Asset Management Planning for Wastewater Systems – A Case Study in Gardner, MA

2021 NEWEA Annual Conference

Steve Landry, P.E.

TATA & HOWARD

James Hoyt, P.E.

Presentation Topics

- Wastewater Asset Management
- Grant Opportunities
- Gardner's Wastewater History
- Project Approach
- Project Results
- The City's Next Steps

Background

Asset Management Study through MassDEP Grant Program

Study included Water, Wastewater, Stormwater

Case Study of Gardner Wastewater portion of the study

Asset Management

"Asset Management for water, wastewater, and stormwater utilities is a systematic approach to making financial decisions that are most likely to achieve long-term sustainability and deliver consistent service in a cost-efficient manner."

- Source: Massachusetts Clean Water Trust Asset Management Grant Program

Asset Management Program Grants

MassDEP and SRF Clean Water Trust support AM planning programs by offering subsidized SRF financing

The AM planning financial assistance grants

60% of total eligible project costs, up to max award of $150,000	Remainder with in-kind services or capital contribution	Program provides $2 Million annually for AM grants

Asset Management Program Grants

August

Proposals/PEF due

March

Grant Awards issued following

One Year

AM work/reports expected to be completed within one year of issuance of Grant Agreements

Eligible AM Activities

Asset Inventory

Level of Service

Criticality/Risk Analysis

Life Cycle Cost Analysis

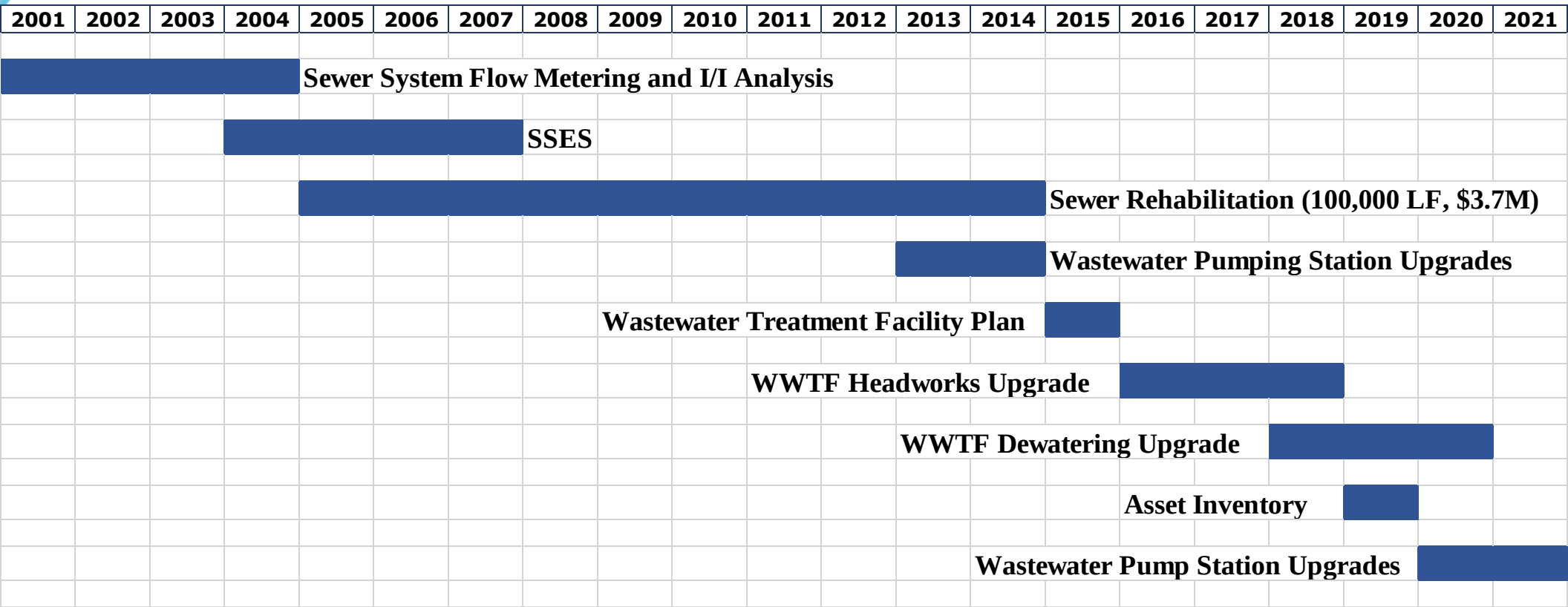
Funding Analysis

Asset Management Software and Training

Asset Management Program Plan

Asset Management Report

Gardner Wastewater



Project Goals

Provide a comprehensive Asset Management Plan

- Assist with prioritizing capital improvements

Projects included Water, Wastewater and Stormwater

Wastewater project included both below and above ground

Above Ground Assets

Asset Inventory:

Condition, Redundancy, Consequence of Failure, and Useful Life

Priority List of Assets (PLA)

Replacement within next 5 years

Secondary List of Assets (SLA)

