuous duty; software selectable
- 10-30 VDC wide range power supply

Viper SC Specifications

General

Frequency Range	136-174 MHz, 215-240 MHz, 406-512 MHz, 928-960 MHz
Channel Bandwidth	6.25 kHz (VHF/UHF only), 12.5 kHz, 25 kHz, 50 kHz
Modes of Operation	Simplex, Half-Duplex
Modulation	2FSK, 4FSK, 8FSK, 16FSK
Certifications	FCC, IC, UL

Receiver

VHF/UHF BER @ 1x10-6	
6.25 kHz	-115@4 kbps; -106@8 kbps; -100@12 kbps
12.5 kHz	-116@8 kbps; -109@16 kbps; -102@24 kbps; -95@32 kbps
25 kHz	-114@16 kbps; -106@32 kbps; -100@48 kbps; -92@64 kbps
50 kHz	-111@32 kbps; -104@64 kbps; -97@96 kbps; -88@128 kbps
MAS BER @ 1x10-6	
12.5 kHz	-112@8 kbps; -106@16 kbps; -99@24 kbps; -90@32 kbps
25 kHz	-111@16 kbps; -104@32 kbps; -97@48 kbps; -89@64 kbps
50 kHz	-108@32 kbps; -101@64 kbps; -94@96 kbps; -85@128 kbps
Adjacent Channel	45 dB@6.25 kHz (VHF/UHF only); 60 dB@12.5 kHz; 70 dB@25 kHz; 75 dB@50 kHz

Transmitter

Frequency Stability	1.0 ppm
Carrier Output Power	1-10 Watts (VHF/UHF), 1-8 Watts (MAS)
Duty Cycle	100% (Power Foldback for High Temps)
Output Impedance	50 Ω

Electrical

Tx Current	1.2-3.6A@10V; 0.6-1.8A@20V; 0.4-1.2A@30V
Rx Current	450mA@10V; 240mA@20V; 170mA@30V
Primary Power	10-30 VDC

Mechanical

Nominal Dimensions	5.50 W x 2.125 H x 4.25” D, (13.97 x 5.40 x 10.8 cm)
Shipping Weight	2.4 lbs, 1.1 kg

Environmental

Operating Temperature	-30° to +60° C
Operating Humidity	5% to 95% Non-condensing

Interfaces

Ethernet	10 BaseT Auto-MDIX RJ-45
Serial COM 1, COM 2	RS-232 DB-9
Antenna	TNC Female (Tx/Rx), SMA Female (Rx)-Dual port models only

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4. DESIGN MATRIX BUDGET SUMMARY

PRELIMINARY DESIGN COST ESTIMATE
HAVERHILL SCADA UPGRADES

PRELIMINARY DESIGN COST ESTIMATE	1 WASTEWATER TREATMENT PLANT	2 ROSEBUD	3 WHISPERING CREEK	4 FARRWOOD DRIVE	5 MORNINGSIDE	6 HOYT ROAD	7 MILLVALE	8 NEWTON ROAD	9 TAMARAC DRIVE	10 ROSEMONT	11 FONDI ROAD	12 UPPER HILLDALE	13 LAKE
Control Panels	$ 7,260	$ 4,989	$ 5,704	$ 4,989	$ 4,989	$ 5,082	$ 4,989	$ 4,989	$ 3,872	$ 5,192	$ 5,192	$ 5,192	$ 5,192
Radio Accessories (tower)	$ 825	$ 312	$ 312	$ 312	$ 312	$ 341	$ 341	$ 312	$ 312	$ 341	$ 341	$ 341	$ 312
Instrumentation	$ -	$ 1,870	$ 1,870	$ 1,870	$ 1,870	$ 1,870	$ 1,870	$ 1,870	$ 1,870	$ 1,870	$ 1,870	$ 1,870	$ 1,870
Computer & Software	$ 13,585	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Construction	$ 7,150	$ 4,125	$ 4,125	$ 4,125	$ 4,125	$ 4,125	$ 4,125	$ 4,125	$ 4,125	$ 4,125	$ 4,125	$ 4,125	$ 4,125
W&C Design, Bidding, Const.	$ 12,188	$ 1,188	$ 1,188	$ 1,188	$ 1,188	$ 1,188	$ 1,188	$ 1,188	$ 1,188	$ 1,188	$ 1,188	$ 1,188	$ 1,188
W&C Implementation	$ 1,838	$ 1,963	$ 1,963	$ 2,000	$ 1,963	$ 2,025	$ 2,000	$ 1,925	$ 2,025	$ 2,113	$ 2,113	$ 2,113	$ 2,113
W&C Startup	$ 3,000	$ 1,650	$ 1,650	$ 1,675	$ 1,650	$ 1,700	$ 1,675	$ 1,625	$ 1,700	$ 1,750	$ 1,750	$ 1,750	$ 1,750
W&C Total	$ 17,025	$ 4,800	$ 4,800	$ 4,863	$ 4,800	$ 4,913	$ 4,863	$ 4,738	$ 4,913	$ 5,050	$ 5,050	$ 5,050	$ 5,050
TOTAL	**$ 45,845**	**$ 16,096**	**$ 16,811**	**$ 16,158**	**$ 16,096**	**$ 16,331**	**$ 16,187**	**$ 16,033**	**$ 15,092**	**$ 16,578**	**$ 16,578**	**$ 16,578**	**$ 16,549**

PRELIMINARY DESIGN COST ESTIMATE
HAVERHILL SCADA UPGRADES

PRELIMINARY DESIGN COST ESTIMATE	PUMP STATIONS												
	14 HALES LANDING	15 ROUTE 110	16 ALVANOS	17 CALEWOOD	18 CARLETON STREET	19 CLYDEDALE	20 COFFIN AVE	21 CONCORDIA	22 DANIELLE DRIVE	23 FERRY ROAD	24 HANOVER	25 HYATT AVE	26 NORTH AVE
Control Panels	$ 5,192	$ 7,849	$ 7,739	$ 7,849	$ 7,849	$ 7,739	$ 7,739	$ 4,989	$ 7,849	$ 7,849	$ 7,739	$ 7,849	$ 7,849
Radio Accessories (tower)	$ 341	$ 312	$ 312	$ 312	$ 312	$ 341	$ 341	$ 312	$ 312	$ 312	$ 341	$ 312	$ 312
Instrumentation	$ 1,870	$ 1,870	$ 1,870	$ 1,870	$ 1,870	$ 1,870	$ 1,870	$ 1,870	$ 1,870	$ 1,870	$ 1,870	$ 1,870	$ 1,870
Computer & Software	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Construction	$ 4,125	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 4,125	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 8,800
W&C Design, Bidding, Const.	$ 1,188	$ 1,188	$ 1,188	$ 1,188	$ 1,188	$ 1,188	$ 1,188	$ 1,188	$ 1,188	$ 1,188	$ 1,188	$ 1,188	$ 1,188
W&C Implementation	$ 2,113	$ 1,963	$ 1,838	$ 1,838	$ 1,963	$ 1,963	$ 1,838	$ 1,963	$ 1,963	$ 1,963	$ 1,838	$ 2,000	$ 1,963
W&C Startup	$ 1,750	$ 1,650	$ 1,550	$ 1,550	$ 1,650	$ 1,650	$ 1,550	$ 1,650	$ 1,650	$ 1,650	$ 1,550	$ 1,675	$ 1,650
W&C Total	$ 5,050	$ 4,800	$ 4,575	$ 4,575	$ 4,800	$ 4,800	$ 4,575	$ 4,800	$ 4,800	$ 4,800	$ 4,575	$ 4,863	$ 4,800
TOTAL	**$ 16,578**	**$ 23,631**	**$ 23,296**	**$ 23,406**	**$ 23,631**	**$ 23,550**	**$ 23,325**	**$ 16,096**	**$ 23,631**	**$ 23,631**	**$ 23,325**	**$ 23,693**	**$ 23,631**

