

Water Main Recapitalization

Background

The City owns and operates a water and sewer utility that serves 7909 customers, or an estimated population of 25,000. Much of the infrastructure was built by Levitt between 1962 and 1970. At that time, unlined cast iron piping was commonly used for water distribution mains. Unlined cast iron pipe suffers from a corrosive action called tuberculation.

Tuberculation in the pipes results in small iron deposits which can be carried into the water when turbulence occurs. This results in discolored reach customers. While there is no known health risk, the discolored water is an undesired nuisance and unacceptable from a water quality perspective.



Hydrant Flushing, City of Bowie

High velocity flow created turbulence which lifted small iron particulates into suspension.

The tuberculation also affect water flow as it reduces the pipe size and create higher friction on the pipe surfaces.

Tuberculated pipes affect flow rates and cause pressure loss.



Pipe diameter is reduced.

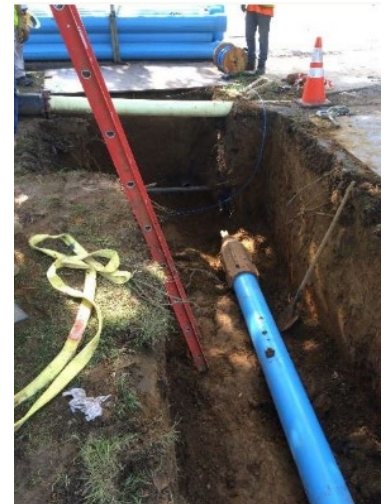
Tuberculation increases the friction in the pipe.

A presentation to City Council was made in December 2016. For more details, review that presentation at this link: [December 2016 Presentation to Council](#).

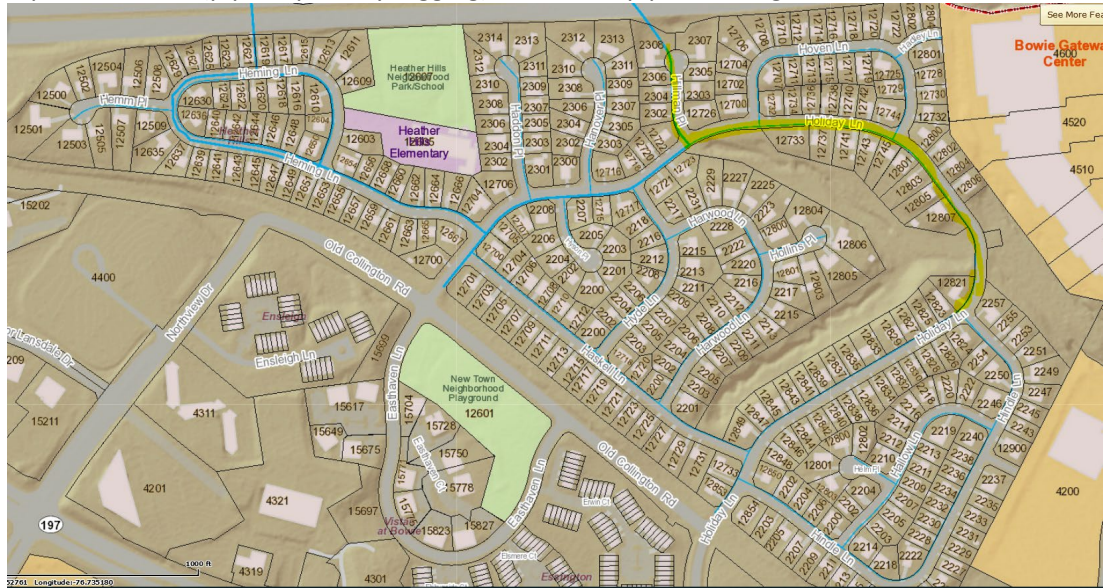
Project Scope

This project will replace approximately 7 miles of distribution system piping over a 10 year period. The first two phases were smaller projects directed at two areas with known water flow problems.

