

# NASHUA REDUCES CSOs WITH GREEN INFRASTRUCTURE AND TRENCHLESS TECHNOLOGY

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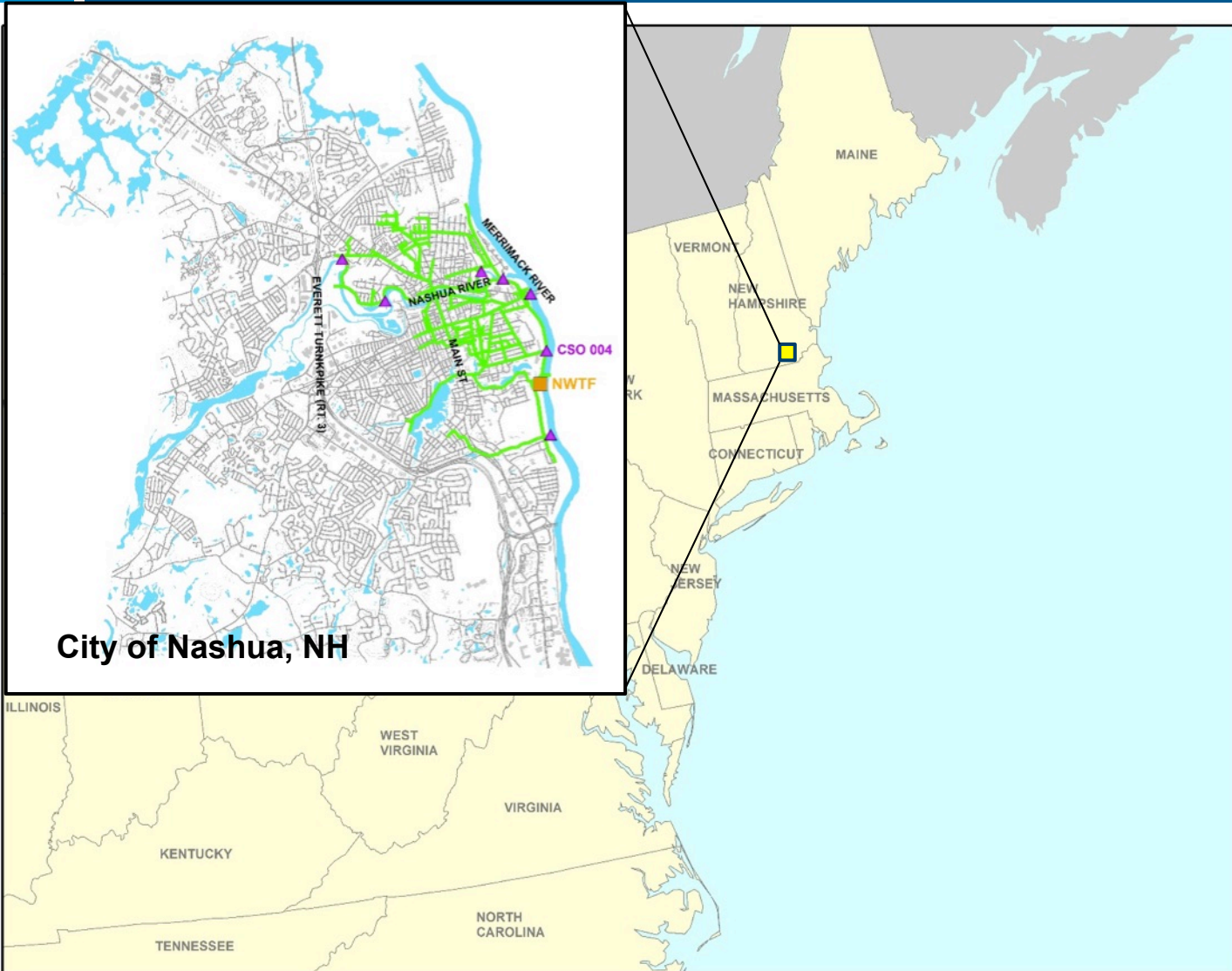
June 6, 2017

# Presentation Outline

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- 1. Project Background**
- 2. CSO-004 Catchment Area and Improvements**
- 3. Results**

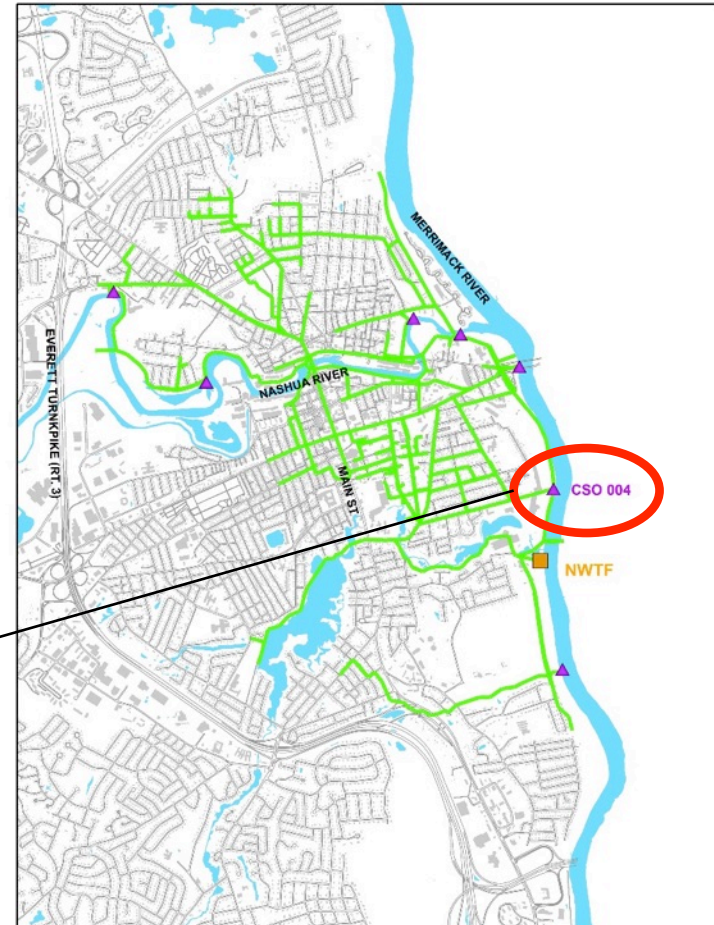
# Project Location



# CSO-004

- CSO-004 is located directly downstream of the Burke Street interceptor
- CSO-004 was modified to include a new storage tank to prevent CSO events

