

STEP BY STEP:

A Data Collection & Planning Approach for
Addressing Sewer Collection System Improvements
through the Plymouth CMOM Program



ENVIRONMENTAL
 PARTNERS

— An Apex Company —

SPEAKERS



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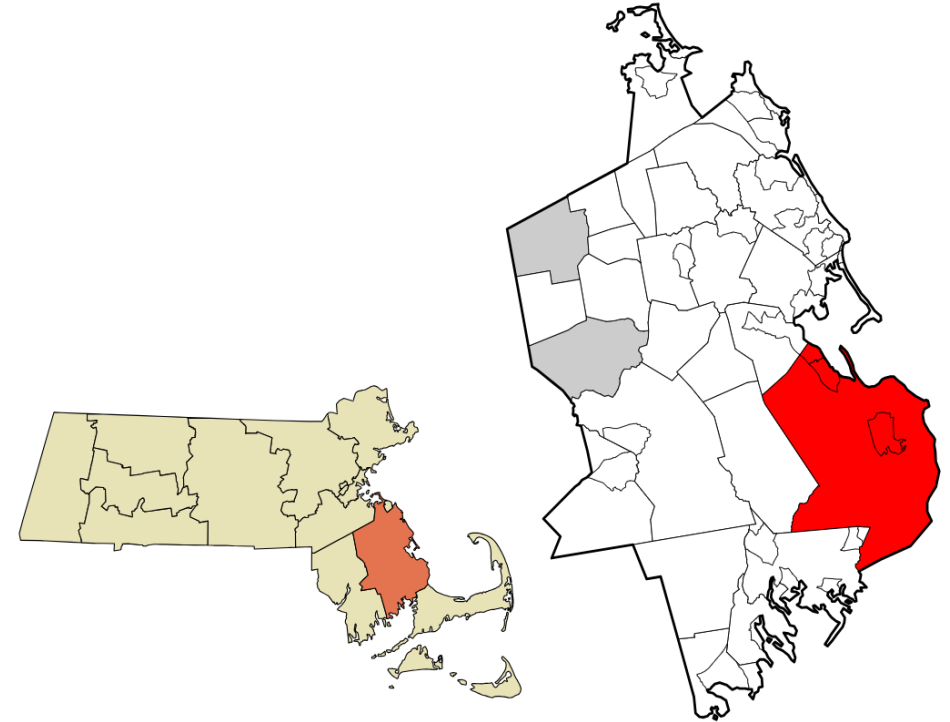
AGENDA

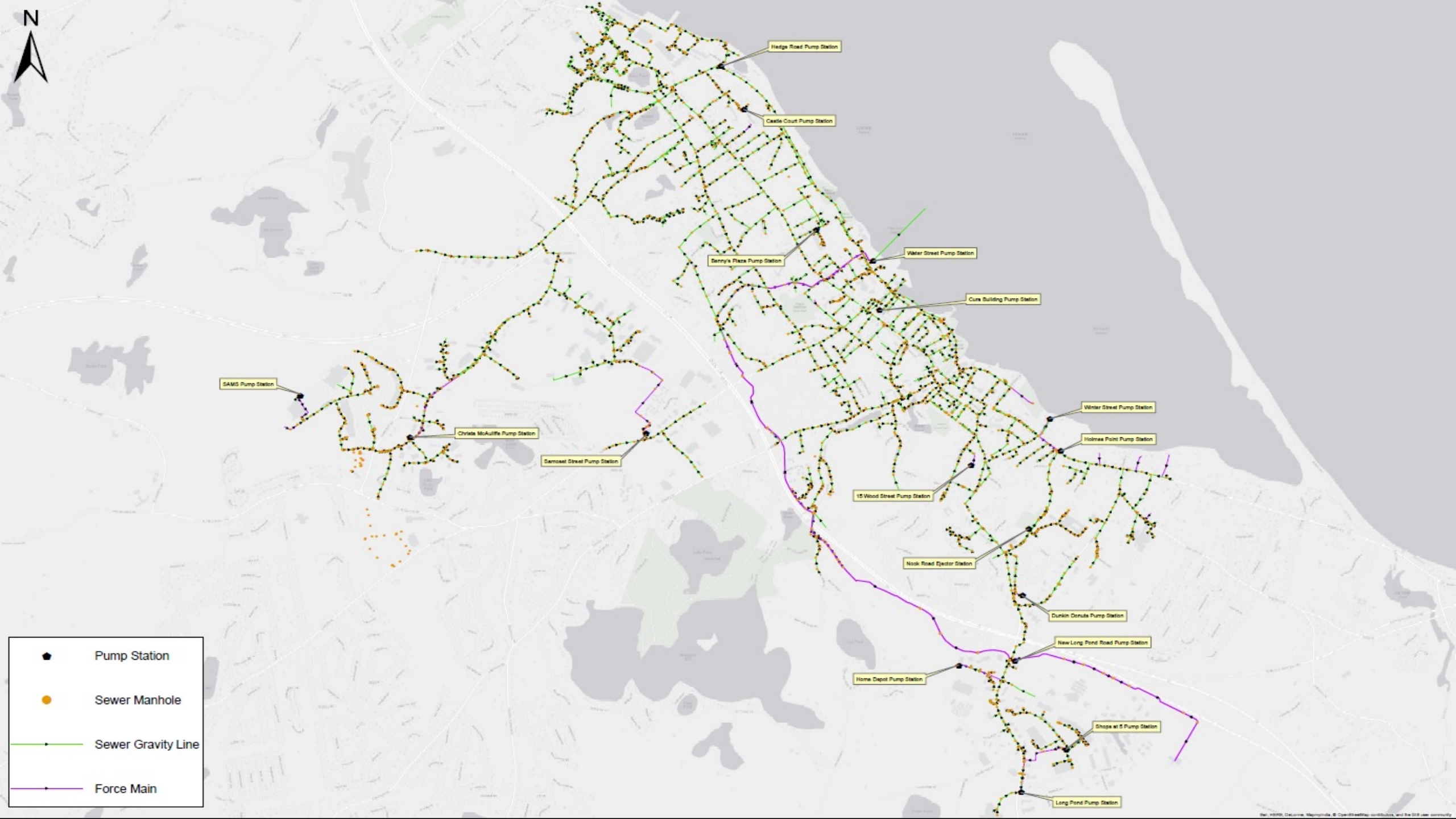
- Background and Project Area
- History of CMOM Program
- Corrective Action Plan
 - Phase I – Data Collection through Cleaning and Inspection
 - Phase II – Long-Term Plan for Future Improvements
- Collection System Improvements
- Next Steps and Acknowledgments
- Questions