PRELIMINARY DESIGN COST ESTIMATE
HAVERHILL SCADA UPGRADES

PRELIMINARY DESIGN COST ESTIMATE	27 PEAR TREE	28 PEOPLES PLACE	29 RUSSET HILL	30 GOLDEN HILL	31 SOUTH CROSS ROAD	32 SRYBNY	33 BRADFORD GLEN	34 GALE HILL TANK (REPEATER)	35 WARD HILL TANK (REPEATER)	36 W. MEADOW HILL TANK (REPEATER)	SUBTOTAL 1
Control Panels	$ 7,849	$ 7,739	$ 7,849	$ 7,739	$ 4,879	$ 7,849	$ 7,849	$ 5,830	$ 5,830	$ 5,830	$ 232,942
Radio Accessories (tower)	$ 312	$ 312	$ 312	$ 341	$ 341	$ 341	$ 312	$ 6,380	$ 6,380	$ 6,380	$ 30,305
Instrumentation	$ 1,870	$ 1,870	$ 1,870	$ 1,870	$ 1,870	$ 1,870	$ 1,870	$ -	$ -	$ -	$ 59,840
Computer & Software	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 13,585
Construction	$ 8,800	$ 8,800	$ 8,800	$ 8,800	$ 4,125	$ 8,800	$ 8,800	$ 13,750	$ 13,750	$ 13,750	$ 259,875
W&C Design, Bidding, Const.	$ 1,188	$ 1,188	$ 1,188	$ 1,188	$ 1,188	$ 1,188	$ 1,188	$ 6,813	$ 1,813	$ 1,813	$ 60,625
W&C Implementation	$ 1,963	$ 1,963	$ 1,963	$ 1,838	$ 1,963	$ 1,838	$ 1,838	$ 1,313	$ 1,313	$ 1,313	$ 68,650
W&C Startup	$ 1,650	$ 1,650	$ 1,650	$ 1,550	$ 1,650	$ 1,550	$ 1,550	$ 1,125	$ 1,125	$ 1,125	$ 59,125
W&C Total	$ 4,800	$ 4,800	$ 4,800	$ 4,575	$ 4,800	$ 4,575	$ 4,575	$ 9,250	$ 4,250	$ 4,250	$ 188,400
TOTAL	**$ 23,631**	**$ 23,521**	**$ 23,631**	**$ 23,325**	**$ 16,015**	**$ 23,435**	**$ 23,406**	**$ 35,210**	**$ 30,210**	**$ 30,210**	**$ 784,947**

Appendix C

WRIGHT-PIERCE
Engineering a Better Environment

City of Haverhill, MA
PUMP STATION CAPITAL IMPROVEMENT PLAN
W-P PROJECT 13497A

ALVANOS DRIVE
Ejector Pump Station
Replace pump station with submersible; and connect to radio

ITEM	UNIT	QUAN.	UNIT PRICE	COST
PROCESS				
Pumps, pipe, valves	LS	1	$120,000.00	$120,000
CIVIL				
Wet well, excavation	LS	1	$125,000.00	$125,000
INSTRUMENTATION				
Instrumentation/Controls	LS	1	$30,000.00	$30,000
ELECTRIC				
General	LS	1	$30,000.00	$30,000
			Material Subtotal:	$305,000

			$305,000
General Contractor OH&P	15%	$	45,750
Bond and Insurance	1%	$	3,050
Engineering Design and Bidding Services	20%	$	61,000
Design Contingency	5%	$	15,250
Engineering Services During Construction and Resident Observation	30%	$	91,500
Construction Contingency	5%	$	15,250
Legal/Admin and Easements	2%	$	6,100
Material Testing	1%	$	3,050
Allowance, Traffic Control		$	5,000
Allowance Utility		$	5,000
	TOTAL:		$556,000

City of Haverhill, MA
PUMP STATION CAPITAL IMPROVEMENT PLAN
W-P PROJECT 13497A

BRADFORD GLENN
Flooded Suction Station
Relocate & replace controls; replace pumps & valves; add generator; and connect to radio

ITEM	UNIT	QUAN.	UNIT PRICE	COST
PROCESS				
Drywell structure/piping inspection & thickness testing	LS	1	$ 5,000	$ 5,000
Pumps, pipe, valves	LS	1	$ 80,000	$ 80,000
CIVIL				
Conduits, Pads & Cabinets	LS	1	$ 15,000	$ 15,000
Contingency - Full Replacement	LS	1	$ 150,000	$ 150,000
INSTRUMENTATION				
Instrumentation/Controls	LS	1	$ 30,000	$ 30,000
SAFETY				
Safety Improvements	LS	1	$ 2,000	$ 2,000
ELECTRIC				
General & Generator 35 kw	EA	1	$ 35,000	$ 35,000
Relocation topside	LS	1	$ 20,000	$ 20,000
			Material Subtotal:	$ 337,000

		$	337,000
General Contractor OH&P	15%	$	50,550
Bond and Insurance	1%	$	3,370
Engineering Design and Bidding Services	20%	$	67,400
Design Contingency	10%	$	33,700
Engineering Services During Construction and Resident Observation	30%	$	101,100
Construction Contingency	5%	$	16,850
Legal/Admin and Easements	2%	$	6,740
Material Testing	1%	$	3,370
Allowance, Traffic Control		$	-
Allowance Utility		$	-
	TOTAL:	$	620,000

City of Haverhill, MA
PUMP STATION CAPITAL IMPROVEMENT PLAN
W-P PROJECT 13497A

CALEWOOD DRIVE
Flooded Suction Station
Relocate & replace controls; replace pumps & valves; add generator; and connect to radio

ITEM	UNIT	QUAN.	UNIT PRICE	COST
PROCESS				
Drywell structure/piping inspection & thickness testing	LS	1	$ 5,000	$ 5,000
Pumps, pipe, valves	LS	1	$ 80,000	$ 80,000
CIVIL				
Conduits, Pads & Cabinets	LS	1	$ 15,000	$ 15,000
Contingency - Full Replacement	LS	1	$ 150,000	$ 150,000
INSTRUMENTATION				
Instrumentation/Controls	LS	1	$ 30,000	$ 30,000
SAFETY				
Safety Improvements	LS	1	$ 2,000	$ 2,000
ELECTRIC				
General & Generator 19 kw	EA	1	$ 25,000	$ 25,000
Relocation topside	LS	1	$ 20,000	$ 20,000
			Material Subtotal:	$ 327,000

		$327,000
General Contractor OH&P	15%	$49,050
Bond and Insurance	1%	$3,270
Engineering Design and Bidding Services	20%	$65,400
Design Contingency	10%	$32,700
Engineering Services During Construction and Resident Observation	30%	$98,100
Construction Contingency	5%	$16,350
Legal/Admin and Easements	2%	$6,540
Material Testing	1%	$3,270
Allowance, Traffic Control		$10,000
Allowance Utility		$10,000
TOTAL:		$622,000

City of Haverhill, MA
PUMP STATION CAPITAL IMPROVEMENT PLAN
W-P PROJECT 13497A

CARLETON STREET
Flooded Suction Station
Replace pump station with submersible; and connect to radio.