CSO 004



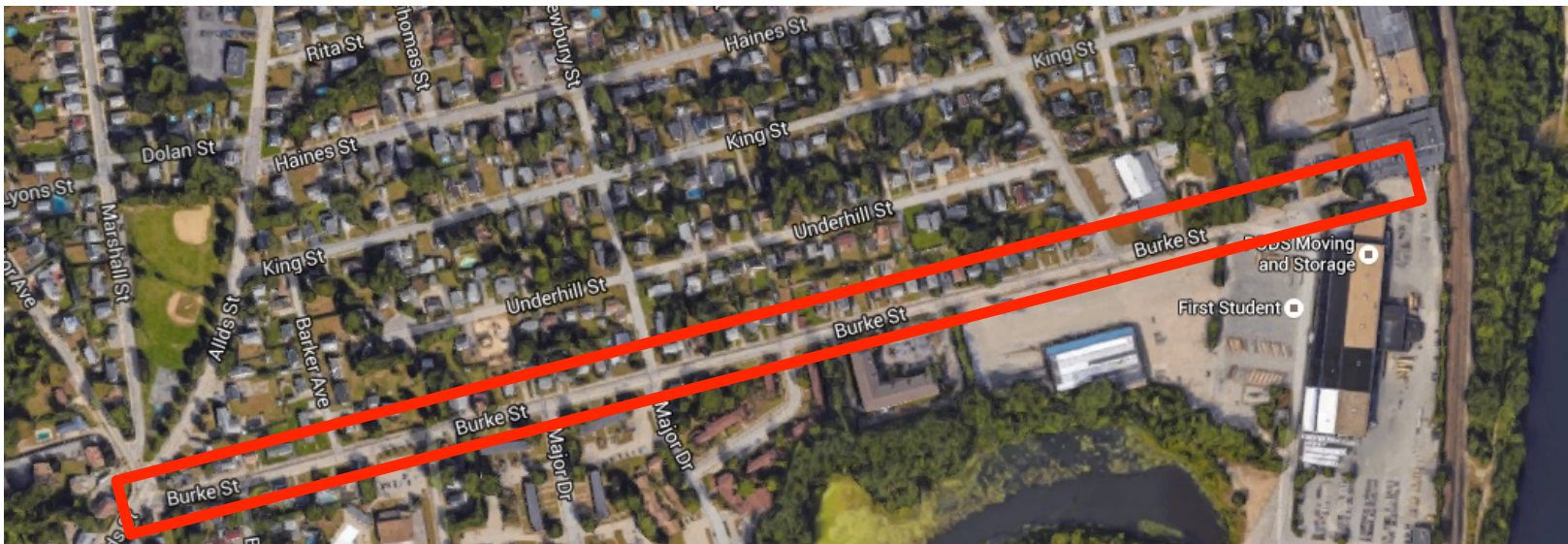
# Design Basis for CSO-004

NPDES #	Location	Level of Control
CSO 003	Farmington Rd	5-year “actual” storm
<b>CSO 004</b>	<b>Burke St</b>	<b>2-year TP40 storm</b>
CSO 005/006	E. Hollis St / Nashua R.	2-year “actual” storm
CSO 007	Tampa St	2-year or 5-year “actual” storm
CSO 008	Broad St	1-year storm
CSO 009	Lock St	2-year or 5-year “actual” storm



# Burke Street

- ~3,500 feet long
- 24-inch diameter clay interceptor (installed in early 1900's)
- Largely clay chimney type lateral connections
- Significant issues with sinkholes and failing laterals
- Residential, commercial and industrial use