Lianna Place to Longridge: 0.2 miles of pipe was replaced using a method known as pipe bursting. This process pulls a new pipe through existing pipe. A mole is pulled ahead of the new pipe which burst the old pipe in place and creates space large enough for the new pipe. By completing the project with pipe bursting, impacts to streets, trees and wetlands were avoided. This project was recognized with an Award of Excellence by the American Council of Engineering Companies, Maryland.



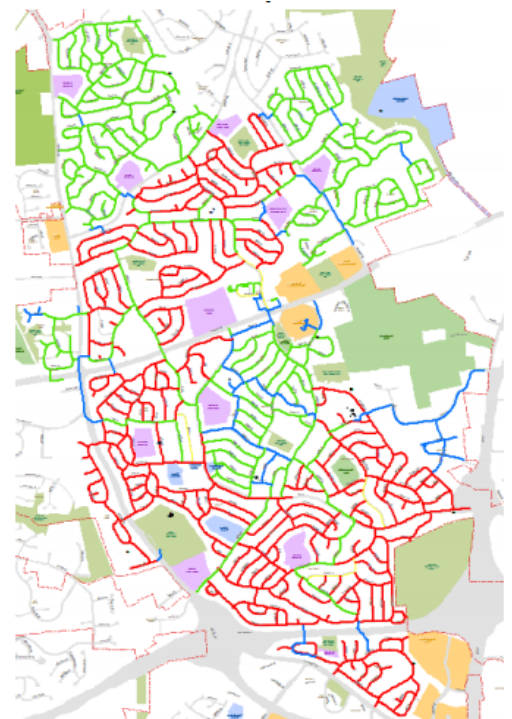
Heather Hills: After completion of a hydraulic analysis, 0.4 miles of piping has been identified to be replaced along Hillman Place and a large section of Holiday Lane. This project includes some 'open cut' work (pipe expose by digging), and some pipe bursting as described above.



Phases 1-3: It is not possible to validate pipe condition without digging it up. However, based on investigations to date, there are many miles of piping that is suffering from the tuberculation corrosion. The scope of these three future phases is to replace piping determined to be the most problematic based on continued assessments and hydraulic modeling. These phases will aim to replace approximately 7 miles of pipe in order to improve water quality and flow. Phase 1 has been identified to replace all remaining piping in Heather Hills section.

Long Term Planning: While this project focuses on replacing seven miles of deteriorated pipe, it is highly likely that additional water main replacements will be needed. The diagram here shows the assumed pipe conditions based on extrapolating findings from limited testing and assessments to 'like pipes'.

Unfortunately, all water distribution infrastructure eventually requires replacement. These future replacement needs will be evaluated and recommended to ensure the water distribution system is able to continue to service the Bowie water and sewer customers.



Assumed pipe conditions. Red (42 miles) = poor; green = good; blue=unknown.

Total Project Cost

In order to complete this project, a loan will be required. So the total project cost includes both design and construction costs and the cost of the interest costs on the loan.

- Design and construction costs \$12,024,000
 - Cost of Debt (Interest) \$1,721,580
- Total Project Cost 13,745,580

The current project schedule, as presented in the 2020-2025 Capital Improvement Program, carries out the work in phases as shown in the below table:

Task	Miles Replaced (estimated)	2019	2020	2021	2022	2023	2024	2025	2026	2027
Replace Liana Place Water Main (0.2 miles)	0.2									
Design Fee, Heather Hills Water Main		\$5,000								
Construction Heather Hills Water Main (0.4 miles)	0.4		\$870,000							
Phase 1 Design			\$250,000							
Phase 1 Construction (est 2.5 miles)	2.5			\$3,400,000	-->	-->				
Phase 2 Design						\$265,000				
Phase 2 Construction (est 2.5 miles)	2.5						\$3,600,000	-->	-->	
Phase 3 Design									\$300,000	
Phase 3 Construction (est 2.5 miles)	2.2									\$3,300,000
Totals	7.8	\$5,000	\$1,120,000	\$3,400,000	\$0	\$265,000	\$3,600,000	\$0	\$300,000	\$3,300,000

The project, including loan costs, is being funded by the recap fee added to each customer's quarterly bill at \$22.75. The below table shows revenues from this fee and expenses (project costs and loan fees).