BACKGROUND AND PROJECT AREA

- Town of Plymouth is located ~40 miles south of Boston and ~40 miles east of Providence
 - ~64,269 residents (2022 U.S. Census)
 - ~18,000 residents serviced by Town's collection system
- Town of Plymouth's sewer collection system consists of ~56 miles of gravity mains, ~17 miles of force mains and 17 pump stations
 - Original system dates back to the 1870s
 - System has seen significant expansion over past 50 years
- Plymouth WWTF treats an average daily flow of 1.6 MGD





SAMS Pump Station

Christa McAuliffe Pump Station

Samoset Street Pump Station

Hedge Road Pump Station

Cattle Court Pump Station

Benny's Plaza Pump Station

Water Street Pump Station

Cure Building Pump Station

Winter Street Pump Station

Holmes Point Pump Station

15 Wood Street Pump Station

Nook Road Ejector Station



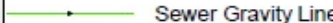
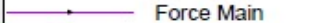
Dunkin Donuts Pump Station

New Long Pond Road Pump Station

Home Depot Pump Station

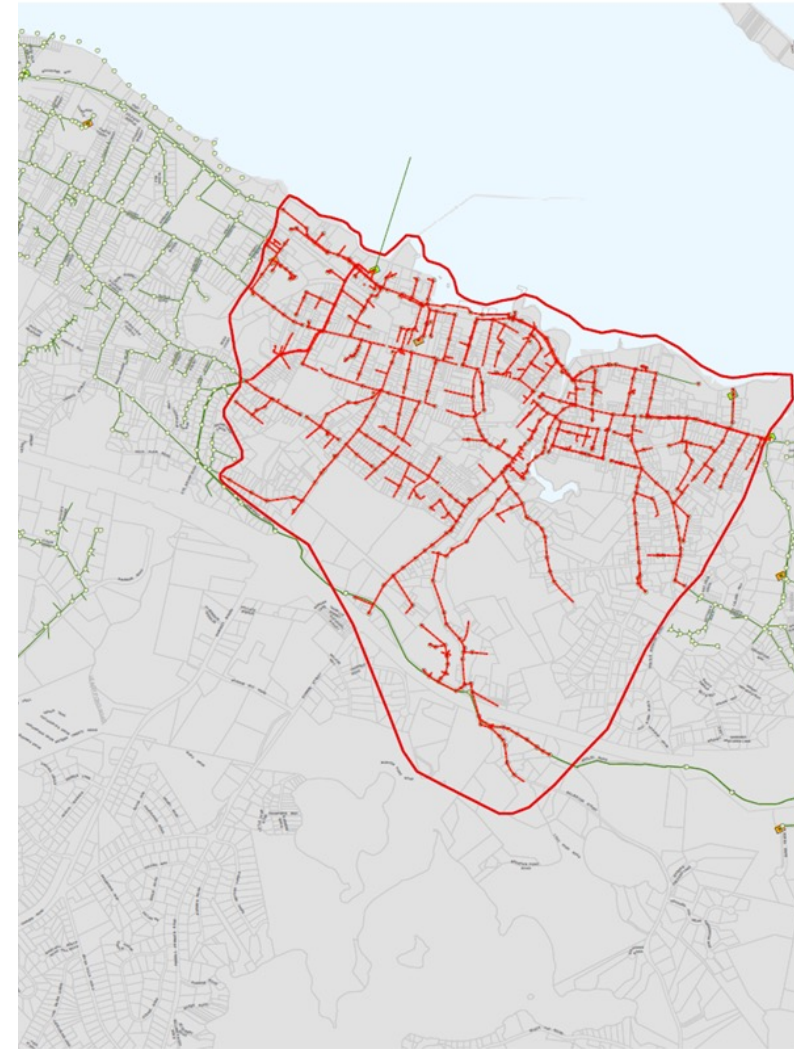
Shops at 5 Pump Station

Long Pond Pump Station

-  Pump Station
-  Sewer Manhole
-  Sewer Gravity Line
-  Force Main

HISTORY OF CMOM PROGRAM

- EPA issued Clean Water Act Administrative Order on April 11, 2013
 - Requires Town to submit a Capacity, Management, Operation and Maintenance (CMOM) Program Implementation Annual Report for EPA's review
- Town submitted Corrective Action Plan on March 14, 2014 (revised December 30, 2014)
- EPA granted Town approval to implement their revised Corrective Action Plan
- Town retained Environmental Partners Group to oversee the implementation of the first phase of inspection and cleaning in FY 2016 (Downtown Plymouth)