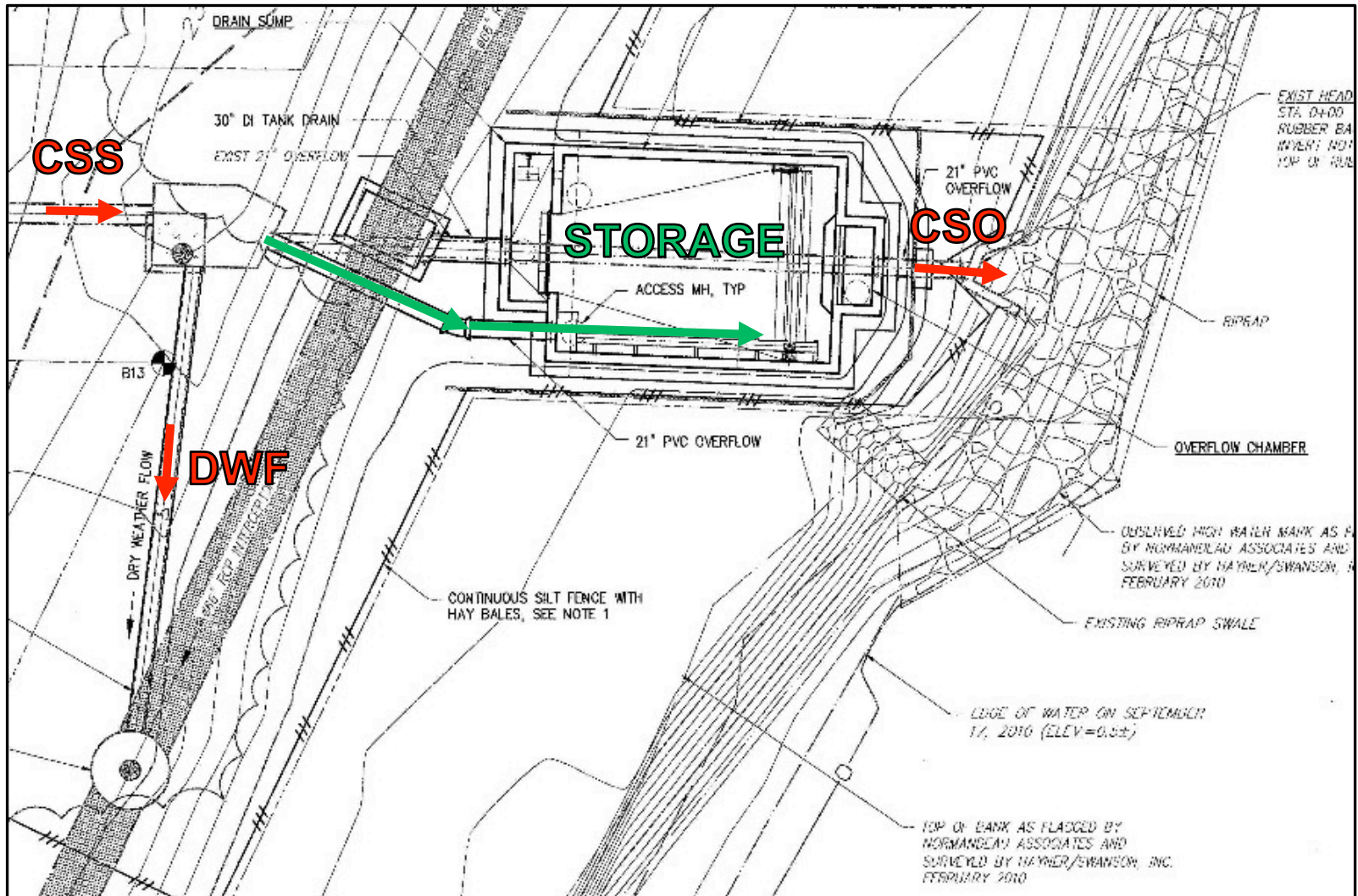
# CSO-004 Area Improvements

- CSO-004 Storage Tank
- Burke Street Improvements – 2 Stage Project
- Stage 1
  - Interceptor Improvements
  - Drainage and Access Structure Improvements
- Stage 2
  - Service Lateral Improvements
  - Surface Improvements
  - Green Infrastructure





# Flow Path After Tank



# Burke Street Interceptor Improvements

- CIPP Lining of the Interceptor
  - Approximately 3500 feet of 100+ year old 24-inch diameter clay combined sewer lined
- Why lining?
  - Deep, old interceptor piping
  - Significant utility conflicts
  - Busy road – Commercial vehicles, trucks and school buses



# Drainage and Access Structure Improvements

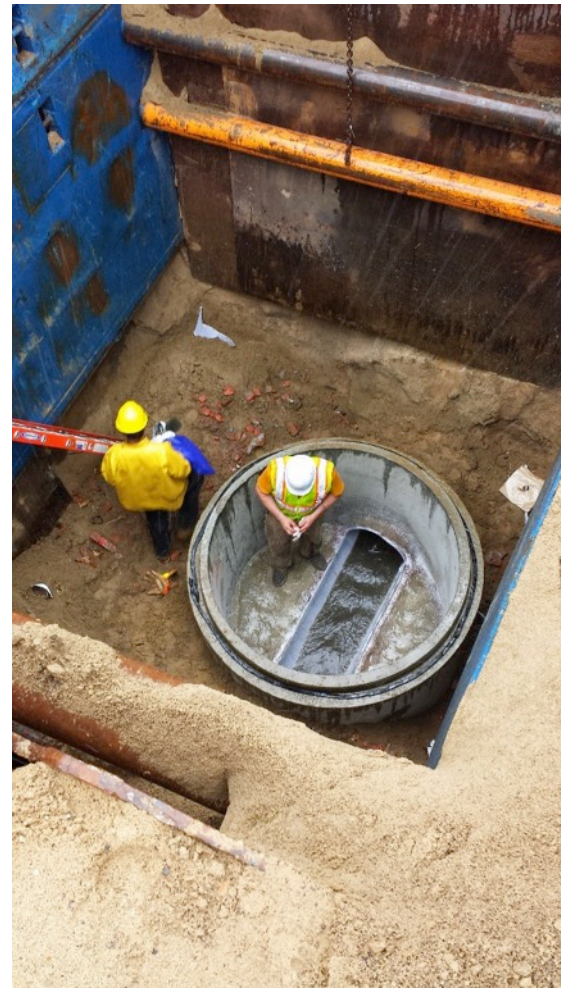
- Existing “Maholes”
  - Brick manholes with triangular covers
- Install additional manholes on exist. interceptor
- Significant stretches with no access to interceptor





# Drainage and Access Structure Improvements

- New doghouse manhole installation





# Drainage and Access Structure Improvements

- Line some catch basins, replace others
  - Brick and concrete catch basins in various states of disrepair
- Install hoods on all existing catch basins, replace grates



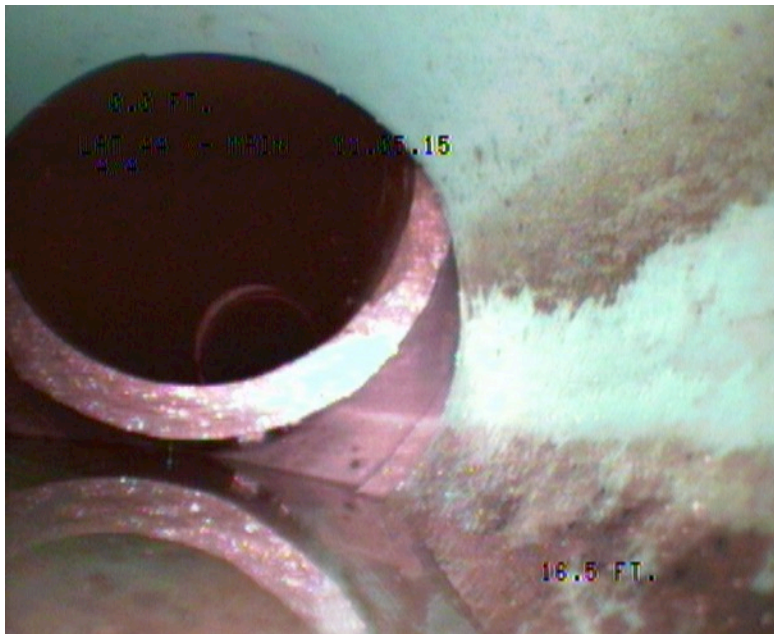
# Service Lateral Improvements

- Many service laterals were as old as the clay interceptor (100+ years)
- Significant issues with lateral collapses and sinkholes
- Significant root issues



# Service Lateral Improvements

- Service laterals are chimney connections, generally 6-inch diameter clay
- CCTV Lateral inspection
  - Significant joint offsets
  - Many laterals had wyes with one or both connections capped
  - CCTV inspection of laterals was incomplete





# Service Lateral Improvements

- Categorizing Lateral Rehabilitation Methods
- Filling in the blanks
- Working with the client to determine extent of rehab