ITEM	UNIT	QUAN.	UNIT PRICE	COST
PROCESS				
Pumps, pipe, valves	LS	1	$ 150,000	$ 150,000
CIVIL				
Wet well/valve vault, excavation	EA	1	$ 100,000	$ 100,000
INSTRUMENTATION				
Instrumentation/Controls	LS	1	$ 30,000	$ 30,000
ELECTRIC				
Electric - General	LS	1	$ 30,000	$ 30,000
Electrical - Generator 33kw	EA	1	$ 40,000	$ 40,000
			Material Subtotal:	$ 350,000

		$	350,000
General Contractor OH&P	15%	$	52,500
Bond and Insurance	1%	$	3,500
Engineering Design and Bidding Services	20%	$	70,000
Design Contingency	10%	$	35,000
Engineering Services During Construction and Resident Observation	30%	$	105,000
Construction Contingency	5%	$	17,500
Legal/Admin and Easements	2%	$	7,000
Material Testing	1%	$	3,500
Allowance, Traffic Control		$	-
Allowance Utility		$	10,000
	TOTAL:	$	654,000

City of Haverhill, MA
PUMP STATION CAPITAL IMPROVEMENT PLAN
W-P PROJECT 13497A

CLYDEDALE AVENUE
Vacuum-Prime Pump Station
Retrofit station to submersible; new PLC controls; replace generator; and connect to radio.

ITEM	UNIT	QUAN.	UNIT PRICE	COST
PROCESS				
Pumps, pipe, valves	LS	1	$120,000.00	$120,000
CIVIL				
Wet well, excavation	LS	1	$90,000.00	$90,000
INSTRUMENTATION				
Instrumentation/Controls	LS	1	$30,000.00	$30,000
ELECTRIC				
General	LS	1	$30,000.00	$30,000
Electrical - Generator 35kw	EA	1	$50,000.00	$50,000
			Material Subtotal:	$320,000

			$320,000
General Contractor OH&P	15%	$	48,000
Bond and Insurance	1%	$	3,200
Engineering Design and Bidding Services	20%	$	64,000
Design Contingency	5%	$	16,000
Engineering Services During Construction and Resident Observation	30%	$	96,000
Construction Contingency	5%	$	16,000
Legal/Admin and Easements	2%	$	6,400
Material Testing	1%	$	3,200
Allowance, Traffic Control		$	-
Allowance Utility		$	10,000
	TOTAL:		$583,000

City of Haverhill, MA
PUMP STATION CAPITAL IMPROVEMENT PLAN
W-P PROJECT 13497A

COFFIN AVENUE
Submersible Pump Station
New Submersible Station; complete

ITEM	UNIT	QUAN.	UNIT PRICE	COST
PROCESS				
Pumps, pipe, valves	EA	1	$120,000.00	$120,000
CIVIL				
Wet well, Excavation	EA	1	$125,000.00	$125,000
INSTRUMENTATION				
Instrumentation/Controls	EA	1	$30,000.00	$30,000
ELECTRIC				
General	LS	1	$30,000.00	$30,000
Port. Generator Connect & Disconnect	EA	1	$15,000.00	$15,000
			Material Subtotal:	$320,000

			$320,000
General Contractor OH&P	15%	$	48,000
Bond and Insurance	1%	$	3,200
Engineering Design and Bidding Services	20%	$	64,000
Design Contingency	5%	$	16,000
Engineering Services During Construction and Resident Observation	30%	$	96,000
Construction Contingency	5%	$	16,000
Legal/Admin and Easements	2%	$	6,400
Material Testing	1%	$	3,200
Allowance, Traffic Control		$	-
Allowance Utility		$	-
	TOTAL:		$573,000

City of Haverhill, MA
PUMP STATION CAPITAL IMPROVEMENT PLAN
W-P PROJECT 13497A

CONCORDIA COURTS
Flooded Suction Station
Relocate & retrofit control panel; replace pumps, valves & generator; and connect to radio.

ITEM	UNIT	QUAN.	UNIT PRICE	COST
PROCESS				
PROCESS				
Drywell structure/piping inspection & thickness testing	LS	1	$ 5,000	$ 5,000
CIVIL				
Conduits, Pads and cabinet	LS	1	$ 15,000	$ 15,000
Contingency - Full Replacement	LS	1	$ 230,000	$ 230,000
INSTRUMENTATION				
Instrumentation/Controls	LS	1	$ 30,000	$ 30,000
SAFETY				
Safety improvements	LS	1	$ 1,000	$ 1,000
ELECTRIC				
General & Generator 35 kw	EA	1	$ 30,000	$ 30,000
Relocation topside	LS	1	$ 20,000	$ 20,000
			Material Subtotal:	$ 331,000

		$	331,000
General Contractor OH&P	15%	$	49,650
Bond and Insurance	1%	$	3,310
Engineering Design and Bidding Services	20%	$	66,200
Design Contingency	10%	$	33,100
Engineering Services During Construction and Resident Observation	30%	$	99,300
Construction Contingency	5%	$	16,550
Legal/Admin and Easements	2%	$	6,620
Material Testing	1%	$	3,310
Allowance, Traffic Control		$	-
Allowance Utility		$	10,000
	TOTAL:	$	619,000

City of Haverhill, MA
PUMP STATION CAPITAL IMPROVEMENT PLAN
W-P PROJECT 13497A

DANIELLE DRIVE
Flooded Suction Station
Relocate & replace controls; replace pumps, valves; add generator; and connect to radio.

ITEM	UNIT	QUAN.	UNIT PRICE	COST
PROCESS				
Drywell structure/piping inspection & thickness testing	LS	1	$ 5,000	$ 5,000
Pumps, pipe, valves	LS	1	$ 80,000	$ 80,000
CIVIL				
Conduits and Pads	LS	1	$ 15,000	$ 15,000
Contingency - Full Replacement	LS	1	$ 150,000	$ 150,000
INSTRUMENTATION				
Instrumentation/Controls	LS	1	$ 30,000	$ 30,000
SAFETY				
Safety Improvements	LS	1	$ 2,000	$ 2,000
ELECTRIC				
General & Generator 30 kw	EA	1	$ 35,000	$ 35,000
Relocation topside	LS	1	$ 20,000	$ 20,000
			Material Subtotal:	$ 337,000

		$	337,000
General Contractor OH&P	15%	$	50,550
Bond and Insurance	1%	$	3,370
Engineering Design and Bidding Services	20%	$	67,400
Design Contingency	10%	$	33,700
Engineering Services During Construction and Resident Observation	30%	$	101,100
Construction Contingency	5%	$	16,850
Legal/Admin and Easements	2%	$	6,740
Material Testing	1%	$	3,370
Allowance, Traffic Control		$	10,000
Allowance Utility		$	10,000
	TOTAL:	$	640,000

City of Haverhill, MA
PUMP STATION CAPITAL IMPROVEMENT PLAN
W-P PROJECT 13497A

FARRWOOD DRIVE
Flooded Suction Station
Relocate & retrofit control panel, connect to radio.