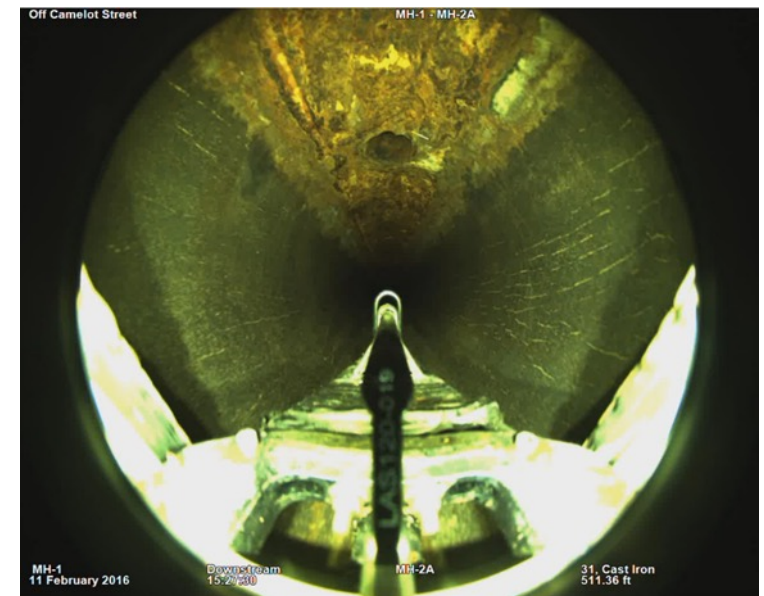


Downtown Plymouth Service Area



CORRECTIVE ACTION PLAN

- EPA set forth a proposed “Routine Cleaning Plan” calling for cleaning of entire collection system every 5 years
 - Equates to approx. 57,000 feet/year
- 5-Year Revised Corrective Action Plan is broken into two tasks:
 - Task 1 encompasses data collection for the sewer collection system including routine cleaning and inspection of all gravity sewer and manholes in the system.
 - Task 2 encompasses plan development for the sewer collection system which will identify the needs to develop a long-term plan.
- Town allocates 10% of annual Routine Cleaning Plan budget for unknown conditions (i.e., heavy cleaning, root/grease removal)



TASK 1 – DATA COLLECTION

- EP retained the services of National Water Main Cleaning Company for sewer pipeline inspections
 - Focus on light cleaning/jet rodding of sewer pipelines
 - Obtain inspection logs and CCTV video inspection reports
- EP retained the services of Duke's Root Control (formerly Midwest Water Group) for sewer manhole inspections
 - Inspection of manholes using 360-degree digital scanning of manholes
- Pipeline and manhole inspections performed annually (between 2015-2019 and 2021-2022) in accordance with NASSCO standards



**NATIONAL WATER
MAIN CLEANING**



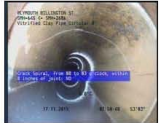

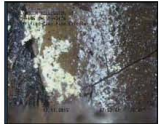
A Carylon Company



PIPE CONDITION ASSESSMENT

- Routine Light and Heavy Cleaning
- CCTV Inspection
- Root Treatment (Chemical and Mechanical)
- Reporting via PACP Requirements
- Data Linkage to Town GIS System

City: PLYMOUTH

 The Environmental Protection Specialists		National Water Main Cleaning Co. 25 Marshall Street Canton, MA 02021 Tel: (781) 828-0863 Fax: E-mail: boston@nwmc-co.com					
Inspection Report							
Date	P/O No.	Weather	Surveyor's Name	Pipe Segment Reference	Section No.		
11/17/2015	Peter Luciani	Dry	A.RODRIGUES		17		
Certificate No.	Survey Customer	System Owner	Date Cleaned	Pre-Cleaning	Sewer Category		
U-315-06023827		U-810-11366	11/17/2015	Jetting			
Street	BILLINGTON ST	Use of Sewer	Sanitary	Upstream MH	SMH-2606		
City	PLYMOUTH	Drainage Area		Downstream MH	SMH-645		
Loc. details		Flow Control	Not Controlled	Dir. of Survey	Upstream		
Location Code	Light Highway	Length surveyed	107.38 ft	Section Length	108.00 ft		
Purpose of Survey	Infiltration/Inflow Investigation		Joint Length	8 inch			
Year Laid			Dia./Height	Vitrified Clay Pipe			
Year Rehabilitated			Material				
Tape / Media No.	TV228-11.17.15		Lining Method				
Add. information:							
1:280	Position	Code	Observation	Grade			
	0.00	AMH	Downstream Manhole, Survey Begins				
	0.00	MWL	Water Level, 25 % of cross sectional area	M 2	14.4 FT		
	8.80	MWLS	Water Level, Sag in pipe, 20 % of cross sectional area	M 2			
	14.40	JOM	Joint Offset Medium	S 1			
	53.29	CS	Crack Spiral, from 08 to 03 o'clock, within 8 inches of joint: NO	S 2	53.29 FT		
	53.29	B	Broken, at 09 o'clock, within 8 inches of joint: NO	S 4			
	73.88	RFJ	Roots Fine Joint, at 01 o'clock, within 8 inches of joint: NO	M 2			
	76.58	S1 RFJ	Roots Fine Joint, from 09 to 03 o'clock, within 8 inches of joint: NO, Start	M 2	53.29 FT		
	76.58	CM	Crack Multiple, from 01 to 03 o'clock, within 8 inches of joint: NO	S 3			
	83.38	LU	Alignment Up, 5 %	M 1			
	107.38	OBB	Obstacles Brick, 20 % of cross sectional area, from 05 to 07 o'clock / DEBRIS	M 3			
	107.38	F1 RFJ	Roots Fine Joint, from 09 to 03 o'clock, within 8 inches of joint: NO, Finish	M 2	73.68 FT		
	107.38	MSA	Survey Abandoned / HEVY DEBRIS NEEDS FURTHER CLEANING				
					76.58 FT		
QBR	QMR	SPR	MPR	OPR	SPRI	MPRI	OPRI
4131	3129	10	22	32	2.5	2	2.13