Nashua Laterals Review Recommendations

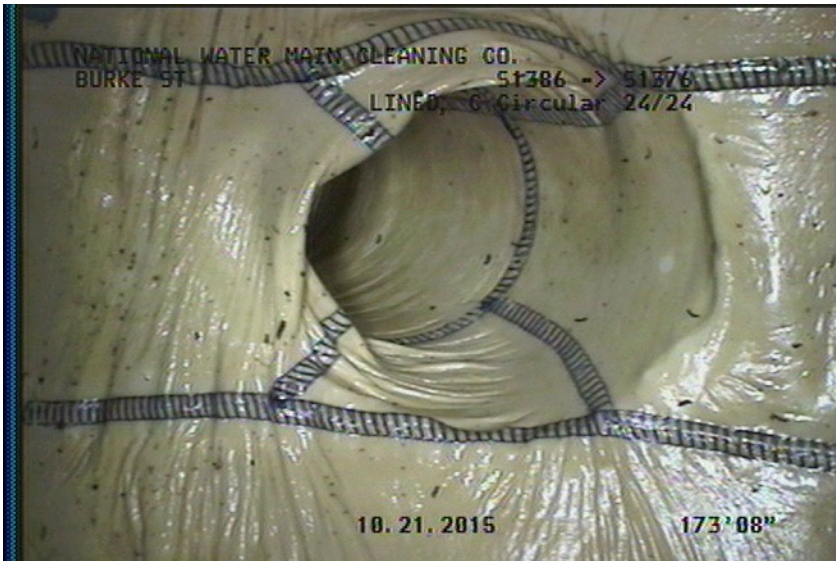
Updated: 10/31/2014

Mainline	Lateral No.	Street Address	Year of Inst.	Tap Dist. (ft)	Type	U/S Access Point	D/S Access Point	Length Surveyed (ft)	Dia (in)	Material	Depth of Main (ft)	Recommendation	Cleanout Recommended?	Permit Available?	Lateral End	Notes
MHS 1226 - MHS 1224	1	164	unk	42.8	Saddle	C/O	M/L	23.0	8	VCP	9	Heavy Cleaning	Yes			Lateral has obstructions and multiple deposit encrustations. Pipe is in sound condition with the exception of a few fine roots at joints. Survey abandoned due to obstruction.
	2	162/164	unk	55	Saddle	C/O	M/L	22.3	8	VCP	10	Heavy Cleaning & GROUTING OF JOINTS	Yes			Multiple offset joints and roots present at every joint. Survey abandoned due to roots.
	3	unk	unk	188	unk	unk	unk	unk	unk	unk	14					
MHS 1225 - MHS 1226	4	160	unk	37.2	Saddle	C/O	M/L	0.0	4	VCP	17					Intruding 4" tap not surveyed.
	5	Yard Structure?	unk	41.8	Factory	C/O	M/L	4.9	6	VCP	18	Liner	Yes			Spiral fracture in lateral. Lining 5 feet upto Wye junction recommended.
	6	Parking Lot (160 Burke)	unk	86.3	Factory	C/O	M/L	3.2	6	VCP	17	No Action Required				
	7	Parking Lot (150 Burke)	1992	194	Factory	C/O	M/L	6.5	6	PVC	18	No Action Required				
MHS 1236 - MHS 1225	8	Catch Basin	unk	21.3	Saddle	C/O	M/L	20.6	6	VCP/PVC	19	Connection Liner	Yes			Cracks and fractures around connection and in lateral pipe. Survey abandoned due to obstruction in pipe
	9	Capped	unk	29.3	Factory	C/O	M/L	6.4	6	VCP		No Action Required				Capped
	10	118-120	1924	69.2	Factory	C/O	M/L	0.0	6	Akron	21	Heavy Cleaning & Liner	Yes			Lateral could not be surveyed due to the presence of large root ball in lateral
	11	118-120	1924	114	Factory	C/O	M/L	15.6	6	Akron	23	Dig & Replace	Yes			Large joint offsets and missing sections in lateral pipe. Survey abandoned due to offset joint.
	12	114-116	unk	185	Factory	C/O	M/L	14.7	6	VCP	24.5	Dig & Replace	Yes			Broken connection to mainline
MHS 1208 - MHS 1235	13	114-116	unk	250	Factory	C/O	M/L	22.9	6	VCP	24.5	No Action Required				
	14	Catch Basin	unk	50.4	Factory	C/O	M/L	23.3	6	VCP/PVC	17	Dig & Replace	Yes			Large pipe offsets and fractures. Survey abandoned due to obstruction in pipe.
	15	78	2011	97.9	Factory	C/O	M/L	60.4	6	PVC	17	No Action Required		Yes		
	16	76	1941	149	Factory	C/O	M/L	69.6	6	Akron	17	Heavy Cleaning & Liner	Yes			Roots and fractures in the pipe. Lining upto transition to 4 inch lateral recommended.
	17	Capped	unk	199	Factory	C/O	M/L	5.2	6	VCP	17	No Action Required				Capped
	18	74	unk	245	Break-In/Hammer	C/O	M/L	0.0	6	Akron	17					Recessed tap not surveyed
	19	112	unk	44.6	Factory	C/O	M/L	0.0	6	VCP	24	Heavy Cleaning	Yes			Lateral needs to be inspected further before recommendation
20	110	1906	97.2	Factory	C/O	M/L	0.0	6	Akron	22	Dig & Replace	Yes			Large Joint offset at connection	
21	108	1978	155	Factory	C/O	M/L	4.7	4	Transite	20.5	Dig & Replace	Yes			Large joint offset in pipe	
22	106	1906	208	Factory	C/O	M/L	19.4	4	VCP		No Action Required				Lateral replaced under phase 1 of the Burke Street contract.	
23	Catch Basin	unk	252	Factory	C/O	M/L	0.0	4	VCP	19	Dig & Replace	Yes			Broken connection to mainline	
24	104	1984	291	Break-In/Hammer	C/O	M/L	11.0	6	PVC	19	Structural Grout - Connection	Yes				Pipe around connection fractured



# Service Lateral Improvements

- CIPP Lining of Service Laterals
  - Many laterals had poor connections, cracking, or small joint separation
  - Lining means no excavation!
- Removal and Replacement of Service Laterals
  - Some laterals were in a condition not conducive to lining



# Service Lateral Improvements

- Project Delivery
  - Maintain bid items in the contract to account for unknown conditions and additional lining and/or replacement
  - Require contractor to undertake inspection of any laterals for which information was not available prior to design
  - Require post inspection and testing of all lateral liners
  - **When in doubt, be conservative**



# Drainage Structure Lining

- Line existing “Maholes”
  - Brick manholes with triangular covers (all covers replaced)
- Line or Replace Existing Catch Basins
  - Install CB hoods
  - New cast iron CB grates





