



DEVELOPING A STORM PIPE REHABILITATION PROGRAM: S-038

June 1, 2020



BEFORE S-038: REACTING TO DAMAGED STORM PIPES

Failing storm pipes



Road sinkhole, flooding, structural damage



Emergency repair = immediate resources

(road closures + traffic control + repair costs)

= \$\$\$



May 2017 sinkhole

\$46,000 to repair

Hours and hours for storm crew

Caused by catch basin that was never brought to grade and roots in pipe

FROM REACTIVE TO PRO-ACTIVE: CREATING A CONDITION ASSESSMENT PROGRAM

- Established S-038: Storm Conveyance Rehabilitation Program
 - Designed to fund the repair or replacement of aging and/or damaged storm pipes
 - First project in program was the Mile Post Pipe Repair Project, which repaired a severely damaged pipe
 - Select pipes to be evaluated
 - Drainage basins
 - Neighborhood/asset age
 - Pipe material type
 - Combination = weighted scores or matrix
 - Decide what data to collect by CCTV and how
 - Pipe size, slope, material
 - Video type (traditional or duck camera)
 - Rating system
 - CCTV review + NASSCO/PACP scores
 - Develop a Criticality Score matrix to help prioritize data
 - Compare data
 - Funding!
- Repair “buckets”



CONDITION ASSESSMENT OVERVIEW

Select Pipes

- City selected aging concrete pipes based on maintenance concerns
- Donegal, Newport Woods, Windtree, Evergreen Terrace pipes

Video Pipes

- Video (called CCTV) selected pipes and assign a score for each pipe based on defects

Data Review

- City's engineering consultant, Osborn Consulting Inc. (OCI) reviewed data and videos of pipes with the most structural defects.
- Developed a Criticality Score matrix
- Add the Structural Score + Criticality Score = Total Pipe Score
- Placed and assign each pipe to a repair or monitoring "bucket" based on Total Pipe Score
- Determine repair type

Pipe Repairs

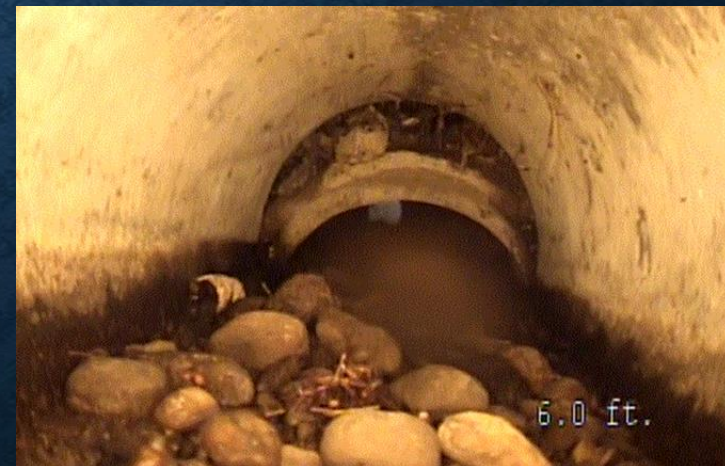
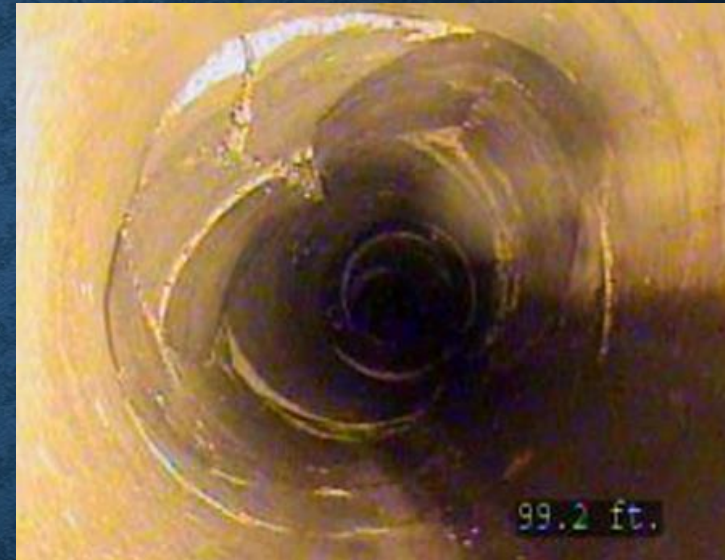
- Bundle repairs by type for contract work
- Tier 1 Open Cut Full and Tier 1 Open Cut Spot planned for Fall 2020
- Tier 1 Trenchless repairs planned for 2021