ITEM	UNIT	QUAN.	UNIT PRICE	COST
PROCESS				
Drywell structure/piping inspection & thickness testing	LS	1	$ 5,000	$ 5,000
CIVIL				
Conduits and Pads	LS	1	$ 15,000	$ 15,000
Contingency - Full Replacement	LS	1	$ 300,000	$ 300,000
INSTRUMENTATION				
Instrumentation/Controls	LS	1	$ 30,000	$ 30,000
SAFETY				
Safety Improvements	LS	1	$ 1,000	$ 1,000
ELECTRIC				
Relocation topside	LS	1	$ 20,000	$ 20,000
			Material Subtotal:	$ 366,000

		$ 366,000
General Contractor OH&P	15%	$ 54,900
Bond and Insurance	1%	$ 3,660
Engineering Design and Bidding Services	20%	$ 73,200
Design Contingency	10%	$ 36,600
Engineering Services During Construction and Resident Observation	30%	$ 109,800
Construction Contingency	5%	$ 18,300
Legal/Admin and Easements	2%	$ 7,320
Material Testing	1%	$ 3,660
Allowance, Traffic Control		$ 10,000
Allowance Utility		$ 10,000
TOTAL:		$ 693,000

City of Haverhill, MA
PUMP STATION CAPITAL IMPROVEMENT PLAN
W-P PROJECT 13497A

FERRY ROAD
Flooded Suction Station
Relocate & replace controls; replace pumps, valves & generator; and connect to radio.

ITEM	UNIT	QUAN.	UNIT PRICE	COST
PROCESS				
Drywell structure/piping inspection & thickness testing	LS	1	$ 5,000	$ 5,000
Pumps, pipe, valves	LS	1	$ 80,000	$ 80,000
CIVIL				
Conduits, Pads and cabinet	LS	1	$ 15,000	$ 15,000
Contingency - Full Replacement	LS	1	$ 150,000	$ 150,000
INSTRUMENTATION				
Instrumentation/Controls	LS	1	$ 30,000	$ 30,000
SAFETY				
Safety Improvements	LS	1	$ 2,000	$ 2,000
ELECTRIC				
General & Generator 9kw	EA	1	$ 20,000	$ 20,000
Relocation topside	LS	1	$ 20,000	$ 20,000
			Material Subtotal:	$ 322,000

		$	322,000
General Contractor OH&P	15%	$	48,300
Bond and Insurance	1%	$	3,220
Engineering Design and Bidding Services	20%	$	64,400
Design Contingency	10%	$	32,200
Engineering Services During Construction and Resident Observation	30%	$	96,600
Construction Contingency	5%	$	16,100
Legal/Admin and Easements	2%	$	6,440
Material Testing	1%	$	3,220
Allowance, Traffic Control		$	10,000
Allowance Utility		$	10,000
	TOTAL:	$	612,000

City of Haverhill, MA
PUMP STATION CAPITAL IMPROVEMENT PLAN
W-P PROJECT 13497A

FONDI ROAD
Submersible Pump Station
Retrofit control panel and connect to radio.

ITEM	UNIT	QUAN.	UNIT PRICE	COST
INSTRUMENTATION				
Instrumentation/Controls	LS	1	$ 20,000	$ 20,000
SAFETY				
Fall Protection	LS	1	$ 10,000	$ 10,000
ELECTRIC				
General	LS	1	$ 5,000	$ 5,000
			Material Subtotal:	$ 35,000

		$	35,000
General Contractor OH&P	15%	$	5,250
Bond and Insurance	1%	$	350
Engineering Design and Bidding Services	20%	$	7,000
Design Contingency	10%	$	3,500
Engineering Services During Construction and Resident Observation	30%	$	10,500
Construction Contingency	5%	$	1,750
Legal/Admin and Easements	2%	$	700
Material Testing	1%	$	350
Allowance, Traffic Control		$	10,000
Allowance Utility		$	10,000
	TOTAL:	$	84,000

City of Haverhill, MA
PUMP STATION CAPITAL IMPROVEMENT PLAN
W-P PROJECT 13497A

GOLDEN HILL
Ejector Pump Station
'Replace pump station with submersible; and connect to radio

ITEM	UNIT	QUAN.	UNIT PRICE	COST
PROCESS				
Pumps, pipe, valves	LS	1	$ 120,000	$ 120,000
CIVIL				
Wet well, excavation	LS	1	$ 125,000	$ 125,000
INSTRUMENTATION				
Instrumentation/Controls	LS	1	$ 30,000	$ 30,000
ELECTRIC				
Electric - General	LS	1	$ 30,000	$ 30,000
			Material Subtotal:	$ 305,000

			$305,000
General Contractor OH&P	15%	$	45,750
Bond and Insurance	1%	$	3,050
Engineering Design and Bidding Services	20%	$	61,000
Design Contingency	5%	$	15,250
Engineering Services During Construction and Resident Observation	30%	$	91,500
Construction Contingency	5%	$	15,250
Legal/Admin and Easements	2%	$	6,100
Material Testing	1%	$	3,050
Allowance, Traffic Control		$	5,000
Allowance Utility		$	5,000
	TOTAL:		$556,000

City of Haverhill, MA
PUMP STATION CAPITAL IMPROVEMENT PLAN
W-P PROJECT 13497A

Hales Landing
Submersible pump station
Retrofit control panel and connect to radio.

ITEM	UNIT	QUAN.	UNIT PRICE	COST
INSTRUMENTATION				
Instrumentation/Controls	LS	1	$ 20,000	$ 20,000
ELECTRIC				
General	LS	1	$ 5,000	$ 5,000
			Material Subtotal:	$ 25,000

		$	25,000
General Contractor OH&P	15%	$	3,750
Bond and Insurance	1%	$	250
Engineering Design and Bidding Services	20%	$	5,000
Design Contingency	10%	$	2,500
Engineering Services During Construction and Resident Observation	30%	$	7,500
Construction Contingency	5%	$	1,250
Legal/Admin and Easements	2%	$	500
Material Testing	1%	$	250
Allowance, Traffic Control		$	-
Allowance Utility		$	-
	TOTAL:	$	46,000

City of Haverhill, MA
PUMP STATION CAPITAL IMPROVEMENT PLAN
W-P PROJECT 13497A

HANOVER STREET
Ejector Pump Station
'Replace pump station with submersible; and connect to radio

ITEM	UNIT	QUAN.	UNIT PRICE	COST
PROCESS				
Pumps, pipe, valves	LS	1	$ 120,000	$ 120,000
CIVIL				
Wet well, excavation	LS	1	$ 125,000	$ 125,000
INSTRUMENTATION				
Instrumentation/Controls	LS	1	$ 30,000	$ 30,000
ELECTRIC				
Electric - General	LS	1	$ 30,000	$ 30,000
			Material Subtotal:	$ 305,000

			$305,000
General Contractor OH&P	15%	$	45,750
Bond and Insurance	1%	$	3,050
Engineering Design and Bidding Services	20%	$	61,000
Design Contingency	5%	$	15,250
Engineering Services During Construction and Resident Observation	30%	$	91,500
Construction Contingency	5%	$	15,250
Legal/Admin and Easements	2%	$	6,100
Material Testing	1%	$	3,050
Allowance, Traffic Control		$	-
Allowance Utility		$	10,000
	TOTAL:		$556,000

City of Haverhill, MA
PUMP STATION CAPITAL IMPROVEMENT PLAN
W-P PROJECT 13497A

HILLDALE AVENUE
Submersible pump station
Retrofit control panel and connect to radio.