ENV017-2



MANHOLE CONDITION ASSESSMENT

- Inspection using Rapid View Panoramo 360 SI Digital Camera
- Non-Entry Observations of Cover, Frame, Chimney, Wall, Bench and Invert Condition
- Reporting via MACP Requirements
- Data Linkage to Town GIS System

MACP Survey Report SMH-1 Report Date 2022/11/02

Sheet No 497	Surveyor's name MMH	Certificate Number U-114-0601988	Date 2015/12/15
System Owner PLYMOUTH, MA		Survey Customer ENVIRONMENTAL PARTNERS GROUP	Time 08:34
Drainage Area		Locality/City Name PLYMOUTH	
P.O. No		Location (No. & Name) SANDWICH ST	

Further Location Details Inspection Level Level 1

Outgoing Rim to Invert 6.9 ft.	Outgoing Grade to Invert	Rim to Grade
Use of Sewer Sanitary	Year Laid	Year Rehabilitated
Purpose Infiltration and Inflow Investigation		Sewer Category
Pre-Cleaning	Date Cleaned	Weather
Location Code Light Highway	Potential for Runoff	Evidence of Surcharge No
Access Point Type Manhole	Coordinate System STATE PLANE	
Northing 2805674.243	Easting 888940.013	Elevation
Inspection Status Desoent Inspection		Accuracy of GPS Sub-Meter

Additional Information

Manhole Surface Types

Concrete Pavement <input type="checkbox"/>	Concrete Collar <input type="checkbox"/>	Asphalt <input checked="" type="checkbox"/>	Grass/Dirt <input type="checkbox"/>	Gravel <input type="checkbox"/>	Other <input type="checkbox"/>
--------------------------------------------	------------------------------------------	---------------------------------------------	-------------------------------------	---------------------------------	--------------------------------

Cover

Cover Shape Circular	# of Vent Holes 2
Cover Size 26.0	Vent Hole Diameter > 1/2
Cover Size Width	Cover Bearing Surface Diameter Width
Cover Material Cast Iron	Cover Bearing Surface Diameter
Cover Frame Fit Good	

<p>Cover Type</p> <input checked="" type="checkbox"/> Solid <input type="checkbox"/> Bolted <input type="checkbox"/> Vented/Slots <input type="checkbox"/> Locking <input type="checkbox"/> Gasketed <input type="checkbox"/> Lamphole <input type="checkbox"/> Hatch Single <input type="checkbox"/> Inner Cover <input type="checkbox"/> Hatch Double	<p>Cover Condition</p> <input checked="" type="checkbox"/> Sound <input type="checkbox"/> Missing <input type="checkbox"/> Cracked <input type="checkbox"/> Corroded/Pitted <input type="checkbox"/> Broken <input type="checkbox"/> Bolts Missing <input type="checkbox"/> Restraint Missing <input type="checkbox"/> Restraint Defective
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Cover Insert