Replacement within 6-10 years

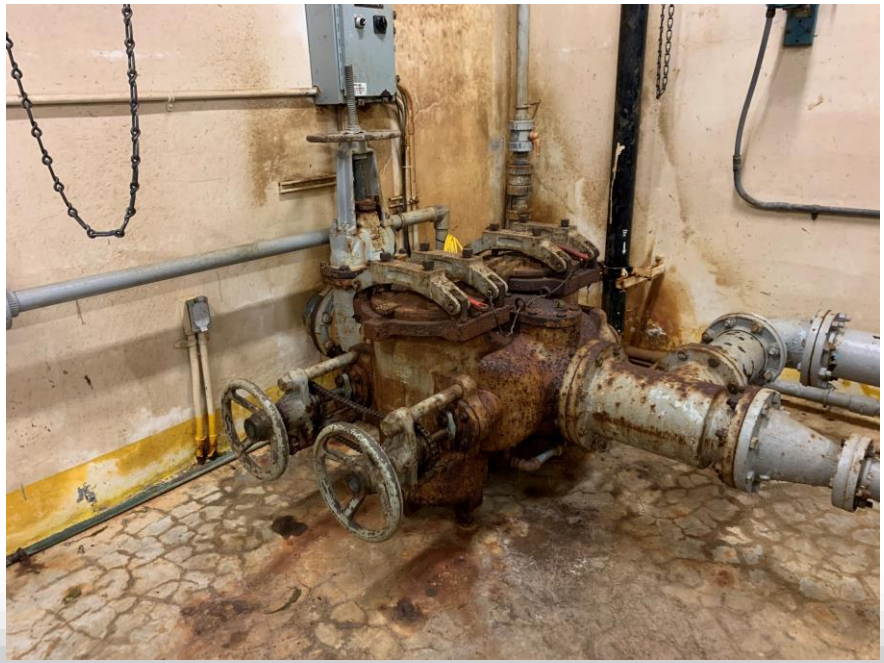
Location ID	Asset Description	SubAsset	Description	Make	Model	Asset ID	Condition	Redundancy	COF	Install Date	Expected Useful Life	Replacement Year
WWTP/ Headworks	Grit Pump No. 1 (South Side)	Rotating Equipment - Pumps	Located at vortex tank no. 1 Overall rating -Very good	Gorman Rupp		3	Very Good	100%	Major	1/1/2017	25	12/26/2041
WWTP/ Headworks	Grit Pump No. 2	Rotating Equipment - Pumps	Located at vortex tank no. 2 Overall rating - Very good			4	Very Good	100%	Major	1/1/2017	25	12/26/2041
WWTP	Septage Receiving Pump	Rotating Equipment - Pumps	Two pumps not used by plant staff	Dorr Oliver	ODS	5	N/A	N/A	N/A	N/A	N/A	N/A
WWTP	Sump Pump	Rotating Equipment - Pumps	grit pump room sump pumps duplex	US PUMP	Unknown	6	N/A	N/A	N/A	N/A	N/A	N/A
WWTP/ Blower Bldg.	Sodium Bisulfite Metering Pump No. 1	Rotating Equipment - Pumps	Located in the Blower Building Overall rating- Very good	Flex Pro	Pro Series M	12	Very Good	100%	Major	1/1/2018	20	12/27/2037
WWTP/Blower Bldg.	Sodium Bisulfite Metering Pump No. 2	Rotating Equipment - Pumps		Flex Pro	Pro Series M	13	Very Good	100%	Major	1/1/2018	20	12/27/2037
WWTP/ Blower Bldg.	Sodium Bisulfite Metering Pump No. 3	Rotating Equipment - Pumps		Milton Roy	Mroy FR111A37	14	N/A	N/A	N/A	N/A	N/A	N/A
WWTP/Blower Bldg.	WAS pump No. 1	Rotating Equipment - Pumps	Blower Bldg. Basement Overall rating - Fair	Robbins Myers	CDQ	15	Good	100%	Major	1/1/2014	25	12/26/2038

Above Ground Assets

Prioritized Capital Improvements

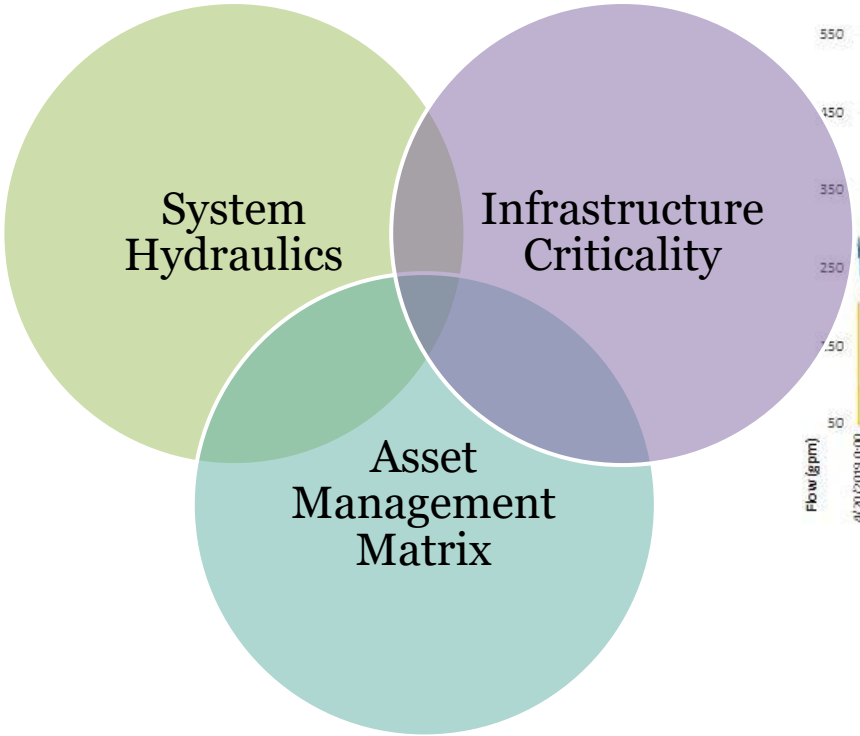
Recommendation	Asset	Estimated Cost	Year
Replace Plant Water Pumps No. 1 and 2	Plant Water Pump No. 1, Plant Water Pump No. 2	$150,000	2020