ITEM	UNIT	QUAN.	UNIT PRICE	COST
INSTRUMENTATION				
Instrumentation/Controls	LS	1	$ 20,000	$ 20,000
ELECTRIC				
General	LS	1	$ 5,000	$ 5,000
			Material Subtotal:	$ 25,000

		$ 25,000
General Contractor OH&P	15%	$ 3,750
Bond and Insurance	1%	$ 250
Engineering Design and Bidding Services	20%	$ 5,000
Design Contingency	10%	$ 2,500
Engineering Services During Construction and Resident Observation	30%	$ 7,500
Construction Contingency	5%	$ 1,250
Legal/Admin and Easements	2%	$ 500
Material Testing	1%	$ 250
Allowance, Traffic Control		
Allowance Utility		$ 10,000
TOTAL:		$ 56,000

City of Haverhill, MA
PUMP STATION CAPITAL IMPROVEMENT PLAN
W-P PROJECT 13497A

HOYT ROAD
Vacuum-Prime Pump Station
Retrofit control panel and connect to radio.

ITEM	UNIT	QUAN.	UNIT PRICE	COST
CIVIL				
Contingency - Full Replacement	LS	1	$ 310,000.00	$ 310,000.00
INSTRUMENTATION				
Instrumentation/Controls	LS	1	$ 20,000	$ 20,000
			Material Subtotal:	$ 330,000

			$330,000
General Contractor OH&P	15%	$	49,500
Bond and Insurance	1%	$	3,300
Engineering Design and Bidding Services	20%	$	66,000
Design Contingency	5%	$	16,500
Engineering Services During Construction and Resident Observation	30%	$	99,000
Construction Contingency	5%	$	16,500
Legal/Admin and Easements	2%	$	6,600
Material Testing	1%	$	3,300
Allowance, Traffic Control		$	-
Allowance Utility		$	-
	TOTAL:		$591,000

City of Haverhill, MA
PUMP STATION CAPITAL IMPROVEMENT PLAN
W-P PROJECT 13497A

HYATT AVENUE
Vacuum-Prime Pump Station
Retrofit station to submersible; new PLC controls; replace generator; and connect to radio.

ITEM	UNIT	QUAN.	UNIT PRICE	COST
PROCESS				
Pumps, pipe, valves	LS	1	$ 120,000	$ 120,000
CIVIL				
Wet well, excavation	LS	1	$ 100,000	$ 100,000
INSTRUMENTATION				
Instrumentation/Controls	LS	1	$ 30,000	$ 30,000
ELECTRIC				
General	LS	1	$ 30,000	$ 30,000
Generator 42.5kw	EA	1	$ 50,000	$ 50,000
			Material Subtotal:	$ 330,000

			$330,000
General Contractor OH&P	15%	$	49,500
Bond and Insurance	1%	$	3,300
Engineering Design and Bidding Services	20%	$	66,000
Design Contingency	5%	$	16,500
Engineering Services During Construction and Resident Observation	30%	$	99,000
Construction Contingency	5%	$	16,500
Legal/Admin and Easements	3%	$	9,900
Material Testing	1%	$	3,300
Allowance, Traffic Control		$	-
Allowance Utility		$	10,000
	TOTAL:		$604,000

City of Haverhill, MA
PUMP STATION CAPITAL IMPROVEMENT PLAN
W-P PROJECT 13497A

LAKE STREET
Submersible pump station
Retrofit control panel and connect to radio.

ITEM	UNIT	QUAN.	UNIT PRICE	COST
INSTRUMENTATION				
Instrumentation/Controls	LS	1	$ 20,000	$ 20,000
SAFETY				
safety improvements	LS	1	$ 10,000	$ 10,000
ELECTRIC				
General,	LS	1	$ 5,000	$ 5,000
			Material Subtotal:	$ 35,000

		$ 35,000
General Contractor OH&P	15%	$ 5,250
Bond and Insurance	1%	$ 350
Engineering Design and Bidding Services	20%	$ 7,000
Design Contingency	10%	$ 3,500
Engineering Services During Construction and Resident Observation	30%	$ 10,500
Construction Contingency	5%	$ 1,750
Legal/Admin and Easements	2%	$ 700
Material Testing	1%	$ 350
Allowance, Traffic Control		$ 10,000
Allowance Utility		$ 10,000
	TOTAL:	$ 84,000

City of Haverhill, MA
PUMP STATION CAPITAL IMPROVEMENT PLAN
W-P PROJECT 13497A

MAIN STREET
Submersible pump station
No recommendations during planning period.

ITEM	UNIT	QUAN.	UNIT PRICE	COST
PROCESS				
			$ -	$ -
CIVIL				
			$ -	$ -
INSTRUMENTATION				
			$ -	$ -
SAFETY				
			$ -	$ -
ELECTRIC				
			$ -	$ -
			Material Subtotal:	$ -

		$ -
General Contractor OH&P	15%	$ -
Bond and Insurance	0%	$ -
Engineering Design and Bidding Services	20%	$ -
Design Contingency	5%	$ -
Engineering Services During Construction and Resident Observation	30%	$ -
Construction Contingency	5%	$ -
Legal/Admin and Easements	2%	$ -
Material Testing	1%	$ -
Allowance, Traffic Control		$ -
Allowance Utility		$ -
TOTAL:		$ -

City of Haverhill, MA
PUMP STATION CAPITAL IMPROVEMENT PLAN
W-P PROJECT 13497A

MAYNARD AVENUE
Submersible pump station
Retrofit control panel and connect to radio.

ITEM	UNIT	QUAN.	UNIT PRICE	COST
INSTRUMENTATION				
Instrumentation/Controls	LS	1	$ 19,000	$ 19,000
SAFETY				
Safety improvements	LS	1	$ 5,000	$ 5,000
ELECTRIC				
General	LS	1	$ 5,000	$ 5,000
			Material Subtotal:	$ 29,000

		$	29,000
General Contractor OH&P	15%	$	4,350
Bond and Insurance	1%	$	290
Engineering Design and Bidding Services	20%	$	5,800
Design Contingency	10%	$	2,900
Engineering Services During Construction and Resident Observation	30%	$	8,700
Construction Contingency	5%	$	1,450
Legal/Admin and Easements	2%	$	580
Material Testing	1%	$	290
Allowance, Traffic Control		$	-
Allowance Utility		$	-
	TOTAL:	$	53,000

City of Haverhill, MA
PUMP STATION CAPITAL IMPROVEMENT PLAN
W-P PROJECT 13497A

MILLVALE (SEVEN SISTERS)
Flooded Suction Station
Relocate & retrofit control panel; connect to radio.