Cover Insert Type None	<p>Cover Insert Condition</p> <input type="checkbox"/> Sound <input type="checkbox"/> Leaking <input type="checkbox"/> Poorly Fitting <input type="checkbox"/> Corroded <input type="checkbox"/> Cracked/Torn/Holes <input type="checkbox"/> Insert Fell
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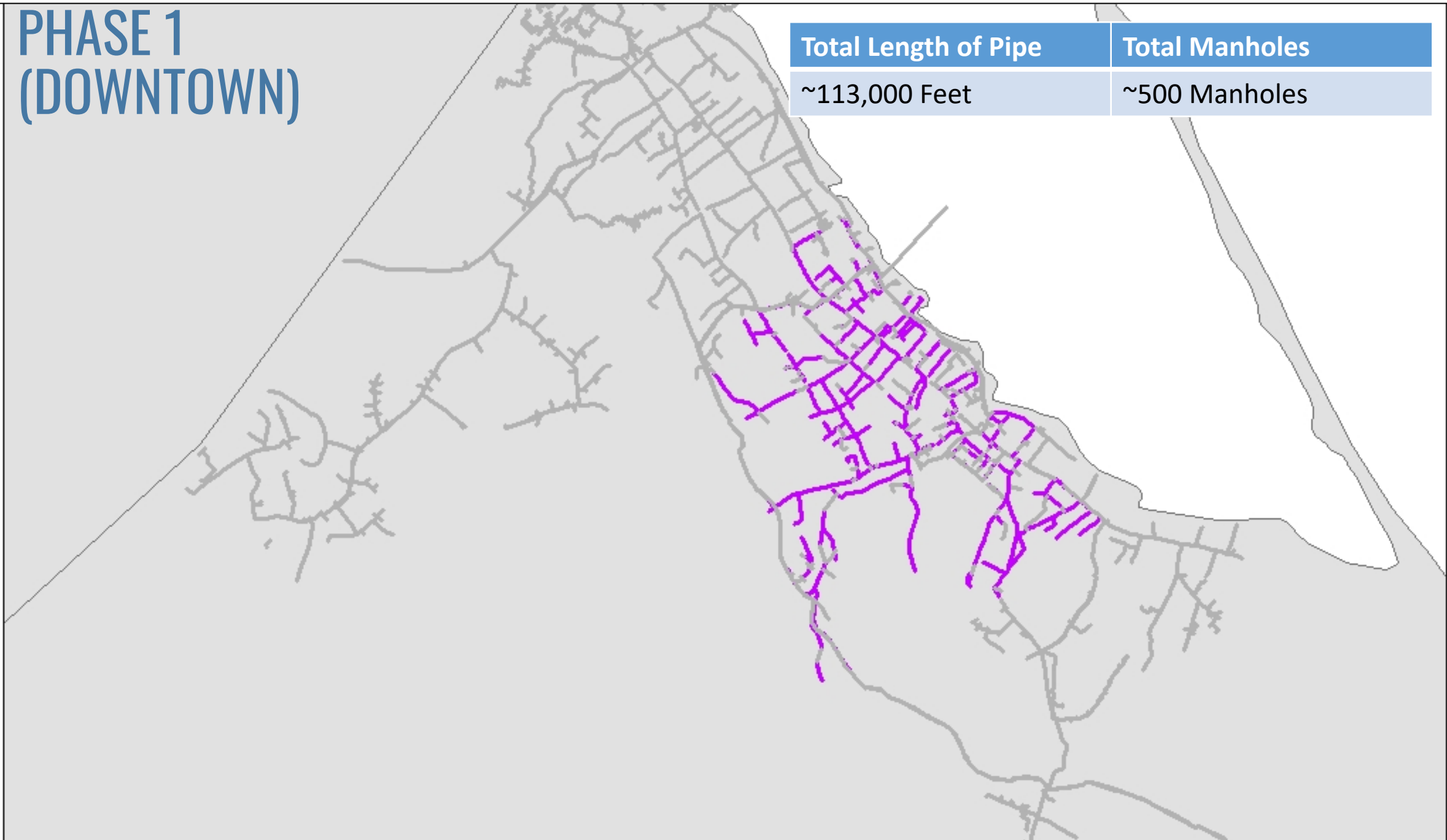
PHASE 1 (DOWNTOWN)