Recapitalization Plan

City of Bowie
Recapitalization Plan - Revenue & Expenditure Projection
FY2018 - FY 2040

Year	Beg. Balance	Inflows		Outflows		Ending Balance
		Revenues	Loan	Pipe Replacement	Debt Service	
2018	\$ -	\$ 715,527.00	\$ -	\$ -	\$ -	\$ 715,527.00
2019	715,527.00	719,836.55	-	5,000.00	-	1,430,363.55
2020	1,430,363.55	719,836.55	-	1,120,000.00	-	1,030,200.10
2021	1,030,200.10	719,836.55	4,950,000.00	3,400,000.00	336,079.00	2,963,957.65
2022	2,963,957.65	971,197.55	-	-	336,079.00	3,599,076.20
2023	3,599,076.20	992,792.65	-	265,000.00	336,079.00	3,990,789.85
2024	3,990,789.85	992,792.65	-	3,600,000.00	336,079.00	1,047,503.50
2025	1,047,503.50	992,792.65	-	-	336,079.00	1,704,217.15
2026	1,704,217.15	992,792.65	-	300,000.00	336,079.00	2,060,930.80
2027	2,060,930.80	992,792.65	-	3,300,000.00	336,079.00	(582,355.55)
2028	(582,355.55)	992,792.65	-	-	336,079.00	74,358.10
2029	74,358.10	992,792.65	-	-	336,079.00	731,071.75
2030	731,071.75	992,792.65	-	-	336,079.00	1,387,785.40
2031	1,387,785.40	992,792.65	-	-	336,079.00	2,044,499.05
2032	2,044,499.05	992,792.65	-	-	336,079.00	2,701,212.70
2033	2,701,212.70	992,792.65	-	-	336,079.00	3,357,926.35
2034	3,357,926.35	992,792.65	-	-	336,079.00	4,014,640.00
2035	4,014,640.00	992,792.65	-	-	336,079.00	4,671,353.65
2036	4,671,353.65	992,792.65	-	-	336,079.00	5,328,067.30
2037	5,328,067.30	992,792.65	-	-	336,079.00	5,984,780.95
2038	5,984,780.95	992,792.65	-	-	336,079.00	6,641,494.60
2039	6,641,494.60	992,792.65	-	-	336,079.00	7,298,208.25
2040	7,298,208.25	992,792.65	-	-	336,079.00	7,954,921.90
Totals		\$ 21,716,501.90	\$ 4,950,000.00	\$ 11,990,000.00	\$ 6,721,580.00	

Notes: The Loan has the following assumptions:
Loan Fees of \$50,000
3 percent interest rate
20 year loan repayment schedule

Growth (Inflation Rate) of Required Cost - 2.2% Annually

Cost Requirement:

Pipe Replacement \$ 11,990,000.00
Cost of Debt (Interest) \$ 1,721,580.00

Total Cost Required \$ 13,711,580.00

* Program balance would be available for future required recapitalization efforts.

Design Consultant

Preliminary phases (Liana Place and Heather Hills) KCI Engineering
Phase 1: AMT Engineering
Phases 2-3: TBD

Construction Contractor	Liana Place: Midas Construction, Inc Heather Hills (Pipe bursting): Anchor Construction Corporation Phase 1- Heather Hills (CIPP): JF Creamer Phases 2-3: To be determined
Anticipated Construction Date	Liana Place: Completed in 2018 Heather Hills (Pipe bursting): Completed in 2019 Phase 1- Heather Hills (CIPP): March 8, 2021 – December 2022 Phase 2-3: To be determined
Project Manager	Name: Pat Rush Phone: 240-544-5689 email: prush@cityofbowie.org
Last updated: 7/21/2021	