# Surface Improvements

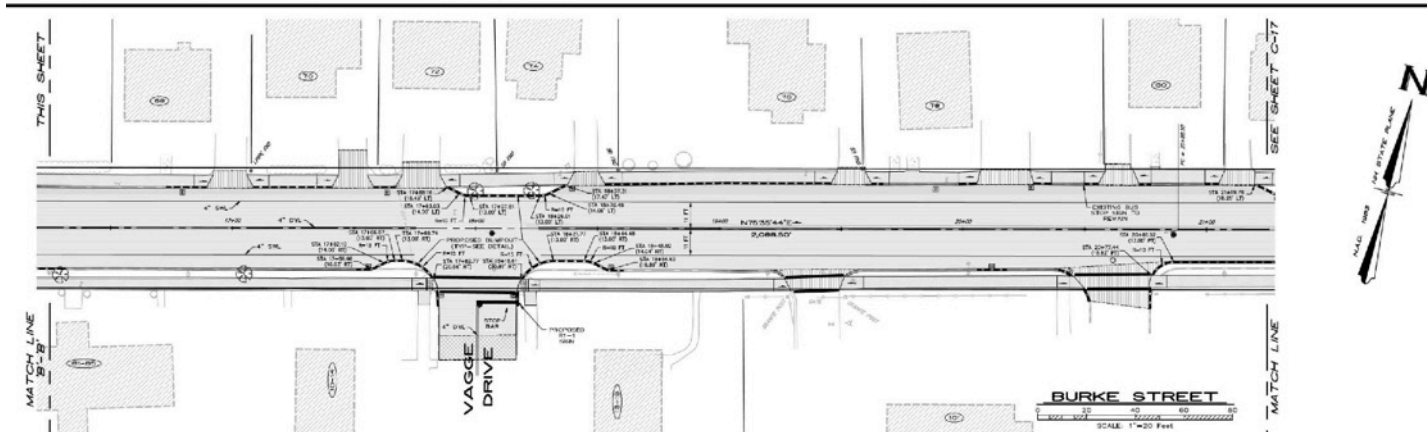
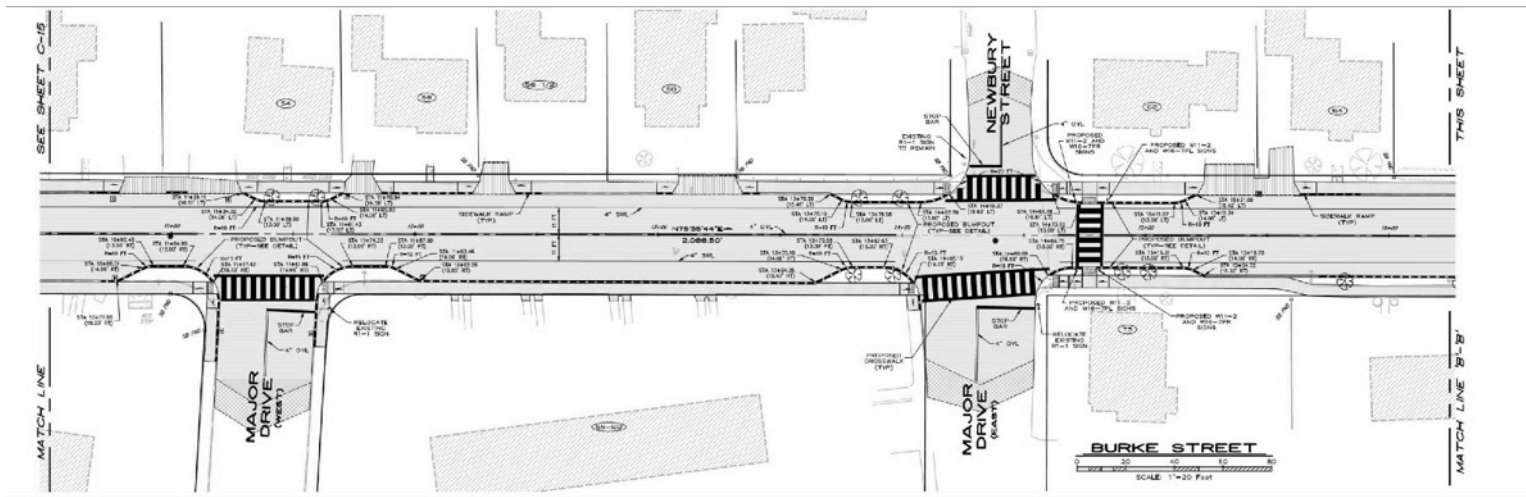
- New Paving
- Paving Challenges
  - No discernable subbase
  - Iron slag present below paving
  - Existing pavement depth varied from 5-10 inches
  - Grind and overlay was not feasible
  - Additional subbase would cause issues with grading and drainage
- Full depth removal, shimming and repaving