Total Length of Pipe

~113,000 Feet

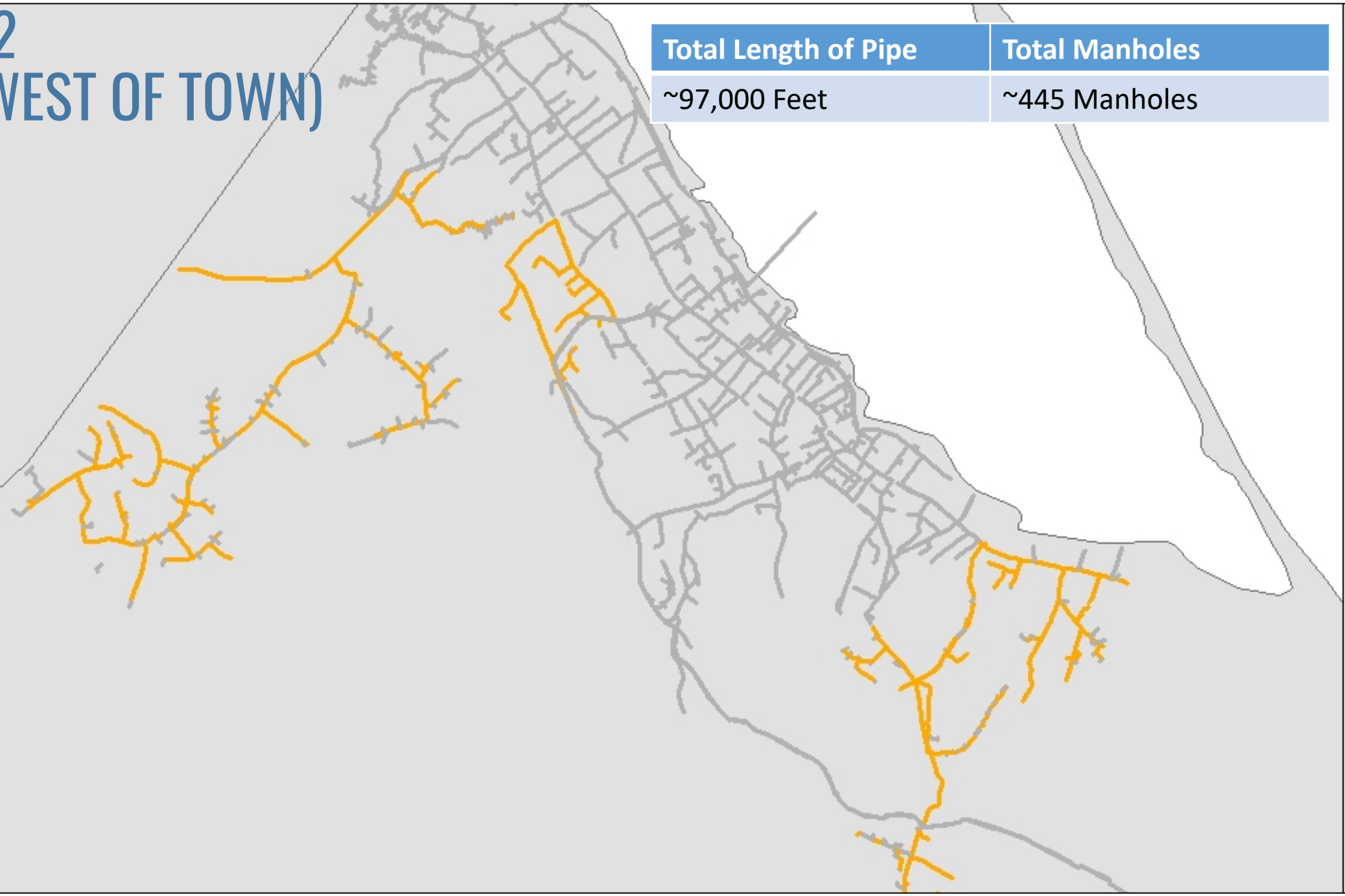
Total Manholes

~500 Manholes



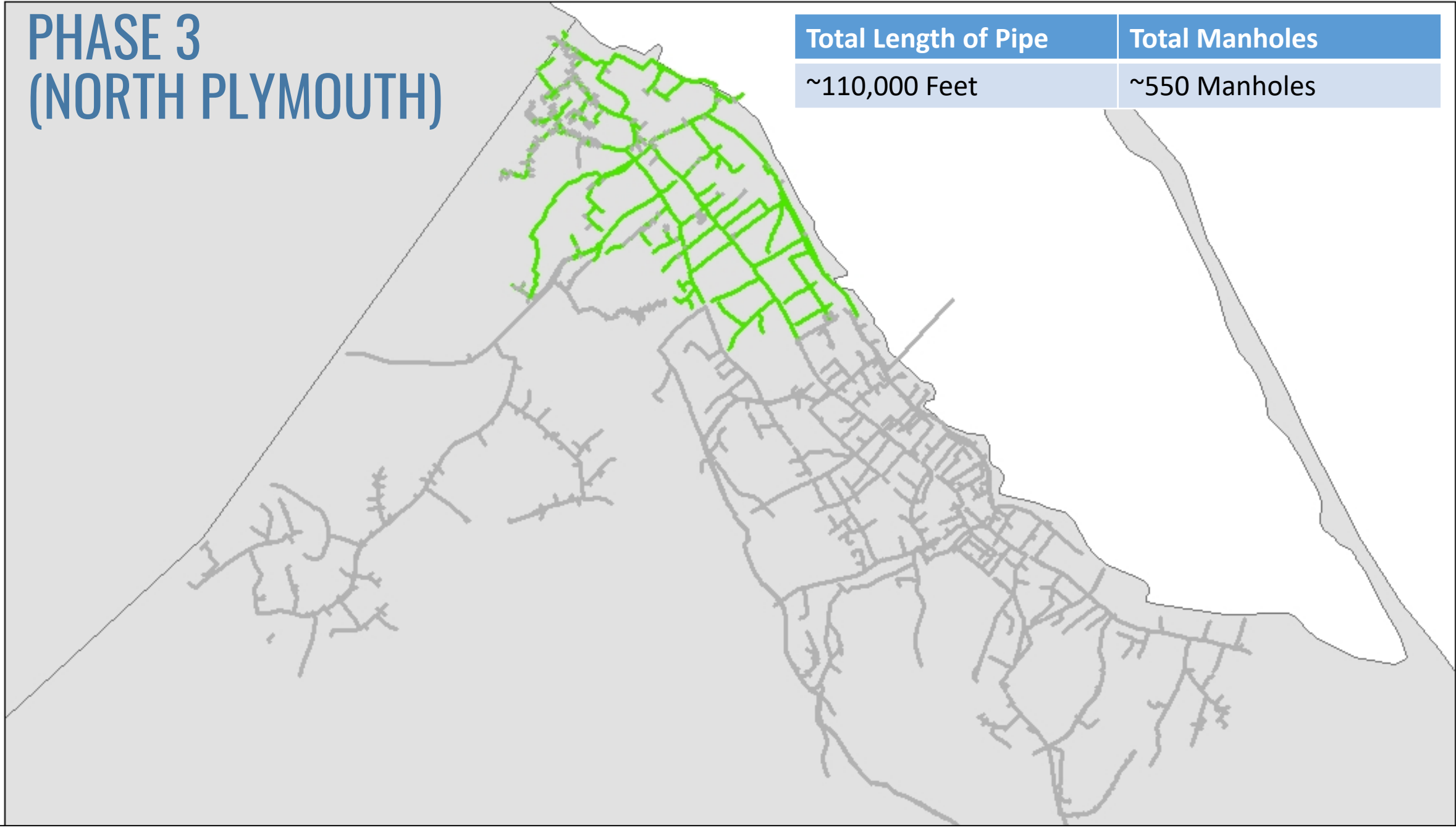
PHASE 2 (EAST/WEST OF TOWN)