ITEM	UNIT	QUAN.	UNIT PRICE	COST
PROCESS				
Drywell structure/piping inspection & thickness testing	LS	1	$ 5,000	$ 5,000
CIVIL				
Conduits, Pads, cabinet	LS	1	$ 15,000	$ 15,000
Contingency - Full Replacement	LS	1	$ 230,000	$ 230,000
INSTRUMENTATION				
Instrumentation/Controls	LS	1	$ 30,000	$ 30,000
SAFETY				
Safety Improvements	LS	1	$ 1,000	$ 1,000
ELECTRIC				
Relocation topside	LS	1	$ 20,000	$ 20,000
			Material Subtotal:	$ 296,000

		$	296,000
General Contractor OH&P	15%	$	44,400
Bond and Insurance	1%	$	2,960
Engineering Design and Bidding Services	20%	$	59,200
Design Contingency	10%	$	29,600
Engineering Services During Construction and Resident Observation	30%	$	88,800
Construction Contingency	5%	$	14,800
Legal/Admin and Easements	2%	$	5,920
Material Testing	1%	$	2,960
Allowance, Traffic Control		$	10,000
Allowance Utility		$	-
	TOTAL:	$	555,000

City of Haverhill, MA
PUMP STATION CAPITAL IMPROVEMENT PLAN
W-P PROJECT 13497A

MORNINGSIDE DRIVE
Flooded Suction Station
Relocate & retrofit control panel; connect to radio.

ITEM	UNIT	QUAN.	UNIT PRICE	COST
PROCESS				
Drywell structure/piping inspection & thickness testing	LS	1	$ 5,000	$ 5,000
CIVIL				
Conduits, Pads, cabinet	LS	1	$ 15,000.00	$ 15,000.00
Contingency - Full Replacement	LS	1	$ 230,000.00	$ 230,000.00
INSTRUMENTATION				
Instrumentation/Controls	LS	1	$ 18,000.00	$ 18,000.00
SAFETY				
Safety Improvements	LS	1	$ 1,000.00	$ 1,000.00
ELECTRIC				
General,	LS	1	$ 15,000.00	$ 15,000.00
Relocation topside	LS	1	$ 20,000.00	$ 20,000.00
			Material Subtotal:	$ 299,000.00

		$ 299,000
General Contractor OH&P	15%	$ 44,850
Bond and Insurance	1%	$ 2,990
Engineering Design and Bidding Services	20%	$ 59,800
Design Contingency	10%	$ 29,900
Engineering Services During Construction and Resident Observation	30%	$ 89,700
Construction Contingency	5%	$ 14,950
Legal/Admin and Easements	2%	$ 5,980
Material Testing	1%	$ 2,990
Allowance, Traffic Control		$ 10,000
Allowance Utility		$ 10,000
	TOTAL:	$ 570,000

City of Haverhill, MA
PUMP STATION CAPITAL IMPROVEMENT PLAN
W-P PROJECT 13497A

NEWTON ROAD
Flooded Suction Station
Relocate & retrofit control panel; connect to radio.

ITEM	UNIT	QUAN.	UNIT PRICE	COST
PROCESS				
Drywell structure/piping inspection & thickness testing	LS	1	$ 5,000	$ 5,000
CIVIL				
Conduits and Pads	LS	1	$ 15,000	$ 15,000
Contingency - Full Replacement	LS	1	$ 300,000	$ 300,000
INSTRUMENTATION				
Instrumentation/Controls	LS	1	$ 20,000	$ 20,000
SAFETY				
Safety Improvements	LS	1	$ 1,000	$ 1,000
ELECTRIC				
General,	LS	1	$ 15,000	$ 15,000
Relocation topside	LS	1	$ 20,000	$ 20,000
			Material Subtotal:	$ 371,000

		$	371,000
General Contractor OH&P	15%	$	55,650
Bond and Insurance	1%	$	3,710
Engineering Design and Bidding Services	20%	$	74,200
Design Contingency	10%	$	37,100
Engineering Services During Construction and Resident Observation	30%	$	111,300
Construction Contingency	5%	$	18,550
Legal/Admin and Easements	2%	$	7,420
Material Testing	1%	$	3,710
Allowance, Traffic Control		$	10,000
Allowance Utility		$	10,000
	TOTAL:	$	703,000

City of Haverhill, MA
PUMP STATION CAPITAL IMPROVEMENT PLAN
W-P PROJECT 13497A

North Avenue
Flooded Suction Station
Replace pump station with submersible; and connect to radio.

ITEM	UNIT	QUAN.	UNIT PRICE	COST
PROCESS				
Pumps, pipe, valves	EA	1	$ 150,000	$ 150,000
CIVIL				
Wet well/Valve vault, excavation	EA	1	$ 100,000	$ 100,000
INSTRUMENTATION				
Instrumentation/Controls	EA	1	$ 30,000	$ 30,000
ELECTRIC				
Electric - General	LS	1	$ 30,000	$ 30,000
Electrical - Generator 35kw	EA	1	$ 50,000	$ 50,000
			Material Subtotal:	$ 360,000

			$360,000
General Contractor OH&P	15%	$	54,000
Bond and Insurance	1%	$	3,600
Engineering Design and Bidding Services	20%	$	72,000
Design Contingency	5%	$	18,000
Engineering Services During Construction and Resident Observation	30%	$	108,000
Construction Contingency	5%	$	18,000
Legal/Admin and Easements	2%	$	7,200
Material Testing	1%	$	3,600
Allowance, Traffic Control		$	-
Allowance Utility		$	10,000
	TOTAL:		$654,000

City of Haverhill, MA
PUMP STATION CAPITAL IMPROVEMENT PLAN
W-P PROJECT 13497A

PEAR TREE
Flooded Suction Station
Relocate & replace controls; connect to radio

ITEM	UNIT	QUAN.	UNIT PRICE	COST
PROCESS				
Drywell structure/piping inspection & thickness testing	LS	1	$ 5,000	$ 5,000
CIVIL				
Conduits, Pads and cabinets	LS	1	$ 15,000	$ 15,000
Contingency - Full Replacement	LS	1	$ 220,000	$ 220,000
INSTRUMENTATION				
Instrumentation/Controls	LS	1	$ 30,000	$ 30,000
SAFETY				
Safety Improvements	LS	1	$ 1,000	$ 1,000
ELECTRIC				
General,	LS	1	$ 10,000	$ 10,000
Relocation topside	LS	1	$ 20,000	$ 20,000
			Material Subtotal:	$ 301,000

		$	301,000
General Contractor OH&P	15%	$	45,150
Bond and Insurance	1%	$	3,010
Engineering Design and Bidding Services	20%	$	60,200
Design Contingency	10%	$	30,100
Engineering Services During Construction and Resident Observation	30%	$	90,300
Construction Contingency	5%	$	15,050
Legal/Admin and Easements	2%	$	6,020
Material Testing	1%	$	3,010
Allowance, Traffic Control		$	10,000
Allowance Utility		$	10,000
	TOTAL:	$	574,000