PRELIMINARY RESULTS

- 288 pipes were selected for the initial Condition Assessment
 - 61 pipes need additional CCTV follow up
 - 229 were CCTVed = approximately 4 miles of pipe!
 - 125 pipes had a Quick Structural Rating (QSR) of <3000. This means that they had little to no defects and can automatically be placed in the Routine Monitoring bucket (10-20 year cycle to CCTV again)
 - 104 pipes had a QSR of >3000. These pipes were selected to be reviewed by OCI.

CONDITION SCORES

- Based on NASSCO standards
- Structural defects
- Revised the Condition Score if needed based on video review (NASSCO standards for water/sewer, and often is adjusted for storm).
- 0 is Good, 5 is Poor

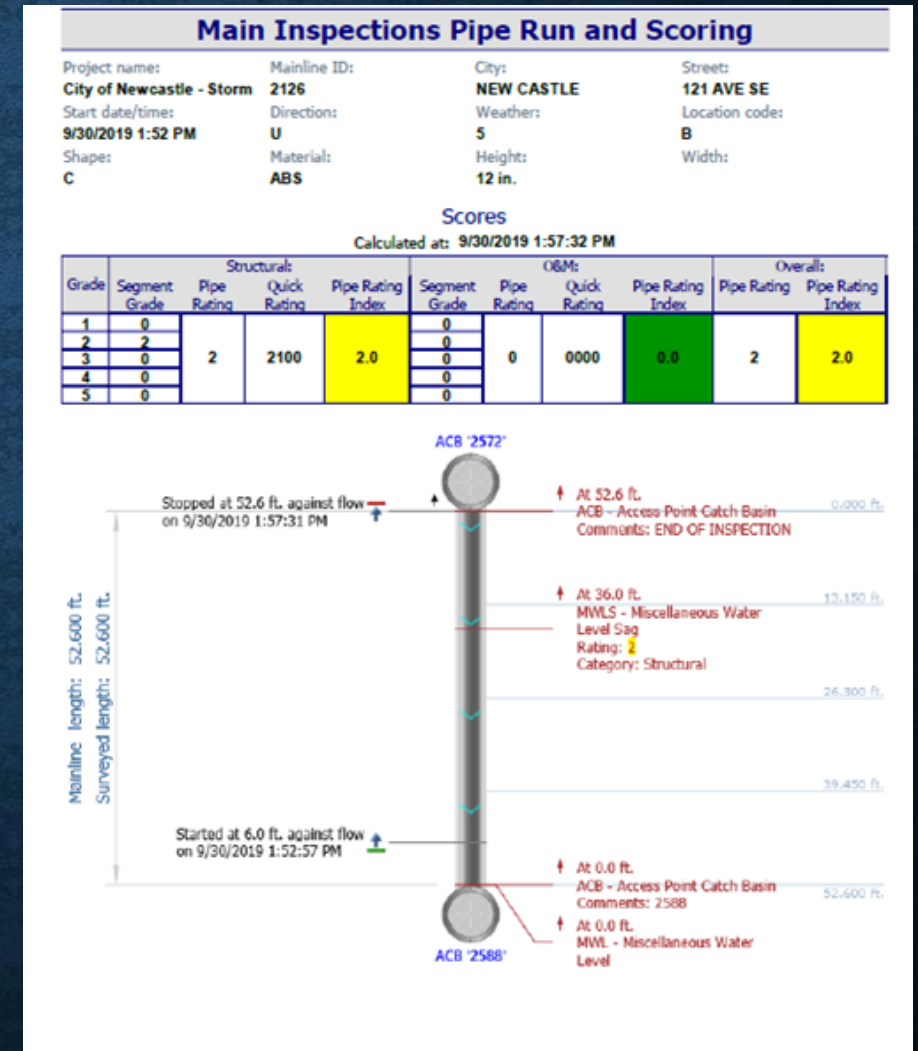


OCI DATA REVIEW

Some highlights of the work that was completed:

- Reviewed each pipe that had a Structural score of 3 or more
 - Video(s) review
 - Report review
- Stitched videos and data together when applicable
- Highlighted incomplete videos, list of GIS updates, etc.