Total Length of Pipe	Total Manholes
~97,000 Feet	~445 Manholes



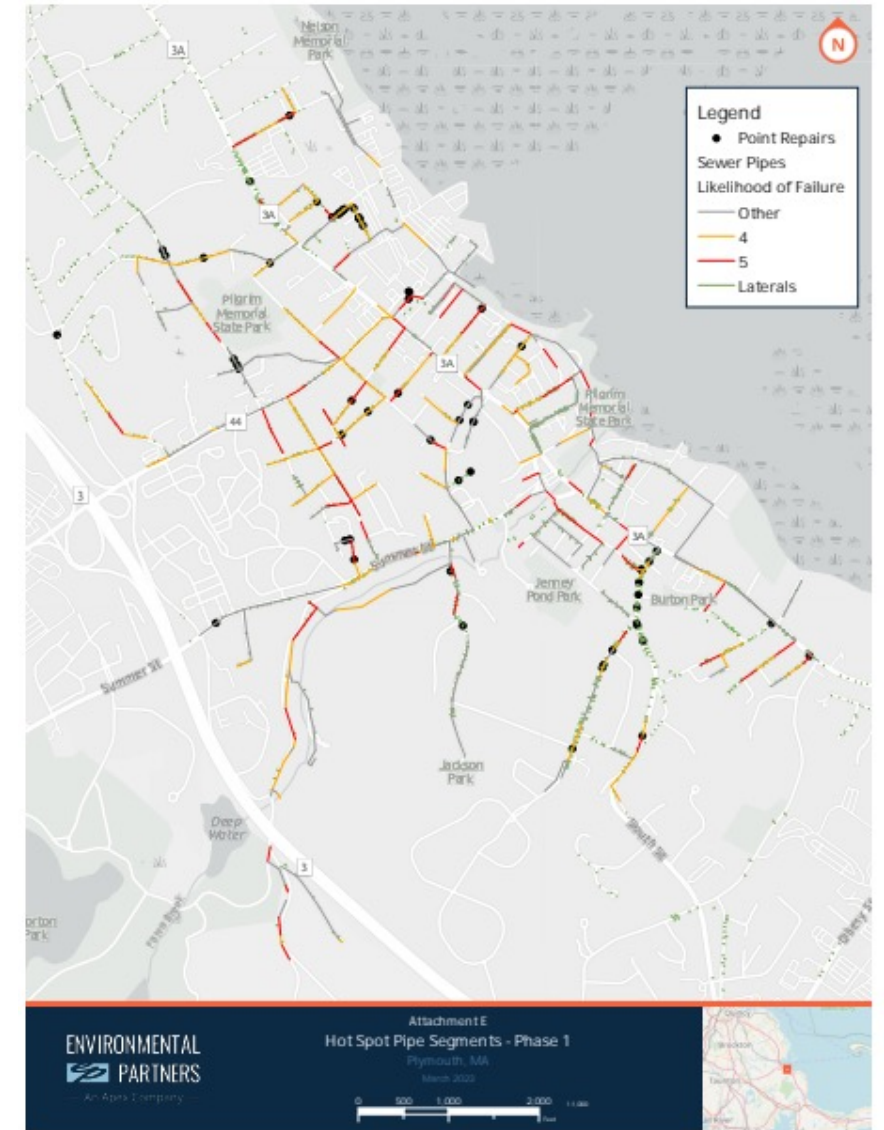
PHASE 3 (NORTH PLYMOUTH)

Total Length of Pipe	Total Manholes
~110,000 Feet	~550 Manholes



TASK 2 – PLAN DEVELOPMENT

- Using data collected in Task 1, EP compiled data and developed recommendations for Corrective Action
 - Update missing/mislabeled info in Town's GIS database
 - Prioritize critical areas "Hot Spots" list that require more frequent cleaning
 - Update/prioritize root treatment list
 - Provide summary list for trenchless pipe rehabilitation (i.e., spot repairs, joint sealing, CIPP lining)
 - Provide summary list for cementitious lining, and/or external grouting of manholes
 - Provide summary list for work requiring excavation (i.e., point repairs)
 - Prioritize a list based on Likelihood of Failure



COLLECTION SYSTEM IMPROVEMENTS

- Using info obtained from CMOM program, Town developed long-term plan to fund and address collection system improvements
- Since 2015, EP has assisted the Town with a number of sewer collection system rehabilitation and/or replacement projects
 - 2019-2020 – Sewer CMOM Collection System Rehab (~\$653,000)
 - 2020-2021 – Cordage Park Gravity Interceptor Relocation (~\$850,000)
 - 2021-2022 – Court Street Sewer Replacement (~\$478,000)
 - 2021-2022 – Sewer CMOM Collection System Rehabilitation (~\$435,000)
- Identifying problem areas through CMOM program saves time and money!



CASE STUDY

Sewer CMOM Collection System Rehabilitation (2021-2022)



SEWER CMOM REHABILITATION

- In September 2021, Town put out to bid the rehabilitation of the Town's sewer collection system along Pleasant Street, Stafford Street, Standish Avenue, and Towns Street
 - Work scope later revised to include other roads
- Project was awarded to National Water Main Cleaning Company and completed in the Spring of 2022
- CIPP lining of gravity sewer and cementitious/epoxy lining of manholes
- Exterior grouting and interior crack sealing to address I/I concerns
- Replacing damaged manhole frames/covers
- Rebuilding of benches/inverts



PIPELINE REHABILITATION TABLE

CMOM Rehabilitation 2021

Plymouth, MA

Primary Pipe Rehabilitation Schedule

PipeID	Street	Length	Taps	Intruding Taps	LoF	Survey Abandoned	Surveyed Length	Point Repair	Point Repair Length	Point Repair Notes
3634	PLEASANT STREET	233	12	5	5.1	Yes	224.3	No		
1235	PLEASANT STREET	91	3	1	5.1	No		No		
3956	PLEASANT STREET	286	15	2	5.1	No		Yes	2	Possibly lined through
1644	STAFFORD STREET	175	9	4	5.2	No		Yes	2	Hole in pipe at SC
1651	STAFFORD STREET	396	15	3	5.1	No		No		
1641	STAFFORD STREET	134	2	0	5.2	Yes	Reversal Complete	No		
1547	STANDISH AVENUE	304	12	2	5.1	No		No		
2578	STANDISH AVENUE	199	5	1	5.1	No		No		
8018	STANDISH AVENUE	259	11	4	5.1	No		Yes	2	Large hole in pipe
2210	STANDISH AVENUE	227	17	5	5.1	No		Yes	2	Broken void visible
2063	TOWNS STREET	275	8	2	5.1	No		Yes	3	Large hole in pipe
		2580	109	29						