City of Haverhill, MA
PUMP STATION CAPITAL IMPROVEMENT PLAN
W-P PROJECT 13497A

PEOPLES PLACE
Flooded Suction Station
Relocate & replace controls; replace pumps & valves; add generator; and connect to radio

ITEM	UNIT	QUAN.	UNIT PRICE	COST
PROCESS				
Drywell structure/piping inspection & thickness testing	LS	1	$ 5,000	$ 5,000
Pumps, pipe, valves	LS	1	$ 80,000	$ 80,000
CIVIL				
Conduits, Pads, cabinet	LS	1	$ 15,000	$ 15,000
Contingency - Full Replacement	LS	1	$ 150,000	$ 150,000
INSTRUMENTATION				
Instrumentation/Controls	LS	1	$ 30,000	$ 30,000
SAFETY				
Safety Improvements	LS	1	$ 2,000	$ 2,000
ELECTRIC				
General, generator 35kw	EA	1	$ 40,000	$ 40,000
Relocation topside	LS	1	$ 20,000	$ 20,000
			Material Subtotal:	$ 337,000

		$	337,000
General Contractor OH&P	15%	$	50,550
Bond and Insurance	1%	$	3,370
Engineering Design and Bidding Services	20%	$	67,400
Design Contingency	10%	$	33,700
Engineering Services During Construction and Resident Observation	30%	$	101,100
Construction Contingency	5%	$	16,850
Legal/Admin and Easements	2%	$	6,740
Material Testing	1%	$	3,370
Allowance, Traffic Control		$	5,000
Allowance Utility		$	10,000
	TOTAL:	$	635,000

City of Haverhill, MA
PUMP STATION CAPITAL IMPROVEMENT PLAN
W-P PROJECT 13497A

ROSEBUD / RIDGELAND HEIGHTS
Vacuum-Prime Pump Station
Retrofit station to submersible; new PLC controls; replace generator; and connect to radio.

ITEM	UNIT	QUAN.	UNIT PRICE	COST
PROCESS				
Pumps, pipe, valves	LS	1	$ 120,000	$ 120,000
CIVIL				
Wet well, excavation	LS	1	$ 100,000	$ 100,000
INSTRUMENTATION				
Instrumentation/Controls	LS	1	$ 30,000	$ 30,000
ELECTRIC				
Electric - General	LS	1	$ 30,000	$ 30,000
Electrical - Generator	EA	1	$ 50,000	$ 50,000
			Material Subtotal:	$ 330,000

			$330,000
General Contractor OH&P	15%	$	49,500
Bond and Insurance	1%	$	3,300
Engineering Design and Bidding Services	20%	$	66,000
Design Contingency	5%	$	16,500
Engineering Services During Construction and Resident Observation	30%	$	99,000
Construction Contingency	5%	$	16,500
Legal/Admin and Easements	2%	$	6,600
Material Testing	1%	$	3,300
Allowance, Traffic Control		$	-
Allowance Utility		$	10,000
	TOTAL:		$601,000

City of Haverhill, MA
PUMP STATION CAPITAL IMPROVEMENT PLAN
W-P PROJECT 13497A

ROSEMONT STREET
Submersible pump station
Retrofit control panel and connect to radio.

ITEM	UNIT	QUAN.	UNIT PRICE	COST
PROCESS				
Pumps, pipe, valves	LS	0	$ -	$ -
CIVIL				
safety	LS	0	$ -	$ -
INSTRUMENTATION				
Instrumentation/Controls	LS	1	$ 20,000	$ 20,000
SAFETY				
Safety improvements	LS	1	$ 10,000	$ 10,000
ELECTRIC				
General,	LS	1	$ 5,000	$ 5,000
			Material Subtotal:	$ 35,000

		$	35,000
General Contractor OH&P	15%	$	5,250
Bond and Insurance	1%	$	350
Engineering Design and Bidding Services	20%	$	7,000
Design Contingency	10%	$	3,500
Engineering Services During Construction and Resident Observation	30%	$	10,500
Construction Contingency	5%	$	1,750
Legal/Admin and Easements	2%	$	700
Material Testing	1%	$	350
Allowance, Traffic Control		$	-
Allowance Utility		$	-
	TOTAL:	$	64,000

City of Haverhill, MA
PUMP STATION CAPITAL IMPROVEMENT PLAN
W-P PROJECT 13497A

ROUTE 110
Flooded Suction Station
Relocate & replace controls; replace pumps, valves, and generator; and connect to radio

ITEM	UNIT	QUAN.	UNIT PRICE	COST
PROCESS				
Drywell structure/piping inspection & thickness testing	LS	1	$ 5,000	$ 5,000
Pumps, pipe, valves	LS	1	$ 140,000	$ 140,000
CIVIL				
Conduits, Pads, cabinet	LS	1	$ 15,000	$ 15,000
Contingency - Full Replacement	LS	1	$ 100,000	$ 100,000
INSTRUMENTATION				
Instrumentation/Controls	LS	1	$ 30,000	$ 30,000
SAFETY				
Safety Improvements	LS	1	$ 1,000	$ 1,000
ELECTRIC				
General, generator 30kw	EA	1	$ 40,000	$ 40,000
Relocation topside	LS	1	$ 20,000	$ 20,000
			Material Subtotal:	$ 346,000

		$	346,000
General Contractor OH&P	15%	$	51,900
Bond and Insurance	1%	$	3,460
Engineering Design and Bidding Services	20%	$	69,200
Design Contingency	10%	$	34,600
Engineering Services During Construction and Resident Observation	30%	$	103,800
Construction Contingency	5%	$	17,300
Legal/Admin and Easements	2%	$	6,920
Material Testing	1%	$	3,460
Allowance, Traffic Control		$	10,000
Allowance Utility		$	10,000
	TOTAL:	$	657,000

City of Haverhill, MA
PUMP STATION CAPITAL IMPROVEMENT PLAN
W-P PROJECT 13497A

RUSSETT HILL
Flooded Suction Station
Relocate & replace controls; connect to radio

ITEM	UNIT	QUAN.	UNIT PRICE	COST
PROCESS				
Drywell structure/piping inspection & thickness testing	LS	1	$ 5,000	$ 5,000
CIVIL				
Conduits and Pads	LS	1	$ 15,000	$ 15,000
Contingency - Full Replacement	LS	1	$ 230,000	$ 230,000
INSTRUMENTATION				
Instrumentation/Controls	LS	1	$ 30,000	$ 30,000
SAFETY				
Safety Improvements	LS	1	$ 1,000	$ 1,000
ELECTRIC				
General	LS	1	$ 10,000	$ 10,000
Relocation topside	LS	1	$ 20,000	$ 20,000
			Material Subtotal:	$ 306,000

		$	306,000
General Contractor OH&P	15%	$	45,900
Bond and Insurance	1%	$	3,060
Engineering Design and Bidding Services	20%	$	61,200
Design Contingency	10%	$	30,600
Engineering Services During Construction and Resident Observation	30%	$	91,800
Construction Contingency	5%	$	15,300
Legal/Admin and Easements	3%	$	9,180
Material Testing	1%	$	3,060
Allowance, Traffic Control		$	5,000
Allowance Utility		$	10,000
	TOTAL:	$	581,000

City of Haverhill, MA
PUMP STATION CAPITAL IMPROVEMENT PLAN
W-P PROJECT 13497A

SOUTH CROSS ROAD
Flooded Suction Station
Relocate & retrofit control panel; connect to radio.