Now we've looked at the data – how do we prioritize the repair work?



DEVELOPING A CRITICALITY MATRIX

- When the City has numerous pipe defects, it is important to have a consistent approach to prioritize which pipes are repaired first.
- The City worked with OCI to develop a Criticality Score Matrix.
 - Each item in the matrix is assigned a point value.
 - Each pipe is evaluated using the matrix and assigned a **Criticality Score**
 - Scores range from 0 to 5.
 - The higher the score, the higher the priority.

CRITICALITY SCORE MATRIX

Criticality Score	
Factor	Point Value
Snow Route 1 (Lifeline roads)	2
Snow Route 2 (Priority roads)	1
Snow Route 3, 4, 5	0
Under pavement	1
Diameter >12"	1
Slope >15%	1
Within 5' of buffer of a Critical Area Tract	
Stream flow	
Within 20' of a Critical Infrastructure Parcel (as mapped and defined by the City in 4/2020)	
Total	0-5

CONDITION SCORE + CRITICALITY SCORE

- At this point, each pipe has a Condition Score AND a Criticality Score
- Next, we utilized the matrix below to determine the priority for each pipe rehabilitation:
 - Tier 1 (first-priority) rehabilitation
 - Tier 2 (second-priority)
 - Regular monitoring

		Criticality score				
		1	2	3	4	5
Condition score	5	First-priority rehabilitation or maintenance program				
	4	Second-priority rehabilitation or maintenance program			First-priority rehabilitation or maintenance program	
	3	Regular monitoring				
	2	Regular monitoring				
	1	Regular monitoring				

Figure 1. Pipe risk management matrix

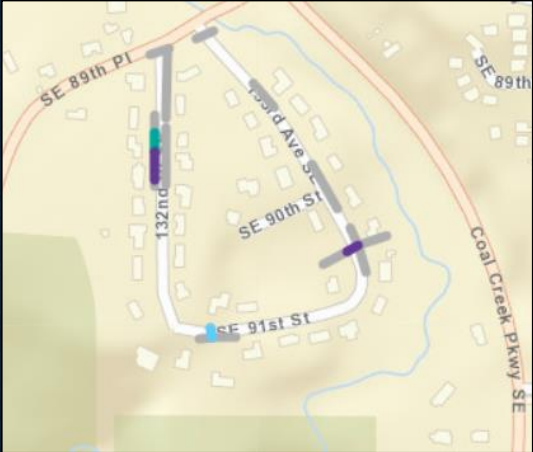
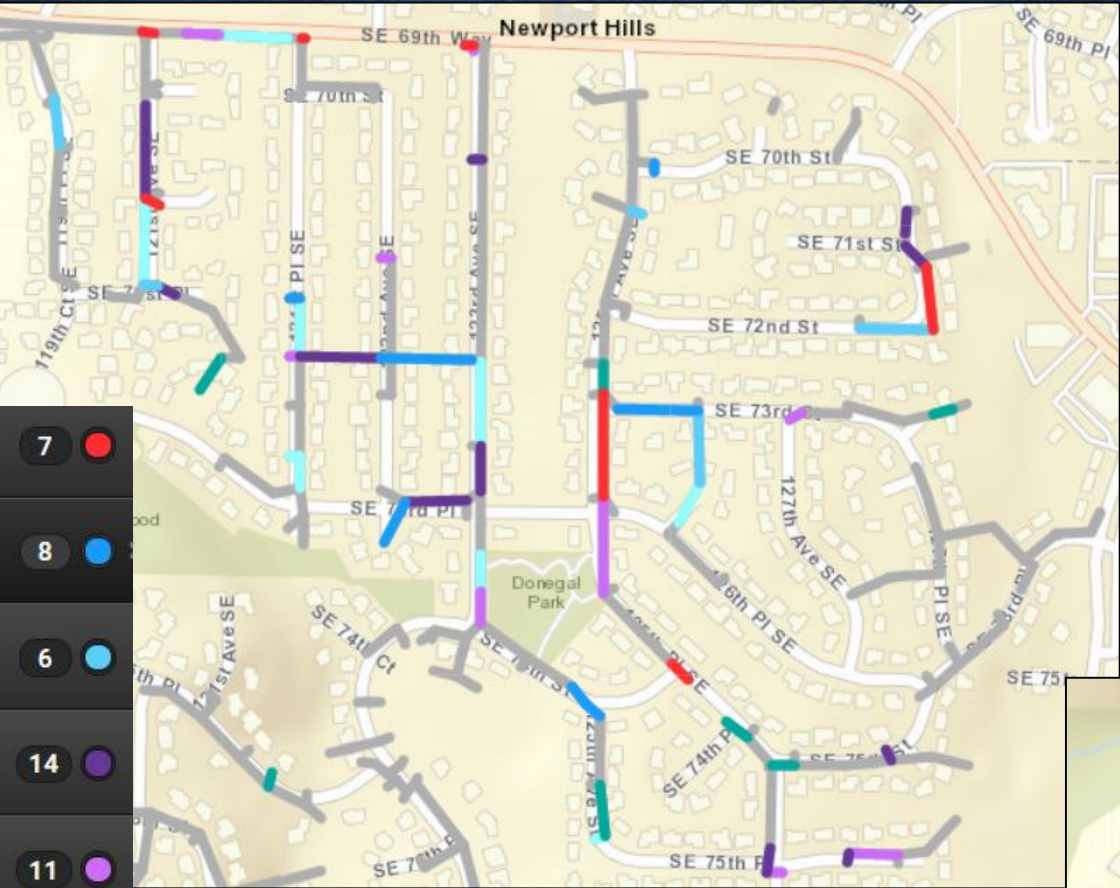
PIPE REHAB BUCKETS