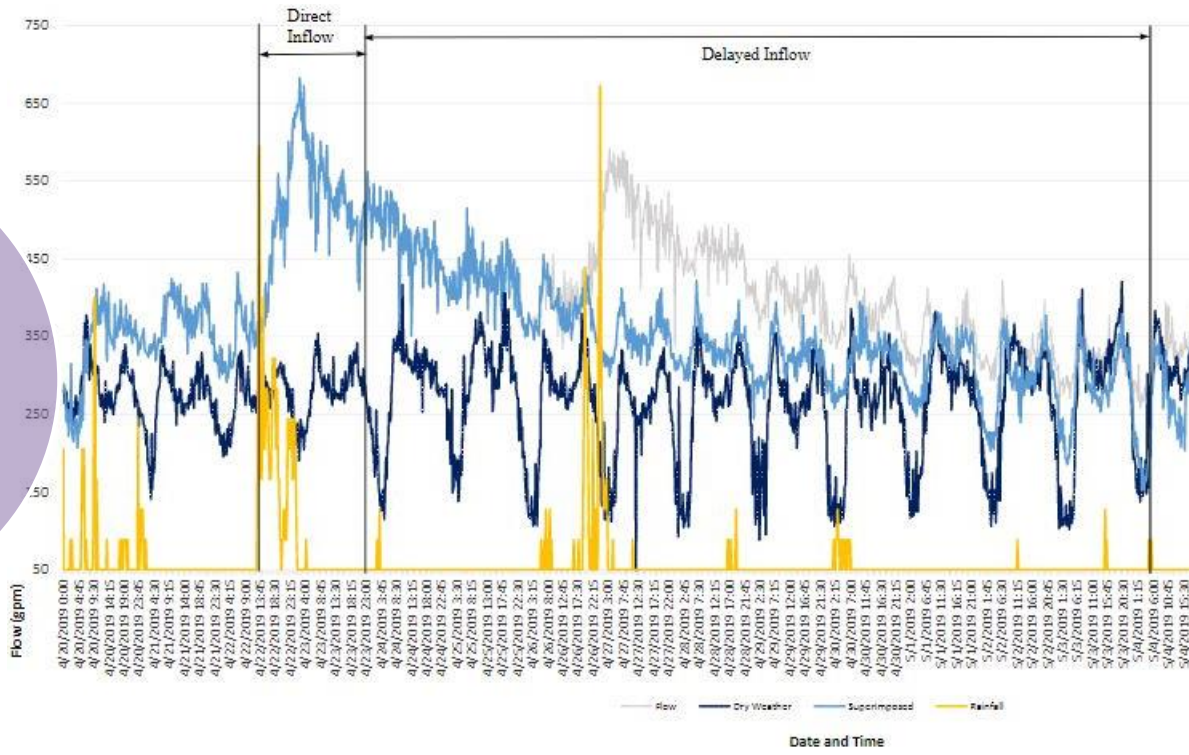
- Plant Water Pumps:
  - Asset ID: 26/27
  - Model: Peerless C810AM/BF
  - Condition: Very Poor
  - Redundancy: 100%
  - Consequence of Failure: Major
  - Install Year: 2000
  - Expected Useful Life: 25 years