MANHOLE REHABILITATION TABLE

CMOM Rehabilitation 2021
 Plymouth, MA
 Manhole Rehabilitation Schedule

MHID	India	Depth	Severity	Repair Type	Leak	Replace Cover	Install Drop	Chimney Seal	Lining	Grout & Wipe Joints	Curtain Grout	Rebuild Bench/Channel	Root Treatment	Vac	Special Obsv or Repair	Repair Notes	Street Location
SMH-378		5.90	1	Bench/Channel					X			X				Debris in bench - cracks in mortar but no seepage	Pleasant Street
SMH-320	Yes	4.00	1	Bench/Channel					X			X				Debris in channel	Towns Street
SMH-338		5.70	2	Grout; Line/Epoxy					X		X		X			Fine roots throughout wall - grout and line	Stafford Street
SMH-339		5.50	1	Bench/Channel					X			X				Debris in bench and channel	Stafford Street
SMH-342	Yes	5.00	1	Chimney Seal	X			X	X							Leak from chimney - mortar and install chimney seal	Stafford Street
SMH-345	Yes	4.10	2	Grout; Line/Epoxy					X		X		X			Medium roots throughout wall - grout and line manhole	Stafford Street
SMH-348	Yes	3.60	1	Chimney Seal	X			X	X							Leak in chimney - mortar and apply chimney sealant	Stafford Street
SMH-351	Yes	5.50	1	Vac					X					X		Debris in channel partially blocking flow	Stafford Street
SMH-352	Yes	5.00	0	Cover		X			X							Light inflow from cover	Stafford Street
SMH-1368		0.00	3	Special					X						X	Water Valve Did Not Scan	Pleasant Street
SMH-376		7.70	1	Bench/Channel					X			X				Debris in channel partially blocking flow	Pleasant Street
SMH-1167		6.70	0	Line/Epoxy	X				X							Weeping throughout structure - line	Standish Ave
SMH-519		7.00	0	Cover; Vac		X			X					X		Slight debris in channel; replace cover	Standish Ave
SMH-688		7.90	0	Chimney Seal				X	X							Profile and apply chimney sealant	Standish Ave
SMH-689		7.60	0	Chimney Seal				X	X							Profile and apply chimney sealant	Standish Ave
SMH-690		6.90	1	Cover		X			X							Replace cover	Standish Ave
SMH-691		7.00	1	Cover; Chimney Seal		X		X	X							Replace cover and apply chimney sealant	Standish Ave
SMH-693		6.70	0	Chimney Seal				X	X							Profile and apply chimney sealant	Standish Ave
SMH-694		6.70	0						X								Standish Ave
SMH-321	Yes	5.90	0			X			X								Towns Street
SMH-340		12.96	3	Vac					X					X		Vac out channel	Stafford Street
SMH-117		6.36	1	Line/Epoxy					X							Reline structure; profile chimney	Standish Ave
SMH-893		7.30	2	Grout; Line/Epoxy	X				X	X						Debris on bench; leaks throughout - grout and reline	Standish Ave
SMH-894		8.42	0						X								Standish Ave
SMH-895		8.12	0						X								Standish Ave
SMH-942		7.06	0						X								Standish Ave
SMH-943		8.04	0						X								Standish Ave
SMH-887		8.56	1	Line/Epoxy					X							Patch and reline chimney	Standish Ave
SMH-906		10.60	0						X								Standish Ave
SMH-919		6.74	2	Vac; Line/Epoxy					X					X		Vac out channel and reline	Standish Ave
SMH-936		5.74	0						X								Standish Ave
SMH-937		6.94	2	Install drop; Line/Epoxy			X		X							Install drop and reline	Standish Ave
SMH-2591		7.18	2	Chimney seal; Grout				X	X	X						Grout wall joints and apply chimney sealant	Standish Ave





0 850 1,700 3,400 Feet

1 in = 1,582 feet
ENVIRONMENTAL PARTNERS



**Sewer Rehabilitation
196-2103
Town of Plymouth**
Sheet Index Page



FINAL SUMMARY

- Cured-in-Place Pipe (CIPP) lining of approximately 1,842 linear feet of 8-inch pipe
- Reinstating one hundred and nine (109) service connections with cutter
- Grouting fifty (50) service connections
- Chemical grouting of approximately two hundred and nine (209) gallons
- Completing two (2) point repairs at broken or collapsed pipes
- Replacing five (5) manhole frame and cover
- Furnishing and installing two (2) inside drop connection into an existing sewer manholes;
- Sewer manhole cementitious and epoxy lining of approximately one hundred and ninety-six (196) vertical feet
- Exterior manhole grouting and interior crack sealing of four (4) manholes to stop leaks
- Rebuilding bench and invert in nine (9) manholes
- Exterior grouting and interior crack injection of seven (7) manholes



NEXT STEPS & ACKNOWLEDGEMENTS

- CMOM Phase 2 scheduled to begin in Winter of 2024
- Town to look into funding next round of Sewer CMOM rehabilitation work in FY25
- A BIG thank you to the team!
 - Town of Plymouth Department of Public Works
 - U.S. EPA Region 1
 - National Water Main Cleaning Company
 - Duke's Root Control / Midwest Water Group
 - Environmental Partners Design Team



Q&A



THANK YOU

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