Tier	Bucket Type	Description	CIP/City Crews
1	Open Cut Spot Priority	<10' of repair	Either
	Open Cut Full Priority	Full Pipe	CIP
	Trenchless Spot Priority	Pipe Patch	City Crews
	Trenchless Full Priority	CIPP	CIP
	Jetting		
2	Open Cut Spot 2 nd Tier	<10' of repair	Either
	Trenchless Spot 2 nd Tier	Pipe Patch	City Crews
	Trenchless Full 2 nd Tier	CIPP	CIP
	Jetting		Contractor
	Regular Monitoring		Consultant/Contractor

PRELIMINARY RESULTS

Tier	Bucket Type	Description	CIP/City Crews	# Pipes (total)
1	Open Cut Spot Priority	<10' of repair	CIP	8
	Open Cut Full Priority	Full Pipe	CIP	7
	Trenchless Spot Priority	Pipe Patch	City staff	11
	Trenchless Full Priority	CIPP	CIP	14
	Jetting	Clean pipes	City contractor	1
2	Open Cut Spot 2 nd Tier	<10' of repair	Either	6
	Trenchless Spot 2 nd Tier	Pipe Patch	City staff	12
	Trenchless Full 2 nd Tier	CIPP	CIP	11
	Jetting	Clean pipes	City contractor	3
	Regular Monitoring	20-year cycle	Consultant/City	24
	Uninspected – needs GIS follow up		City staff	3
	Utility Connection	Bore	Utility/City Inspect	5

MAPS OF TIER 1 & TIER 2 WORK



- ✓ Storm Pipe Tier 1 Open Cut Full Repla... 7 ●
- ✓ Storm Pipe Tier 1 Open Cut Spot Repair 8 ●
- ✓ Storm Pipe Tier 2 Open Cut Spot Repair 6 ●
- ✓ Storm Pipe Tier 1 Trenchless Full (CI... 14 ●
- ✓ Storm Pipe Tier 2 Trenchless Full (CI... 11 ●
- ✓ Storm Pipe Tier 1 Trenchless Spot (Pi... 11 ●
- ✓ Storm Pipe Tier 2 Trenchless Spot (Pi... 12 ●

NEXT STEPS

- Continue Condition Assessment for Storm Pipes that meet criteria
- Begin Tier 1 pipe rehabilitation efforts
- Plan for Tier 2 pipe rehabilitation efforts



Surface Water Management Division

Public Works Department