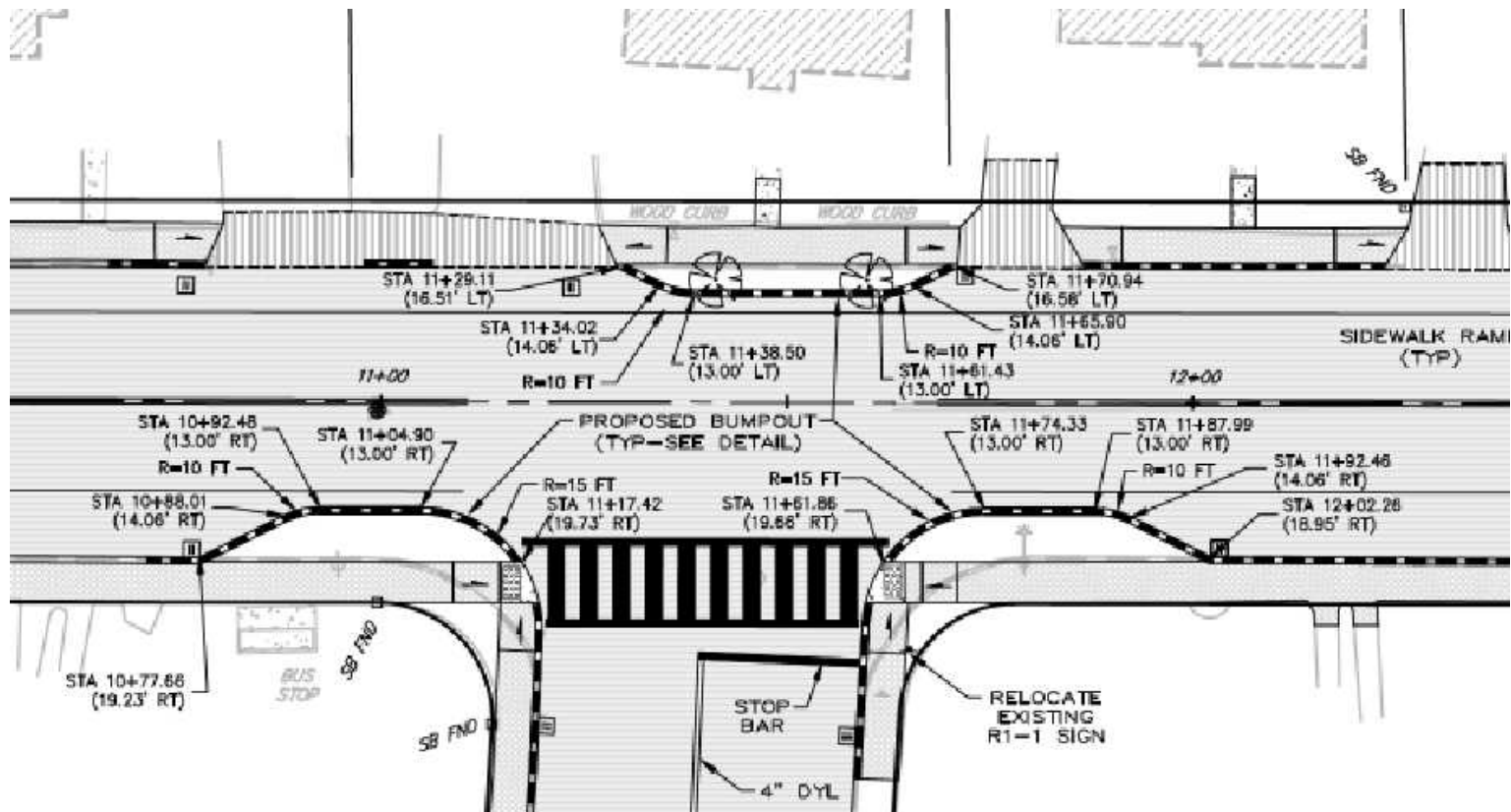
# Surface Improvements

- Focused on pedestrian friendliness and traffic calming



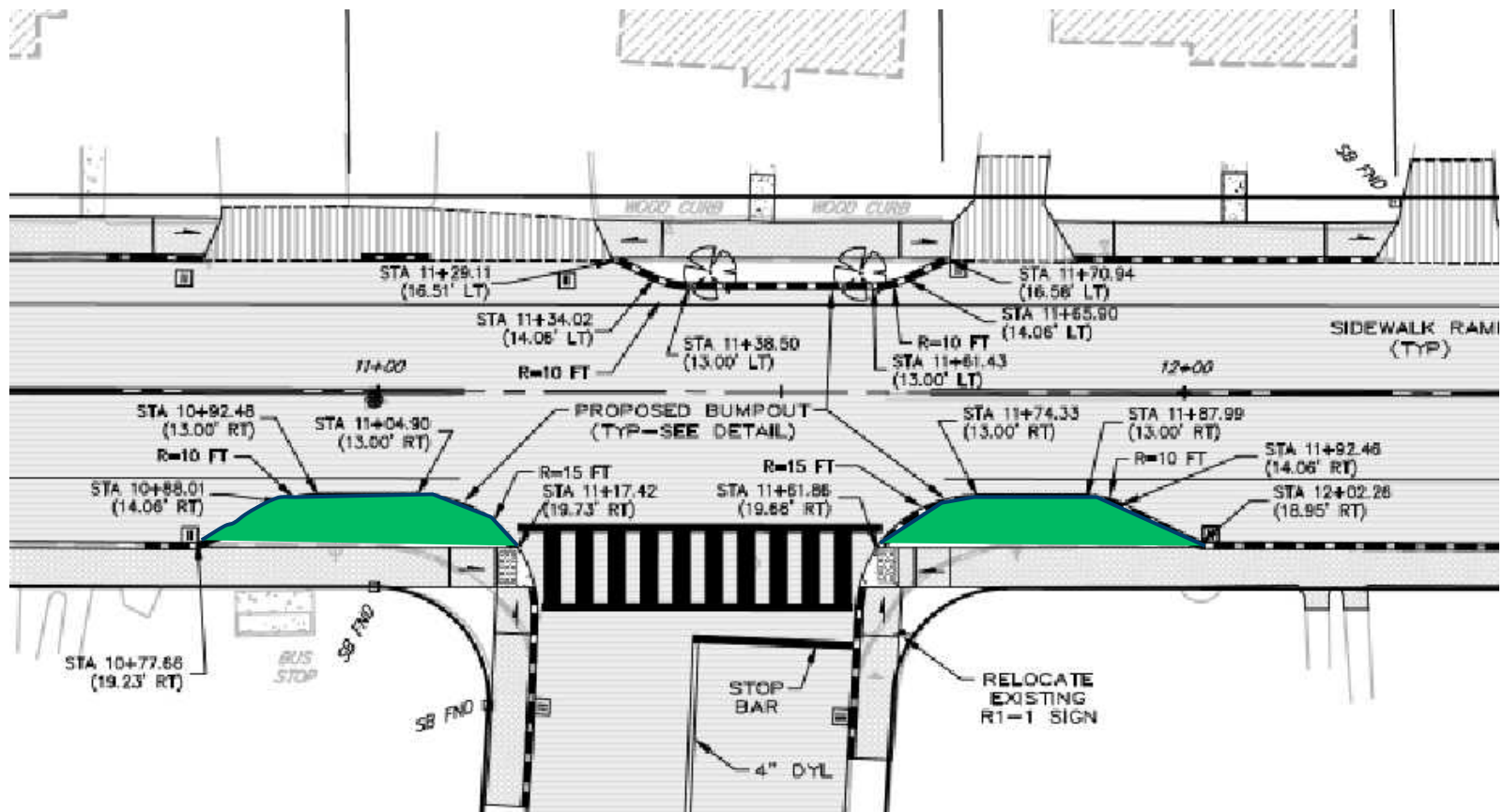
# Surface Improvements

- Bump outs for traffic calming and at crosswalks
- New drainage pattern, relocated and additional catch basins