Below Ground Assets

Three Circles Approach



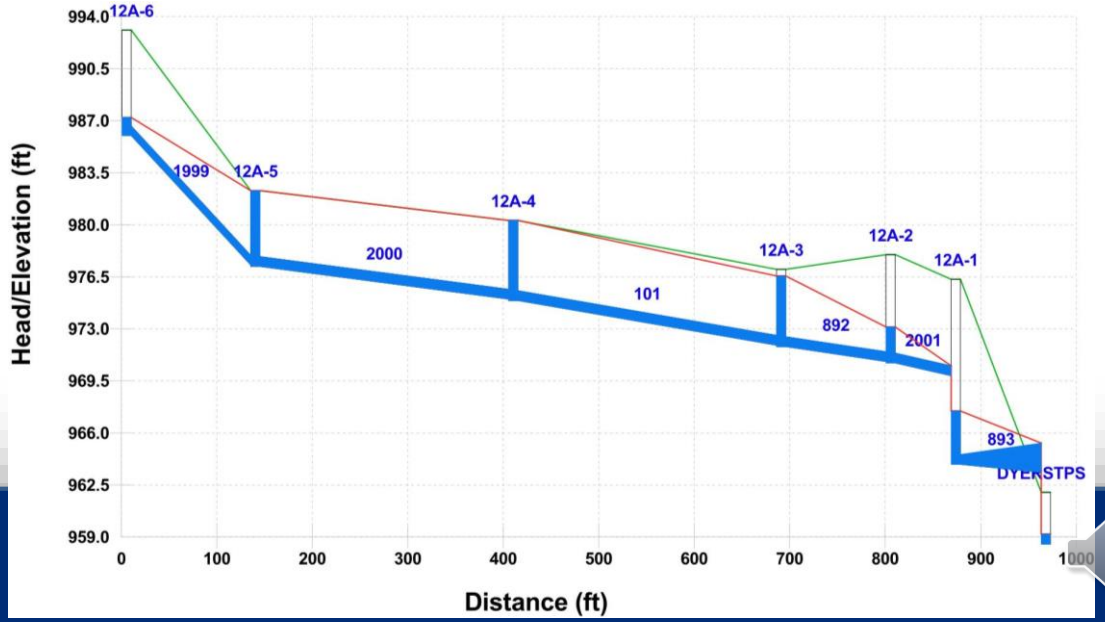


Hydraulics - Developing Flows

- Reviewed water meter and WWTF data for 2019
- Conducted a six-week flow metering program
- Estimated infiltration and inflow on a per basin basis
- Developed flow scenarios and calibrated the model
  - Max Day Flow (base sanitary flow*P.F. + dry weather infiltration)
  - 1-year Storm (base sanitary flow *P.F. + dry weather infiltration + 1-yr inflow)
  - 5-year Storm (base sanitary flow *P.F. + dry weather infiltration + 5-yr inflow)

Hydraulics - Hydraulic Capacity

- Modeled q/Q for collection system
- Identified pipes with potential capacity issues
  - Max Day Flow > 70% pipe capacity
  - 1-year Storm Event flow > 100% pipe capacity
  - 5-year Storm Event flow > 100% pipe capacity
- Reviewed SMH with surcharging

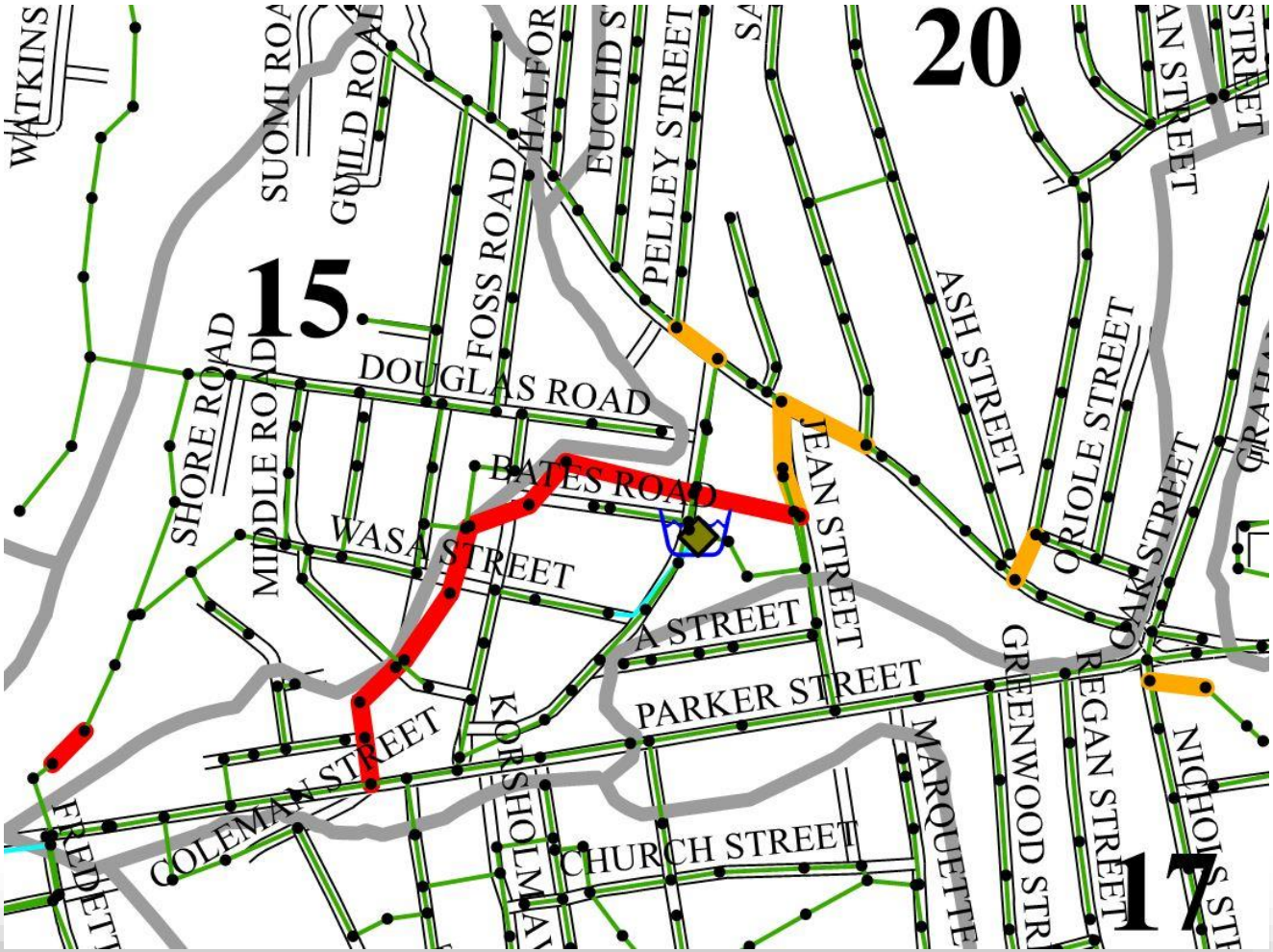


Hydraulics - Hydraulic Deficiencies

Legend

Gravity Main

- Hydraulically Sufficient
- Over 100% Capacity for 1 Year Inflow
- Over 70% Capacity for Max Day