ITEM	UNIT	QUAN.	UNIT PRICE	COST
PROCESS				
Drywell structure/piping inspection & thickness testing	LS	1	$ 5,000	$ 5,000
CIVIL				
Conduits , Pads and cabinet	LS	1	$ 15,000	$ 15,000
Contingency - Full Replacement	LS	1	$ 230,000	$ 230,000
INSTRUMENTATION				
Instrumentation/Controls	LS	1	$ 30,000	$ 30,000
SAFETY				
Safety Improvements	LS	1	$ 1,000	$ 1,000
ELECTRIC				
General,	LS	1	$ 10,000	$ 10,000
Relocation topside	LS	1	$ 20,000	$ 20,000
			Material Subtotal:	$ 306,000

		$	306,000
General Contractor OH&P	15%	$	45,900
Bond and Insurance	1%	$	3,060
Engineering Design and Bidding Services	20%	$	61,200
Design Contingency	10%	$	30,600
Engineering Services During Construction and Resident Observation	30%	$	91,800
Construction Contingency	5%	$	15,300
Legal/Admin and Easements	2%	$	6,120
Material Testing	1%	$	3,060
Allowance, Traffic Control		$	10,000
Allowance Utility		$	10,000
	TOTAL:	$	583,000

City of Haverhill, MA
PUMP STATION CAPITAL IMPROVEMENT PLAN
W-P PROJECT 13497A

SOUTH NEW STREET - TO BE REPLACED IN 2016
Submersible pump station
Retrofit control panel and connect to radio.

ITEM	UNIT	QUAN.	UNIT PRICE	COST
INSTRUMENTATION				
Instrumentation/Controls	LS	1	$ 20,000	$ 20,000
			Material Subtotal:	$ 20,000

		$	20,000
General Contractor OH&P	15%	$	3,000
Bond and Insurance	1%	$	200
Engineering Design and Bidding Services	20%	$	4,000
Design Contingency	10%	$	2,000
Engineering Services During Construction and Resident Observation	30%	$	6,000
Construction Contingency	5%	$	1,000
Legal/Admin and Easements	2%	$	400
Material Testing	1%	$	200
Allowance, Traffic Control		$	-
Allowance Utility		$	-
	TOTAL:	$	37,000

City of Haverhill, MA
PUMP STATION CAPITAL IMPROVEMENT PLAN
W-P PROJECT 13497A

SRYBNY AVENUE
Flooded Suction Station
Relocate & replace controls; replace pumps, valves; add generator; and connect to radio

ITEM	UNIT	QUAN.	UNIT PRICE	COST
PROCESS				
Drywell structure/piping inspection & thickness testing	LS	1	$ 5,000	$ 5,000
Pumps, pipe, valves	LS	1	$ 120,000	$ 120,000
CIVIL				
Conduits , Pads and cabinets	LS	1	$ 15,000	$ 15,000
Contingency - Full Replacement	LS	1	$ 100,000	$ 100,000
INSTRUMENTATION				
Instrumentation/Controls	LS	1	$ 30,000	$ 30,000
SAFETY				
Safety Improvements	LS	1	$ 2,000	$ 2,000
ELECTRIC				
General, generator 50kw	EA	1	$ 75,000	$ 75,000
Relocation topside	LS	1	$ 20,000	$ 20,000
			Material Subtotal:	$ 362,000

		$	362,000
General Contractor OH&P	15%	$	54,300
Bond and Insurance	1%	$	3,620
Engineering Design and Bidding Services	20%	$	72,400
Design Contingency	10%	$	36,200
Engineering Services During Construction and Resident Observation	30%	$	108,600
Construction Contingency	5%	$	18,100
Legal/Admin and Easements	2%	$	7,240
Material Testing	1%	$	3,620
Allowance, Traffic Control		$	5,000
Allowance Utility		$	10,000
	TOTAL:	$	681,000

City of Haverhill, MA
PUMP STATION CAPITAL IMPROVEMENT PLAN
W-P PROJECT 13497A

TAMARAC DRIVE
Vacuum-Prime Pump Station
Relocate & retrofit controls; connect to radio.

ITEM	UNIT	QUAN.	UNIT PRICE	COST
CIVIL				
Conduits, Pads & Cabinets	LS	1	$ 15,000	$ 15,000
Contingency - Full Replacement	LS	1	$ 274,000.00	$ 274,000.00
INSTRUMENTATION				
Instrumentation/Controls	LS	1	$ 20,000	$ 20,000
SAFETY				
Safety improvements , Ventilation	LS	1	$ 1,000	$ 1,000
ELECTRIC				
Relocation topside	LS	1	$ 20,000	$ 20,000
			Material Subtotal:	$ 330,000

			$330,000
General Contractor OH&P	15%	$	49,500
Bond and Insurance	1%	$	3,300
Engineering Design and Bidding Services	20%	$	66,000
Design Contingency	5%	$	16,500
Engineering Services During Construction and Resident Observation	30%	$	99,000
Construction Contingency	5%	$	16,500
Legal/Admin and Easements	2%	$	6,600
Material Testing	1%	$	3,300
Allowance, Traffic Control		$	10,000
Allowance Utility		$	-
	TOTAL:		$601,000

City of Haverhill, MA
PUMP STATION CAPITAL IMPROVEMENT PLAN
W-P PROJECT 13497A

WHISPERING CREEK
Flooded Suction Station
Relocate & retrofit control panel; connect to radio.

ITEM	UNIT	QUAN.	UNIT PRICE	COST
PROCESS				
Drywell structure/piping inspection & thickness testing	LS	1	$ 5,000	$ 5,000
CIVIL				
Conduits, Pads and cabinets	LS	1	$ 15,000	$ 15,000
Contingency - Full Replacement	LS	1	$ 230,000	$ 230,000
INSTRUMENTATION				
Instrumentation/Controls	LS	1	$ 20,000	$ 20,000
SAFETY				
Safety Improvements	LS	1	$ 1,000	$ 1,000
ELECTRIC				
General,	LS	1	$ 15,000	$ 15,000
Relocation topside	LS	1	$ 20,000	$ 20,000
			Material Subtotal:	$ 301,000

		$	301,000
General Contractor OH&P	15%	$	45,150
Bond and Insurance	1%	$	3,010
Engineering Design and Bidding Services	20%	$	60,200
Design Contingency	10%	$	30,100
Engineering Services During Construction and Resident Observation	30%	$	90,300
Construction Contingency	5%	$	15,050
Legal/Admin and Easements	2%	$	6,020
Material Testing	1%	$	3,010
Allowance, Traffic Control		$	5,000
Allowance Utility		$	10,000
	TOTAL:	$	569,000

WRIGHT-PIERCE

Engineering a Better Environment