# Green Infrastructure

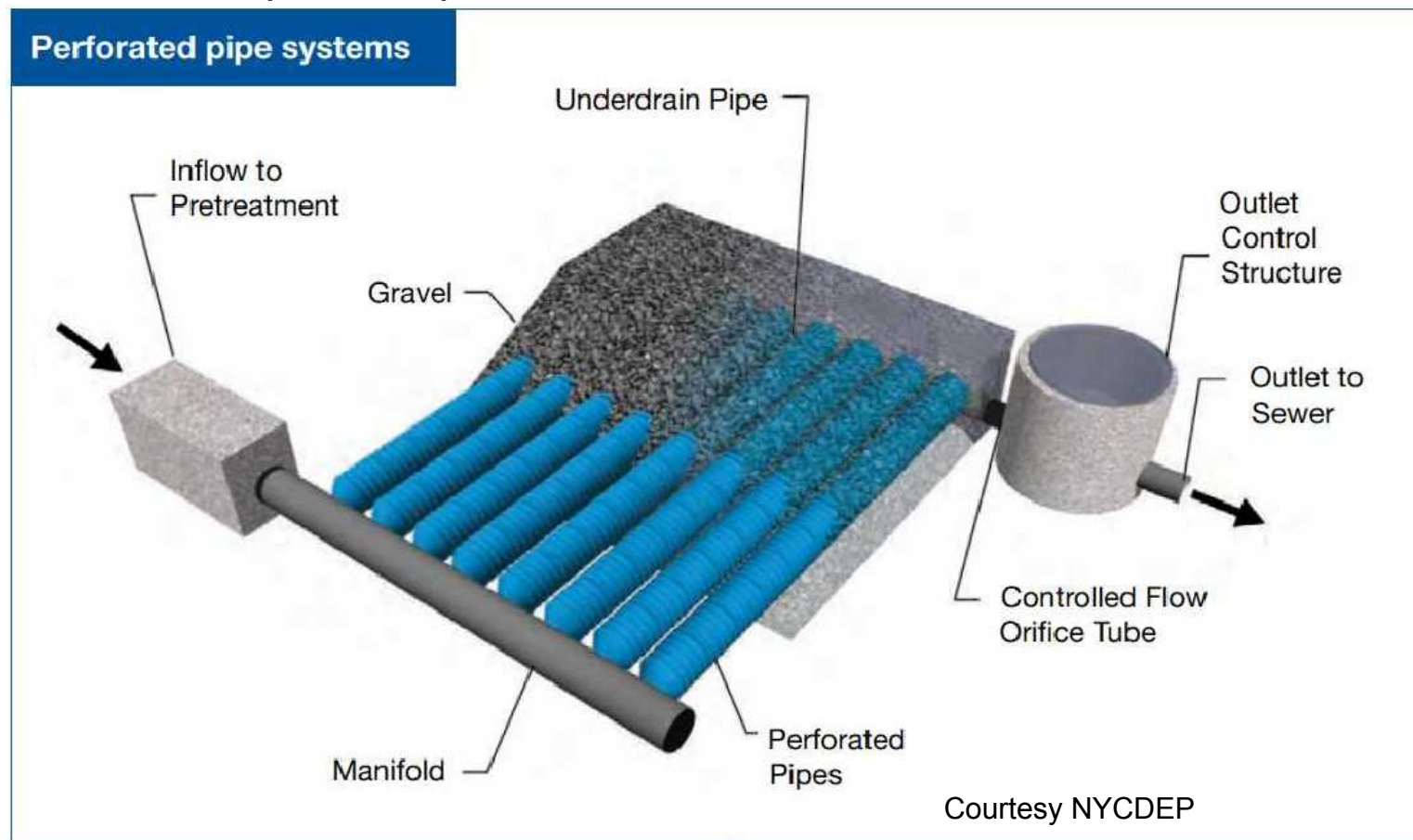
- Green infrastructure opportunity presented itself due to surface modification
  - Bump outs for traffic calming and crosswalks