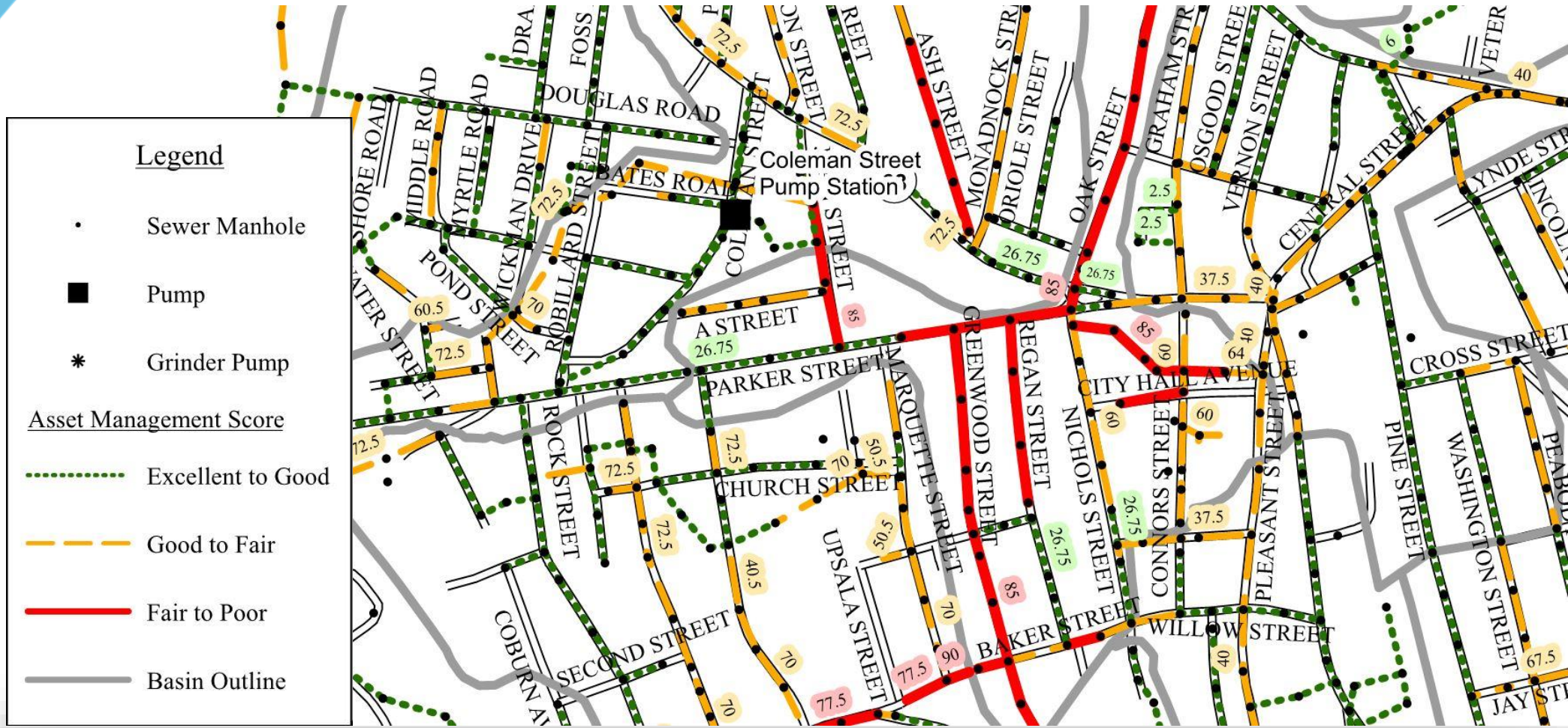


Asset Management Matrix

- Workshop with the City to identify needs and concerns
- Develop custom matrix to score pipe segments based on:
  - Pipe Material
  - Pipe Age
  - Infiltration
  - Soils
  - Known O&M Issues

Weight	Performance Criteria	Rating	Weighted Rating
35	Material		
	Clay	100	35
	Asbestos Cement	80	28
	Unlined Cast Iron	40	14
	Cement Lined Cast Iron	30	10.5
	Concrete	20	7
	Ductile Iron	15	5.25
	Cement Lined Ductile Iron	10	3.5
	HDPE	5	1.75
	PVC	5	1.75
	Field Lined	5	1.75
25	Age		
	Pre 1925	100	25
	1925-1939	90	22.5
	1940-1948	80	20
	1949-1959	70	17.5
	1960-1972	40	10
	1973-1989	10	2.5
	1990-Present	0	0
25	Infiltration		
	Excessive	100	25
	Average	50	12.5
	Low	10	2.5
10	Metal in Potentially Corrosive Soils		
	Yes	100	10
	No	0	0
5	Known O&M Issues		
	Yes	100	5
	No	0	0