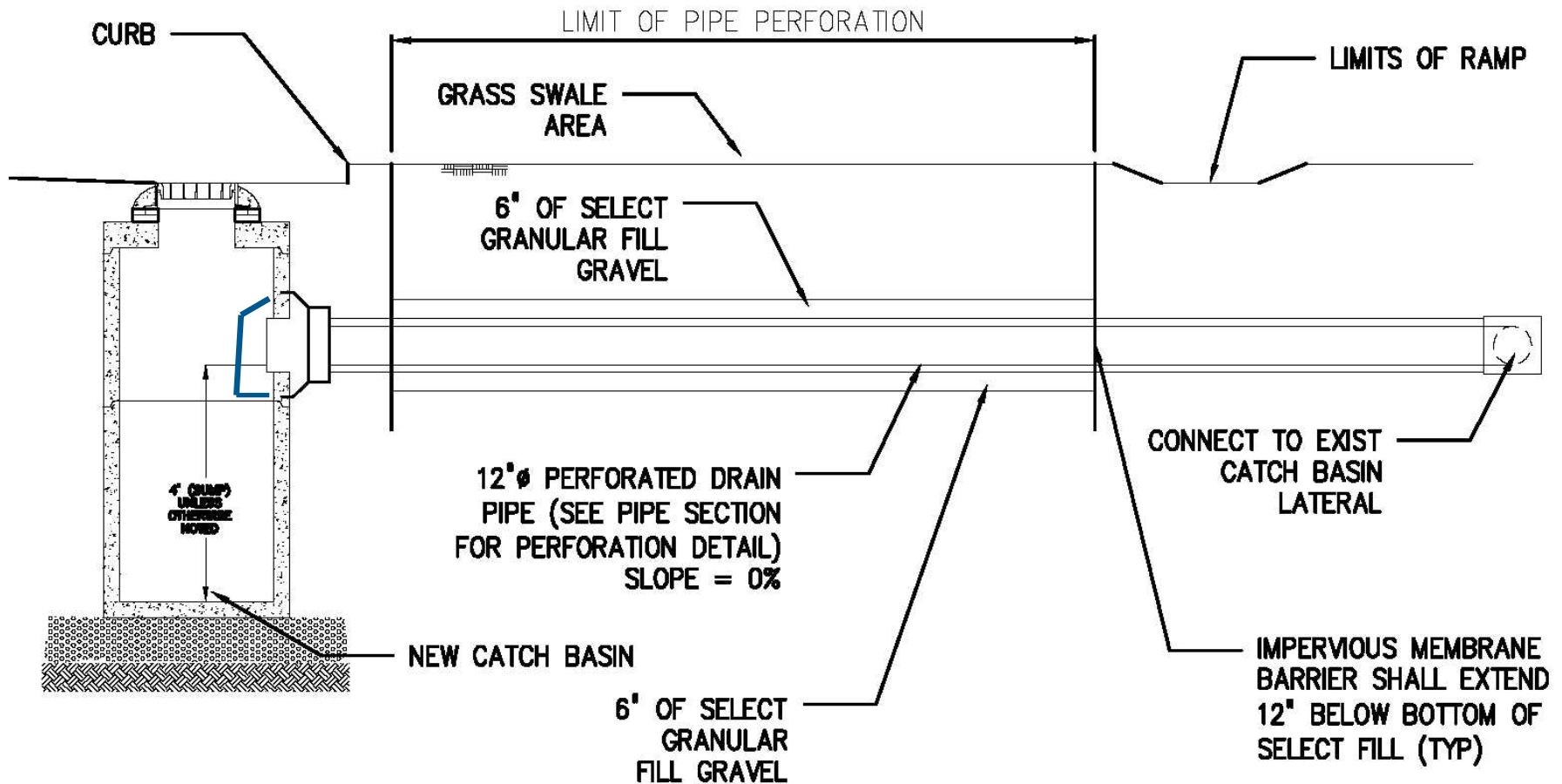
# Green Infrastructure

- Modified infiltration bed design
  - Smaller footprint than traditional infiltration beds
  - Limited space for pretreatment



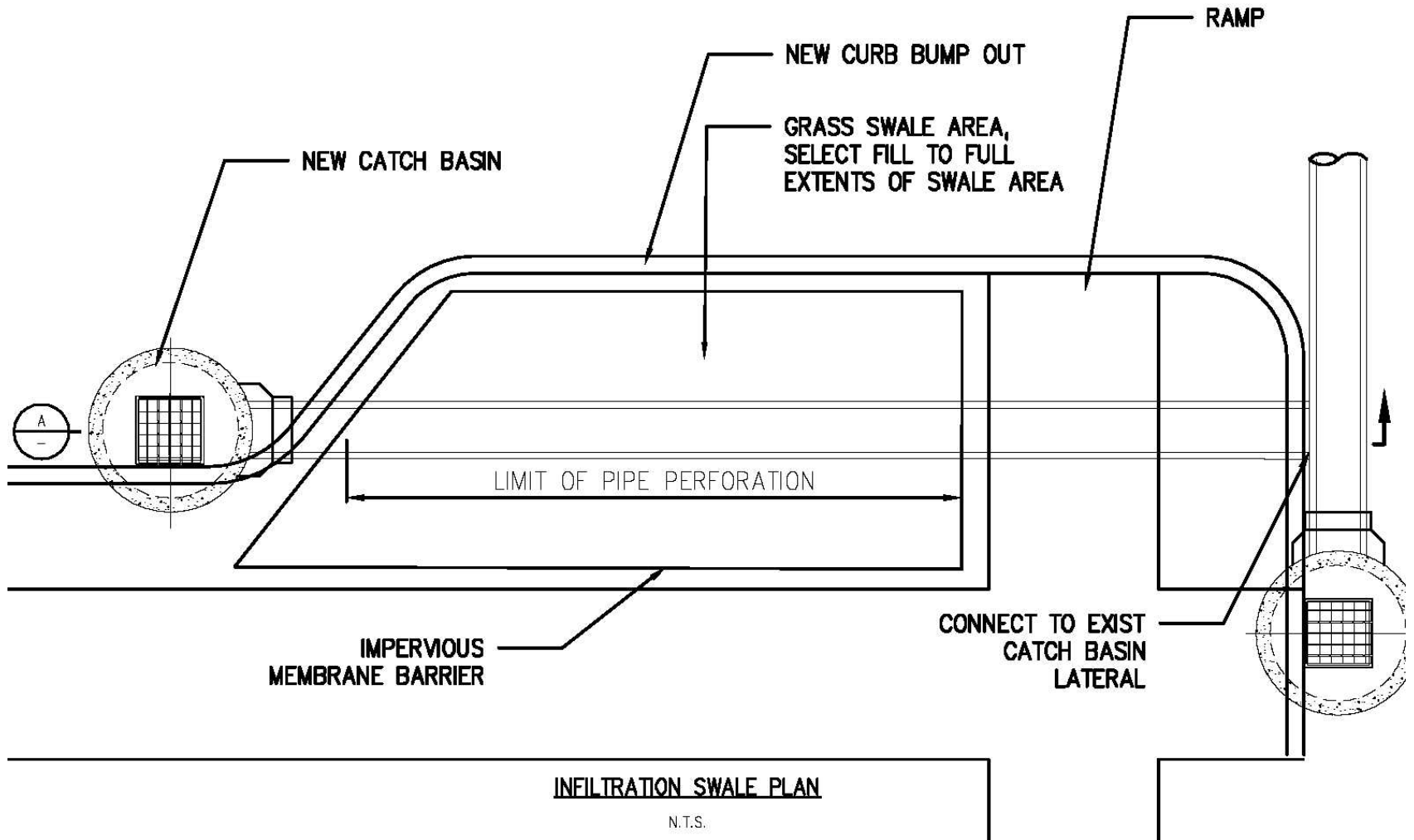
# Green Infrastructure

- Modified infiltration bed design



# Green Infrastructure

- Modified infiltration bed design





# Green Infrastructure

- Public Input
  - The public was sensitive to lost parking
  - Without loss of parking green spaces disappeared, including bump outs
  - Infiltration below city streets, instead of in green areas



# Green Infrastructure

- Modified infiltration bed design





# Green Infrastructure

- Modified infiltration bed design





# Green Infrastructure

- Modified infiltration bed design



# Green Infrastructure

- Green strip infiltration



# Results

- Results of work completed to date
  - CSOs reduced as a result of construction of the new CSO-004 Storage Tank
  - Restriction in Burke Street interceptor completely removed, structural integrity restored to interceptor pipe
  - Water infiltration into pipe joints and lateral connection points reduced or eliminated
- Expected results for Phase 2 Work
  - Elimination of sinkhole issues due to collapsing/damaged service lateral connections
  - Peak shaving of wet weather events by infiltration basins
  - Elimination of post storm puddling
  - A more pedestrian friendly Burke Street – Vetoed by the public
  - Surface Improvements
- Expected completion – June 2017



# Acknowledgements

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Joe Mendola, P.E. (City of Nashua)

Dan Dudley, (NHDES)

Matthew Jones, P.E. (Hazen and Sawyer)



# Hazen

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