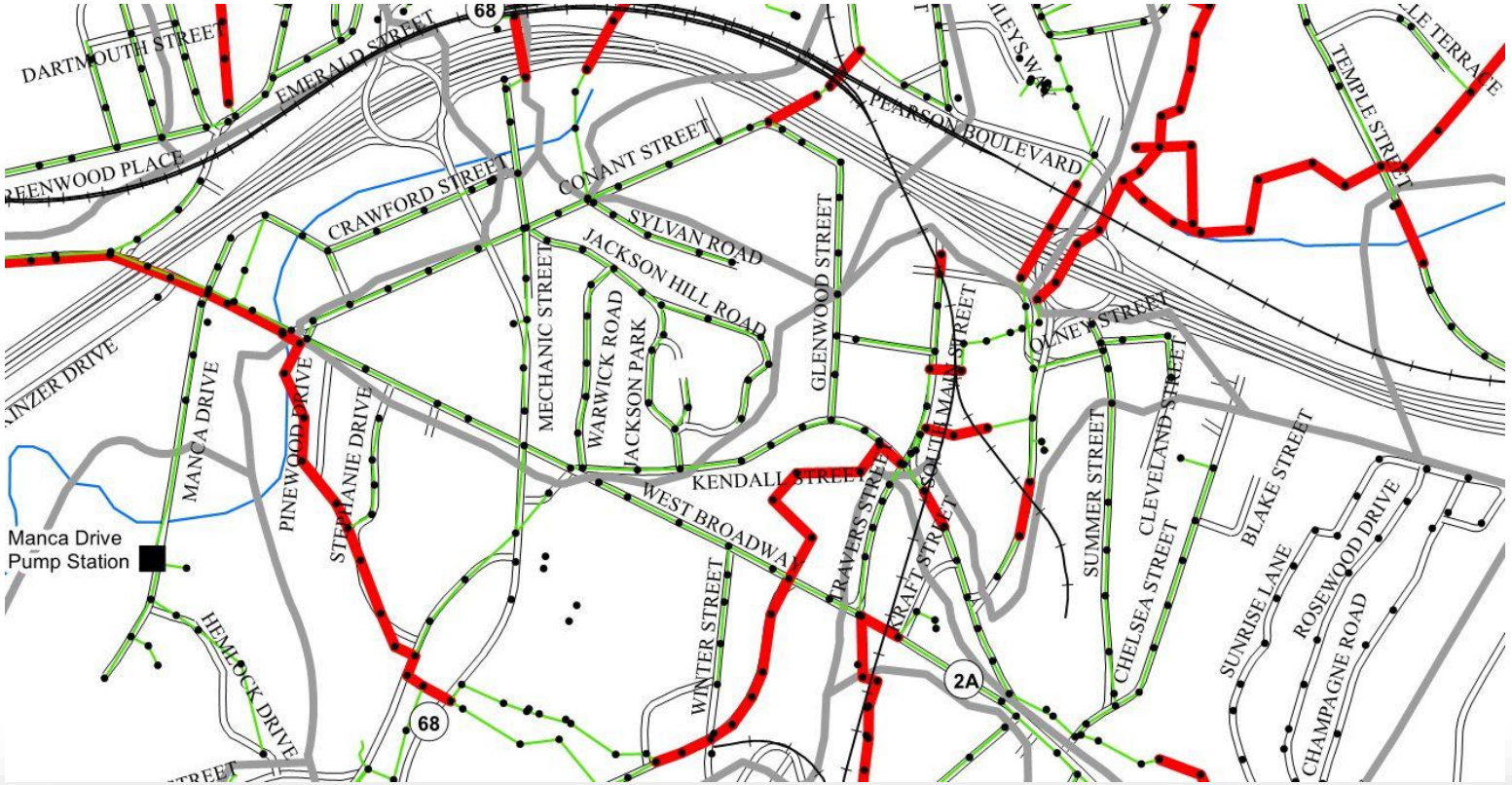
Asset Management Scores



Criticality

- Risk Assessment
- Identified pipes with highest consequence of failure
  - Railroad and Highway Crossings
  - Environmentally Sensitive areas
  - Large Interceptors

Criticality

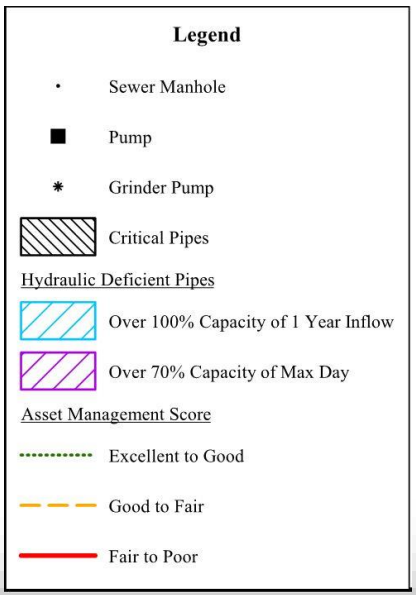


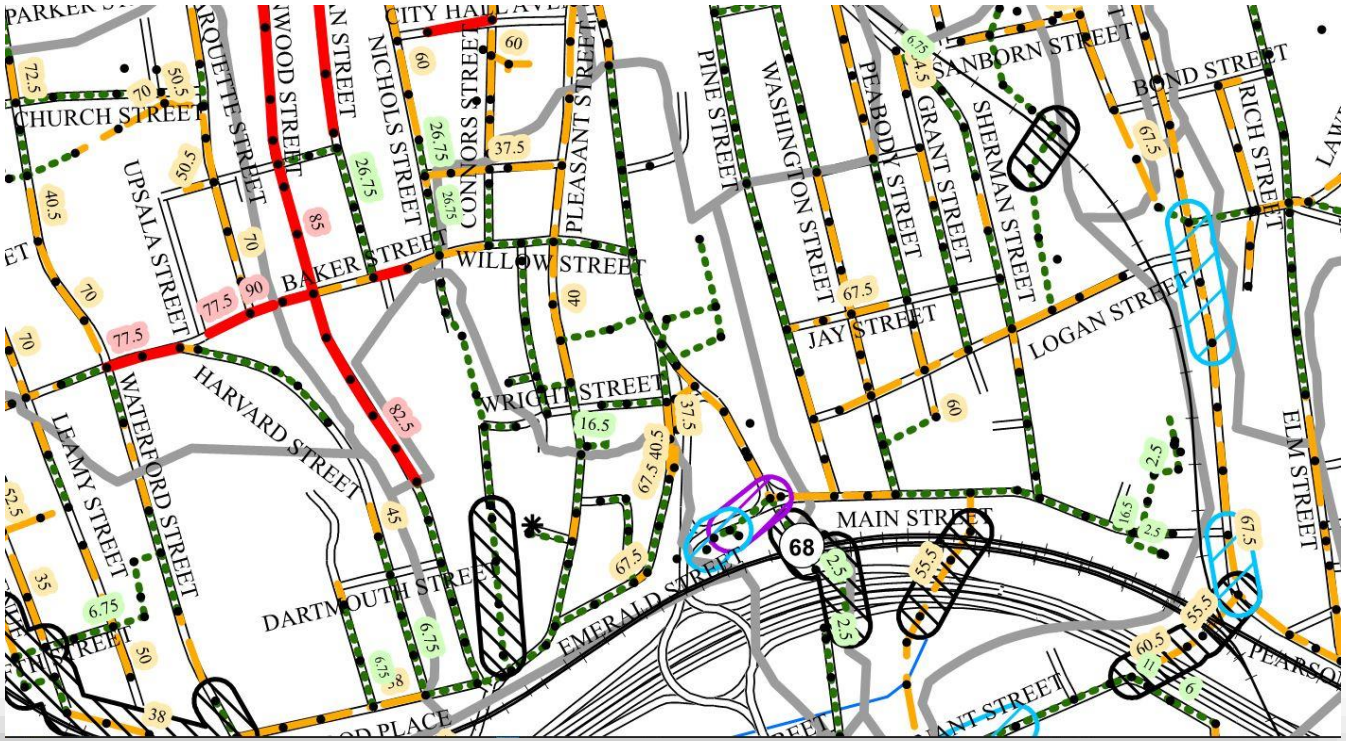
Legend

- Sewer Manhole
- Pump
- Grinder Pump
- Non Critical Pipes
- Critical Pipes

Prioritization of Below Ground Improvements

- Smart spending of Capital
- Prioritize projects with overlapping risks





Project Results

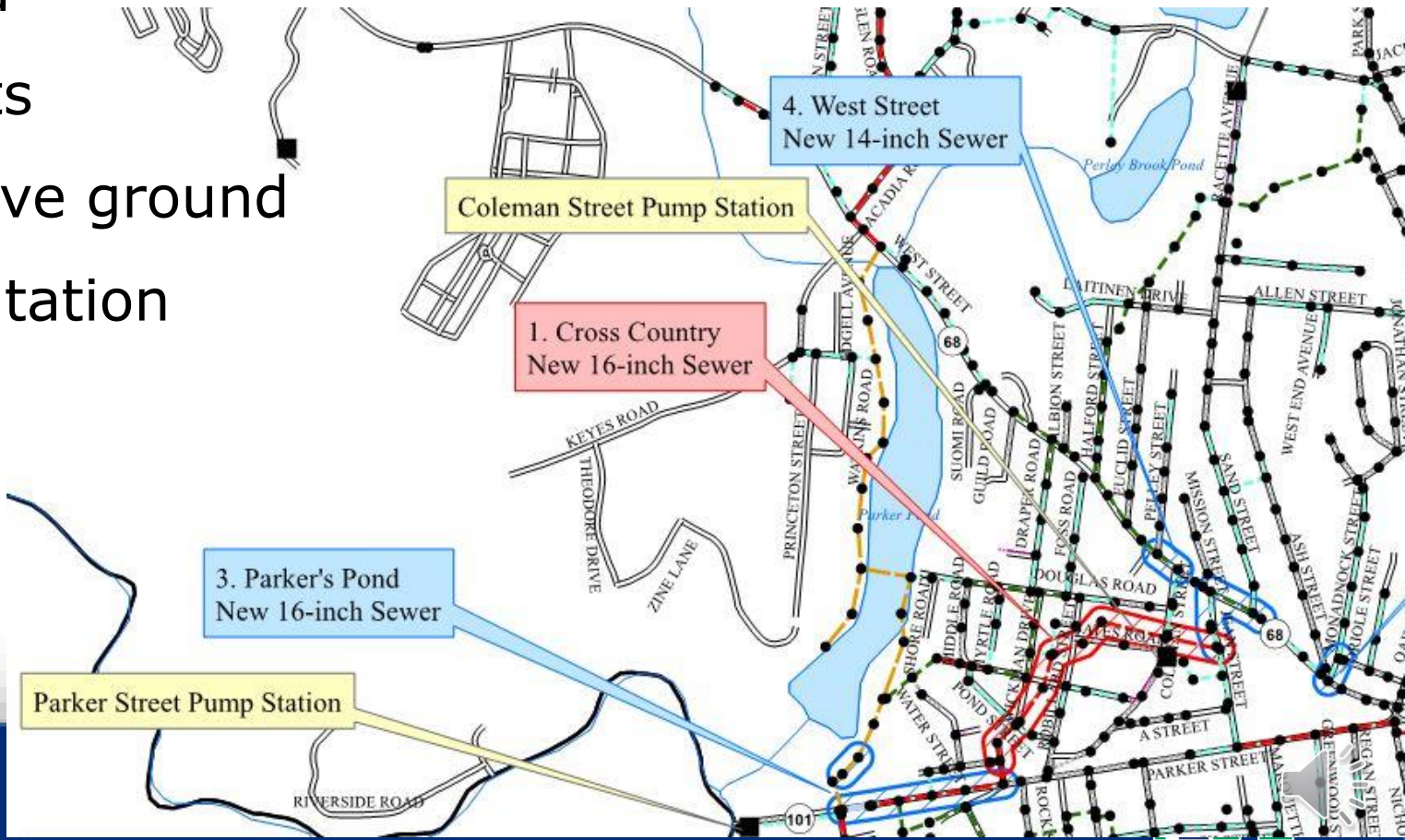
- Prioritized List of Above and Below Ground Improvements

Item No.	Location	From	To	Hydraulic	Asset Management Rating	Critical
1	Cross Country	Jean Street	Parker Street	Y	73	Y

Item No.	Location	From	To	Hydraulic	Asset Management Rating	Critical
3	Parker's Pond	Along Parker's Pond	Parker Street	Y	38	Y
4	West Street	Pelley Street	Jean Street	Y	73	N
5	Monadnock Street	Oriole Street	West Street	Y	73	N

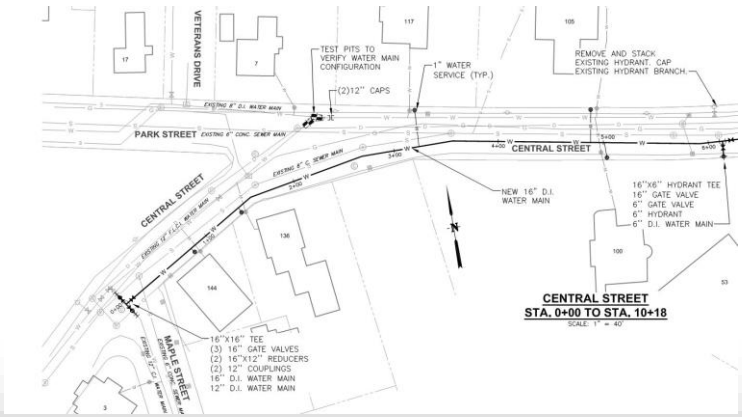
Project Results

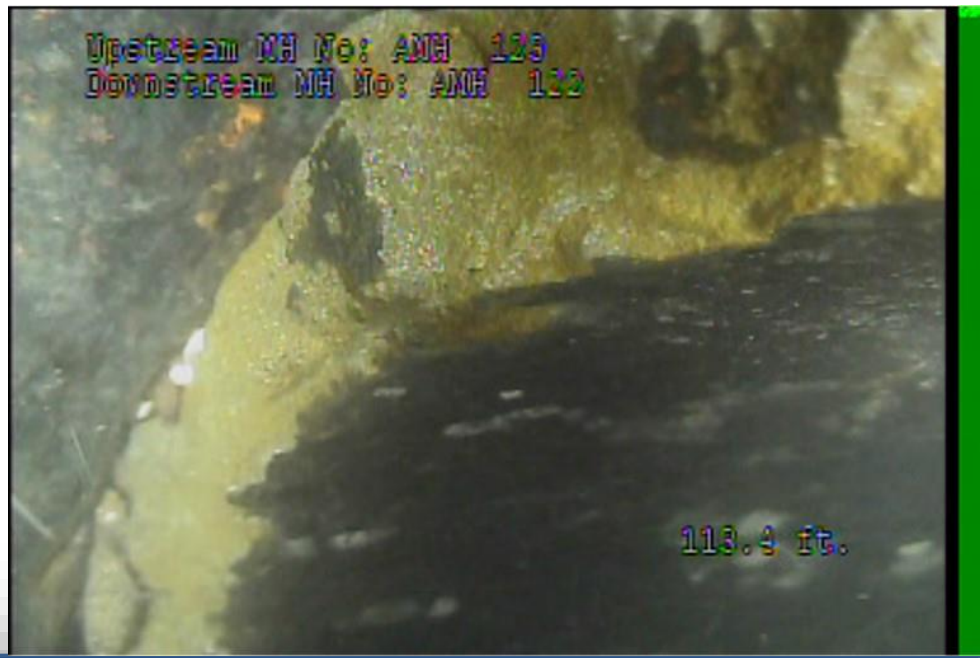
- $2.5M of high priority below ground improvements
- $8.5M of above ground asset rehabilitation



City's Next Steps

- Sewer CCTV Inspection and Pipe Lining project underway
- Pump Station Rehabilitation
- Ongoing Improvements at the WWTF





Summary

- Asset Management is a valuable tool for identifying, prioritizing capital improvements
- Funding opportunities available to communities
- 3 Circle approach helps identify areas to focus future work
- City is putting results to work

Thank you!

Thank you to the City of Gardner DPW: Dane Arnold & Chris Coughlin